
**INTERNATIONAL COMMISSION
for the
CONSERVATION of ATLANTIC TUNAS**

**R E P O R T
for biennial period, 2014-15
PART II (2015) - Vol. 2
English version **SCRS****

MADRID, SPAIN

2016

INTERNATIONAL COMMISSION FOR THE CONSERVATION OF ATLANTIC TUNAS

CONTRACTING PARTIES

(at 31 December 2015)

Albania, Algeria, Angola, Barbados, Belize, Brazil, Cabo Verde, Canada, China (People's Rep.), Côte d'Ivoire, Curaçao, Egypt, El Salvador, Equatorial Guinea, European Union, France (St. Pierre & Miquelon), Gabon, Ghana, Guatemala, Guinea (Rep.), Honduras, Iceland, Japan, Korea (Rep.), Liberia, Libya, Mauritania, Mexico, Morocco, Namibia, Nicaragua, Nigeria, Norway, Panama, Philippines, Russia, Sao Tomé & Príncipe, 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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(since 17 November 2015)

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S. DEPYPERE, EU
(since 17 November 2015)

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(since 17 November 2015)

Panel No.

PANEL MEMBERSHIP

Chair

| | | |
|--------------------------------------|---|---------------|
| -1- <i>Tropical tunas</i> | Angola, Belize, Brazil, Cabo Verde, Canada, China (People's Rep.), Côte d'Ivoire, Curaçao, El Salvador, Equatorial Guinea, European Union, France (St. Pierre & Miquelon), Gabon, Ghana, Guatemala, Guinea (Rep.), Honduras, Japan, Korea (Rep.), Liberia, 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- <i>Temperate tunas, North</i> | Albania, Algeria, Belize, Brazil, Canada, China (People's Rep.), Egypt, European Union, France (St. Pierre & Miquelon), Guatemala, Iceland, Japan, Korea (Rep.), Libya, Mauritania, Mexico, Morocco, Norway, Panama, St. Vincent and the Grenadines, Syria, Tunisia, Turkey, United States, Venezuela. | Japan |
| -3- <i>Temperate tunas, South</i> | Belize, Brazil, China (People's Rep.), European Union, Japan, Korea (Rep.), Mexico, Namibia, Panama, Philippines, South Africa, Turkey, United States, Uruguay. | South Africa |
| -4- <i>Other species</i> | Algeria, Angola, Belize, Brazil, Canada, China (People's Rep.), Côte d'Ivoire, Egypt, Equatorial Guinea, European Union, France (St. Pierre & Miquelon), Gabon, Guatemala, Guinea (Rep.), Honduras, Japan, Korea (Rep.), Liberia, Mauritania, Mexico, Morocco, Namibia, Nigeria, Norway, Panama, Sao Tome & Principe, Senegal, South Africa, St. Vincent & the Grenadines, Trinidad & Tobago, Tunisia, Turkey, United States, Uruguay, Venezuela. | Brazil |

SUBSIDIARY BODIES OF THE COMMISSION

| | |
|--|--|
| STANDING COMMITTEE ON FINANCE & ADMINISTRATION (STACFAD) | S. LAPOINTE, Canada (since 15 November 2009) |
| STANDING COMMITTEE ON RESEARCH & STATISTICS (SCRS) Sub-Committee on Statistics: G. DÍAZ (United States), Convener Sub-Committee on Ecosystems: K. YOKAWA (Japan), A. HANKE (Canada), Conveners | D. DIE, United States (since 3 October 2014) |
| CONSERVATION & MANAGEMENT MEASURES COMPLIANCE COMMITTEE (COC) | D. CAMPBELL, United States (since 25 November 2013) |
| PERMANENT WORKING GROUP FOR THE IMPROVEMENT OF ICCAT STATISTICS AND CONSERVATION MEASURES (PWG) | F. DONATELLA, European Union (since 16 November 2015) |
| STANDING WORKING GROUP TO ENHANCE DIALOGUE BETWEEN FISHERIES SCIENTISTS AND MANAGERS (SWGSM) | M. TSAMENYI, Ghana (since 25 November 2013) |

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, 2014-2015, Part II (2015)*", which describes the activities of the Commission during the second half of said biennial period.

This issue of the Biennial Report contains the Report of the 24th Regular Meeting of the Commission (St. Julians, Malta, 10-17 November 2015) 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.

MARTIN TSAMENYI
Commission Chairman

REPORT OF THE STANDING COMMITTEE ON RESEARCH AND STATISTICS (SCRS)
(Madrid, 28 September to 2 October 2015)

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**REPORT OF THE
STANDING COMMITTEE ON RESEARCH AND STATISTICS (SCRS)**
(Madrid, Spain – 28 September to 2 October 2015)

1. Opening of the meeting

The 2015 Meeting of the Standing Committee on Research and Statistics (SCRS) was opened on Monday, September 28, at the Hotel Velázquez in Madrid by Dr David Die, Chair of the Committee. Dr Die 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. He noted that 2015, as with previous years, has been very busy for both the SCRS and the Secretariat, with many ICCAT scientific meetings being held during the year. He then reiterated that the Secretariat is always committed to assisting the SCRS in its work and expressed his certainty that the work during the week would meet the high expectations of the Contracting Parties. He also expressed his sadness at the absence of the new Scientific Coordinator Dr Miguel Neves dos Santos and expressed his best wishes for his quick recovery. The opening address of the Executive Secretary is attached as **Appendix 12**.

The Chair of the SCRS, Dr David Die, thanked the Executive Secretary and the Secretariat for their cooperation and work throughout 2015 and their support for the SCRS. The SCRS Chair reiterated the comments made by the Executive Secretary regarding the absence of Dr Neves dos Santos and on behalf of the SCRS sent his best wishes to him and his family.

2. Adoption of Agenda and arrangements for the meeting

The Tentative Agenda was revised and adopted with some changes (attached as **Appendix 1**). Full assessments were carried out this year on bigeye (BET) and blue shark (BSH). Also a data preparatory meeting was held for bluefin tuna this year, in preparation for a new assessment in 2016.

The following scientists served as rapporteurs of the various species sections (Agenda Item 8) of the 2015 SCRS Report.

| | |
|--------------------------|--|
| Tropical tunas - General | P. Bannerman |
| YFT - Yellowfin tuna | S. Cass-Calay |
| BET - Bigeye tuna | H. Murua |
| SKJ - Skipjack tuna | J. Amande |
| ALB - Albacore | H. Arrizabalaga, J. Ortiz de Urbina (Med.) |
| BFT - Bluefin tuna | Y. Takeuchi (West), S Bonhommeau (East) |
| BIL - Billfishes | F. Arocha |
| SWO - Swordfish | R. Coelho (Atl.), G. Tserpes (Med.) |
| SBF - Southern bluefin | |
| SMT - Small tunas | N. Abid |
| SHK - Sharks | E. Cortes |

The Secretariat served as rapporteur for all other Agenda items.

3. Introduction of Contracting Party delegations

The Executive Secretary introduced the 28 Contracting Parties present at the 2015 meeting: Algeria, Brazil, Canada, Cabo Verde, China (People's Rep.), Côte d'Ivoire, Equatorial Guinea, European Union, France (SPM), Gabon, Ghana, Guinea (Rep.), Japan, Korea (Rep.), Mauritania, Mexico, Morocco, Namibia, Norway, Russian Federation, São Tomé and Príncipe, Senegal, Tunisia, Turkey, United Kingdom (O.T.), United States, Uruguay and Venezuela. 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), inter-governmental organizations (Food and Agriculture Organization of the United Nations – FAO), and non-governmental organizations (Birdlife International – BI, Federation of Maltese Aquaculture Producers – FMAP, International Seafood Sustainability Foundation – ISSF, Oceana, Pew Charitable Trusts, The Ocean Foundation, and WWF Mediterranean Programme – WWF) were admitted as observers and welcomed to the 2014 SCRS (see **Appendix 2**).

5. Admission of scientific documents

The Secretariat informed the Committee that 199 scientific papers had been submitted at the 2015 inter-sessional meetings. The Secretariat also informed that, last year, a deadline of 6 days before the beginning of the species groups meetings was established for submitting titles and abstracts and 3 days before the meeting to submit the full document. The objective of this deadline is to facilitate the work of the rapporteurs in preparing the meeting. Taking into account the limited time that the groups have to complete their work, adherence to deadlines greatly contributes to improving the work of the SCRS.

Besides the scientific documents, there are 9 reports of inter-sessional meetings and species groups, 46 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 information contained in the 2015 Secretariat Report on Research and Statistics related to fisheries and biological data submitted for 2014, including revisions to historical data. The activities and information included in this report refer to the period between 1 December 2014 and 4 September 2015 (the reporting period). Regarding the activities conducted by the Secretariat, in the most recent years, in addition to the normal activities developed on statistics, publications, data funds management and others, the Secretariat is dedicating (apart from the usual preparation of the majority of the datasets required by each assessment) a lot of additional work to stock assessment activities, whether participating actively in the assessment or coordinating and managing external support to the SCRS work.

The Secretariat reiterated to the CPCs the Commission's requirement of using the MOST RECENT standard electronic forms for data submission and complete all the information requested. The information requested in Task I fleet characteristics (TIFC) was object of a large revision in 2014 (information now requested by individual vessel), aiming to collect better information on fishing capacity by fishery, fleet structure, and yearly based (gear independent) global effort (effective fishing days). It was noted that this was the first year (2014 fishing activity) in which this Task I data were requested on an individual vessel basis. The outcome of this exercise was promising. The SCRS can count on better information to properly evaluate the effective fishing activity taking place in the ICCAT Convention area.

For the reporting period, the Secretariat has received by-catch and discard information, mainly from the newly adopted ST09-NatobPrg data submission forms as the vast majority of by-catch information recorded by CPCs comes from observer programmes. Additional data for seabirds and sea turtles were submitted separately by CPCs. It was stressed that all future by-catch data submissions should be made using these new observer data collection forms. The Secretariat then provided a summary of the use of various data funds. These did not include activities funded by the ICCAT Atlantic-wide Research Programme for Bluefin Tuna (GBYP), Enhanced Billfish Research Program (EBRP) or the ICCAT/Japan Capacity-Building Assistance Project (JCAP).

The Committee was presented with an update of the various ICCAT publications. The new deadline for documents was met with less than optimal success. Currently, the deadline is 6 and 3 days before the meeting to submit titles and documents for the species groups. However, as with 2014, more than 50% of the documents have been submitted after the deadlines.

During 2015, the Secretariat undertook an exhaustive work plan in terms of statistical related tasks, aiming to complete all the major SCRS demands and priorities for 2015. All major tasks were finalised in a timely manner, and the outcome used by the SCRS during 2015. As always, however, in order to complete priority tasks, several ongoing projects including the ICCAT DB documentation framework, the full revision of the tagging database including the development of applications to read data directly from the forms to the database (which has been postponed for four years and is crucial), development of various shape files for the GIS system, and deployment of statistical databases on the ICCAT cloud, were postponed. It is important to note that, those postponed projects, have no immediate repercussions for the accomplishments of the SCRS in 2015. Important future activities include planned improvements and additions to the Java applications which access the ICCAT statistical databases. Also, the structure for the observer database to store the data from forms ST09-NatObPrg has been created, but as of yet, no application has been developed. This will require extensive coding due to the complex nature of the data being submitted and will need to be completed in 2016. Due to these applications all being migrated to the Java programming language, the Secretariat is striving to undertake continued training in this capacity to maintain and continue development on the applications as well as other resources for the maintenance of the ICCAT databases. Also the ICCAT VMS system is in great need of an upgrade both to the hardware and software components of this system.

The Committee acknowledged the extensive workload conducted by the Secretariat and thanked them for their support of the SCRS processes. The Committee proposed that a new deadline for the submission of SCRS documents should be implemented; these documents should be provided in their entirety at least one week before the meeting in which they are to be presented to facilitate their review by participating scientists prior to these meetings.

The Coordinator of the ICCAT-Japan Capacity-Building Assistance Project (JCAP) introduced the project started in December 2014 as a 5 year-project and presented a progress report of the activities conducted in 2015. The JCAP trust fund has been dedicated to assisting developing CPCs to effectively implement ICCAT measures including those related to the monitoring, control and surveillance of tuna fishing activities as well as the improvement of data collection, analysis and reporting. The summary of final report of the former project ICCAT/Japan Data Management Improvement Project (JDMIP) which was finished its 5 years term in November 2014 was also presented.

Following the Coordinator's presentation, the SCRS Chair and CPCs welcomed the outcome of the activities carried out this year and expressed their gratitude to the support of the JCAP toward capacity building of the developing CPCs. In response, Japan remarked that taking into account that this project is very much welcomed by CPCs, they will make an effort to keep contributing through JCAP for coming years while the budgetary situation is getting difficult year by year.

7. Review of national fisheries and research programs

In accordance with the Revised Guidelines for the Preparation of Annual Reports (ICCAT Ref. [12-13]), only information relative to new research programs (Part I of the Annual Report) 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 revised guidelines for the preparation of the Annual Reports including the Summary Tables.

Algeria

Algerian catches of tuna and tuna-like species recorded for 2014 are in the order of 556.79 t for swordfish, 243.83 t for bluefin tuna and 1,873.55 t for small tunas. We note that there has been an increase in swordfish production for 2014 as well as for small tunas as compared with those for 2013.

As regards the bluefin tuna fishery, eight (8) national purse seiners with lengths of between 25 and 40 m have participated in the live bluefin tuna fishing campaign in 2014. The totality of the quota allocated to Algeria has been fished, i.e. 243.8 t. Sampling was carried out on 44 dead specimens of bluefin tuna which were measured for size and sexed on board the fishing vessel.

As regards *Xiphias gladius*, size and weight sampling was carried out at landing ports on a sample of 52 individuals.

In relation to collecting statistical data on fishing activity, a harmonised monitoring and collection device is operational at national level, which enable the fisheries administration and the scientific institutions to have better information in order to estimate the level of catches, fishing effort and to work together to implement appropriate management measures.

This device which enables indirect assessment is strengthened by annual performance by prominent national scientists from the National Centre of Research and Development of the Fisheries and Aquaculture (CNRDPA) of two fishery resources assessment campaigns: one pelagic and the other demersal (direct assessment) along the Algerian coast. Regarding the large fisheries migrators within the framework of the lines of research of the CNRDPA on the study of bluefin tuna juveniles, information is collected and is being analysed. The growth study must also be taken care of. In addition, a biological sampling device for swordfish in pilot ports is operational.

Brazil

In 2014, the Brazilian tuna fleet fishing for tunas and tuna-like fish consisted of 127 fishing boats, registered in 7 different ports. The Brazilian catch of tunas and tuna-like fish, including marlins, sharks and other species of less importance (e.g. wahoo, dolphinfish, etc.) was 39,296.4 t (live weight), representing a small decline from 2013, when about 40,000 t were landed. Most of the catches again were done by baitboat vessels (25,907.3 t; 65.9%), targeting skipjack (SKJ), which accounted for the majority of their catches (24,873.5 t), as well as of the total production of tuna and tuna-like species landed in Brazil (63%). Longline catches reached 9,733.2 t, being made up mainly of swordfish (SWO) (2,890.1 t); blue shark (BSH) (2,548.0 t); and bigeye tuna (BET) (1,965.5 t). About 10% of all Brazilian catches of tunas and tuna-like fish (3,655.9 t) came from 300 artisanal and small-scale boats (10 to 20 m LOA), based predominantly in the southeast and northeast region and targeting a variety of species, with various fishing gears, including mainly handline, trolling and other surface gears. The main species caught by this fleet, as usual, were bigeye tuna, dolphin fish and yellowfin tuna. It is important to highlight that Brazilian Task I catches of 2013 and 2014 are preliminary and under revision. Due to the discontinuity of the financial support provided by the Ministry of Fisheries and Aquaculture to the Scientific Subcommittee of the Standing Committee for the Management of the Tuna Fisheries in Brazil, several scientific activities were suspended, such as the collection of biological data, including the size of the fish caught. Nevertheless, initiatives are in course to reverse this regrettable situation. Research on the by-catch of seabirds and sea turtles in the longline fishery, however, has continued, including the development of measures to avoid their catches.

Cabo Verde

In 2014, Cabo Verde's semi-industrial and industrial tuna fleet was comprised of four large purse seiners, sixty-five smaller ones (MIS, HS, LL, LHP and BB) which essentially fished yellowfin tuna (*Thunnus albacares*), bigeye tuna (*Thunnus obesus*) and skipjack tuna (*Katsuwonus pelamis*). In addition, some artisanal fisheries and the sport fishery also catch small tunas (frigate tuna, wahoo, Atlantic black skipjack, etc.) and billfish (marlins and swordfish), respectively. Total tuna catches increased in 2014 to about 28,000 t (4,507 t of yellowfin tuna, 15,254 t of skipjack tuna, 2,271 t of bigeye tuna and 5,500 t of frigate tuna). It should be noted that the increased catch of frigate tuna spp., which reached in 2014 about 5,500 t. Catches increased slightly compared to 2013 (15,000 t). An authorised foreign fleet also operated in the Cabo Verde EEZ, on the basis of fishing agreements or contracts. These vessels mostly belong to the European Union and Asian countries. Licence applications from foreign vessels generally state tunas as target species, but the main species fished continue to be shark and swordfish, according to the catches reported by some European Union vessels. In the national fishery, shark did not exceed 0.9% of total landings, as by-catch. The sport fishery continued to be very important economically, socially, culturally and politically, but this fishery is not yet monitored. The INDP is responsible for regular monitoring of tuna fishing activities and the work consists in collecting catch and fishing effort statistics. This work is supplemented by information from different sources (factories, Directorate of Marine Resources, Customs etc.). Multi-species samplings were also carried out in the industrial and artisanal fisheries.

Canada

Bluefin tuna are harvested in Canadian waters from July through December. The adjusted Canadian quota for 2014 was 487.3 t which includes an 86.5 t transfer from Mexico. A total of 701 licensed fishermen were active (i.e. licenses that had landings) in the directed bluefin fishery using rod and reel, handlines, tended lines, electric harpoon and trap nets to harvest 402.20 t. An additional 60.70 t was harvested as by-catch in the pelagic longline fleet in the swordfish and other tunas fishery. These figures include 0.273 t of mortality associated with tagging studies.

The swordfish fishery in Canadian waters takes place from April to December. Canada's adjusted swordfish quota for 2014 was 1892.5 t with landings reaching 1604.2 t. The tonnage taken by longline gear was 1371.2 t while 233.0 t were taken by harpoon. Of the 77 licensed swordfish longline fishermen, 57 were active in 2014. Only 66 of 1,242 harpoon licenses reported swordfish landings in 2014.

The other tunas (albacore, bigeye and yellowfin) are at the northern edge of their range in Canada and are harvested from May through October. In 2014, other tunas accounted for approximately 11%, by weight, of the commercial large pelagic species landed in Atlantic Canada.

The Canadian Atlantic statistical systems provide real time monitoring of catch and effort for all fishing trips targeting pelagic species. At the completion of each fishing trip, independent and certified Dockside Monitors must be present for off-loading to weigh out the landing, and verify log record data.

Canada continues to actively support scientific research such as; tagging of bluefin tuna that addresses questions related to mixing, migration and the distribution within the Canadian EEZ. For sharks, research has focused on assessments of northwest Atlantic populations of porbeagle (2015), shortfin mako (2015) and blue sharks (2014) using 131 pop-up archival satellite tags (PSATs).

China (People's Rep.)

The number of vessels from China that operated in the Atlantic Ocean decreased from 17 in 2013 to 13 in 2014. Longline was the only fishing gear used to fish tunas, tuna-like species and sharks and the target species were still bigeye tuna and bluefin tuna. The total catch was 2800.7 t (in round weight), 718.9 t lower than that in 2013 (3519.6 t). The catch of bigeye tuna and bluefin tuna amounted to 2231.8 t and 37.6 t in 2014, respectively. The catch of bigeye tuna accounted for 79.7% of the total in 2014, however, it was 139.5 t lower than that in 2013 (2371.3 t). Yellowfin tuna, swordfish and albacore tuna, etc. were taken as by-catch. The catch of yellowfin tuna decreased from 211.4 t in 2013 to 92.4 t in 2014. The catch of swordfish was 266.2 t, with a 8.8% decrease compared with the previous year (291.9 t in 2013). The catch of albacore tuna was 68.7 t, which was 77.5 t less than that in 2013 (146.2 t). 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 PRC. PRC has carried out a national scientific observer program for the tuna fishery in ICCAT waters since 2001. Two observers in 2014 have been dispatched on board two Chinese Atlantic tuna longliners covering the areas of S2°29'~S6°23', W21°30'~W29°46' (targeting bigeye tuna) and N50°30'~N54°47', W28°47'~W35°05' (targeting bluefin tuna) since October 2014. Data of target species and non-target species (sharks, sea turtles, especially) were collected during the observation.

Côte d'Ivoire

Total catches of tuna and tuna-like species landed in the different docks amount to 4108611.096 kg: respectively 3132656.94 kg of large tunas, 724438.123 kg of small tunas, 197384.1 kg of associated species and 129115.64 kg of shark. The major species for the different groups were: *Katsuwonus pelamis* (2370470.69 kg) for large tunas, *Auxis thazard* (291724.13 kg) for small tunas, *Istiophorus albicans* 99211.36 kg for tuna-like species and *Prionace glauca* 93359 kg for shark. The quota has not been exceeded for the species concerned. Therefore, Côte d'Ivoire fully supports ICCAT work and abides by the regulations and the treaties in view of better management of existing resources. To do so, it is essential to acquire knowledge on the biology and to reinforce research staff.

Equatorial Guinea (Rep.)

The Republic of Equatorial Guinea has an exclusive economic zone (EEZ) of some 314,000 km², with 644 km of coast, and full sovereignty for exploitation of available fishery resources. The jurisdictional waters of the country are divided into two fishing areas: an island area and another continental area. Maritime fishing in Equatorial Guinea is directed at catching the main available resources. The available fishing resources are: small coastal pelagics such as sardines, herrings, among others; large ocean pelagics: tuna and tuna-like species; coastal demersal species: snapper, seabream, rooster hind, and finally, the deep water species, such as: meagre, shrimp, among others. As regards the two fishing methods practised, the coastal population carries out artisanal fishing as a long-standing tradition and has broad experience in this subsector, while industrial fishing is undertaken by vessels of privately-held companies, which are mainly foreign, European and Asian, through agreements and/or contracts signed with the Ministry of Fisheries and the Environment. In relation to research, the Ministry of Fisheries and the Environment expects that project UTF/EQG concerned with technical assistance by the FAO is soon to be implemented. In terms of statistics, the General Directorate of Fishery Resources has prepared a draft bill "Establishment of a National Fisheries Statistical Control". For conservation of the marine ecosystem and to ensure reproduction of biological species, the Law Regulating Fishery Activity in the Republic of Equatorial Guinea prohibits the use of trawl, purse seine nets and longlines by the industrial fishery within the area of 4 nautical miles, measured from the base line, i.e. the low-water mark.

European Union

Several Member States of the European Union (EU) have fleets actively fishing in the ICCAT Convention area. These are: Croatia, Cyprus, France, Greece, Ireland, Italy, Malta, Netherlands, Portugal, Spain, and United Kingdom.

The EU fleet targets most of the species that are regulated by ICCAT i.e. bluefin tuna, skipjack, yellowfin, bigeye, albacore, swordfish, marlins, sailfish and sharks. Other groups of species such as small tunas (bullet tuna, Atlantic bonito, frigate tuna, little tunny and dolphinfish) are also caught by the EU fleets operating in the ICCAT Convention area.

The EU fleet uses a wide range of fishing gears: purse seiners, baitboats, longlines, hand-lines, troll, harpoons, mid-water trawls, traps and sport fishing. This diversity also constitutes a concrete challenge in faithfully reporting on such variety, namely through Task I and II data, but also information on by-catch, interactions with associated species, the composition of fleets, etc.

Moreover, the EU pays special attention to ensure a timely and complete submission of information by keeping the EU Member States updated on the different ICCAT reporting obligations, clearly identifying data, deadlines, formats, and contact persons responsible for the compilation of reports and data submission to ICCAT.

France – Saint Pierre & Miquelon

The total catches taken against the ICCAT quotas allocated to France (in respect of St. Pierre & Miquelon - SPM) amount to 3.41 t of tuna and tuna-like species for 2014. It should be noted that the technical problems of the vessel found throughout the year and the issue of finding a specialised tuna fishing crew hampered the success of the 2014 fishing campaign. Since the quotas allocated to France (in respect of SPM) only allowed a local vessel owner to exploit one vessel, French catches of tuna and tuna-like species were taken by a 28 metre longline fishing vessel. This vessel, acquired by a vessel owner from St. Pierre, has sailed under the French flag since 9 March 2011 to exploit the French tuna quotas (northern swordfish mainly). It also has the possibility of fishing western bluefin tuna. Fishing is regulated through the grant of fishing authorisations by the State representative on the archipelago. Vessels are under an obligation to report catches and can also embark a fisheries controller from time to time. All landings as well as exported products are controlled. France (in respect of SPM) can perform controls through several administrations (maritime affairs, gendarmerie, national navy, etc.). Fisheries control campaigns, both at sea and on land, are regularly carried out. There has been no report of any infringement in 2014 in the context of these fisheries.

Gabon

Gabon has an 800 km long coastline and an Exclusive Economic Zone (EEZ) which covers 213,000 km². During the year, this stretch is home to a diversity of tuna and tuna-like species. However, since Gabon does not have the capacity to exploit in particular its tuna resources that migrate towards another EEZ, it has concluded Fishing Agreements so as to profit from the financial spin-offs generated by exploitation of this resource. This fisheries resource is managed by the General Directorate of Fisheries.

Ghana

The tuna industry in Ghana comprises skipjack (*Katsuwonus pelamis*), yellowfin (*Thunnus albacares*) and bigeye tuna (*Thunnus obesus*). 20 baitboats, and 17 purse-seiners are currently fishing within the EEZ of Ghanaian coastal waters and beyond exploit these tuna species amongst other minor tuna-like species such as black skipjack (*Euthynnus alletteratus*). During the year under review, skipjack catches were the highest (68%), followed by yellowfin (26%), bigeye (5%) and other tuna-like species (1%), respectively. Catches of the principal tuna species for the year 2014 rose slightly to 76844 t from 62290 t in 2013. Both fleets employ Fish Aggregating Devices (FADs) in fishing and collaborate extensively by sharing their catch during fishing operations. Over 85% of catches are conducted off FADs.

Recent improvements in sampling coupled with the provision of more logbook information from the fishery has contributed to a better understanding of the spatio-temporal distribution of the species. It is envisaged that further synthesis of the database on Ghana from series spanning 2006-2014 would give a clear sampling strategy to improve the catch and species composition of the entire catch (Task II) in relation to innovations observed in the fishery.

An observer programme was organized in 2014 on board 6 purse seine vessels with the aim of training officers on proper methods of estimating catches and filling out information in logbooks. Also the programme was conducted to estimate the proper species composition of the catch. In addition, the Regional Observer Programme (ROP) of ICCAT was observed with national observers on board 15 surface fleets from January to February 2014.

Beach sampling of billfishes continued off the western coastline of Ghana from artisanal drift gill operators with very low catches of swordfish and no white marlin species. Estimates of sharks from the artisanal fishery were obtained from the western shelf of Ghana.

Drift nets are also used in capturing sharks which are consumed locally with no by-catch and discards in the fishery. Few sharks were recorded on observer missions (purse seiners) with most of them released alive.

Guinea (Rep.)

Guinea (Rep.) enjoys a privileged situation in terms of fishery resources. Two types of fishery (artisanal and industrial) exploit resources in Guinean maritime waters. The artisanal fishery is completely dominated by national fishers while the industrial fishery is dependent on a foreign fleet of vessels subject to different arrangements (Fishing Agreements, Charterings, Consignments).

Three Guinean-flagged purse seiners operated in 2014 within the framework of the ICCAT Convention. The vessels were the following: Avra, Belouga and Harmonia, previously called Mervent, which generally land their catches in Abidjan in Côte d'Ivoire and sometimes in Dakar in Senegal and occasionally in the port of Tema, in Ghana.

The total catches reported by the three Guinean tuna vessels in 2014 amount to 7 559 935 kg (all species taken together), i.e. a decrease of 14.32% as compared to 2013 for which 8 822 955 kg of tuna were reported.

Catches reported in this way are mostly comprised of skipjack tuna (*Katsuwonus pelamis*) representing 90.78% of the total catch and a relatively low proportion of yellowfin tuna (*Thunnus albacares*) with 9.22%.

Since 2010, appropriate measures have been taken by the authorities of the Ministry of the Fisheries and Aquaculture to monitor the activity of tuna vessels flying the Guinean flag and to provide statistics to ICCAT on a regular basis.

Japan

Longline is the only tuna-fishing gear deployed by Japan at present in the Atlantic Ocean. The coverage of the logbook from the Japanese longline fleet was 90-100 % before 2013. The current coverage for 2014 is estimated to be about 98%. In 2014, fishing days were 15,200, which was 64% of the average value of the past ten years. The catch of tunas and tuna-like fish (excluding sharks) is estimated to be about 24,000 t, which is about 82% of the average catch of the past ten years. In 2014, the most dominant species was bigeye representing 57% of the total tuna and tuna-like fish catch in weight. The next dominant species was yellowfin tuna (16%) and the third species was bluefin tuna (6%). Observer trips were conducted on longline boats in the Atlantic. A total of 1076 fishing days were monitored between August 2014 and April 2015.

Korea

In 2014, 6 Korean longline vessels engaged in fishing for tuna and tuna-like species in the Atlantic Ocean. The total catch of tuna longline was 1,470 t, declining by 31.5% from the previous year. Bigeye tuna, albacore tuna and yellowfin tuna dominated the catches with 1,039 t, 66 t and 116 t, respectively. The catch of northern swordfish was 35 t and southern swordfish was 53 t. And the catches of shark species were 136 t. Fishing area was almost the same as in the previous years, which had been in the tropical area of the Atlantic Ocean (20°N ~20°S, 20°E~60°W) throughout the year from January to December. One Korean tuna purse seine caught about 80 t of Atlantic bluefin tuna in 2014. Data collection and reporting is compliant with the Act on Fisheries Information and Data Reporting revised and put into effect from 5 December 2012. The electronic data reporting system has changed from a weekly to a daily basis since 1 September 2015. It includes recording in the logbook of discards/release for target and bycatch species and also the method of bycatch mitigation used and obligates the daily submission of this to the National Fisheries Research and Development Institute (NFRDI). In accordance with the Act, the NFRDI is undertaking the cross-checking of data between logbook, catch document, observer report and VMS data.

Mauritania

In Mauritania, the tuna fleet operating in the exclusive economic zone is entirely foreign; it is essentially composed of Spanish, Japanese and Senegalese vessels. These fleets operate under a free access regime and land their production abroad. These species are also fished as by-catch by industrial pelagic vessels, which are 100% foreign. The catches of these species reported by these fisheries closely correlate to those of sardinellas (prey of preference) which were targeted by these fleets. These statistics show that by-catch of high seas tuna taken by the industrial fishery amounted in 2011 to 16,000 t and essentially comprised *Sarda sarda* (76%), compared to frigate tuna (12%). Since 2012, catches have fallen following non-renewal of the fishing agreement between Mauritania and the EU. The agreement signed in 2015 which provides for an annual quota of 20,000 t of tuna compared to 15,000 t in the previous agreement will only come into force in late 2015 or early 2016 following its validation by the European Parliament.

Catches reported by the artisanal and coastal fishery have increased since 2010 to reach 1648 t in 2013 and 1253 t in 2014. In 2012, catches were essentially comprised of *Sarda Sarda* (77%) landed at Nouadhibou. In 2013 and 2014, the catches were dominated by *Acanthocybium solandri* and *Scomberomorus tritor*.

Mexico

This report describes the characteristics of the longline yellowfin tuna (*Thunnus albacares*) fishery in the Gulf of Mexico, and the species making up the by-catch, highlighting compliance with national regulations and/or recommendations and resolutions by the International Commission for the Conservation of Atlantic Tunas (ICCAT).

The Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA) through the National Commission of Aquaculture and the Fisheries (CONAPESCA) is the national authority in charge of implementing policies, programmes and regulations that facilitate the competitive and sustainable development of Mexico's fisheries and aquaculture sector. For its part, the National Fisheries Institute (INAPESCA) is responsible for carrying out scientific research and collecting statistics on the longline tuna fishery in the Gulf of Mexico.

Yellowfin tuna (*Thunnus albacares*) fishing in the Gulf of Mexico is carried out by mid-size longline vessels. In this fishery, in addition to the target species, other species are taken as by-catch: skipjack tuna (*Katsuwonus pelamis*), bigeye tuna (*Thunnus obesus*), Atlantic bluefin tuna (*Thunnus thynnus*), sharks and swordfish, among others.

The legal framework that regulates this fishery includes the General Law on Sustainable Fisheries and Aquaculture (LGPAS), and the Official Mexican Standard which governs exploitation of tuna species using longline vessels in waters of Federal Jurisdiction of the Gulf of Mexico and Caribbean Sea (NOM-023-PESC-1996), which was updated in February 2014 for the purpose of updating and incorporating the regulations adopted by ICCAT.

Morocco

Fishing of tuna and tuna-like species attained a production of 6792.09 t in 2014 compared to 7815.1 t in 2013, which is a decrease in volume of around 13%. However, the bluefin tuna quota allocated by ICCAT has been fully exhausted.

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

Collection of fishing and effort statistical data is virtually exhaustive, and is performed through fisheries administrative structures (Fisheries Department) and the National Fisheries Office, established along Morocco's Atlantic and Mediterranean coasts. Moreover, a subsequent control is also carried out by the Exchange Office regarding the export of fisheries products.

On the scientific level, the National Institute of Fisheries Research (INRH), through its Regional Centres (6 centres), covering the entire Moroccan coast, has reinforced collection of biological data on the major species (bluefin tuna and swordfish). The Regional Centre of the INRH in Tangier serves as coordinator for the collection of all these data. In recent years, monitoring of other species has begun, in particular, the tropical species (bigeye tuna, among others) and small tunas, with an extension of the research work towards areas located to the south of Morocco.

Great progress has been recorded in terms of statistical and biological data collection, as evidenced by the series of scientific papers, and the Task II databases, submitted by Moroccan researchers to the different SCRS sessions, for the purposes of tuna stock assessments.

Namibia

Namibia, as a member of ICCAT, strives to fully implement all ICCAT conservation and management measures. Foreign fishing vessels entering Namibian ports are thoroughly inspected to ensure that they have not contravened national laws and regulations of Namibia or those of other States, as well as conservation and management measures adopted by ICCAT and any other RFMOs or international organisation of which Namibia is a member. In addition, monitoring measures are in place to ensure that all products coming from licensed tuna fishing vessels, when entering or leaving the country, are accompanied by the necessary documents.

Namibia continued to undertake research in 2014 on all ICCAT species caught by boats operating in Namibian waters. Data obtained from log sheets supplied to fishing vessels, as well as data collected by Fisheries Inspectors deployed at all landing points and those data collected by Fisheries Observers onboard fishing vessels were analysed and the results were submitted to ICCAT in July 2015. The landings for most species, namely; albacore (ALB), swordfish (SWO), bigeye tuna (BET), blue shark (BSH), shortfin mako shark (SMA) and blue marlin (BUM) have increased in 2014 when compared to 2013, with SWO, BSH, SMA and BUM having more than doubled.

Fisheries observers were also tasked to observe the activities of fishing vessels at sea and report any violations for possible action to be taken against the culprits. Furthermore, Namibia had deployed Fisheries Inspectors both at sea onboard Fisheries Patrol vessels and in the harbours, to ensure strict compliance with the country's rules and regulations related to the exploitation of marine living resources, including those adopted by Namibia as part of its obligations to RFMOs and international organisations.

Norway

Norway caught one specimen of Atlantic bluefin tuna (*Thunnus thynnus*) as by-catch in 2014. There have been observed and caught a few specimens of Atlantic swordfish (*Xiphias gladius*) and Atlantic bonito (*Sarda sarda*) in Norwegian waters in 2014. Several observations of Atlantic bluefin tuna were made along the coast of Norway in 2014. Norway continuously works on present and historical data on tuna and tuna-like species and aims at incorporating the data on these species into an ecosystem perspective. Norway participated at the SCRS annual science meeting in 2014.

Russia

Fishery. In 2014 and 2015 a specialized (purse seine) tuna fishery fleet flying the Russian flag did not carry out any operations. In 2014 trawling vessels caught 739 t of tuna of 4 species and 1 t of Atlantic bonito as a by-catch in the Eastern-Central Atlantic. In the first half of 2015 the trawling vessels caught 85 t of 3 tuna species and 128 t of Atlantic bonito.

Scientific researches and statistics. In 2014 AtlantNIRO observers collected biological and fishery material on tunas onboard trawlers in the Eastern-Central Atlantic (area SJ71 according to ICCAT classification). Fish length and weight were measured, fish sex, gonads maturity stages and stomach fullness indices were determined. Species of the small tunas group occurred in trawls as by-catch, from a few individual specimens up to a few dozen. Data on frigate tuna, bullet tuna, Atlantic black skipjack, oceanic skipjack and Atlantic bonito were collected in the amount of 2585 specimens for weight measurements and 468 for biological analyses.

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

Senegal

In 2014, the Senegalese industrial tuna fleet was comprised of six (6) baitboat vessels that mainly targeted tropical tuna, in particular yellowfin (*Thunnus albacares*), bigeye (*Thunnus obesus*) and skipjack (*Katsuwonus pelamis*) and one (1) longline vessel targeting swordfish. However, a section of the artisanal fisheries (handline, troll and purse seine net) and the sport fishery were directed at billfish (marlins, swordfish and sailfish) and small tunas (Atlantic black skipjack, mackerel, Atlantic bonito, frigate tuna, etc.) and shark.

The total catches of Senegalese baitboats are estimated at 4196 t, of which 500 t were yellowfin tuna, 3252 t skipjack, 361 t bigeye and 83 t Atlantic black skipjack and frigate tuna. Catches in 2014 decreased by 29% as compared to 2013 (5910 t). As for the longline fishery, catches are estimated at 246 t, i.e. a decrease of 42% compared to 2013 (424 t). Catches are essentially comprised of swordfish (192 t), shark (22 t), marlins (10 t) and sailfish (2 t). As regards the artisanal fisheries, the catches of small tunas and tuna-like species in 2014 are estimated at 6850 t. Shark are estimated at 885 t.

For the sport fishery, catches were estimated at 28 t (31 in 2013), of which 22 t were marlins, 4 t sailfish and 2 t yellowfin tuna.

For research and statistics, the Centre of Oceanographic Research in Dakar - Thiaroye (CRODT) ensured the monitoring of the fishing activities of all tuna vessels visiting the port of Dakar. The work consists in collecting fisheries catch and effort statistics via fishing activity logbooks. This work is supplemented by information from various sources (factories, vessel owners, Directorate of Maritime Fisheries, Customs, etc.). Multi-species sampling is also carried out in the port when the tuna vessels land their catches. Monitoring of landings and samplings of billfish is always carried out in the main artisanal fishery ports.

Tunisia

The tuna and tuna-like management and conservation plans are essentially governed by the provisions of Law No. 94-13 of 31 January 1994 and its implementing texts.

In 2014, as for previous years, these plans were supported by implementation of all the control programmes (onboard observer programme) and the at-sea and in-port inspection programmes in particular during the periods of prohibition on fishing for bluefin tuna and swordfish.

Within the framework of bluefin tuna fishing capacity adjustment, Tunisia has maintained the same number of tuna vessels in 2013, i.e. 21 vessels, which is a total reduction in overcapacity since the bluefin tuna fleet has decreased from 42 vessels in 2010 to 21 vessels in 2014.

In this context and within the framework of improvement of collection of bluefin tuna catch statistics and monitoring of implementation of measures taken to mitigate by-catch and discards in the tuna and swordfish fisheries, the competent authority, in addition to the catch documentation, has covered 5% of its tuna and artisanal fisheries with scientific observers.

Allocation of bluefin tuna fishing quotas and perfection of gears targeting swordfish have hugely reduced by-catch given that in 2014 the national observers programme did not detect any by-catches of sea turtles or mammals.

It should be noted that total bluefin tuna catches in 2014 reached 1056.566 t, i.e. 99.96% of the adjusted national quota which is 1057 t. 88.85% of these catches were caged in farming facilities and 11.15% of catches were exported live to Turkey.

Turkey

The total amount of catch of marine fish by Turkey was 537,344.6 t during the year 2014. The portion of the tuna and tuna-like fishes in total catch was 20,886.1 t. In 2014, the amounts of catch of tuna and tuna-like species were 555.0 t, 19,031.5 t, 55.7 t, 0.3 t, 681.9 t, and 561.7 t for bluefin tuna, Atlantic bonito, swordfish, albacore, little tunny and bullet tuna, respectively. Almost all bluefin tunas were caught by purse seiners, which have an overall length of 35-62 meters. The fishing operation was conducted intensively off Antalya Bay in the south of Turkey and in the eastern Mediterranean region. The bluefin tuna catch started at the end of May and finished at the end of June.

United Kingdom - OTs

The level of fishing effort in the United Kingdom Overseas Territories (UK OTs) engaged in ICCAT during 2014 increased slightly on previous years in terms of vessels registered, with the Overseas Territory of St Helena registering the first vessel over 20 meters in length to the UK OT fleet, as part of its efforts to expand its fishery. The total tonnage of ICCAT species caught in the UK OTs has remained modest when compared to more developed fisheries. Bermuda and St Helena continue to represent the largest contributors to the total UK OT catch, with much smaller catches in the British Virgin Islands and the Turks and Caicos Islands.

UK OT fishing activity is primarily artisanal or sports-related, there is no fishing involving larger scale methods utilising, for example, fish aggregating devices or purse seines, and only very limited deployment of longlines. However the UK OTs continue their interest in developing commercially viable fisheries to aid in their economic development. The Territories recognise their responsibilities for the sustainable management of their natural environments and have been working with the UK Government to develop fisheries – including developing sustainable management plans and facilitating development of the fishing sector. The establishment of robust management frameworks is, however, dependent upon long term investment, which is in turn reliant on the retention of some existing quotas and the potential for expansion in others (such as S. albacore or swordfish) which might come under pressure if fisheries were expanded.

United States

Total (preliminary) reported U.S. catch of tunas (YFT, SKJ, BET, ALB, BFT) and swordfish, including dead discards, in 2014 was 6,841 t, a decrease of about 9% from 7,534 t in 2013. Swordfish catches (including estimated dead discards) decreased from 2,944 t in 2013 to 1,962 t in 2014, and provisional landings from the U.S. fishery for yellowfin tuna increased in 2014 to 2,666 t from 2,332 t in 2013. U.S. vessels fishing in the northwest Atlantic caught in 2014 an estimated 810 t of bluefin tuna, an increase of about 149 t compared to 2013. Provisional skipjack tuna landings decreased by about 40 t to 77 t from 2013 to 2014, bigeye tuna landings decreased by 15 t compared to 2013 to an estimated 866 t in 2014, and albacore landings decreased from 2013 to 2014 by 140 t to 459 t.

U.S. Government (NOAA) and university scientists, working independently or in collaboration (including collaborations with scientists from other CPCs), conducted research in 2014 involving a variety of ICCAT and bycatch species. Such research included larval surveys, the development of abundance indices, electronic tagging to investigate movements, habitat usage and post-release mortality, and the collection and analysis of biological samples to study topics such as age and stock structure, fecundity, genetics (including direct estimates of stock size), and mercury concentrations. Additional topics included the influence of environmental factors on distribution and catch rates, and factors affecting by-catch rates and survival.

Uruguay

In 2014, the Uruguayan tuna fleet did not carry out any activity. This inactivity was due to several factors which persist to date; a recovery of the sector is anticipated from 2016. The analysis of catch and effort statistics of the species of interest to the Commission continued. A research campaign was carried out onboard DINARA's research vessel, aimed at large pelagic resources. During this campaign, catch was recorded, size and sex sampling was carried out, biological samples were taken, and a total of 285 individuals were tagged, the blue shark being the most represented (n=271). In addition, experiments were performed to evaluate by-catch mitigation measures. Uruguay participated in and contributed papers to several SCRS meetings, including the sharks species group meeting (1 document), the Sub-Committee on Ecosystems (2 documents) and the billfish species group (1 document). In 2013 Uruguay started the process to review and update its National Sea Birds and Sharks Action Plans. This work, which continued in 2014 and terminated in early 2015, is available on the DINARA web site (www.dinara.gub.uy). The work to control third party vessels in port continued, having started in 2009. In port inspections were carried out to determine which species are landed, their origin and to control formal aspects of vessel documentation. All ICCAT recommendations adopted during the 2014 Commission Meeting have been implemented into Uruguayan law, and are currently in force through decree.

Venezuela

In 2014, the Venezuelan fleet directed at pelagic resources which operated in the Atlantic Ocean was made up of 83 industrial vessels: 73 longliners, 4 purse seiners and 6 baitboats; and in addition 49 artisanal vessels are registered that operate using gillnets off the central coast of Venezuela, from Playa Verde community. This year there were 6,476.7 t of catches of tuna and tuna-like species in the Atlantic Ocean, of which 6,296.9 t correspond to landings and 179.822 t to discards. 88.9% of landings are tuna, yellowfin tuna (*T. albacares*) being the most important (59.9%), while skipjack tuna (*K. pelamis*), albacore (*T. alalunga*), bigeye tuna (*T. obesus*), blackfin tuna (*T. atlanticus*) and frigate tuna (*A. thazard*) reached 19.1%, 4.5%, 2.3%, 1.4% and 1.1%, respectively. By-catch was made up of billfish, including in particular sailfish (*Istiophorus albicans*) (3.3%) and blue marlin (*Makaira nigricans*) (2.2%) and sharks the landings of which represent 2.4%. 62.3% of landings were from the purse seine fishery, 7% from baitboat, 24.7% from longline and 5.9% from artisanal fisheries. In 2014, research on the large pelagics fishery continued; these include tunas, billfish and sharks; and the scientific observers programme onboard industrial longline, baitboat and purse seine vessels was maintained.

- Cooperating Non-Contracting Parties, Entities and Fishing Entities

Chinese Taipei

In 2014, the number of authorized fishing vessels was 117 with 75 targeting bigeye tuna and 42 targeting albacore, and the total catch of tuna and tuna-like species was about 26,400 t. Bigeye tuna was the most dominant species, which accounts for 50% of the total catch in weight, followed by albacore with catch accounting for 29% of the total catch. We have carried out a scientific observer program for the tuna fishery in ICCAT waters since 2002. In 2014, there were 21 observers deployed on fishing vessels operating in the Atlantic Ocean, and the observer coverage on albacore and bigeye vessels was 8.3% and 13.7%, respectively. The research programs conducted by scientists in 2014 included the research on CPUE standardizations and assessments of bigeye tuna, albacore, swordfish, sailfish and sharks; the impact of climatic change on major tuna stocks; studies of shark by-catch and abundance index; the age and growth of sharks; and the research on incidental catch of ecological related species. The research results were presented at the inter-sessional working group meetings and regular meetings of the SCRS. As for the reporting obligation, the related statistical information and information required by ICCAT recommendations was submitted to the ICCAT Secretariat within the required timeframe.

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 2014, including revisions to Ghanaian catches for the period 1973-2012 that have been incorporated since the last assessment. The revisions to Ghanaian yellowfin tuna catches for the period 2006-2014 are still pending review by the SCRS. Readers interested in a more complete summary of the state of knowledge on yellowfin tuna stock status should consult the detailed report of the 2011 ICCAT Yellowfin Tuna Stock Assessment Session (Anon. 2012c). The Tropical Tunas Work Plan (**Appendix 11**) 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 exploited sizes range from 30 cm to 170 cm FL. Juvenile yellowfin tuna 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. Spawning on the main fishing grounds, the equatorial zone of the Gulf of Guinea, occurs primarily from December to April. Spawning also takes place in the Gulf of Mexico, the southeastern Caribbean Sea and off Cabo Verde, although the peak spawning can occur in different months in these regions. The relative importance of the various spawning grounds is unknown.

Although the distinct spawning areas might imply separate stocks, or substantial heterogeneity in the distribution of yellowfin tuna, a single stock for the entire Atlantic is currently assumed. 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 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.

A recent study in the eastern Atlantic Ocean further described the reproductive traits of female yellowfin tuna including, sex-ratio, size at maturity, spawning seasonality, fish condition and fecundity. Size at 50% maturity was estimated at 103.9 cm fork length when cortical alveoli were used as a maturity threshold, however a larger size at 50% maturity was estimated when more advanced oocytes were used. The conclusions of this research could have implications for stock assessment, and will be further evaluated at the next stock assessment of yellowfin tuna.

Tagging studies of yellowfin in the Pacific and Indian Oceans suggest that natural mortality is age-specific, and higher for juveniles than for adults. Nevertheless, uncertainties remain as to the exact parameterization of the age-specific natural mortality function. As was applied for the recent bigeye tuna assessment, an age-specific natural mortality function (e.g. Lorenzen) may also be useful for yellowfin. The most recent stock assessment does not consider sex-specific natural mortality or growth, yet there are disparities in average size by gender. Males are predominant in the catches of larger sized fish (over 145 cm), which could result if large females experience a higher natural mortality rate, perhaps as a consequence of spawning. In contrast, females are predominant in the catches of intermediate sizes (120 to 135 cm), which could result from differential growth (e.g. females having a lower asymptotic size than males). Recent results from studies in the Indian Ocean support the latter hypothesis.

It is generally agreed that growth rates are relatively slow initially, increasing at the time the fish leave the nursery grounds. This interpretation is supported by analyses of size frequency distributions as well as tagging data. Regardless, questions remain concerning the most appropriate growth model for Atlantic yellowfin tuna, as analyses of hard part growth increments support somewhat different growth patterns.

Younger age classes of yellowfin tuna (40-80 cm) 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 an impact on the biology and on the ecology of yellowfin due to changes in feeding and migratory behaviors.

These uncertainties in stock structure, natural mortality, and growth could have important implications for the stock assessment. The proposed Atlantic Ocean Tropical Tuna Tagging Programme (AOTTP), if fully successful, will help reduce these uncertainties.

YFT-2. Fishery indicators

Yellowfin tuna have been exploited by three major gears (longline, baitboat and purse seine fisheries) and by many countries throughout its range. Detailed data are available since the 1950s (**YFT-Table 1**). Overall Atlantic catches have declined by nearly half from the peak in 1990 (193,600 t) to 103,400 t estimated for 2014. The most recent catch distribution is given in **YFT-Figure 1**. However, it should be noted that official reports are not yet available from several Contracting and/or non-Contracting Parties, and that this figure incorporates provisional scientific estimates of Ghanaian catches for 2006-2012.

In the eastern Atlantic, purse seine catches declined by over 60% between 1990 and 2007 (127,700 t to 47,900 t), but subsequently increased to 71,827 t in 2014 (**YFT-Table 1; YFT-Figure 2**). Baitboat catches have declined by 50% since 1990 (from 19,600 t to 9,400 t). Longline catches, which were 10,300 t in 1990, declined to 5,000 t in 2014. In the western Atlantic, purse seine catches (predominantly from Venezuela) were as high as 25,700 t during the mid-1980s, but have since declined nearly 90%, to 2,600 in 2014. Baitboat catches also declined 90% since a peak in 1994 (7,100 t), and for 2014 were estimated to be below 500 t. Since 1990, longline catches have generally fluctuated between 10,000 t and 20,000 t.

The decline in purse seine catches during 1992-2007 was in large part due to a decline in the number of European and associated fleet purse seine vessels operating in the eastern Atlantic (e.g. from 44 vessels in 2001 to 25 vessels in 2006; **SKJ-Figure 9**). However, since that time, the number of purse seiners and overall fleet efficiency has increased as newer vessels with greater fishing power and carrying capacity have moved from the Indian Ocean to the Atlantic. The Committee notes that in 2015, three new purse seine vessels moved from the Pacific Ocean to the Atlantic Ocean. By 2010, overall carrying capacity of the purse seine fleet had increased significantly, to about the same level as in the 1990s, and FAD based fishing has accelerated even more rapidly than free school fishing.

The Committee noted that surface fisheries for tropical tunas in the eastern Atlantic have expanded in recent years. Since 2011, significant catches of yellowfin tuna have been obtained by EU purse seiners south of 15°S off the coast of West Africa (in association with skipjack and bigeye on FADs). Another recent change is the implementation in 2012 of the strategy of fishing on floating objects off of Mauritania (north of 15°N). Catches on floating objects in this area tended to consist almost entirely of skipjack. Effort directed in this manner may therefore have a reduced impact on yellowfin tuna.

The species composition and catch at size of tropical tunas landed by Ghanaian baitboats and purse seiners have been reevaluated since the last yellowfin tuna assessment. This led to the adoption of new estimates of Task I and Task II catch and effort and size for these fleets for the period 1973-2005. Provisional estimates for the period 2006-2014 are also available, and are included in **YFT-Table 1**. The Committee reviewed and adopted the 2006-2012 landings of skipjack and bigeye at stock assessment meetings of those species. However, the yellowfin tuna landings for this period require further evaluation prior to adoption. A comparison of the most recent estimates of total catch and that available for the last assessment is shown in **YFT-Figure 3**.

Numerous catch rate series were available during the 2011 stock assessment; most have not been updated since that time. 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, and 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 a clear trend since. The Japanese longline index was updated through 2013, and suggests some increase in catch rates in the most recent years (**YFT-Figure 7**).

The average weight trends by fleet (1970-2010) are shown in **YFT-Figure 8**. The recent average weight in European purse seine catches, which represent the majority of the landings, had 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 9**. The variability in overall catch at age is primarily due to increasing 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 age structured model 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 9**). The impact of this change in selectivity on estimates of MSY is clearly seen in the results from age structured models (**YFT-Figure 10**). 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 11**. 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 12**).

In summary, 2010 reported catches were well below MSY levels, stock biomass was estimated to most likely be about 15% below the Convention objective and fishing mortality rates most likely about 13% below F_{MSY} . The trends in the most recent years through 2010 were 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 conducted in 2011 considered a number of constant catch scenarios. The results from all models were summarized to produce estimated probabilities of achieving the Convention objective ($B > B_{MSY}$, $F < F_{MSY}$), for a given level of constant catch, for each year up to 2025 (**YFT-Figure 13** and **YFT-Table 2**). Maintaining catch levels at 110,000 t had been expected to lead to a biomass somewhat above B_{MSY} by 2016 with a 60% probability. These projections have not been updated, however the overall catches in 2012-2014 were lower than 110,000 t (**YFT-Table 1**). These lower catch levels could have had a higher probability of achieving the management objective within the same time frame.

YFT-5. Effect of current regulations

Closures in various time-areas in the eastern tropical Atlantic have been in place during some prior years, imposing restrictions on either FAD-associated sets or all surface gears. Recommendation 11-01 (later Rec. 14-01) implemented a closure of surface fishing on FADs in the area from the African coast to 10°S, 5°W-5°E during January-February in the Gulf of Guinea. This closure came into effect in 2013. The efficacy of the area-time closure (moratorium) agreed in Rec. 14-01 was evaluated by examining fine-scale (1°x1°) skipjack, yellowfin, and bigeye catch by month distributions from the European and associated purse seine fleet FAD fishery and the Ghanaian purse seine and baitboat fishery. After reviewing this information, the Committee concluded that the moratorium has not been effective at reducing the mortality of juvenile bigeye tuna, and any reduction in yellowfin tuna mortality was minimal, largely due to the redistribution of effort into areas adjacent to the moratorium area. (See Response to Commission 19.1.) Rec. 14-01 also implemented a TAC of 110,000 t for 2012 and subsequent years. The overall catches in 2012 (104,100 t), 2013 (98,600 t) and 2014 (103,100 t) were lower than this TAC.

YFT-6. Management recommendations

The Atlantic yellowfin tuna stock was estimated to be overfished in 2010. Continuation of catch levels in the order of 110,000 t was expected to lead to a biomass somewhat above B_{MSY} by 2016 with a 60% probability. These projections have not been updated, however the overall catches in 2012-2014 were lower than 110,000 t (**YFT-Table 1**). These lower catch levels could result in a higher probability of achieving the management objective within the same time frame. However, 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 longterm 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 strongly recommends a yellowfin tuna stock assessment be conducted in 2016. This is consistent with the strategic plan of the SCRS and is considered a priority because: 1) the last assessment was conducted in 2011, 2) since the last assessment there have been significant changes to the historical landings and catch at size data, 3) since the last assessment there has been a large increase in FAD associated fishing, and an influx of purse seiners from the Pacific and Indian Oceans and 4) fishery indicators available for the period starting 2012 are insufficient to provide strong indication of changes in stock status that may have occurred since the last assessment.

ATLANTIC YELLOWFIN TUNA SUMMARY

| | |
|---|--|
| Maximum Sustainable Yield (MSY) | 144,600 ¹ (114,200 - 155,100) |
| 2014 Yield | 103,400 t |
| Relative Biomass B_{2010}/B_{MSY} | 0.85 (0.61-1.12) ² |
| Relative Fishing Mortality: $F_{current(2010)}/F_{MSY}$ | 0.87 (0.68-1.40) ² |
| Stock Status | Overfished: Yes Overfishing: No |

Management measures in effect:
[Rec. 11-01 as revised in 14-01]:

- Time-area closure for FAD associated surface fishing
 - TAC of 110,000 t
 - Specific authorization to fish for tropical tunas for vessels 20 meters or greater.
 - Specific limits of number of longline and/or purse seine boats for a number of fleets
-

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 Median (10th-90th percentiles) from joint distribution of age-structured and production model bootstrap outcomes considered.

YFT-Table 1. Estimated catches (t) of yellowfin (*Thunnus albacares*) by area, gear and flag. (v2, 2015-09-25).

| | | | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|--------------|-----|---------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|--------|--------|--------|--------|--------|--------|--------|
| TOTAL | | | 193604 | 167602 | 163770 | 163451 | 173744 | 154588 | 149152 | 137375 | 144496 | 136325 | 132154 | 153455 | 134427 | 122448 | 119445 | 101745 | 105449 | 95963 | 109341 | 120637 | 114055 | 104834 | 104092 | 100795 | 103443 |
| | ATE | | 160873 | 130705 | 126058 | 124706 | 125530 | 119314 | 116096 | 105034 | 113576 | 105615 | 96531 | 113132 | 104767 | 97467 | 88207 | 75677 | 77177 | 71795 | 91218 | 101861 | 93262 | 87155 | 84231 | 81879 | 89154 |
| | ATW | | 32731 | 36897 | 37712 | 38745 | 48215 | 35274 | 33056 | 32341 | 30919 | 30710 | 35623 | 40323 | 29660 | 24982 | 31238 | 26068 | 28272 | 24167 | 18123 | 18777 | 20794 | 17678 | 19861 | 18916 | 14287 |
| | MED | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 |
| Landings | ATE | Bait boat | 19648 | 17772 | 15095 | 18471 | 15652 | 13496 | 11365 | 12683 | 14265 | 16729 | 10022 | 14034 | 11145 | 9967 | 14639 | 9725 | 9463 | 7044 | 8365 | 9592 | 7143 | 8330 | 5816 | 6702 | 9448 |
| | | Longline | 10253 | 9082 | 6518 | 8537 | 14638 | 13723 | 14236 | 10495 | 13872 | 13561 | 11369 | 7570 | 5790 | 9075 | 11442 | 7317 | 7234 | 13437 | 8562 | 7385 | 5544 | 6602 | 5510 | 5550 | 5023 |
| | | Other surf. | 2175 | 3748 | 2450 | 2122 | 2030 | 1989 | 2065 | 2136 | 1674 | 1580 | 2424 | 2074 | 1826 | 2540 | 2928 | 2152 | 2988 | 2534 | 1693 | 3012 | 1690 | 1253 | 1949 | 2939 | 1449 |
| | | Purse seine | 127673 | 97182 | 99532 | 92130 | 90151 | 87597 | 87616 | 78225 | 82278 | 71964 | 70664 | 89068 | 85685 | 74580 | 57663 | 55429 | 56745 | 47944 | 71590 | 80449 | 77017 | 67948 | 69084 | 65354 | 71827 |
| | ATW | Bait boat | 4718 | 5359 | 6276 | 6383 | 7094 | 5297 | 4560 | 4275 | 5511 | 5349 | 6753 | 5315 | 6009 | 3764 | 4868 | 3867 | 2695 | 2304 | 886 | 1331 | 1436 | 2311 | 1108 | 1403 | 493 |
| | | Longline | 18851 | 13667 | 16594 | 12129 | 11790 | 11185 | 11882 | 11554 | 11671 | 13326 | 15760 | 14872 | 11921 | 10166 | 16019 | 14449 | 14249 | 13557 | 13192 | 12782 | 13038 | 10677 | 12558 | 12405 | 7765 |
| | | Other surf. | 2362 | 3457 | 3483 | 4152 | 9719 | 12454 | 5830 | 4801 | 4581 | 5345 | 5241 | 7027 | 3763 | 6445 | 7134 | 5118 | 6880 | 5959 | 1973 | 3285 | 3590 | 2425 | 2885 | 1470 | 3444 |
| | | Purse seine | 6800 | 14414 | 11359 | 16081 | 19612 | 6338 | 10784 | 11710 | 9157 | 6523 | 7870 | 13108 | 7966 | 4607 | 3217 | 2634 | 4442 | 2341 | 2067 | 1370 | 2722 | 2256 | 3302 | 3635 | 2581 |
| | 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 | 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 | 1 |
| Landings(FP) | ATE | Purse seine | 1124 | 2921 | 2463 | 3447 | 3059 | 2509 | 813 | 1495 | 1488 | 1781 | 2051 | 387 | 321 | 1305 | 1534 | 1054 | 747 | 836 | 1008 | 1423 | 1869 | 3021 | 1872 | 1332 | 1401 |
| 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 | 1 | 1 | 6 |
| | ATW | Longline | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 167 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 6 | 5 | 9 | 8 | 9 | 7 | 3 | 4 |
| | | Other surf. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Landings | ATE | Angola | 292 | 510 | 441 | 211 | 137 | 216 | 78 | 70 | 115 | 170 | 35 | 34 | 34 | 34 | 34 | 111 | 0 | 405 | 98 | 701 | 520 | 485 | 191 | 0 | 541 |
| | | Belize | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 3 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 405 | 1794 | 3172 | 5861 | 5207 | 7036 |
| | | Benin | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Cambodia | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Canada | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Cabo Verde | 2136 | 1932 | 1426 | 1536 | 1727 | 1781 | 1448 | 1721 | 1418 | 1663 | 1851 | 1684 | 1802 | 1868 | 3236 | 6019 | 5648 | 4568 | 7905 | 4638 | 5856 | 6002 | 4603 | 7513 | 4507 |
| | | Cayman Islands | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | China PR | 0 | 0 | 0 | 139 | 156 | 200 | 124 | 84 | 71 | 1535 | 1652 | 586 | 262 | 1033 | 1030 | 1112 | 1056 | 1000 | 365 | 214 | 169 | 220 | 170 | 130 | 20 |
| | | Chinese Taipei | 2244 | 2163 | 1554 | 1301 | 3851 | 2681 | 3985 | 2993 | 3643 | 3389 | 4014 | 2787 | 3363 | 4946 | 4145 | 2327 | 860 | 1707 | 807 | 1180 | 537 | 1463 | 818 | 914 | 844 |
| | | Congo | 22 | 17 | 18 | 17 | 14 | 13 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Cuba | 798 | 658 | 653 | 541 | 238 | 212 | 257 | 269 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Curaçao | 0 | 0 | 0 | 0 | 0 | 0 | 3183 | 6082 | 6110 | 3962 | 5441 | 4793 | 4035 | 6185 | 4161 | 0 | 1939 | 1368 | 7351 | 6293 | 5302 | 4413 | 6792 | 3727 | 5152 |
| | | Côte D'Ivoire | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 673 | 213 | 99 | 302 | 565 | 175 | 482 | 216 | 626 | 90 | 470 | 385 | 1471 | 2077 | 324 |
| | | EU.España | 68603 | 53464 | 49902 | 40403 | 40612 | 38278 | 34879 | 24550 | 31337 | 19947 | 24681 | 31105 | 31469 | 24884 | 21414 | 11795 | 11606 | 13584 | 24409 | 32793 | 25560 | 21026 | 18854 | 11878 | 14267 |
| | | EU.Estonia | 0 | 234 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | EU.France | 45684 | 34840 | 33964 | 36064 | 35468 | 29567 | 33819 | 29966 | 30739 | 31246 | 29789 | 32211 | 32753 | 32429 | 23949 | 22672 | 18940 | 11330 | 16115 | 18923 | 20280 | 22036 | 18506 | 20291 | 21086 |
| | | EU.Ireland | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | EU.Latvia | 0 | 255 | 54 | 16 | 0 | 55 | 151 | 223 | 97 | 25 | 36 | 72 | 334 | 334 | 334 | 334 | 334 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | EU.Lithuania | 0 | 332 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | EU.Poland | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | EU.Portugal | 179 | 328 | 195 | 128 | 126 | 231 | 288 | 176 | 267 | 177 | 194 | 4 | 6 | 4 | 5 | 16 | 274 | 865 | 300 | 990 | 537 | 452 | 355 | 335 | 69 |
| | | EU.United Kingdom | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 21 | 22 | 1 | 0 |
| | | Faroe Islands | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Gabon | 0 | 0 | 0 | 12 | 88 | 218 | 225 | 225 | 295 | 225 | 162 | 270 | 245 | 44 | 44 | 44 | 44 | 44 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Gambia | 2 | 16 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Georgia | 0 | 25 | 22 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Ghana | 11988 | 9254 | 9331 | 13283 | 9984 | 9268 | 8182 | 15080 | 13222 | 20815 | 12304 | 23392 | 18100 | 15002 | 14044 | 13019 | 13686 | 11115 | 14127 | 18237 | 15732 | 11043 | 9347 | 13167 | 19138 |
| | | Guatemala | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2906 | 5265 | 3461 | 3736 | 2603 | 3124 | 2803 | 2949 | 4023 | 3754 |
| | | Guinea Ecuatorial | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 892 | 892 | 199 | 0 | 0 | 0 | 11 |
| | | Guinée Rep. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 298 | 292 | 1559 | 1484 | 823 | |
| | | Honduras | 0 | 0 | 2 | 0 | 0 | 4 | 3 | 4 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Japan | 5887 | 4467 | 2961 | 2627 | 4194 | 4770 | 4246 | 2733 | 4092 | 2101 | 2286 | 1550 | 1534 | 1999 | 5066 | 3088 | 4206 | 8496 | 5266 | 3563 | 3041 | 3348 | 3637 | 3843 | 3114 |
| | | Korea Rep. | 324 | 259 | 174 | 169 | 436 | 453 | 297 | 101 | 23 | 94 | 142 | 3 | 8 | 209 | 984 | 95 | 4 | 303 | 983 | 381 | 324 | 20 | 26 | 97 | 77 |
| | | Libya | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 208 | 73 | 73 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Maroc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 79 | 108 | 95 | 183 | 95 | 102 | 110 | 110 | 44 | 272 | 55 | 137 | 107 | |
| | | Mixed flags (FR+ES) | 0 | 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 (ETRO) | 12601 | 4856 | 10921 | 9875 | 8544 | 8970 | 9567 | 6706 | 7225 | 5418 | 5448 | 10169 | 8209 | 5396 | 4294 | 1781 | 127 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | NEI (Flag related) | 1115 | 2310 | 1315 | 1157 | 2524 | 2975 | 3588 | 3368 | 5464 | 5679 | 3072 | 2090 | 133 | 466 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Namibia | 0 | 0 | 0 | 0 | 35 | 14 | 72 | 69 | 3 | 147 | 59 | 165 | 89 | 139 | 85 | 135 | 59 | 28 | 11 | 1 | 9 | 90 | 0</ | | |

| | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | |
|----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|------|------|------|------|------|------|------|--|
| Norway | 1790 | 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 | 1498 | 7976 | 8338 | 10973 | 12066 | 13442 | 7713 | 4293 | 2111 | 1315 | 1103 | 574 | 1022 | 0 | 1887 | 6170 | 8557 | 9363 | 6175 | 5982 | 5048 | 4358 | 5004 | 3899 | 4587 | |
| Philippines | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 126 | 173 | 86 | 0 | 50 | 9 | 68 | 13 | 30 | 88 | 53 | 152 | 89 | 134 | 5 | 56 | | |
| Russian Federation | 0 | 3200 | 1862 | 2160 | 1503 | 2936 | 2696 | 4275 | 4931 | 4359 | 737 | 0 | 0 | 0 | 4 | 42 | 211 | 42 | 33 | 0 | 0 | 0 | 0 | 0 | | |
| S. Tomé e Príncipe | 164 | 187 | 170 | 181 | 125 | 135 | 120 | 109 | 124 | 114 | 122 | 122 | 122 | 122 | 134 | 145 | 137 | 0 | 160 | 165 | 169 | 0 | 0 | 0 | | |
| Senegal | 90 | 132 | 40 | 19 | 6 | 20 | 41 | 208 | 251 | 834 | 252 | 295 | 447 | 279 | 681 | 1301 | 1262 | 819 | 588 | 1279 | 1212 | 1050 | 1683 | 1247 | 612 | |
| Seychelles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| South Africa | 624 | 52 | 69 | 266 | 486 | 183 | 157 | 116 | 240 | 320 | 191 | 342 | 152 | 298 | 402 | 1156 | 1187 | 1063 | 351 | 303 | 235 | 673 | 174 | 440 | 1512 | |
| St. Vincent and Grenadines | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 14 | 0 | 101 | 209 | 83 | 74 | 28 | 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. | 3615 | 0 | 0 | 0 | 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 | 1 | 0 | | |
| UK.Sta Helena | 92 | 100 | 166 | 171 | 150 | 181 | 151 | 109 | 181 | 116 | 136 | 72 | 9 | 0 | 0 | 0 | 344 | 177 | 97 | 104 | 65 | 163 | 149 | 53 | 152 | |
| Ukraine | 0 | 215 | 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 | 24 | 145 | 483 | 450 | 331 | 23 | 10 | 124 | 21 | | |
| 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 | 23 | 34 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 327 | 327 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | | |
| Barbados | 89 | 108 | 179 | 161 | 156 | 255 | 160 | 149 | 150 | 155 | 155 | 142 | 115 | 178 | 211 | 292 | 197 | 154 | 156 | 79 | 129 | 131 | 195 | 188 | 218 | |
| Belize | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 143 | 1164 | 1160 | 940 | 264 | 42 | 41 | 38 | 33 | |
| Brazil | 1758 | 1838 | 4228 | 5131 | 4169 | 4021 | 2767 | 2705 | 2514 | 4127 | 6145 | 6239 | 6172 | 3503 | 6985 | 7223 | 3790 | 5468 | 2749 | 3313 | 3617 | 3499 | 2836 | 2645 | 2866 | |
| Canada | 7 | 29 | 25 | 71 | 52 | 174 | 155 | 100 | 57 | 22 | 105 | 125 | 70 | 73 | 304 | 240 | 293 | 276 | 168 | 53 | 166 | 50 | 93 | 74 | 34 | |
| China PR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 628 | 655 | 22 | 470 | 435 | 17 | 275 | 74 | 29 | 124 | 284 | 248 | 258 | 126 | 94 | 81 | 73 | |
| Chinese Taipei | 5221 | 2009 | 2974 | 2895 | 2809 | 2017 | 2668 | 1473 | 1685 | 1022 | 1647 | 2018 | 1296 | 1540 | 1679 | 1269 | 400 | 240 | 315 | 211 | 287 | 305 | 252 | 345 | 197 | |
| Colombia | 237 | 92 | 95 | 2404 | 3418 | 7172 | 238 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Cuba | 53 | 18 | 11 | 1 | 14 | 54 | 40 | 40 | 15 | 15 | 0 | 0 | 65 | 65 | 65 | 65 | 65 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Curaçao | 170 | 150 | 160 | 170 | 155 | 140 | 130 | 130 | 130 | 130 | 130 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Côte D'Ivoire | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | | |
| Dominica | 18 | 12 | 23 | 30 | 31 | 9 | 0 | 0 | 0 | 80 | 78 | 120 | 169 | 119 | 81 | 119 | 65 | 103 | 124 | 102 | 110 | 132 | 119 | 120 | | |
| Dominican Republic | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 89 | 220 | 226 | 226 | 226 | 226 | 226 | 226 | 226 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| EU.España | 2 | 1462 | 1314 | 989 | 7 | 4 | 36 | 34 | 46 | 30 | 171 | 0 | 0 | 0 | 0 | 0 | 1 | 84 | 81 | 69 | 27 | 33 | 32 | 138 | 113 | |
| EU.France | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 122 | 456 | 712 | 412 | 358 | 647 | |
| EU.Netherlands | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | | |
| EU.Portugal | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 151 | 60 | 88 | 179 | 260 | 115 | 127 | 92 | 4 | 2 | |
| FR.St Pierre et Miquelon | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Grenada | 530 | 620 | 595 | 858 | 385 | 410 | 523 | 302 | 484 | 430 | 403 | 759 | 593 | 749 | 460 | 492 | 502 | 633 | 756 | 630 | 673 | 0 | 0 | 0 | | |
| Jamaica | 0 | 0 | 0 | 0 | 0 | 0 | 21 | 21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Japan | 1734 | 1698 | 1591 | 469 | 589 | 457 | 1004 | 806 | 1081 | 1304 | 1775 | 1141 | 571 | 755 | 1194 | 1159 | 437 | 541 | 986 | 1431 | 1539 | 1106 | 1024 | 734 | 723 | |
| Korea Rep. | 484 | 1 | 45 | 11 | 0 | 0 | 84 | 156 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 580 | 279 | 270 | 10 | 52 | 56 | 470 | 472 | 115 | 39 | |
| Mexico | 112 | 433 | 742 | 855 | 1093 | 1126 | 771 | 826 | 788 | 1283 | 1390 | 1084 | 1133 | 1313 | 1208 | 1050 | 938 | 890 | 956 | 1211 | 916 | 1174 | 1414 | 1004 | 1045 | |
| NEI (ETRO) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 36 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| NEI (Flag related) | 2985 | 2008 | 2521 | 1514 | 1880 | 1227 | 2374 | 2732 | 2875 | 1730 | 2197 | 793 | 42 | 112 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Panama | 2651 | 2249 | 2297 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 2804 | 227 | 153 | 119 | 2134 | 0 | 0 | 1995 | | |
| Philippines | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 36 | 106 | 78 | 12 | 79 | 145 | 299 | 230 | 234 | 151 | 167 | 0 | 0 | 0 | 30 | 72 | 76 | |
| Seychelles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| St. Vincent and Grenadines | 40 | 48 | 22 | 65 | 16 | 43 | 37 | 35 | 48 | 38 | 1989 | 1365 | 1160 | 568 | 4251 | 0 | 2680 | 2989 | 2547 | 2274 | 854 | 963 | 551 | 352 | 505 | |
| Sta. Lucia | 58 | 49 | 58 | 92 | 130 | 144 | 110 | 110 | 276 | 123 | 134 | 145 | 94 | 139 | 147 | 172 | 103 | 82 | 106 | 97 | 223 | 114 | 98 | 136 | 93 | |
| Suriname | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1943 | 1829 | | |
| Trinidad and Tobago | 304 | 543 | 4 | 4 | 120 | 79 | 183 | 223 | 213 | 163 | 112 | 122 | 125 | 186 | 224 | 295 | 459 | 615 | 520 | 629 | 788 | 799 | 931 | 1128 | 1141 | |
| U.S.A. | 5666 | 6914 | 6938 | 6283 | 8298 | 8131 | 7745 | 7674 | 5621 | 7567 | 7051 | 6703 | 5710 | 7695 | 6516 | 5568 | 7091 | 5529 | 2473 | 2788 | 2510 | 3010 | 4100 | 2332 | 2666 | |
| UK.Bermuda | 15 | 17 | 42 | 58 | 44 | 44 | 67 | 55 | 53 | 59 | 31 | 37 | 48 | 47 | 82 | 61 | 31 | 30 | 15 | 41 | 37 | 100 | 66 | 36 | 12 | |
| UK.British Virgin Islands | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 3 | 10 | |
| UK.Turks and Caicos | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 6 | 2 | |
| Uruguay | 18 | 62 | 74 | 20 | 59 | 53 | 171 | 53 | 88 | 45 | 45 | 90 | 91 | 95 | 204 | 644 | 218 | 35 | 66 | 76 | 122 | 24 | 6 | 7 | 0 | |
| Vanuatu | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 681 | 689 | 661 | 555 | 873 | 816 | 720 | 330 | 207 | 124 | 17 | |
| Venezuela | 10556 | 16503 | 13773 | 16663 | 24789 | 9714 | 13772 | 14671 | 13995 | 11187 | 11663 | 18651 | 11421 | 7411 | 5774 | 5097 | 6514 | 3911 | 3272 | 3198 | 4783 | 4419 | 4837 | 5050 | 3772 | |
| 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 | 1 | |
| EU.Malta | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | |
| Maroc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Landings(FP) ATE | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Belize | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19 | 50 | 71 | 27 | 109 | 35 | |
| Cabo Verde | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 77 | 28 | 39 | 40 | 103 | 152 | 58 | 35 | 82 | 256 | |

| | | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | |
|----------|----------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|---|
| | Curaçao | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 25 | 22 | 16 | 176 | 95 | 89 | 114 | 86 | 78 | |
| | Côte D'Ivoire | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 267 | 116 | 24 | |
| | EU.España | 364 | 940 | 859 | 1149 | 910 | 559 | 87 | 384 | 494 | 733 | 714 | 0 | 0 | 335 | 368 | 142 | 154 | 67 | 270 | 279 | 352 | 358 | 140 | 146 | 353 | |
| | EU.France | 530 | 982 | 1033 | 1554 | 1461 | 1074 | 472 | 658 | 703 | 832 | 914 | 344 | 309 | 672 | 597 | 244 | 128 | 33 | 52 | 203 | 181 | 344 | 347 | 129 | 115 | |
| | Guatemala | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 57 | 35 | 17 | 32 | 9 | 34 | 8 | 12 | 13 | 19 | |
| | Guinée Rep. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 72 | 0 | 66 | 20 | 67 | 95 | 389 | 876 | 487 | 461 | |
| | Mixed flags (EU tropical) | 230 | 998 | 571 | 744 | 688 | 876 | 254 | 452 | 291 | 216 | 423 | 42 | 13 | 298 | 570 | 292 | 251 | 416 | 464 | 467 | 857 | 1601 | 0 | 0 | 0 | |
| | Panama | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 155 | 125 | 177 | 114 | 99 | 54 | 101 | 54 | 163 | 59 | |
| | St. Vincent and Grenadines | 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 | |
| Discards | ATE | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Chinese Taipei | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 6 | |
| | 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 | 0 |
| | ATW | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 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 | 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 | 5 | 6 | 5 | 9 | 8 | 9 | 7 | 3 | 3 | |
| | U.S.A. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 167 | 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 | |

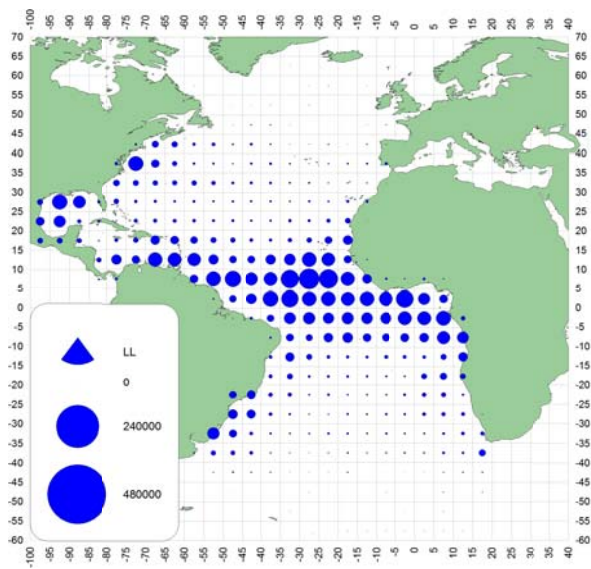
1. Brazilian Task I catches from 2012 to 2014 are preliminary and under revision.

2. Ghanaian Task I catches from 2006 to 2014 are provisional and could be revised.

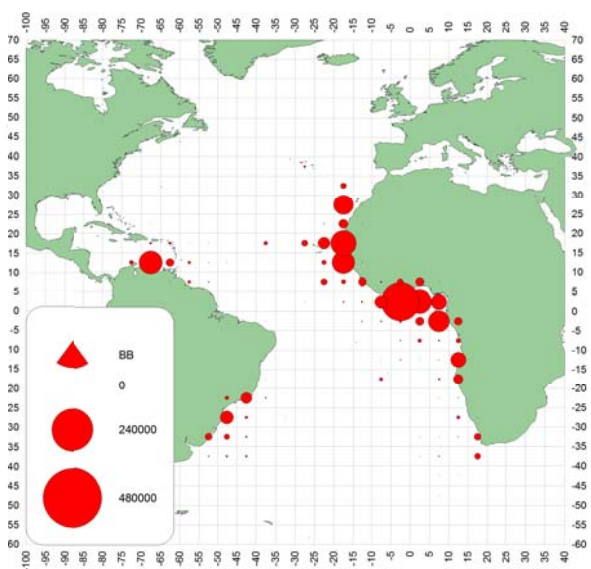
YFT-Table 2. Kobe II matrices giving the probability that the biomass will exceed the level that will produce MSY and the fishing mortality will fall below the fishing mortality rate that would maintain MSY, in any given year, for various constant catch levels based on combined model results.

| 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 |

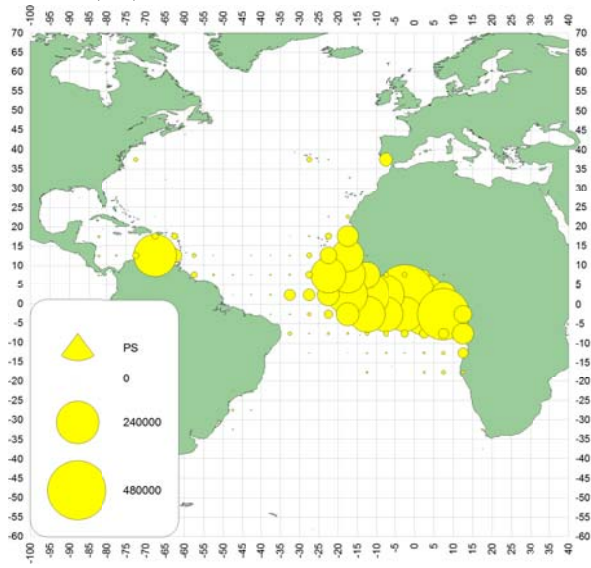
a)



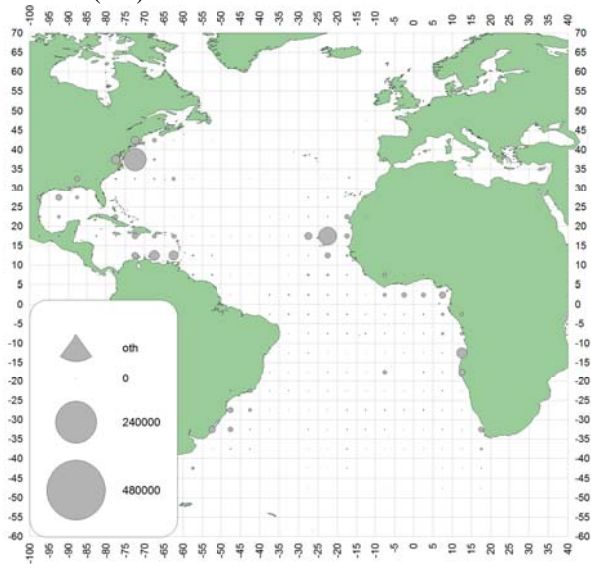
a. YFT (LL)



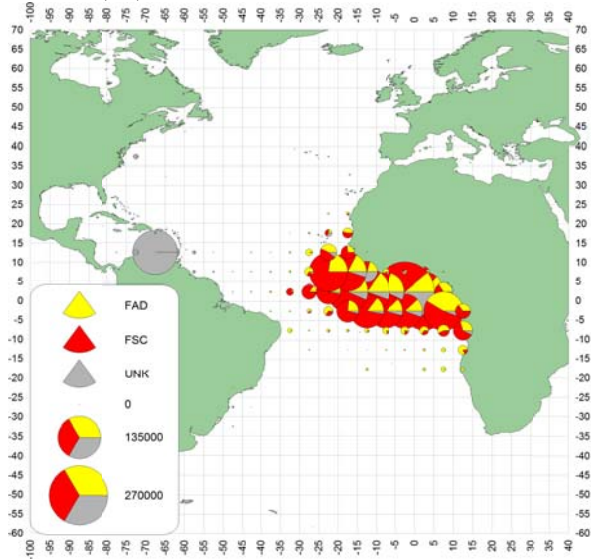
b. YFT (BB)



c. YFT (PS)

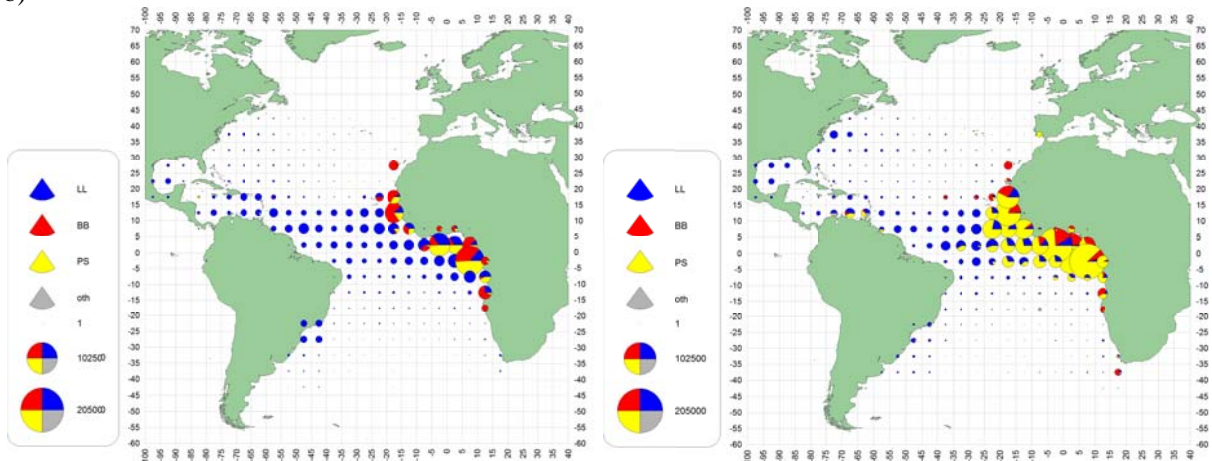


d. YFT (oth)



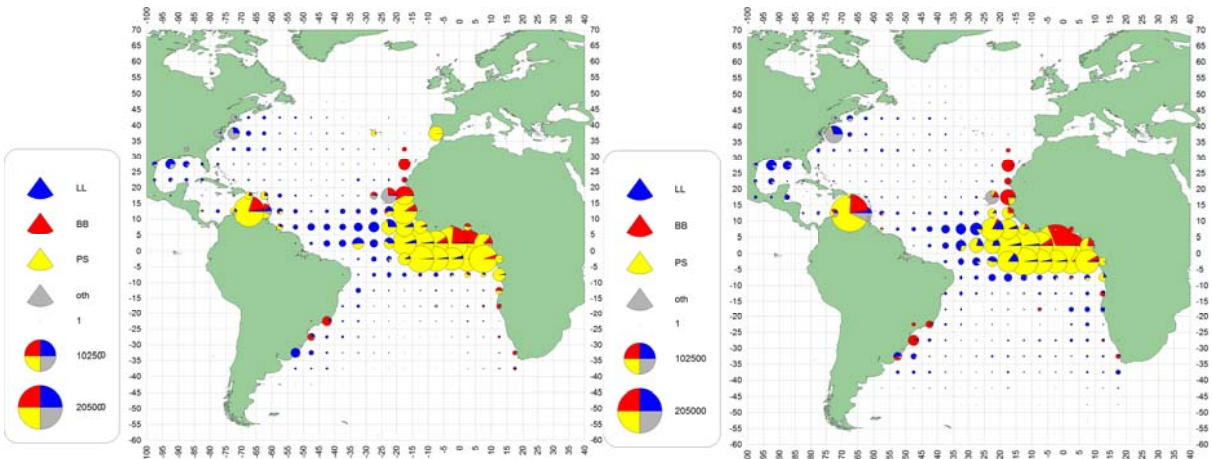
e. YFT (FAD/FREE 1991-2013)

b)



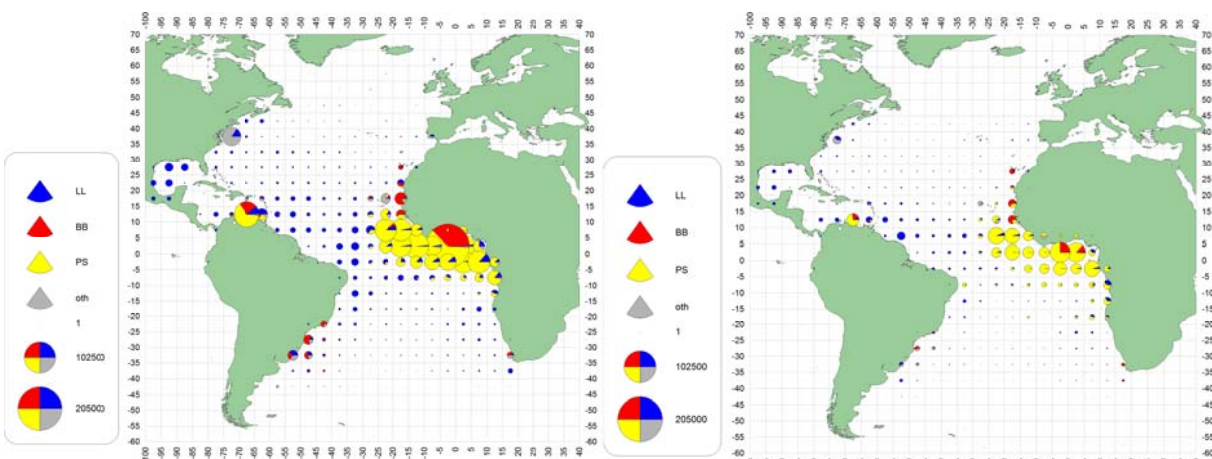
a. YFT(1960-69)

b. YFT(1970-79)



c. YFT(1980-89)

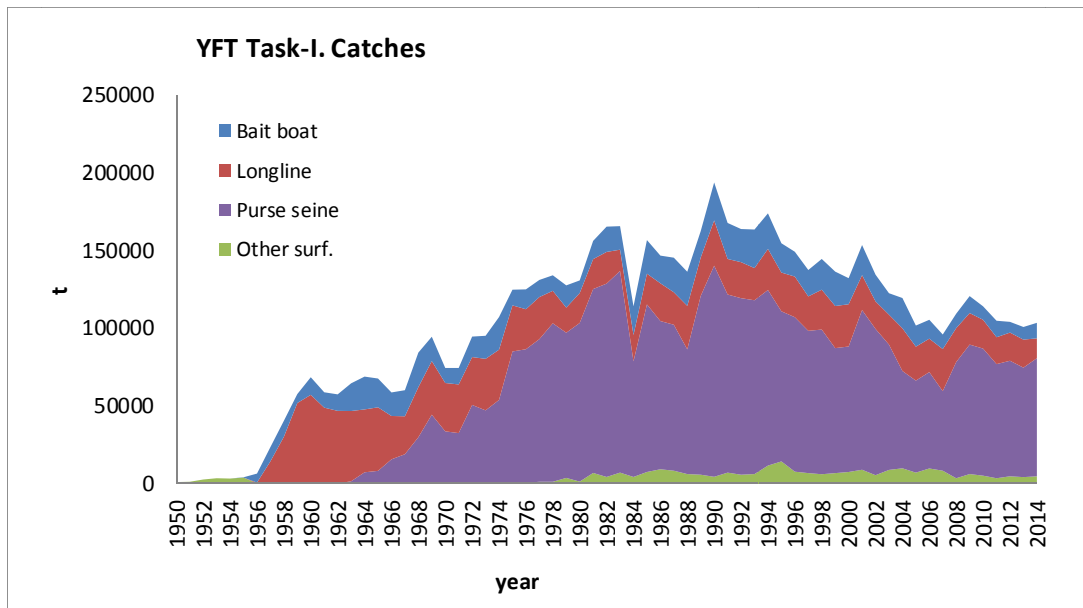
d. YFT(1990-99)



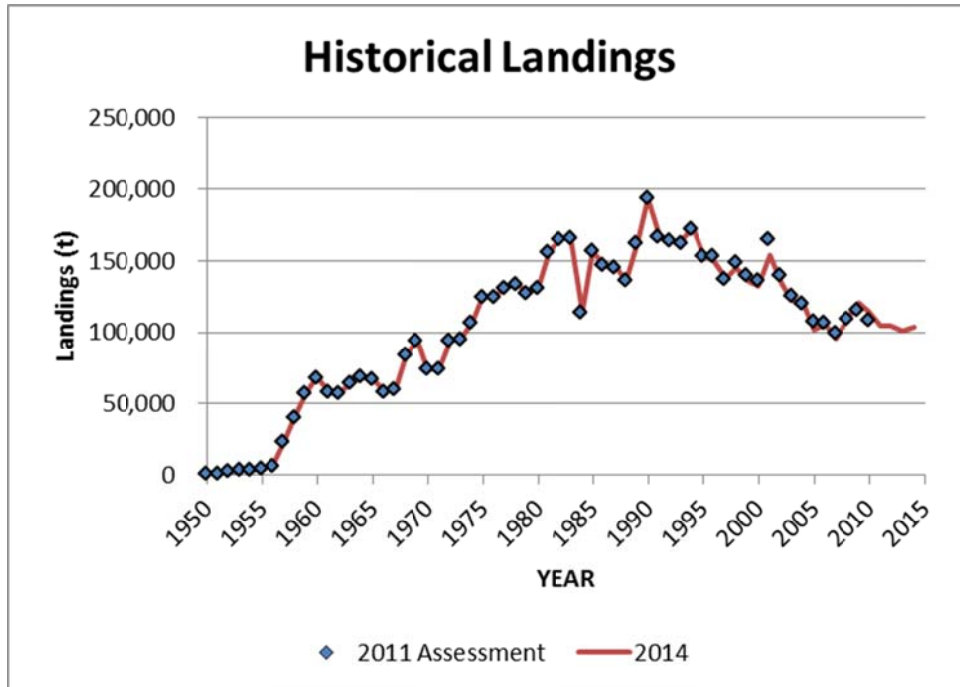
e. YFT (2000-09)

f. YFT(2010-13)

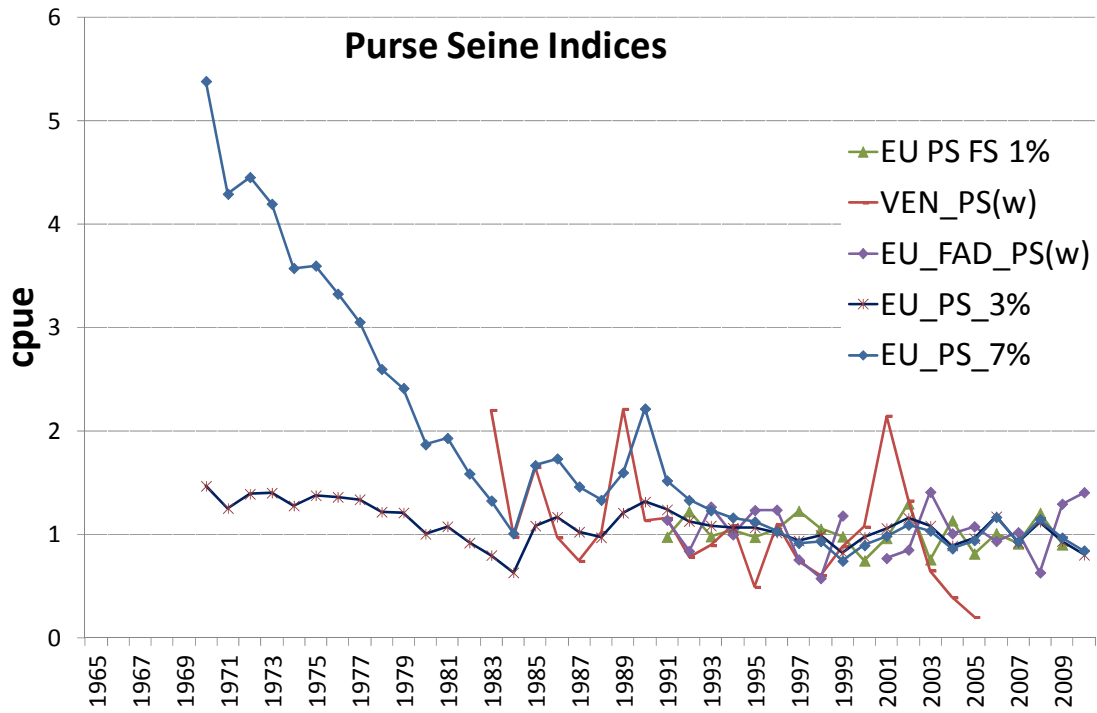
YFT-Figure 1. Geographical distribution of yellowfin tuna catches a) by major gears [a-e] and b) decade [a-f]. The maps b) are scaled to the maximum catch observed during 1960-2013.



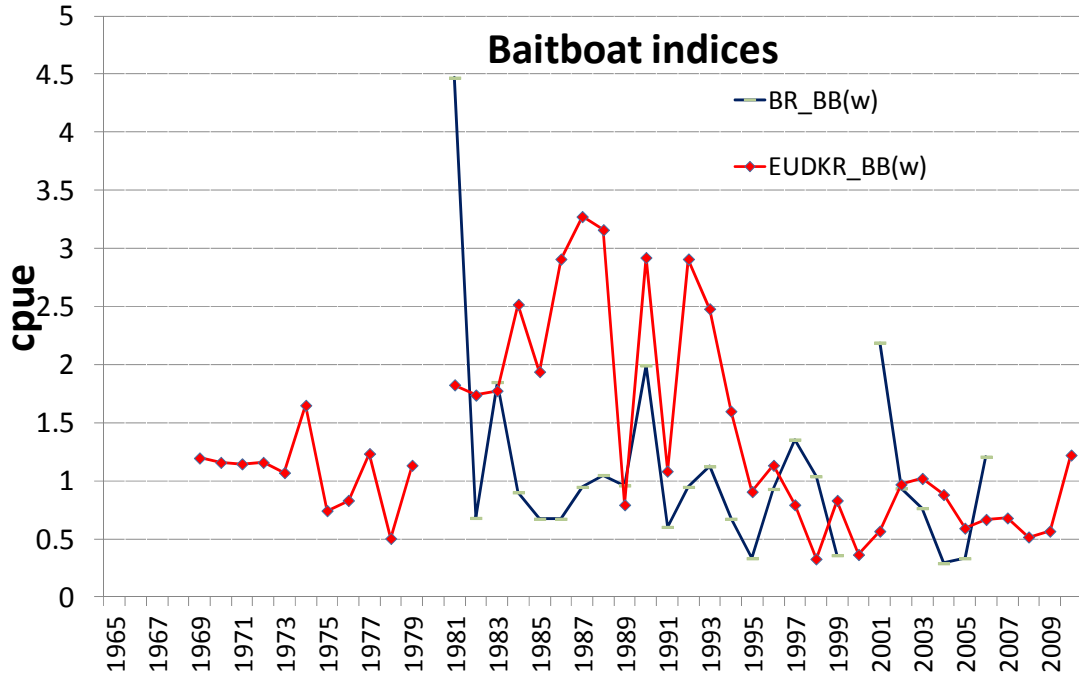
YFT-Figure 2. Estimated annual catch (t) of Atlantic yellowfin tuna by fishing gear, 1950-2014.



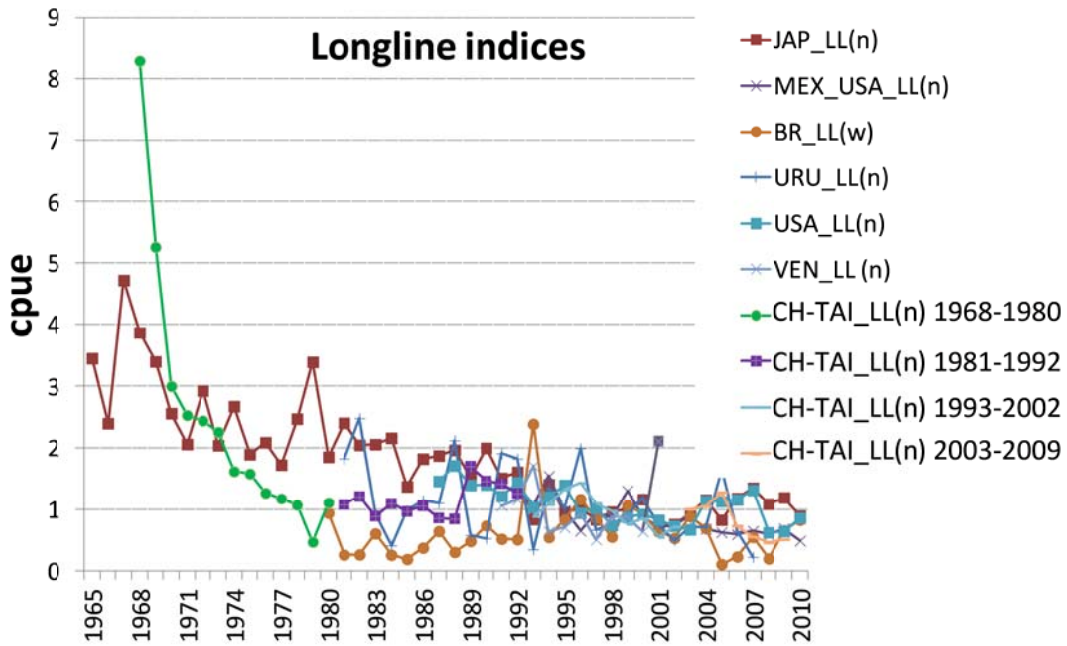
YFT-Figure 3. Comparison of the current estimated historical total catch trend with that available for the 2011 assessment.



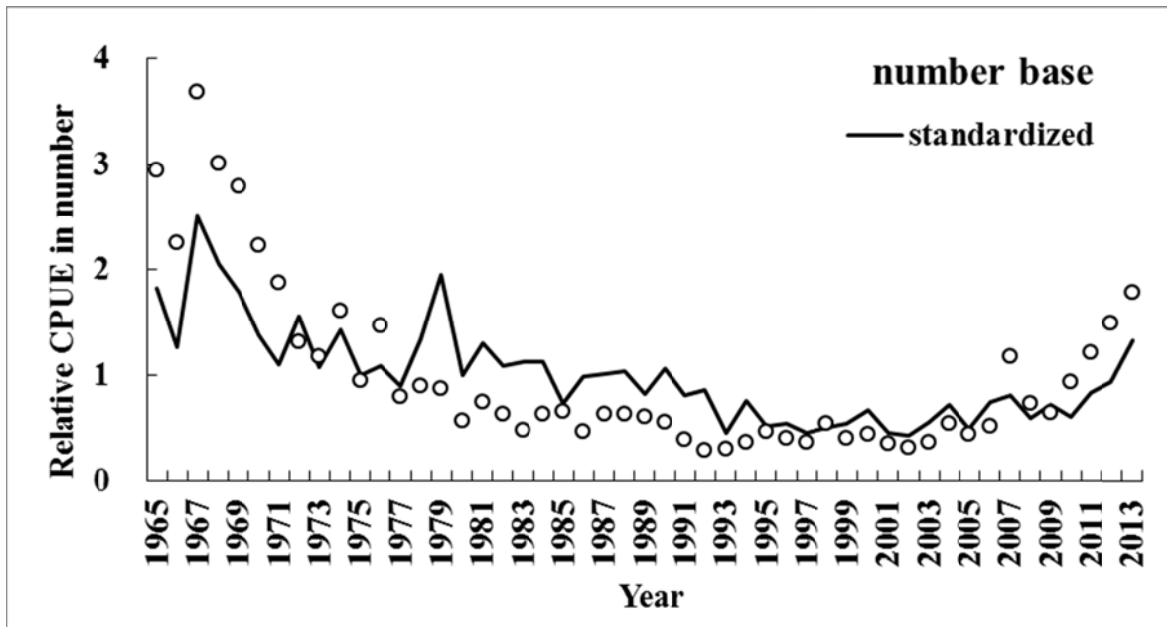
YFT-Figure 4. Yellowfin relative catch rate trends (both nominal and applying various annual increases in effectiveness) from purse seine fleets, in weight.



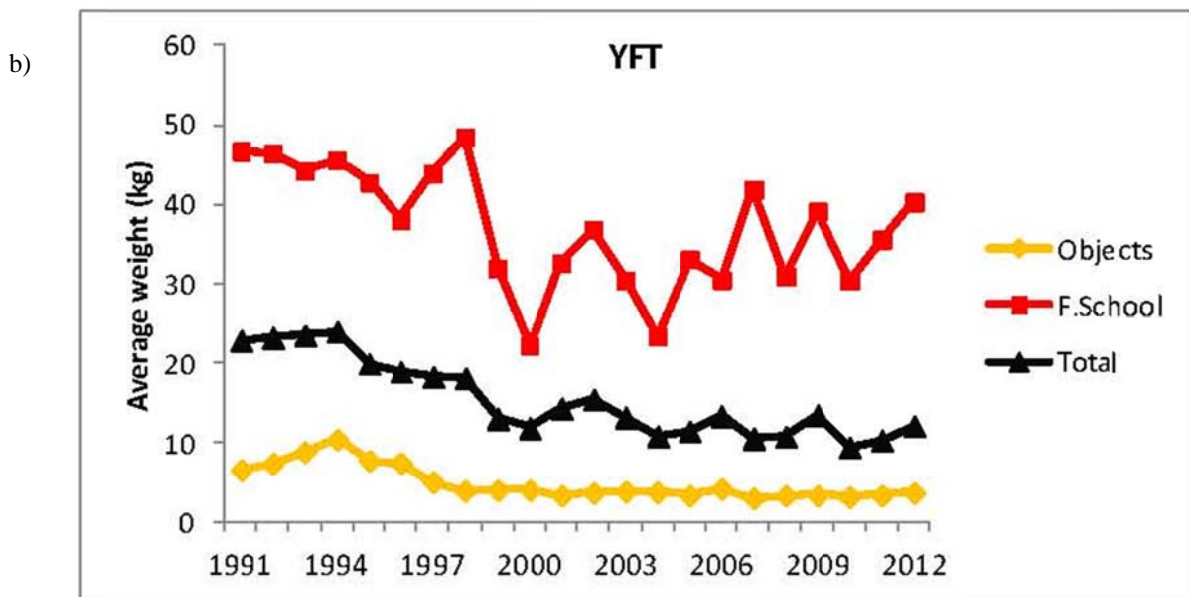
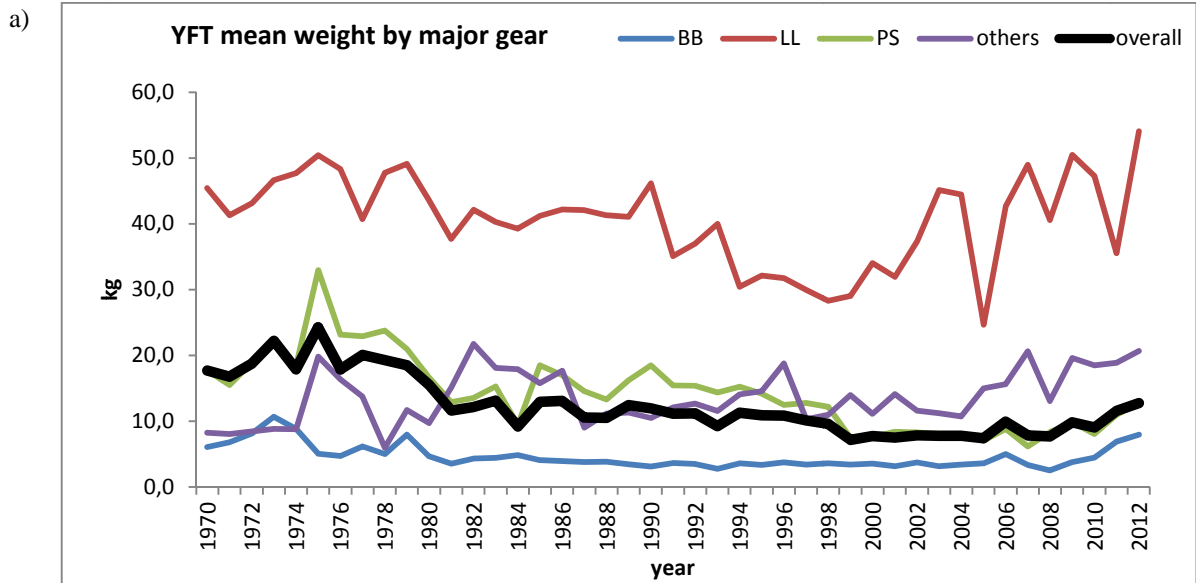
YFT-Figure 5. Yellowfin standardized catch rate trends from baitboat fleets, in weight.



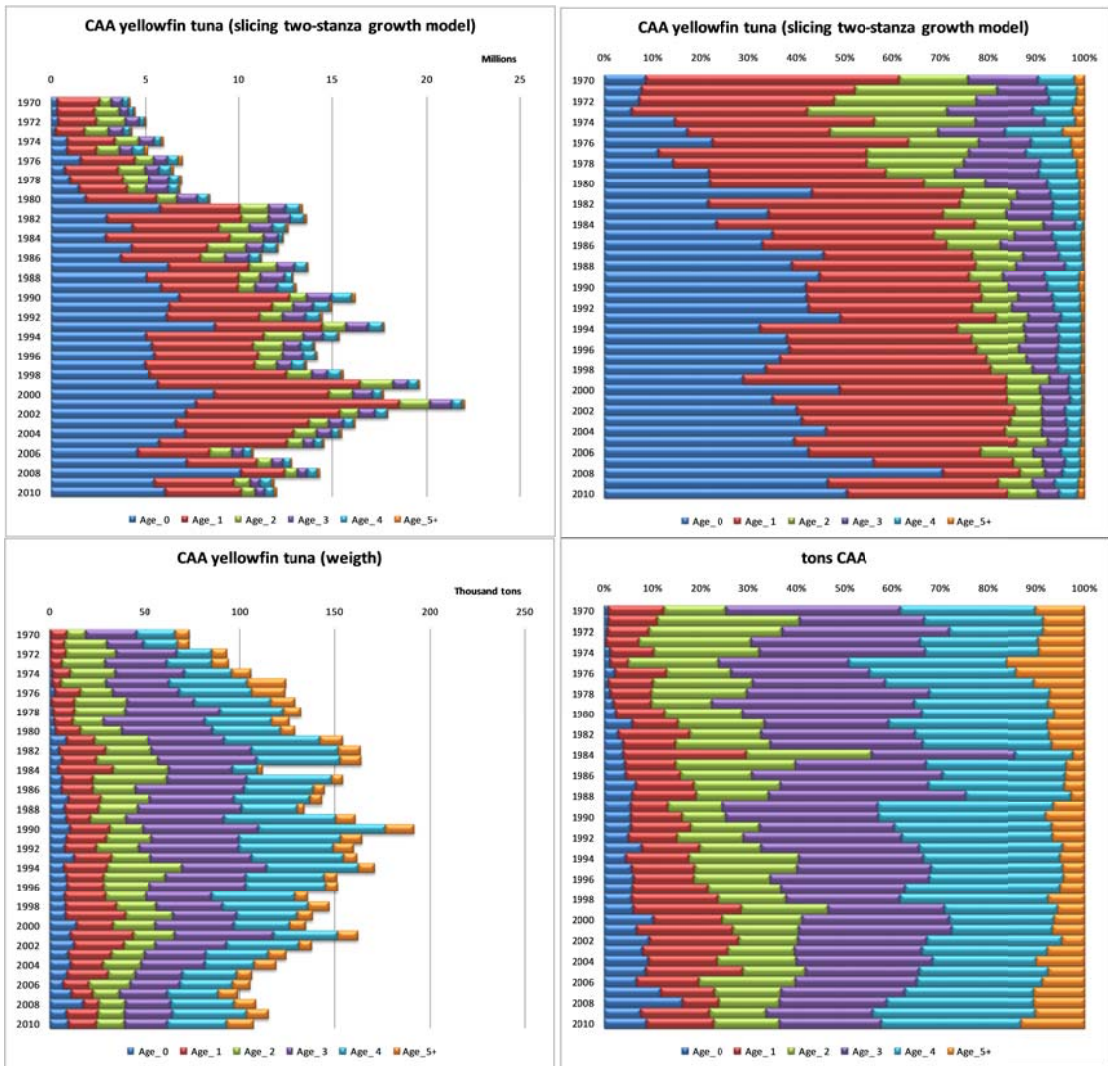
YFT-Figure 6. Yellowfin standardized catch rate trends from longline fleets, in weight (w) and numbers (n).



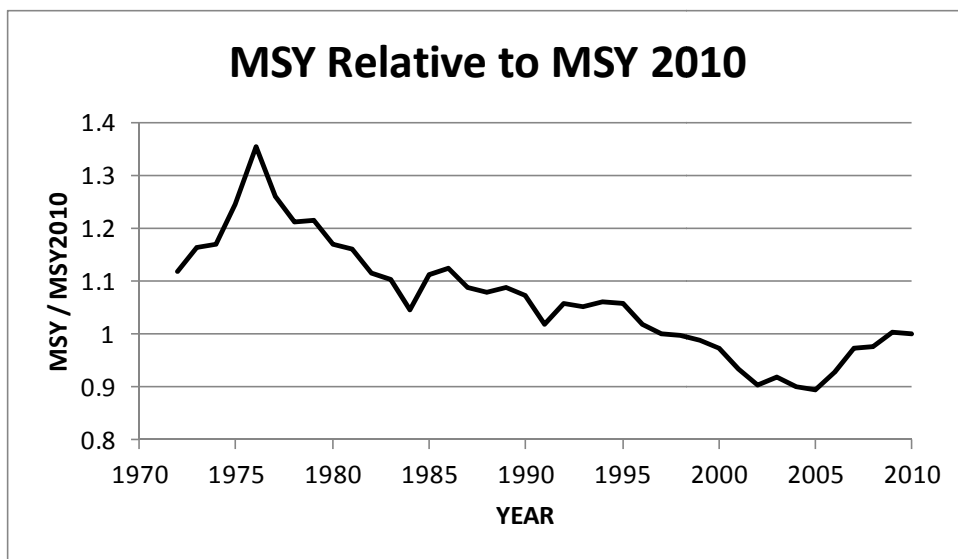
YFT-Figure 7. Yellowfin standardized catch rate trends from the Japanese longline fleet (in numbers), updated through 2013.



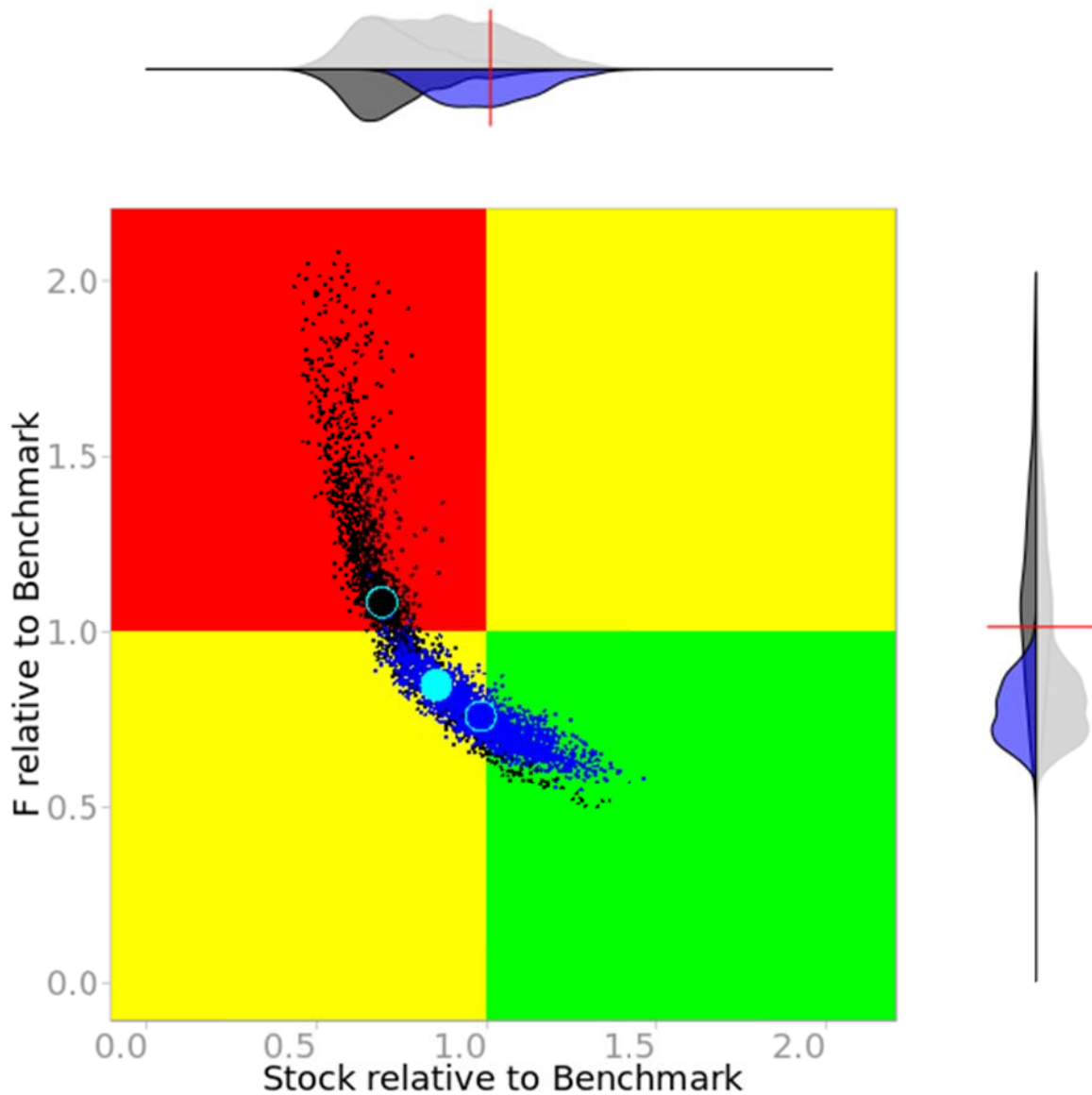
YFT-Figure 8. Trend of mean weight for yellowfin tuna based on the catch-at-size data a) by major fisheries (1970-2012) (NOTE: 2011 and 2012 are preliminary values based on some reported CAS series) and b) for European purse seiners (total) and separated between free schools and FAD associated schools (1991-2012).



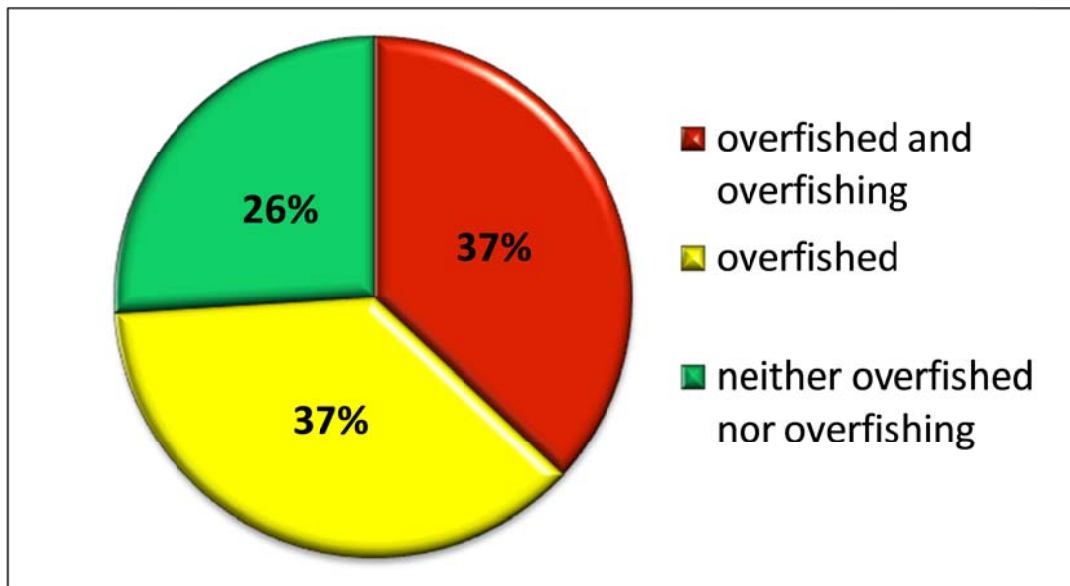
YFT-Figure 9. Distribution of Atlantic yellowfin catches by age (0-5+) in numbers of fish (top row) and in weight (bottom row) for 1970-2010.



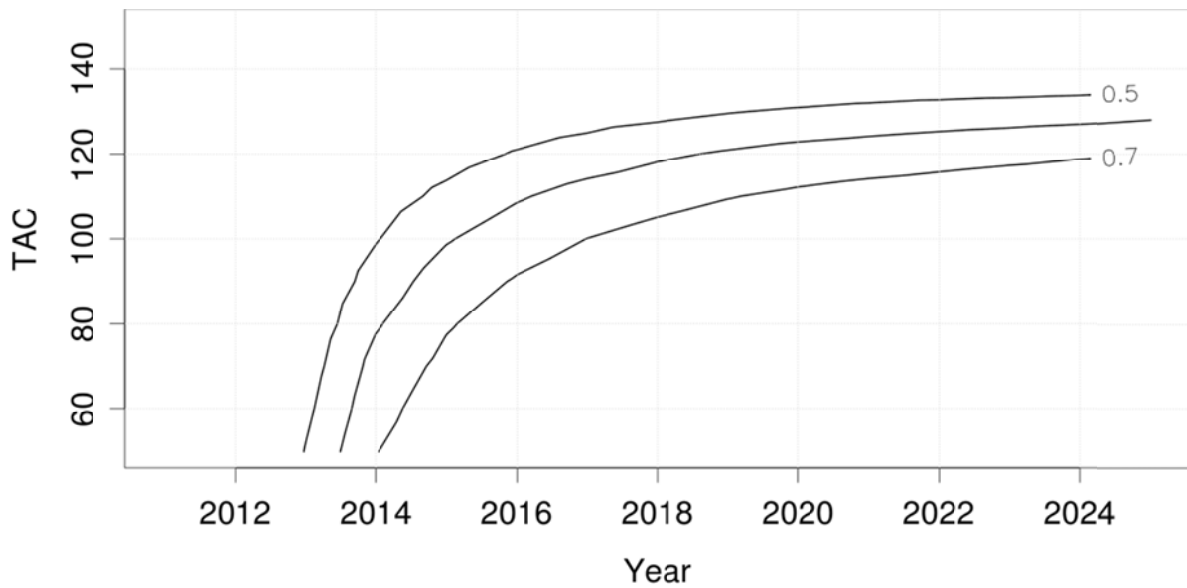
YFT-Figure 10. Estimates of historical MSY values, relative to the MSY estimated for 2010, for Atlantic yellowfin obtained through the age-structured model analysis, which considers the changes in selectivity that have occurred.



YFT-Figure 11. 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 12. 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 13. 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

A new stock assessment for bigeye tuna was conducted in 2015 through a process that included a data preparatory meeting in May (SCRS/2015/011) and an assessment meeting in July (SCRS/2015/015). The stock assessment used fishery data from the period 1950-2014 and most indices of relative abundance used in the assessment were also constructed through 2014.

BET-1. Biology

Bigeye tuna are distributed throughout the Atlantic Ocean between 50°N and 45°S, 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. In the western Pacific these daily patterns have been associated with feeding and are synchronized with depth changes in the deep scattering layer. 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. 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. The growth rates of bigeye tuna by sex are different based on Indian Ocean tagging data, males reaching around 10 cm larger L_{inf} than females. Bigeye tuna become mature around 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. Indian and Pacific Oceans tagging data showed that bigeye longevity is over 10 years, which may imply lower natural mortality rates than previously being assumed for the Atlantic Ocean. Therefore, the Committee has adopted a new natural mortality vector which is considered to more appropriately reflect this. 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 and ICCAT has detailed data on the fishery for this stock since the 1950s. Scientific sampling at landing ports for purse seine vessels from the EU and associated fleets has 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 fish 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. In the eastern Atlantic, these fleets are comprised of vessels flying the flags of Ghana, EU-France, EU-Spain and others which are mostly managed by EU companies. The longline fleets operated across a broader geographic range, covering tropical and temperate regions (**BET-Figure 1**). 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 purse seine fishery, unlike yellowfin tuna, bigeye tuna are mostly caught while fishing on floating objects such as logs or manmade fish aggregating devices (FADs). The estimated total numbers of FADs released yearly has increased since the beginning of the FAD fishery, especially in recent years. During 2010-2014, landings of bigeye in weight caught by longline fleets represent 48%, while purse seine fleets represent 37% and baitboat fleets represent 15% of the total (**BET-Table 1**).

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 97,000 t and continued to increase, reaching an historic high of about 135,000 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 2014 at the time of the assessment (July 2015) was 68,390 t and currently are estimated to be around 72,585 t. The increase (around 4,200 t) in reported catches provided since the stock assessment meeting are mainly due to upwards revision of catches for both longline and purse seine fleets (Japanese longline estimates increased by 2,845 t, Curaçao purse seine increased by 730 t).

After the historic high catch in 1994, all major fisheries exhibited a decline in catch while the relative share by each fishery in total catch remained relatively constant until 2008. These reductions in catch were related to declines in fishing fleet size (longline) as well as decline in CPUE (longline and baitboat). Although the general trend of decreasing catches continued for longline and baitboat, the purse seiner catches increased, as did the relative contribution of PS in the total catches. In the period 2009-2012 PS catches reached levels observed in 1994-1995 and reached the maximum observed catch by PS in 2011. Since then, PS catches have slightly decreased. The number of active purse seiners declined by more than half from 1994 until 2006, but then increased as some vessels returned from the Indian Ocean to the Atlantic (**SKJ-Figure 9**) and since 2010, the number of PS vessels has remained stable. While the number of purse seiners operating in 2010-2014 was stable PS carrying capacity during the same period showed an increasing trend. It was also noted that 3 PS moved from the Pacific Ocean to the Atlantic Ocean in 2015.

Species composition and catch at size from the Ghanaian fleet of baitboats and purse seiners, has been thoroughly reviewed during the past few years. This review has led to new estimates of Task I, and partially Task II catch and effort and size, for these fleets for the period 1973-2013. This revision has shown that catches of bigeye tuna by Ghanaian fleets over the period 1996-2005 were significantly lower than previously estimated by an average of 2,500 t but larger for the period 2006-2013. Although the Committee agreed to use the new estimates for 2006-2013, and carry over of 2013 estimate to 2014 for the assessment, after the stock assessment meeting, some issues with the area stratification used to estimate the species composition of recent Ghanaian catches were identified; which implies that the most recent Ghanaian catches (from 2012 to 2014) could be underestimated by 25% (2012) and 45% (2013 and 2014). Thus, estimates for 2012-2014 are considered provisional and should be reviewed in the future.

Significant catches of small bigeye tuna continue to be channeled to local West African markets, predominantly in Abidjan, and sold as “faux poisson” in ways that make their monitoring and official reporting challenging. Monitoring of such catches has recently progressed through a coordinated approach that allows ICCAT to properly account for these catches and thus increase the quality of the basic catch and size data available for assessments. Currently those catches are included for the main PS fleet in the ICCAT Task I data used for the assessment.

Mean average weight of bigeye tuna decreased prior to 1998 but has remained relatively stable at around 10 kg for the last decade (**BET-Figure 3**). This mean weight, however, is quite different for the different fishing gears, around 62 kg for longliners, 7 kg for baitboats, and 4 kg for purse seiners. In the last ten years, several longline fleets have shown increases in the 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 average weights between 3 kg and 4 kg. Average weight of bigeye tuna caught in free schools is more than twice the average weight of those caught around FADs. Since 1991, when bigeye catches were identified separately for FADs for EU and associated purse seine fleets, the majority of bigeye tuna are caught in sets associated with FADs (75%-80%). Similarly baitboat-caught bigeye tuna weighted between 6 and 10 kg over the same period, but with greater inter-annual variability in average weight compared to longline or purse seine caught fish.

BET-3. State of the stock

Stock status evaluations for Atlantic bigeye tuna have used several modeling approaches, ranging from non-equilibrium production models to integrated statistical assessment models. When possible, the results of different model formulations considered to be plausible representations of the stock dynamics have been used to characterize stock status and the uncertainties in the status evaluations.

In 2010, the stock status determination and management advice was based on the results obtained with non-equilibrium production models. Virtual population analysis results were used to characterize the uncertainty in stock status as related to model structure. Integrated statistical models were also run in 2010 and those results were used to explore the gains obtained by integrating more data sources (e.g. length composition data) as well as to take into account different exploitation patterns and selectivities of different type of gears.

In 2015, results from a non-equilibrium production model and an integrated statistical assessment model, which can account for temporal changes in selectivity, were used to provide the status of the resource. Multiple runs of each model were included in the results, using alternative assumptions in order to better to reflect the uncertainties in the assessment. The non-equilibrium production model results included 3 different runs, which used different individual CPUE indices. These CPUEs were based on longline indices that characterize the adult component of the stock, while the production model dynamics are based on exploitable biomass. The integrated statistical assessment model results included 12 different runs, reflecting different assumptions regarding growth, the influence of spawning biomass on recruitment, and confidence in available size data. Because the results of both non-equilibrium production model and integrated assessment model were considered to represent plausible alternative hypotheses of stock status, they were given equal weight in determining the state of the stock.

In 2015 stock assessment was conducted using similar assessment models to those used in 2010 (Anon. 2011d) but with updated data and relative abundance indices. A non-equilibrium production model was run using the composite index from 2010 and a new composite index generated in 2015 (using a similar procedure as in 2010). The objective was to compare the robustness of the assessment and projection conducted in 2010 with the assessment done in 2015. The results of 2010 assessment were projected until 2014 using the reported catches. The exercise showed that stock status for 2010, when re-estimated in 2015, was more pessimistic than originally estimated during the 2010 assessment. In general, data availability has continued to improve. There are still missing data within the ICCAT database on detailed catch statistics, catch and effort and fish size from some important fleets for which estimation of catches were available. All these issues forced the Committee to estimate the catch of some important fleets as well as assume catch-at-size for an important part of the overall catch which contribute to the overall uncertainty in the assessment results. Final modifications to these inputs were performed during the assessment meeting, such as an update of the total catch of Ghanaian fleet for the period 2006-2013, catch for 2014, and the identification of representative CPUE indices for stock assessment.

A number of standardized indices of abundance were developed by national scientists for selected fleets for which data were available at greater spatial and/or temporal resolution. These indices represented data from five different fleets, four longline fleets and one baitboat fleet which were used in different stock assessment methods (**BET-Figure 4**). These indices were used for non-equilibrium production model and integrated statistical assessment model. For the non-equilibrium production model, the Committee considered that it is more appropriate to use multiple indices in separate runs, as different hypotheses of stock dynamics, rather than including potentially conflicting indices in a single run or combined as a single index. This is different from the approach taken in the 2010 stock assessment. In 2010 assessment, a single combined CPUE index, which is a combination of various CPUE indices available at that time, was used for various non-equilibrium production model runs.

The stock biomass estimated from the three non-equilibrium production model runs declines from the beginning of the time series in the 1950s (**BET-Figure 5**). The decline in biomass corresponds with increasing fishing mortality including a sharp increase of fishing mortality and catch in the 1990s and a peak of fishing mortality by the end of the 1990s. From the late 1990s, the biomass and fishing mortality trajectories of the 3 scenarios were different. While biomass increased and fishing mortality decreased in one of the runs using the Chinese Taipei CPUE; biomass continued to decrease at a lower rate in the other runs and fishing mortality showed a general increasing trend in one run (except for the last 3 years when F decreased) and was somewhat stable in the last run. The three runs show similar trajectories of increasing F and decreasing B towards the red area of the Kobe plot ($F > F_{MSY}$ and $B < B_{MSY}$) until the end of the 1990s, but 2 out of 3 runs estimate that on average the stock still remains in the red area since 2000; while the third estimates a recovery towards the green area since the mid-2000s (**BET-Figure 6**). The results based on the three scenarios suggest that the stocks status in recent years varied between scenarios (B_{2014}/B_{MSY} ratio is from 0.554 to 1.225 and F_{2014}/F_{MSY} ratio is from 0.576 to 1.436 (**BET-Figure 7**).

The SS3 model results indicate that fishing mortality increased steadily since the beginning of the fishery, rapidly increased by the end of the 1990s, fluctuating around the level corresponding to F_{MSY} in the 2000s, then increased sharply at the end of the 2000s where $F > F_{MSY}$ in 2011, and decreased in the latest three years. However, it remained at levels higher than F_{MSY} in 7 out of 12 scenarios in 2014 (**BET-Figure 8**). With regards to biomass, it decreased constantly since the beginning of the time series and fell below and remained below B_{MSY} levels since 2010. It should be noted that those F_{MSY} and B_{MSY} trajectories (**BET-Figure 7**) was estimated using 2014 selectivity pattern without accounting for selectivity changes over time. The results based on the twelve cases studied suggest that the stocks status in recent years varied between cases (B_{2014}/B_{MSY} ratio is from 0.435 to 0.917 and F_{2014}/F_{MSY} ratio is from 0.776 to 1.635 (**BET-Figure 9a**). In the combined phase plot of equally weighted 12 SS3 scenarios, taking into account the uncertainty around the point estimates from all scenarios, there was an estimated 67% chance that the stock is being overfished and overfishing is occurring in 2014 (**BET-Figure 9b**).

The current MSY may be below what was achieved in past decades because overall selectivity has shifted to smaller fish; the impact of this change in selectivity on estimates of MSY is clearly seen in the results from integrated statistical assessment models (**BET-Figure 10**). While the potential MSY has decreased over time this spawning stock biomass required to produce this MSY has increased.

Most of the integrated statistical assessment model runs give a similar view compared to the non-equilibrium production model runs regarding the historical evolution of the relative patterns in biomass and fishing mortality. Both assessment models suggest that biomass decreased throughout the period investigated, with the exception of one run of the non-equilibrium production model where a recovery is observed since 2005. For fishing mortality, both assessment models show that F increased sharply by the late 90s, then fluctuated to reach a similar level of the late 1990s in 2004/2005 and increased again in 2011 to decrease the last three years. **BET-Figure 11** shows a combined Kobe phase plot of both assessment models, which formulates the basis of the management recommendation. The combined plot was developed by giving equal weighting between non-equilibrium production model and integrated statistical assessment model results. Within each model type equal weighting was given to each run. There was an estimated 70% chance that the stock is being overfished and overfishing is occurring in 2014.

The incorporation of the revised catch estimates for Ghana, as well as additional reporting and corrections, has resulted in a somewhat different catch history from what was available for the last assessment in 2010. The projections done in 2010, which provide a characterization of the prospects of the stock achieving or being maintained at levels consistent with the Convention objective, over time, showed that the probabilities of the stock being maintained at levels capable of producing MSY by 2015 were about 60% for a future constant catch set at the current TAC level of 85,000 t. As stated in 2010, any changes in the exploitation pattern and 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 – during the projected period would have affected and changed the outcomes of those projections. Although recent catches from the period 2012 to 2014 has been lower than the adopted TAC the status of the stock has worsened. The proportion of small age 0 and 1 bigeye has shown a continuous increase since the beginning of the time series which may affect the prospect of recovery of the population and worsened the status of the stock as it was forecast in 2010. The relative contribution of purse seine gear to the total catch has increased by 50% in the period 2009-2014 from the period 2000-2008.

The Committee notes, as it did in previous assessments, that there is considerable uncertainty as well as potential bias 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 2010 but there is still a lack of information regarding detailed fishing effort and catch-at-size data from certain fleets.

BET-4. Outlook

It is noteworthy that the modeled probabilities of the stock achieving levels consistent with the Convention objective at the end of the projection time period in 2028 are 29% for a future constant catch at the current TAC level of 85,000 t, and 41% probability at current levels of 70,000 t. Higher probabilities of rebuilding require longer timeframes and/or larger reduction of current catches. For instance, 49% probability of rebuilding would be achieved by 2028 with a constant catch of 65,000 t and 58% of probability with catches of 60,000 t, (**BET-Table 2**).

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 reported catches and the current selectivity pattern is maintained. ICCAT established a TAC of 85,000 t for 2010 onwards through Rec. 09-01, and Rec. 11-01. Note that because this TAC does not affect all countries that can land bigeye tuna, in theory the total catch removed from the stock could exceed 85,000 t which will worsen the prospect of rebuilding at current TAC levels. 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 was set at 90,000 t. The TAC was later lowered (Rec. 09-01 and later modified by Rec. 14-01) to 85,000 t. Estimates of reported catch for 2002-2014 (**BET-Table 1**) have been always lower than 85,000 t with the exception 2011 where it was close to the TAC. Note, however, that catches for 2012-2014 are still under revision. The current TAC did not result in the stock achieving levels consistent with the Convention objectives.

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, 08-01, 11-01 and 14-01). The Committee examined trends in average bigeye tuna catches by areas as a broad indicator of the effects of such closures as well as changes in juvenile bigeye and yellowfin catches due to the moratorium. The efficacy of the area-time closure (moratorium) agreed in Rec. 14-01 was evaluated by examining fine-scale (1°x1°) skipjack, yellowfin, and bigeye catch by month distributions from the European and associated purse seine fleet FAD fishery and the Ghanaian purse seine and baitboat fishery. After reviewing this information, the Committee concluded that the moratorium has not been effective at reducing the mortality of juvenile bigeye tuna, and any reduction in yellowfin tuna mortality was minimal, largely due to the redistribution of effort into areas adjacent to the moratorium area (for more details see response to Commission 19.1).

BET-6. Management recommendations

The Atlantic bigeye tuna stock was estimated to be overfished and overfishing was occurring in 2014. Projections indicate that catches at the current TAC level of 85,000 t will have around 30% of probability to recover the population to a level that is consistent with the Convention objectives by 2028. Therefore, the Committee recommends the Commission to reduce the TAC to a level that would allow the recovery of the stock with high probability and in as short period as possible in accordance with the principles of Recommendation 11-13.

The Commission should be aware that increased harvests on FADs could have had negative consequences for the productivity of bigeye tuna fisheries (e.g. reduced yield at MSY and increased SSB required to produce MSY) and, therefore, should the Commission wish to increase longterm sustainable yield, the Committee continues to recommend that effective measures be found to reduce FAD-related and other fishing mortality of small bigeye tunas.

ATLANTIC BIGEYE TUNA SUMMARY

| | |
|--|---|
| Maximum Sustainable Yield | 78,824 t (67,725-85,009 t) ¹ |
| Current (2014) Yield | 72,585 t ² |
| Relative Biomass (B_{2014}/B_{MSY}) | 0.67 (0.48-1.20) ¹ |
| Relative Fishing Mortality F_{2014}/F_{MSY} | 1.28 (0.62-1.85) ¹ |
| Stock Status | Overfished: Yes Overfishing: Yes |
| Conservation & management measures in effect: | [Rec. 14-01] <ul style="list-style-type: none"> – Total allowable catch for 2012-2015 is set at 85,000 t for Contracting Parties and Cooperating non-Contracting Parties, Entities or Fishing Entities. – Be restricted to the number of their vessels notified to ICCAT in 2005 as fishing for bigeye tuna. – 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 and February in the area encompassed by the African coast, 10° S, 5°E and 5°W. |

¹ Combined results of non-equilibrium production model and statistical integrated assessment models. Median and 10 and 90 % percentile in brackets.

² Reports for 2014 reflect most recent data but should be considered provisional.

| | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2014 | |
|----------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|---|
| UK.Bermuda | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| UK.Sta Helena | 3 | 3 | 10 | 6 | 6 | 10 | 10 | 12 | 17 | 6 | 8 | 5 | 5 | 0 | 0 | 0 | 25 | 18 | 28 | 17 | 11 | 190 | 51 | 19 | 17 | 17 | |
| 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 | 4 | 2 | 2 | |
| Uruguay | 38 | 20 | 56 | 48 | 37 | 80 | 124 | 69 | 59 | 28 | 25 | 51 | 67 | 59 | 40 | 62 | 83 | 22 | 27 | 201 | 23 | 15 | 2 | 30 | 0 | 0 | |
| Vanuatu | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 104 | 109 | 52 | 132 | 91 | 34 | 42 | 39 | 23 | 9 | 4 | 23 | |
| Venezuela | 161 | 476 | 270 | 809 | 457 | 457 | 189 | 274 | 222 | 140 | 221 | 708 | 629 | 516 | 1060 | 243 | 261 | 318 | 122 | 229 | 85 | 264 | 98 | 94 | 169 | 152 | |
| Landings(FP) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Belize | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 46 | 42 | 16 | 41 | 23 | 23 | |
| Cabo Verde | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 75 | 28 | 37 | 38 | 61 | 102 | 40 | 22 | 45 | 97 | 97 | |
| Curaçao | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 25 | 20 | 13 | 117 | 59 | 46 | 60 | 34 | 42 | 42 | |
| Côte D'Ivoire | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 95 | 45 | 15 | 15 | |
| EU.España | 242 | 625 | 571 | 764 | 605 | 371 | 58 | 255 | 328 | 487 | 474 | 0 | 0 | 223 | 244 | 143 | 88 | 49 | 190 | 250 | 211 | 216 | 98 | 80 | 143 | 143 | |
| EU.France | 352 | 653 | 686 | 1032 | 970 | 713 | 314 | 437 | 467 | 553 | 607 | 229 | 205 | 446 | 397 | 222 | 79 | 26 | 51 | 150 | 122 | 394 | 192 | 56 | 54 | 54 | |
| Guatemala | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 56 | 28 | 15 | 26 | 9 | 18 | 6 | 11 | 5 | 15 | 15 | |
| Guinée Rep. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 72 | 0 | 60 | 20 | 22 | 74 | 203 | 288 | 245 | 209 | 209 | |
| Mixed flags (EU tropical) | 153 | 663 | 379 | 494 | 457 | 582 | 169 | 301 | 193 | 143 | 281 | 28 | 8 | 198 | 378 | 294 | 189 | 348 | 337 | 375 | 324 | 257 | 0 | 0 | 0 | 0 | |
| Panama | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 151 | 106 | 135 | 97 | 85 | 38 | 70 | 41 | 80 | 27 | 27 | |
| St. Vincent and Grenadines | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Discards | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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 | 14 | 22 | 18 | |
| 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 | 0 | |

1 Brazilian Task I catches from 2012 to 2014 are preliminary and under revision.

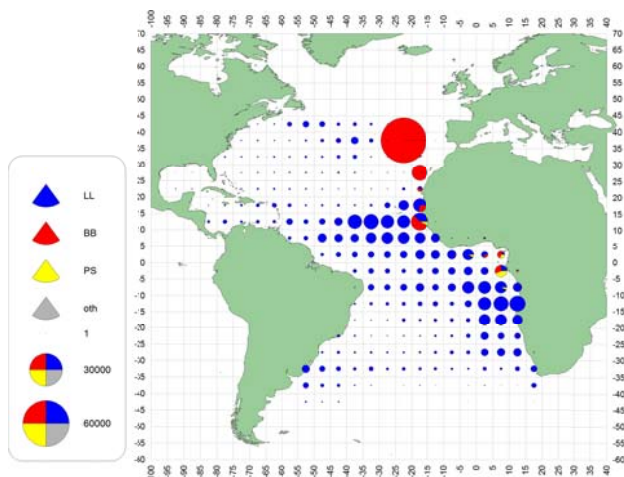
2 Ghanaian Task I catches from 2013 and 2014 are provisional and could be revised.

BET-Table 2. Estimated probabilities of the Atlantic bigeye tuna stock being below F_{MSY} (overfishing not occurring), above B_{MSY} (not overfished) and above B_{MSY} and below F_{MSY} (green zone) in a given year for catch level ('000 t), based upon the 2015 assessment outcomes.

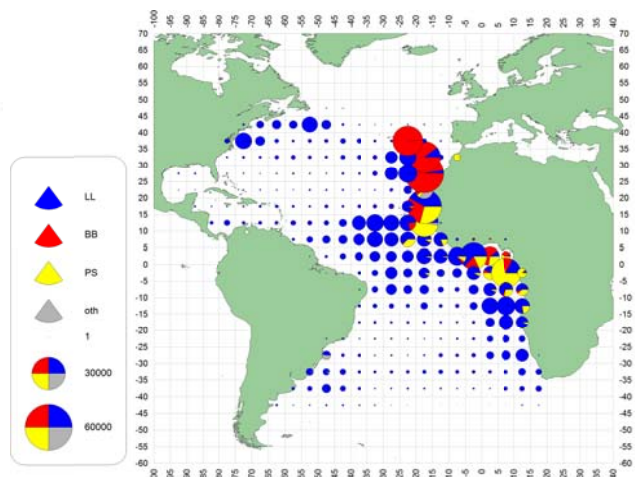
| Probability of Overfishing not occurring ($F < F_{MSY}$) | | | | | | | | | | | | | | |
|---|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Catch (000 t) | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
| 0 | 29 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 40 | 29 | 84 | 89 | 92 | 93 | 94 | 95 | 95 | 96 | 96 | 97 | 97 | 97 | 97 |
| 45 | 29 | 72 | 80 | 84 | 88 | 89 | 91 | 92 | 93 | 94 | 94 | 94 | 95 | 95 |
| 50 | 29 | 61 | 70 | 75 | 79 | 83 | 85 | 87 | 89 | 90 | 91 | 92 | 92 | 93 |
| 55 | 29 | 52 | 59 | 65 | 69 | 73 | 76 | 79 | 81 | 82 | 84 | 85 | 86 | 88 |
| 60 | 29 | 44 | 51 | 55 | 59 | 62 | 65 | 69 | 70 | 72 | 74 | 76 | 77 | 78 |
| 65 | 29 | 38 | 44 | 48 | 51 | 54 | 56 | 58 | 60 | 62 | 63 | 65 | 66 | 68 |
| 70 | 29 | 32 | 38 | 41 | 44 | 47 | 49 | 50 | 52 | 53 | 53 | 59 | 60 | 61 |
| 75 | 29 | 27 | 33 | 36 | 37 | 40 | 42 | 43 | 45 | 50 | 51 | 52 | 52 | 55 |
| 80 | 29 | 24 | 29 | 31 | 33 | 34 | 36 | 42 | 42 | 43 | 46 | 46 | 47 | 51 |
| 85 | 29 | 22 | 26 | 28 | 30 | 31 | 37 | 37 | 38 | 41 | 43 | 45 | 48 | 48 |
| 90 | 29 | 19 | 23 | 24 | 26 | 28 | 31 | 34 | 40 | 39 | 42 | 40 | 43 | 47 |
| 95 | 29 | 17 | 20 | 20 | 20 | 24 | 26 | 31 | 30 | 31 | 31 | 35 | 35 | 38 |
| 100 | 29 | 14 | 15 | 15 | 15 | 16 | 19 | 22 | 24 | 31 | 35 | 37 | 37 | 37 |

| Probability of not being overfished ($B > B_{MSY}$) | | | | | | | | | | | | | | |
|--|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Catch (000 t) | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
| 0 | 17 | 17 | 21 | 33 | 57 | 74 | 85 | 92 | 95 | 97 | 98 | 98 | 99 | 99 |
| 40 | 17 | 17 | 18 | 22 | 31 | 40 | 51 | 60 | 67 | 73 | 78 | 81 | 84 | 87 |
| 45 | 17 | 17 | 18 | 21 | 29 | 37 | 46 | 53 | 60 | 66 | 71 | 76 | 79 | 81 |
| 50 | 17 | 17 | 18 | 20 | 27 | 34 | 41 | 48 | 53 | 59 | 65 | 69 | 72 | 76 |
| 55 | 17 | 17 | 18 | 20 | 25 | 31 | 37 | 42 | 47 | 52 | 56 | 61 | 65 | 68 |
| 60 | 17 | 17 | 17 | 19 | 24 | 28 | 34 | 37 | 41 | 45 | 49 | 53 | 56 | 59 |
| 65 | 17 | 17 | 17 | 18 | 22 | 26 | 30 | 33 | 37 | 40 | 43 | 45 | 48 | 51 |
| 70 | 17 | 17 | 17 | 18 | 21 | 24 | 27 | 30 | 33 | 35 | 38 | 40 | 41 | 43 |
| 75 | 17 | 17 | 17 | 18 | 20 | 23 | 25 | 27 | 29 | 31 | 33 | 34 | 36 | 37 |
| 80 | 17 | 17 | 17 | 17 | 19 | 20 | 23 | 24 | 26 | 27 | 29 | 29 | 31 | 32 |
| 85 | 17 | 17 | 17 | 17 | 19 | 20 | 22 | 23 | 24 | 25 | 30 | 28 | 31 | 35 |
| 90 | 17 | 17 | 17 | 17 | 18 | 19 | 21 | 22 | 22 | 24 | 23 | 23 | 23 | 23 |
| 95 | 17 | 17 | 17 | 16 | 17 | 17 | 17 | 19 | 20 | 19 | 18 | 17 | 17 | 14 |
| 100 | 17 | 17 | 16 | 16 | 16 | 15 | 14 | 15 | 14 | 11 | 13 | 10 | 8 | 7 |

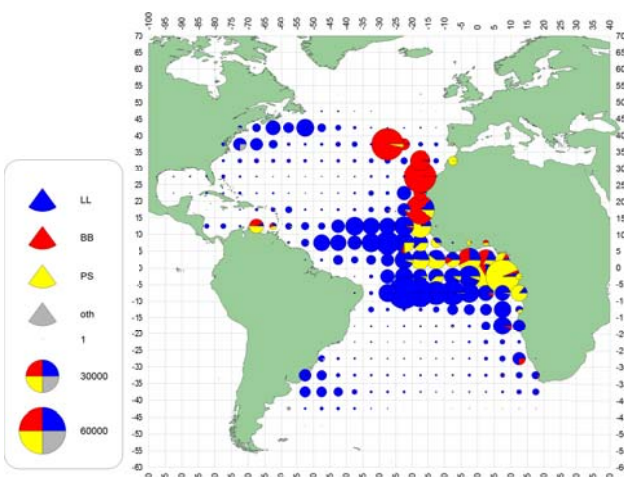
| Probability of being in the green zone ($B > B_{MSY}$ and $F < F_{MSY}$) | | | | | | | | | | | | | | |
|---|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Catch (000 t) | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
| 0 | 17 | 17 | 21 | 33 | 57 | 74 | 85 | 92 | 95 | 97 | 98 | 98 | 99 | 99 |
| 40 | 17 | 17 | 18 | 22 | 31 | 40 | 51 | 60 | 67 | 73 | 78 | 81 | 84 | 87 |
| 45 | 17 | 17 | 18 | 21 | 29 | 37 | 45 | 53 | 60 | 66 | 71 | 76 | 79 | 81 |
| 50 | 17 | 17 | 18 | 20 | 27 | 34 | 41 | 48 | 53 | 59 | 64 | 69 | 72 | 76 |
| 55 | 17 | 17 | 18 | 20 | 25 | 31 | 37 | 42 | 47 | 51 | 56 | 60 | 64 | 68 |
| 60 | 17 | 17 | 17 | 19 | 23 | 28 | 33 | 37 | 40 | 44 | 48 | 52 | 55 | 58 |
| 65 | 17 | 17 | 17 | 18 | 22 | 26 | 30 | 33 | 36 | 39 | 42 | 44 | 46 | 49 |
| 70 | 17 | 17 | 17 | 18 | 21 | 24 | 26 | 30 | 31 | 34 | 36 | 38 | 39 | 41 |
| 75 | 17 | 17 | 17 | 18 | 19 | 22 | 24 | 26 | 27 | 29 | 31 | 32 | 33 | 35 |
| 80 | 17 | 16 | 16 | 16 | 18 | 19 | 21 | 22 | 23 | 25 | 26 | 27 | 28 | 29 |
| 85 | 17 | 16 | 16 | 16 | 18 | 18 | 20 | 21 | 21 | 22 | 25 | 24 | 26 | 29 |
| 90 | 17 | 15 | 15 | 15 | 16 | 16 | 17 | 19 | 19 | 19 | 19 | 18 | 18 | 19 |
| 95 | 17 | 14 | 14 | 13 | 13 | 12 | 12 | 12 | 12 | 11 | 10 | 10 | 10 | 8 |
| 100 | 17 | 12 | 11 | 10 | 8 | 7 | 6 | 6 | 5 | 4 | 6 | 5 | 4 | 3 |



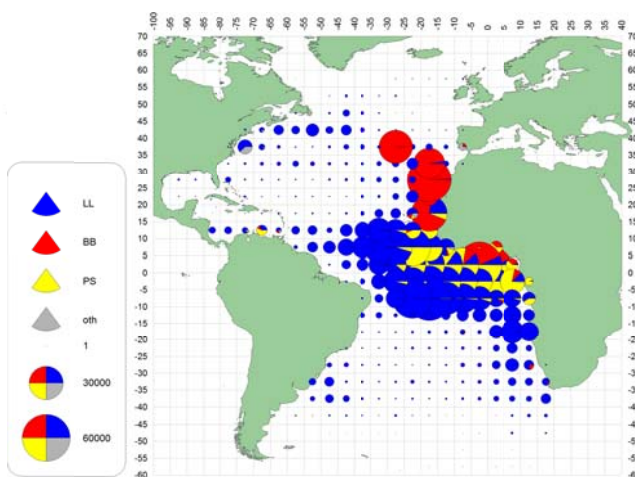
a. BET(1960-69)



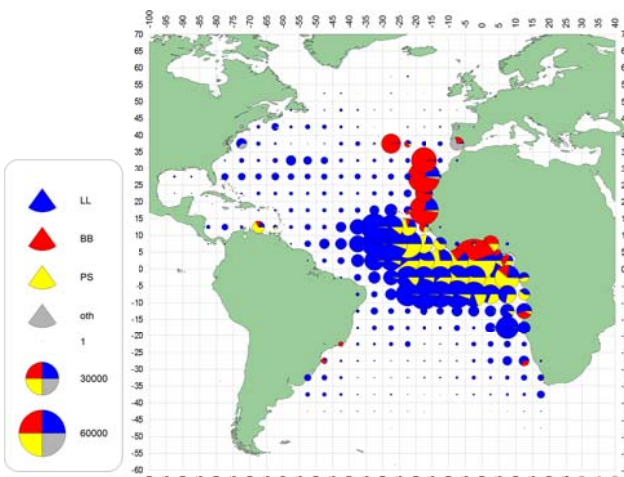
b. BET(1970-79)



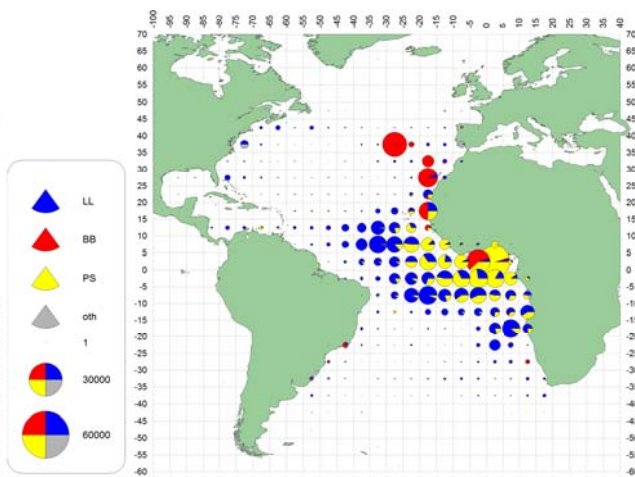
c. BET(1980-89)



d. BET(1990-99)

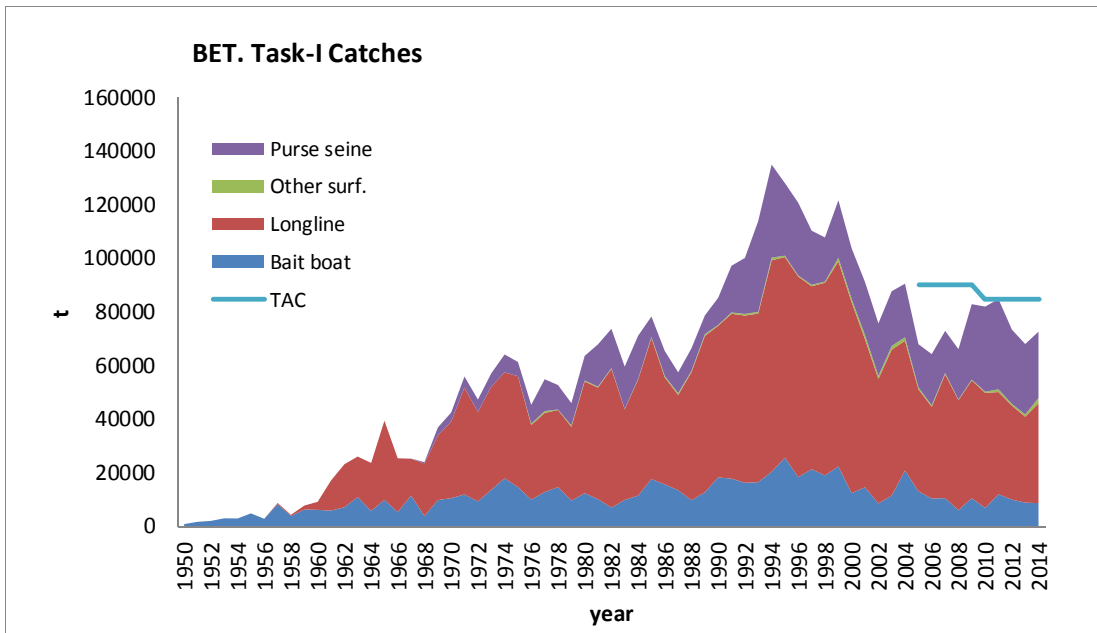


e. BET(2000-09)

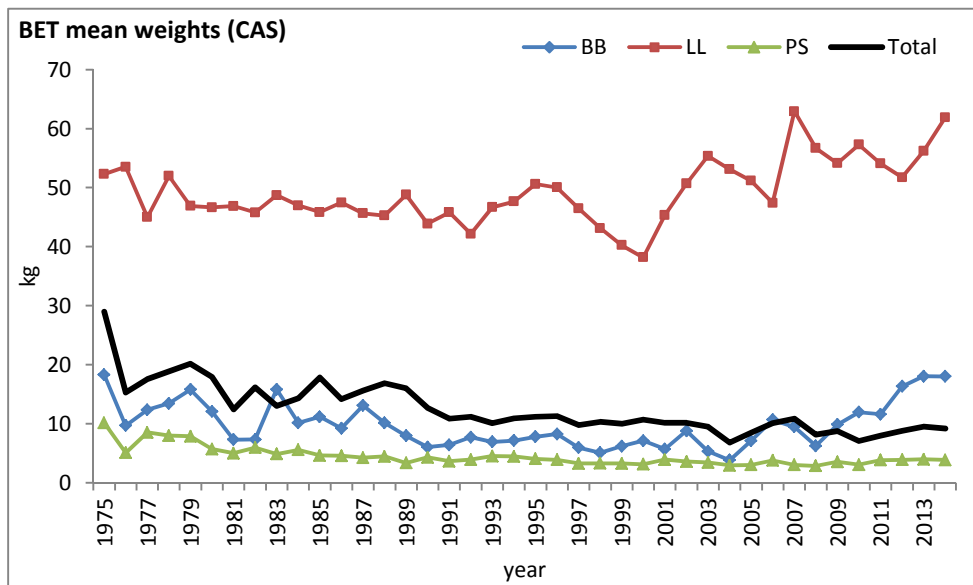


f. BET(2010-13)

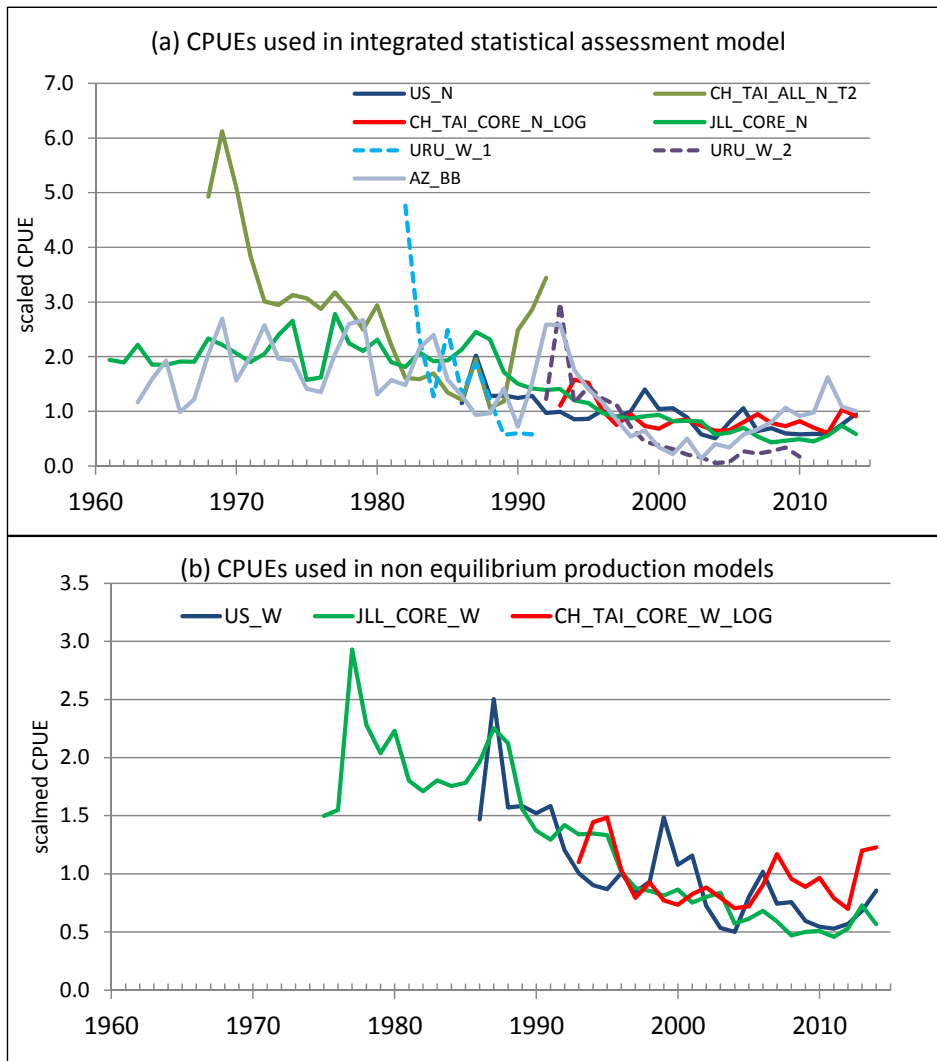
BET-Figure 1 [a-f]. Geographical distribution of the bigeye tuna catch by major gears and decade. The maps are scaled to the maximum catch observed during 1960-2013.



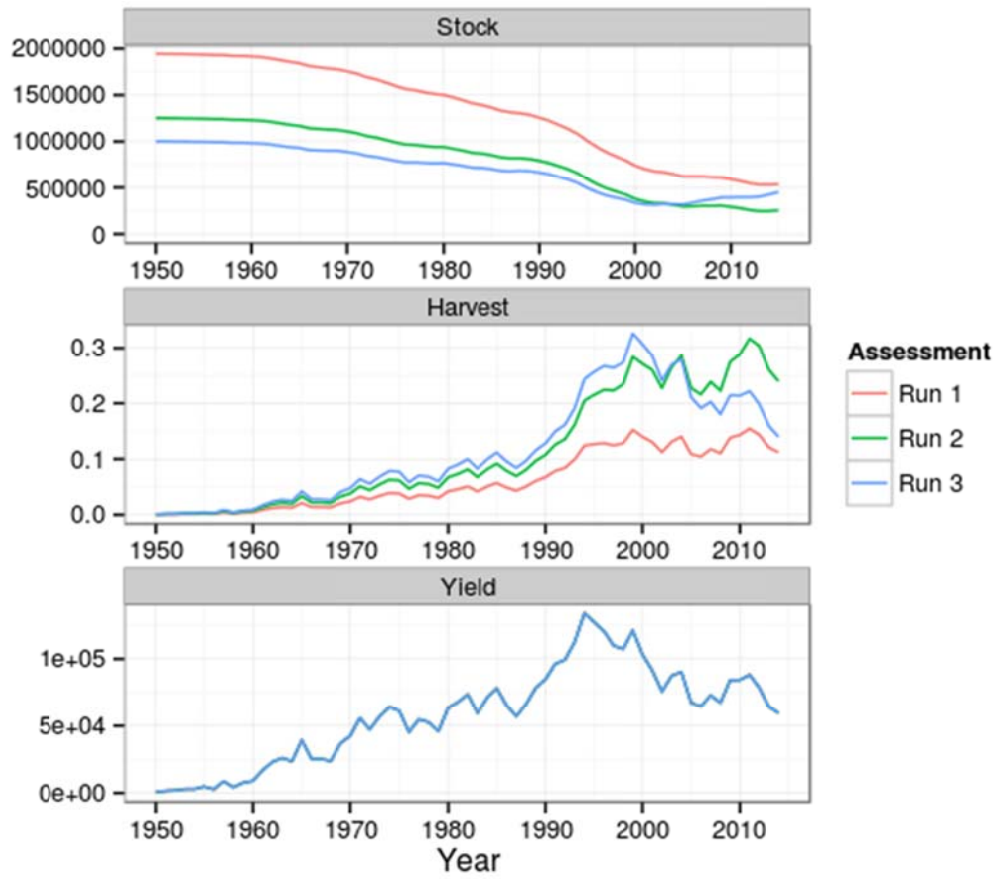
BET-Figure 2. Bigeye estimated and reported catches for all the Atlantic stock (t). The value for 2014 represents preliminary estimates because some countries have yet to provide data for this year or are under revision.



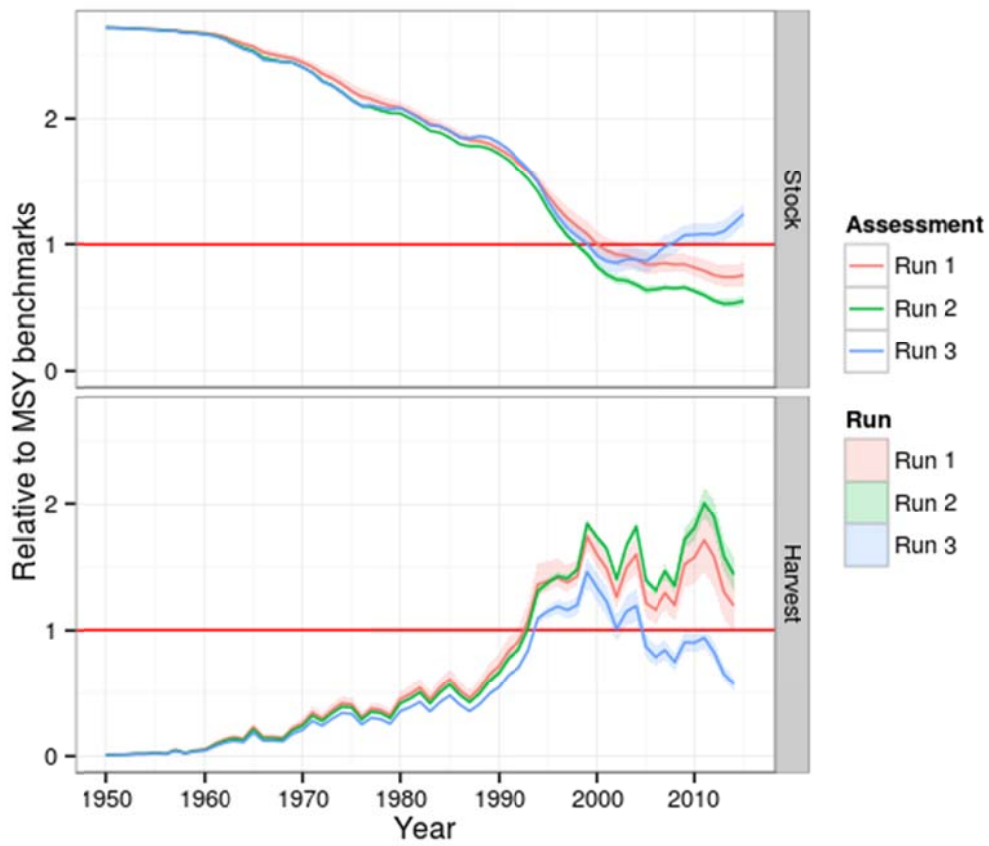
BET-Figure 3. Trend of mean weight for bigeye based on the catch-at-size data for 1975-2014 by major fisheries (BB=Baitboats, LL=Longlines, PS=Purse seine).



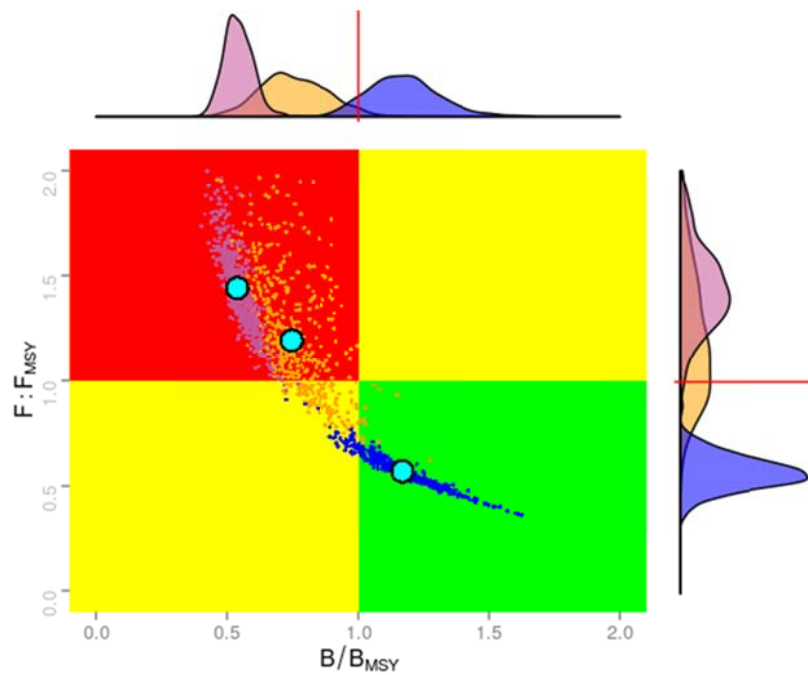
BET-Figure 4. (a) Indices used in the integrated statistical assessment model. Note that these are the annual means but the indices were calculated by area and season for input into the model. (b) Indices used in the non-equilibrium production assessment model.



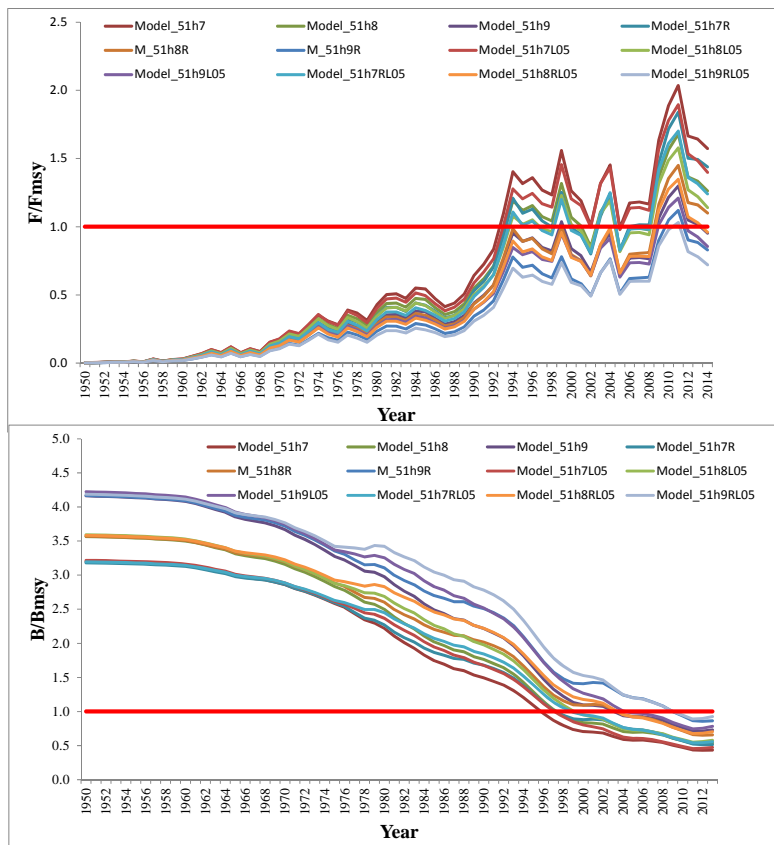
BET-Figure 5. Trajectories of Biomass, fishing mortality and yield from different ASPIC scenarios. Run 1: using USA LL CPUE; Run 2: using Japanese LL CPUE; and Run 3: using Chinese Taipei LL CPUE.



BET-Figure 6. Trajectories of B/B_{MSY} and F/F_{MSY} estimated from the different runs of ASPIC. Lines represent the medians and ribbons the inter-quantiles. Run 1: using USA LL CPUE; Run 2: using Japanese LL CPUE; and Run 3: using Chinese Taipei LL CPUE.

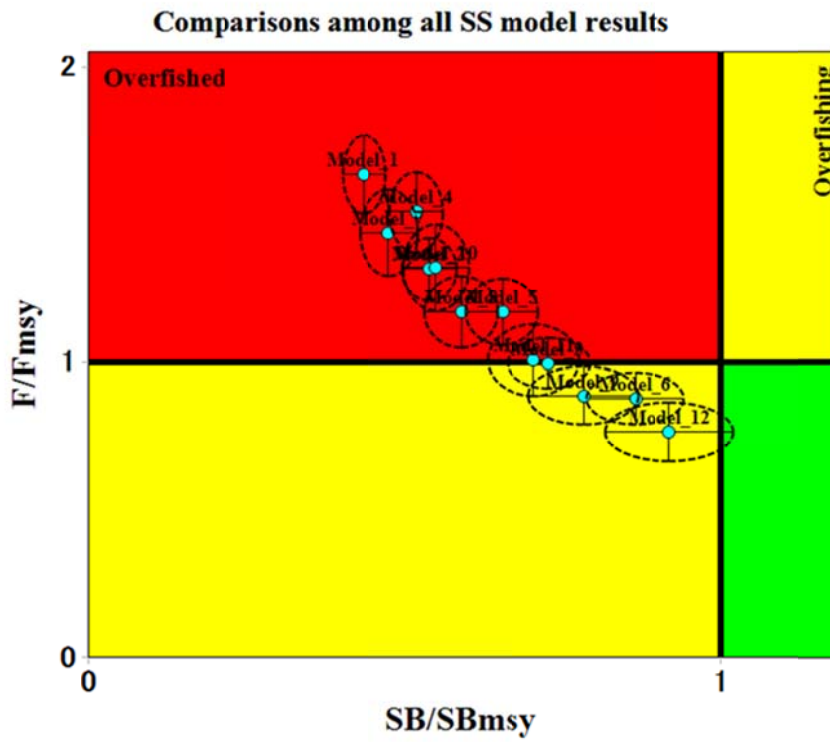


BET-Figure 7. ASPIC: Current status (2014) of bigeye tuna based on ASPIC. Graph combines results for the 3 runs considered. The clouds of points depict the bootstrap estimates of uncertainty for the most recent year (purple = Japan LL run, brown = US LL run, blue= Chinese Taipei LL run). The median point estimate for each models results are shown in open (cyan) circles. 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 red lines represent the benchmark levels (ratios equal to 1.0).

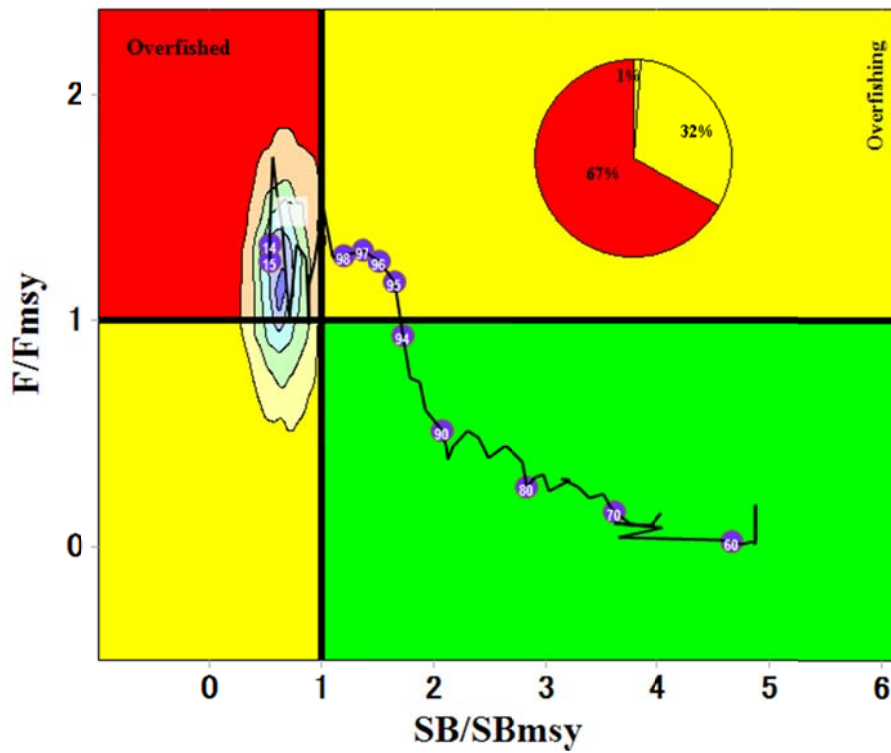


BET-Figure 8. Estimated Spawning Stock Biomass and fishing mortality relative to MSY benchmark (B/B_{MSY} and F/F_{MSY}) both based on 2014 selectivity patterns for the 12 SS3 selected runs.

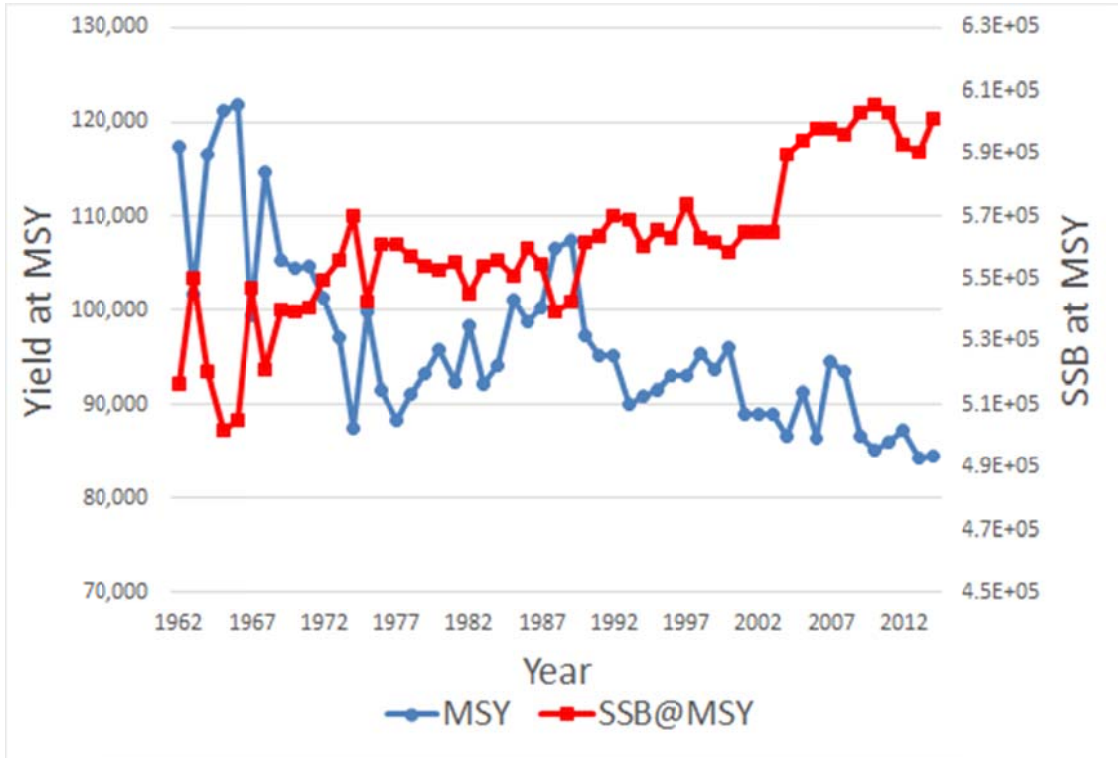
(a)



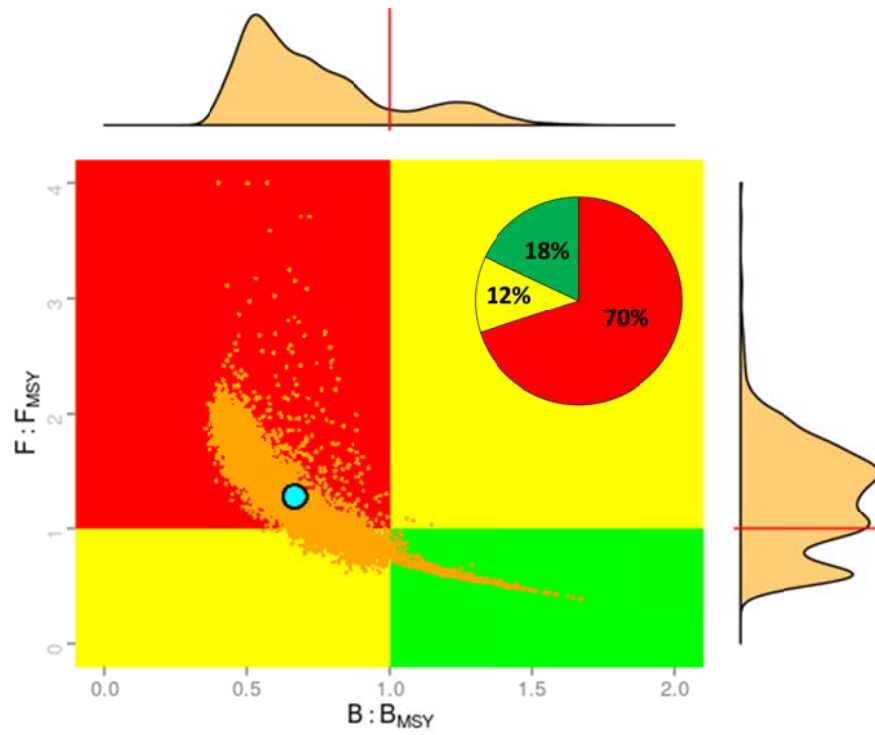
(b)



BET-Figure 9. Kobe Phase Plot for SS3: (A) for all runs separately and (b) combined 2014 status outcomes – the trajectory shown is an illustrative example which accounts for changes in selectivity over time of run 8.



BET-Figure 10. Year/selectivity specific maximum sustainable yield (MSY) and spawning stock biomass (SSB) required to produce that maximum sustainable yield.



BET-Figure 11. Combined Kobe phase plot of non equilibrium production model and integrated stock assessment model. The combined plot was developed by giving equal weighting between production models and integrated assessment model results. Within each model type equal weighting was given to different runs.

8.3 SKJ – SKIPJACK TUNA

Stock assessments for East and West Atlantic skipjack were conducted in 2014 (Anon. 2015a) using catch data available to 2013. The previous assessment of skipjack stocks was only conducted in 2008 (Anon. 2009). This report is an update of that of 2014 covering 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 1A and B**). Skipjack is the predominant species aggregated to FADs where it is caught in association with juvenile yellowfin tuna, bigeye tuna and with other species of epipelagic fauna. Skipjack reproductive potential is considered to be high because it reaches sexual maturity around one year and it spawns opportunistically in warm waters above 25°C throughout the year and in large areas of the ocean. Moreover, the analysis of East Atlantic tagging data has confirmed that the growth of skipjack was quicker in sub-tropical waters than in equatorial waters where it produces most of its spawn. These growth differences depending on latitude must be taken into account if the assessments are carried out on separate stocks between sub-tropical and tropical areas. It is also possible that the growth does not follow the conventional Von Bertalanffy model but rather a two-stanza model. Based on the relationships between life history characteristics and natural mortality, a natural mortality vector decreasing with size has been estimated (**SKJ-Figure 2**). The natural mortality values estimated by this approach are greater than those used in the past for East Atlantic skipjack. Lower values have been obtained by another approach which has been applied for the western stock, whose catches are however composed of larger sized individuals than in the eastern stock.

The increasing use of fish aggregating devices (FADs) since the early 1990s have changed the species composition of free schools. It is noted that, in fact, 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 (growth rate, plumpness of the fish) and on the ecology (distances, movement orientation) of skipjack and yellowfin (“ecological trap” concept).

SKJ-2. Fishery indicators

Following the historic record in 2012 (262,579 t), the total catches of skipjack throughout the Atlantic Ocean (including catches of “faux poisson” landed in Côte d’Ivoire) remain high at 232,551 t (**SKJ-Table 1, SKJ-Figure 3**). This represents a very sharp rise compared to the average catches of the five years prior to 2010 (161,200 t). It is possible, however, that the catches of a segment of the Ghanaian purse seine fleet, transshipped at sea on carriers, have escaped the fishery statistics collection process before 2011. In addition, following the expert missions carried out in Ghana which have shown the existence of bias in the sampling protocol which aims to correct the multi-species compositions of the catches reported in the logbooks, Ghanaian Task I and II statistics have been reviewed in several stages (1973-2005). The review for the period 2006-2012 had shown that the skipjack catches reported by Ghana were underestimated by around 28%, which gives an average of 12,000 t/year. Therefore, all of these historical data have consequently been corrected. The last review carried out in 2015 included 2013 data, but Ghana’s skipjack catches for the period 2012-2014 have been considered underestimated by the working group.

The numerous changes that have occurred in the skipjack fishery since the early 1990s (e.g. the progressive use of FADs and the latitudinal expansion and the westward extension of the fishing area) have brought about an increase in skipjack catchability and in the proportion of biomass exploited. Currently, the major fisheries are the purse seine fisheries, particularly those of EU-Spain, Ghana, Curaçao, Belize, Panama, EU-France, Guinea and Cabo Verde, followed by the baitboat fisheries of Ghana, EU-Spain, EU-Portugal and Senegal. The preliminary estimates of catches made in 2014 in the East Atlantic amounted to 206,234 t, which is an increase of about 52% as compared to the average of 2005-2009 (**SKJ-Figure 4**). It should be noted that there has been a sharp increase in the skipjack catches by the European purse seiners, probably due to the high selling price of this species from 2011 to mid-2013 (**SKJ-Figure 5**). This increase in catches is accompanied by changes in fishing strategies since the proportion of skipjack catches using floating objects has continued to increase. This is the result to some extent of the sharp reduction in seasonal fishing by European purse seiners on free schools after 2006 off the coast of Senegal and of the emergence as from 2012 of atypical fishing off FADs since it involves single-species schools composed of large individuals off the coast of Mauritania (**SKJ-Figure 1B**). These changes in fishing strategy can take place differently in the purse seine fleets, including in fleets that operated similarly in the past (**SKJ-Figure 6**) and are therefore difficult to integrate into stock assessment models.

The unreported catches of some purse seiners were estimated by comparing the monitored landings in West African ports and cannery data to the catches reported to ICCAT. Estimates of the unreported catches of these purse seiners have increased since 2006 and may have exceeded 20,000 t for the three main species of tropical tunas. The Committee expressed the need for the countries and the industry concerned in the region to cooperate to estimate and report these catches accurately to ICCAT. Recent progress in the transmission and review of data submitted to the ICCAT Secretariat has enabled the Committee to partially include these catches and the associated sizes in the skipjack assessment. The magnitudes of these estimates of IUU catch, however, are likely to influence the assessments and the perception of stock status.

The average rate of discards of skipjack on FADs by European purse seiners operating in the eastern Atlantic has been estimated based on onboard observer programmes to be 42 kg per t 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 t 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 7**). However, the latest estimates indicate values close to 10,000 t/year between 2005 and 2014 for all purse seiners operating in the eastern Atlantic (skipjack representing around 30% of the total "faux-poisson": the species composition in 2014 has not been taken into account because it seems less accurate than in previous years). The Committee regularly incorporates these estimates into the reported historical catches for the EU purse seiners since 1982, 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. The preliminary estimates of catches in 2014 made in the West Atlantic amounted to 26,317 t (against the historic record of 40,200 t in 1985). This sharp decrease in 2014 (8% less compared to the average of the 5 previous years) follows the large catches reported by Brazilian baitboats in 2012 is due to incomplete reporting by Brazil in 2013 (**SKJ-Figure 8**). As the fishing effort of this fleet has not increased, these variations could be the result of changes in catchability at local level of this fishery.

It is difficult to discriminate a fishing effort for free schools (composed of large yellowfin tunas) for FAD fishing (targeting skipjack) in the East Atlantic because the fishing strategies can change from one year to the next and in addition, the sea time devoted to activities on FADs and the assistance provided by supply vessels are difficult to quantify. The Committee recognizes that the use of data series on the yearly progression of the sale prices of tropical species by commercial category enables identification of the years when skipjack is most targeted by the purse seiners (which seems to be the case in the past few years, **SKJ-Figure 6**). Nominal purse seine effort, expressed in terms of carrying capacity, has decreased regularly since the mid-1990s up to 2006. However, after this date, several European Union purse seiners have transferred their effort to the East Atlantic, due to piracy in the Indian Ocean, and a fleet of new purse seiners have started operating from Tema (Ghana), whose catches are probably underestimated. All this has contributed to the growth in carrying capacity of the purse seiners, which is gradually nearing the level observed in the early 1990s (**SKJ-Figure 9**). The number of purse seiners follows this trend but seems to have remained steady since 2010; the nominal effort of baitboats has remained stable for over 20 years.

It is recognised that the increase in fishing power linked to the introduction of technological innovation on board the vessels as well as to the development of fishing using floating objects has resulted in an increase in the efficiency of the various fleets, since the early 1980s. In order to take into account the effect of the technological changes in skipjack catchability, an annual yearly growth of 3% is generally assumed as the working hypothesis, although an analysis carried out fixing the MSY and K at the values estimated in the previous stock assessment would suggest an increase in catchability between 1 and 13% per year. Moreover, the estimates on growth in bigeye catchability, whose juveniles are also captured using FADs, would indeed indicate a value of 2.5% per year before 1991 and 6 to 8% thereafter. However, it is not known whether these estimates only reflect technological changes, or the availability of fish as well, resulting from the expansion of the surface area exploited over the years, reaching its historic high in 2013 and which corresponds to the expansion of the fishery towards the West Central Atlantic or more recently to the level of the North and South latitudes (**SKJ-Figure 10**).

The increase in total mortality (Z) between the early 1980s and the late 1990s, estimated using different methods, such as the tag-recovery model, the catch curves by size and the average size observed in the yearly catches, is consistent with an increase in catchability. The steady decrease in average weight up to 2011 (**SKJ-Figure 11**) is also consistent with the fact that the purse seine fleet has increased pressure on juvenile tunas. This trend has reversed since 2012 and at the same time a broadening of the range of sizes caught is observed (**SKJ-Figure 12**). Generally, except the East Pacific, it has been noted that the average skipjack weight observed in the East Atlantic (close to 2 kg) was much lower than the estimates provided for the other oceans (close to 3 kg).

With respect to the West Atlantic, the fishing effort of the Brazilian baitboats, which constitute the main skipjack fishery in this region, seems to have stabilised over the past 20 years. No marked trend regarding the structure of catches by size has been observed (**SKJ-Figure 13**).

SKJ-3. State of the stocks

In all the oceans, the traditional stock assessment models are difficult to apply to skipjack because of their particular biological and fishery characteristics (on the one hand, continuous spawning, spatial variation in growth and on the other, discrimination of effort for free schools and FADs, transition between these two fishing methods which are difficult to quantify). In order to overcome these difficulties, several assessment methods, conventional and non-conventional (based solely on catches, or on development of average size) have been applied to the two stocks of Atlantic skipjack. Several fishery indicators have also been analysed in order to track the development of the state of the stock over time.

Based on the large geographic distances between the fishing areas and current knowledge on small-scale migrations of skipjack in the Atlantic (**SKJ-Figure 1A and B** and **SKJ-Figure 14**), the Committee has also analysed the possibility of using smaller stock units. While recognising the validity of this approach, the Committee does not currently have evidence, such as a sufficient amount of tag-recovery data covering the entire tropical ocean, in order to validate smaller stock units. Consequently, the Committee has decided to maintain the working hypothesis which favours two different units of eastern and western stocks but on an experimental basis to assess a sub-unit in each of the two stocks. The use of smaller areas has however been recommended to monitor the development over time of fishery indicators.

Eastern stock

The Committee has analysed two standardized fishery indices from the EU-purse seine fishery: an index which accounts for skipjack caught in free schools off the coast of Senegal up to 2006 and the second index which characterises fish captured off FADs and in free schools in the equatorial area (**SKJ-Figure 15**). The increase in CPUE of the European purse seiners in the late 1990s is partly the consequence of the increase in the catches of positive sets under FADS, in particular for Spanish vessels since 2011 (**SKJ-Figure 16**). In addition, the introduction of the price of skipjack (price adjusted for inflation) into the standardisation of the CPUE has not improved the fit. Furthermore, the regular increase in the skipjack yields of the baitboats based in Senegal may only be 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 15**). No marked trend has been observed for the Canary Islands baitboats, nor for the peripheral fishery of the Azorean baitboat fishery. Although the Committee has only considered a single stock for the East Atlantic, due to the very low apparent exchange rates between the sectors (based on available information, only 0.9% of tagged fish on both sides of the latitude 10°N have exceeded this limit), a decrease in abundance for a local segment of the stock would probably have little repercussion on abundance in other areas (refer to notion of stock viscosity).

Regardless of the model used: 2 surplus biomass production models (one non-equilibrium conventional model, and one Bayesian model), a model based only on catch and a mortality estimation model based on the average sizes of fish captured, the Committee was not in a position to provide a reliable estimate of the maximum sustainable yield and therefore nor provide advice on the state of the eastern stock. This applies in the Bayesian case, (1) after testing different working hypotheses on the a priori distribution of the input parameters of the surplus production model (i.e. the growth rate and the carrying capacity), and on the impact of the growth of the catchability coefficient on the CPUE of each fleet), and (2) after performing a retrospective analysis in the case of the catch-only based model. The absence of definition of a fishing effort associated with FADs for the purse seiners, the difficulty of taking into account changes in catchability, the lack of marked contrast in the datasets despite the historical development of the fishing pressure (**SKJ-Figure 9**) and the fact that the catches and the CPUEs have increased in parallel in recent years are constraints for effective use of the classic stock assessment methods. The Committee has also highlighted that it is difficult to estimate the MSY in conditions of continuous growth of catches without having reliable indicators on the response of the stock to these increases. These indicators may be improved CPUE series, fishing mortality estimates from tagging programmes or other indicators on the exploitation of this species.

Even if caution must be exercised when formulating a diagnosis on the state of the stock in the absence of quantification by an adequate approach, there is no evidence of a fall in yield, or in the average weight of individuals captured (**SKJ-Figure 11**). The estimated value of the MSY, according to the catch-only assessment model, has tended to increase in recent years but at a growth rate that is lower than that observed for the catches for the same period. However, according to this model, although it is unlikely that the eastern skipjack stock is overexploited, current catches could be at, even above, the MSY.

As in the past, it is difficult to know whether this hypothesis can be applied to all spatial components of this stock in the East Atlantic, due to the moderate exchange rates which seem to exist between the different sectors of this region. The Committee considers that the MSY should be higher than that estimated in the 2008 assessment in a different exploitation plot to the current one, but cannot express an opinion on the level of the new MSY and the sustainability of the current catches, nor on the repercussions of this exploitation plot on juveniles of the two other species of tropical tunas.

Taking into account the biological and fishery specificities of skipjack, the Committee has attempted to develop Harvest Control Rules based on the proportion of individuals whose sizes are larger than the reference sizes (e.g. size at sexual maturity, the size corresponding to the length which maximises the catches for a given cohort, etc.) The Committee recommends, however, that due to the multi-species nature of the tropical tuna fishery, the HCRs on skipjack take into account the consequences of targeting skipjack on the other two species of tropical tunas.

Western stock

The CPUEs in the West were those of the Brazilian baitboat which remain relatively stable, those of the Venezuelan purse seiner, the US pelagic longline and a larval index (**SKJ-Figure 17**). In addition, the average weight of skipjack caught in the West Atlantic is higher than in the East (3 to 4.5 kg compared to 2 to 2.5 kg), at least for the Brazilian baitboat fishery.

The model based on catches and the non-equilibrium surplus biomass production model have estimated respectively the MSY at 30,000 t - 32,000 t (which remains close to the previous estimates in the order of 34,000 t). The fishing mortality vector estimated by a method based on the development of average size of individuals captured over time (mainly from Brazilian catches) shows a profile which is very close to that estimated by the non-equilibrium surplus biomass model (**SKJ-Figure 18**).

It should be emphasised that all these analyses rest on the assumption of a single western stock from the US coast to Brazil and correspond to the current geographic coverage of this fishery.

For the western Atlantic stock, in light of the information provided by the trajectory of B/B_{MSY} and F/F_{MSY} ratios (**SKJ-Figure 19**), it is unlikely that the current catch is larger than the replacement yield.

SKJ-4. Effect of current regulations

There is currently no specific regulation in place for skipjack tuna. Several time/area regulatory measures on banning fishing on FADs (Rec. 98-01) and (Rec. 99-01) or on complete closure to surface fleets (Rec. 14-01) have however been implemented in the East Atlantic but the intended aim was to protect yellowfin and bigeye tuna juveniles.

The new Recommendation (Rec. 14-01) which replaces that concerned with the complete closure of the surface fishery (Rec. 11-01) and establishes a new moratorium on FAD fishing in the area that extends from the African coast to 10°S and 5°W latitude to 5°E longitude during the months of January and February, entered into force in 2013.

SKJ-5. Management recommendations

Despite the absence of evidence that the eastern stock is overexploited, but considering (1) the lack of quantitative findings for the eastern stock assessment, and (2) pending the submission of additional data (including on FADs and on the Grand Tropical Tuna Tagging Programme recommended by the Committee), which are necessary to improve the stock assessment, the Committee recommends that the catch and effort levels do not exceed the level of catch in recent years. In addition, the Commission should be aware that increasing harvests and fishing effort for skipjack could lead to involuntary consequences for other species that are caught in combination with skipjack in certain fisheries. For the West Atlantic, the Committee has not formulated any management recommendation, and has only indicated that the catches should not be allowed to exceed the MSY.

Despite recent progress, the Committee has expressed its concern regarding uncertainties which the under-reporting of skipjack catches may have on the perception of the state of the stocks.

ATLANTIC SKIPJACK SUMMARY TABLE

| | East Atlantic | West Atlantic |
|---|---|---|
| Maximum Sustainable Yield (MSY) | Probably higher than previous estimates (143,000-170,000) | Around 30,000-32,000 t |
| Current yield (2014 ¹) | 206,234 t | 26,317 t |
| Current Replacement Yield | Unknown | Somewhat below 32,000 t |
| Relative Biomass (B_{2013}/B_{MSY}) | Probably >1 | Probably close to 1.3 |
| Mortality due to fishing (F_{2013}/F_{MSY}) | Probably <1 | Probably close to 0.7 |
| Stock Status | Overfished: Not probably Overfishing: Not probably | Overfished: Not probably Overfishing: Not probably |
| Management measures in force | Rec. 14-01 ⁽²⁾ | None |

¹ Reports of catches for 2014 should be considered provisional, particularly for the West Atlantic.

² This moratorium on FADs entered into force in January 2013 and replaces Rec. 11-01.

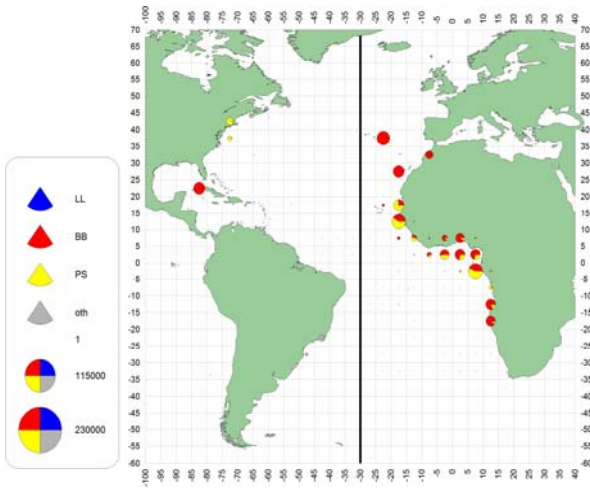
SKJ-Table 1. Estimated catches (t) of skipjack tuna (*Katsuwonus pelamis*) by area, gear and flag. (v2, 2015-09-25)

| | | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|--------------|---------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| TOTAL | | 145019 | 223777 | 171204 | 209807 | 191381 | 174529 | 157116 | 148955 | 161452 | 180687 | 155671 | 163620 | 122524 | 155483 | 181705 | 172082 | 156610 | 152580 | 148863 | 175990 | 204399 | 235764 | 262579 | 251304 | 232551 |
| | ATE | 118909 | 190374 | 141050 | 176585 | 161432 | 152626 | 129545 | 117239 | 132189 | 153278 | 126387 | 132092 | 100887 | 130602 | 154082 | 143438 | 130138 | 127033 | 126775 | 150211 | 181359 | 203368 | 229650 | 222039 | 206091 |
| | ATW | 26110 | 33404 | 30155 | 33221 | 29949 | 21860 | 27562 | 31712 | 29087 | 27356 | 29193 | 31451 | 21600 | 24749 | 27461 | 28517 | 26453 | 25443 | 22022 | 25774 | 23000 | 32383 | 32857 | 29164 | 26317 |
| | MED | 0 | 0 | 0 | 2 | 0 | 43 | 9 | 4 | 176 | 53 | 90 | 77 | 37 | 132 | 161 | 127 | 20 | 104 | 67 | 5 | 40 | 13 | 73 | 101 | 143 |
| Landings | ATE Bait boat | 36922 | 41611 | 35660 | 31656 | 37817 | 33691 | 35872 | 37314 | 46784 | 44762 | 33909 | 56689 | 31076 | 34445 | 54602 | 48185 | 44370 | 35418 | 36263 | 33219 | 41105 | 39764 | 47122 | 18994 | 26196 |
| | Longline | 0 | 5 | 3 | 2 | 10 | 3 | 7 | 47 | 85 | 42 | 48 | 53 | 56 | 66 | 47 | 71 | 201 | 405 | 172 | 58 | 42 | 30 | 21 | 11 | 24 |
| | Other surf. | 1357 | 2067 | 1602 | 1223 | 501 | 445 | 501 | 304 | 923 | 417 | 2423 | 764 | 681 | 551 | 1085 | 2334 | 5253 | 3389 | 3770 | 6357 | 5071 | 5816 | 6679 | 7094 | 2016 |
| | Purse seine | 74802 | 131545 | 91016 | 125831 | 107244 | 105478 | 88949 | 71824 | 76680 | 98821 | 79373 | 72582 | 67408 | 88771 | 90392 | 87560 | 77134 | 82595 | 80774 | 102107 | 126938 | 148363 | 168919 | 189647 | 170936 |
| | ATW Bait boat | 22246 | 23972 | 20852 | 19697 | 22645 | 17744 | 23741 | 26797 | 24724 | 23881 | 25641 | 25142 | 18737 | 21990 | 24082 | 26028 | 23749 | 22865 | 20617 | 22770 | 19923 | 29468 | 30693 | 26606 | 24814 |
| | Longline | 23 | 33 | 29 | 20 | 16 | 34 | 19 | 12 | 21 | 58 | 22 | 60 | 349 | 95 | 206 | 207 | 286 | 52 | 49 | 20 | 30 | 41 | 107 | 1112 | 52 |
| | Other surf. | 600 | 872 | 764 | 710 | 1577 | 2023 | 452 | 556 | 516 | 481 | 467 | 951 | 398 | 367 | 404 | 316 | 372 | 1317 | 455 | 950 | 1104 | 1014 | 475 | 538 | 370 |
| | Purse seine | 3241 | 8527 | 8509 | 12794 | 5712 | 2059 | 3349 | 4347 | 3826 | 2936 | 3063 | 5297 | 2116 | 2296 | 2769 | 1967 | 2045 | 1209 | 901 | 2035 | 1943 | 1859 | 1582 | 908 | 1081 |
| | 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 | 0 |
| | Longline | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 17 | 21 | 12 | 3 | 23 | 27 | 0 | 4 | 5 | 37 | 61 | 42 |
| | Other surf. | 0 | 0 | 0 | 2 | 0 | 43 | 9 | 4 | 176 | 53 | 90 | 77 | 32 | 12 | 40 | 17 | 17 | 44 | 24 | 4 | 27 | 7 | 29 | 31 | 93 |
| | Purse seine | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 103 | 101 | 99 | 0 | 38 | 16 | 1 | 8 | 1 | 7 | 9 | 8 |
| Landings(FP) | ATE Purse seine | 5828 | 15145 | 12769 | 17873 | 15860 | 13010 | 4217 | 7749 | 7716 | 9237 | 10634 | 2004 | 1666 | 6769 | 7956 | 5288 | 3181 | 5226 | 5796 | 8471 | 8205 | 9395 | 6909 | 6293 | 6918 |
| Discards | 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 |
| | Purse seine | 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 |
| | 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 | 69 | 66 | 41 | 13 | 7 | 3 | 15 | 52 | 2 | 32 | 14 | 14 | 14 | 14 | 10 | 0 | 0 | 0 | 0 | 50 | 636 | 44 | 91 | 514 | 12 |
| | Belize | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1373 | 2714 | 7429 | 15554 | 6218 | 10779 |
| | Benin | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 7 | 3 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Canada | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cabo Verde | 806 | 1333 | 864 | 860 | 1007 | 1314 | 470 | 591 | 684 | 962 | 789 | 794 | 398 | 343 | 1097 | 7157 | 4754 | 5453 | 4682 | 4909 | 5155 | 7883 | 5535 | 16016 | 15254 |
| | Cayman Islands | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | China PR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Chinese Taipei | 0 | 5 | 3 | 2 | 10 | 3 | 5 | 47 | 73 | 39 | 41 | 24 | 23 | 26 | 16 | 10 | 9 | 14 | 19 | 6 | 11 | 15 | 2 | 5 | 9 |
| | Congo | 12 | 9 | 9 | 10 | 7 | 7 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cuba | 86 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Curaçao | 0 | 0 | 0 | 0 | 0 | 0 | 7096 | 8444 | 8553 | 9932 | 10008 | 13370 | 5427 | 10092 | 8708 | 0 | 3042 | 1587 | 6436 | 9143 | 9179 | 11939 | 12779 | 17792 | 18086 |
| | Côte D'Ivoire | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1173 | 259 | 292 | 143 | 559 | 1259 | 1565 | 1817 | 2328 | 2840 | 2840 | 5968 | 10923 | 8063 | 2365 |
| | 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 | 0 |
| | EU.España | 47834 | 79908 | 53319 | 63660 | 50538 | 51594 | 38538 | 38513 | 36008 | 44520 | 37226 | 30954 | 25456 | 44837 | 38725 | 28168 | 22277 | 23679 | 35111 | 36722 | 41230 | 56901 | 66985 | 66830 | 51500 |
| | EU.Estonia | 0 | 102 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | EU.France | 17099 | 33271 | 21890 | 33735 | 32779 | 25188 | 23107 | 17023 | 18382 | 20344 | 18183 | 16593 | 16615 | 19899 | 21879 | 14850 | 7034 | 4168 | 4439 | 7789 | 14741 | 13065 | 13139 | 16241 | 17396 |
| | EU.Germany | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | EU.Ireland | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 14 | 14 | 0 | 0 | 8 | 6 | 0 | 0 | 0 | 0 |
| | EU.Latvia | 0 | 92 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | EU.Lithuania | 0 | 221 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 95 |
| | EU.Portugal | 3987 | 8059 | 7477 | 5651 | 7528 | 4996 | 8297 | 4399 | 4544 | 1810 | 1302 | 2167 | 2958 | 4315 | 8504 | 4735 | 11158 | 8995 | 6057 | 1084 | 12974 | 4143 | 2794 | 4049 | 1712 |
| | Gabon | 0 | 0 | 0 | 1 | 11 | 51 | 26 | 0 | 59 | 76 | 21 | 101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Ghana | 24251 | 25052 | 18967 | 20225 | 21258 | 18607 | 24205 | 26364 | 41840 | 52024 | 34980 | 55475 | 37570 | 32977 | 46030 | 54209 | 50492 | 46638 | 41791 | 56303 | 63325 | 61382 | 65776 | 46950 | 51315 |
| | Guatemala | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6389 | 4959 | 5546 | 6319 | 4036 | 2951 | 2829 | 3631 | 4907 | 5811 |
| | Guinea Ecuatorial | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1224 | 1224 | 1010 | 0 | 0 | 1 |
| | Guinée Rep. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1500 | 1473 | 7942 | 7363 | 5484 | 0 |
| | Japan | 2566 | 4792 | 2378 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 4 | 5 | 3 |
| | Korea Rep. | 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 |
| | Maroc | 1197 | 254 | 559 | 310 | 248 | 4981 | 675 | 4509 | 2481 | 848 | 1198 | 268 | 280 | 523 | 807 | 1893 | 3779 | 1570 | 1291 | 2575 | 2317 | 2147 | 2265 | 2042 | 1063 |
| | Mixed flags (FR+ES) | 0 | 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 (ETRO) | 10869 | 11335 | 12409 | 20291 | 17418 | 16235 | 16211 | 6161 | 6748 | 8893 | 7127 | 8122 | 8550 | 9688 | 11137 | 2873 | 248 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Namibia | 0 | 0 | 0 | 0 | 2 | 15 | 0 | 1 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 71 | 2 | 2 | 15 | 1 | 0 |
| | Nigeria | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 45 | 12 | 4 | 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 | 8312 | 8719 | 13027 | 12978 | 14853 | 5855 | 1300 | 572 | 1308 | 1559 | 281 | 342 | 0 | 7126 | 11490 | 13468 | 18821 | 8253 | 8518 | 9590 | 12509 | 10927 | 14558 | 14165 |
| | Rumania | 142 | 349 | 73 | 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 | 1175 | 1110 | 540 | 1471 | 1450 | 381 | 1146 | 2086 | 1426 | 374 | 0 | 0 | 0 | 0 | 0 | 392 | 1130 | 313 | 260 | 0 | 20 | 0 | 0 | 2 |
| | S. Tomé e Príncipe | 204 | 201 | 178 | 212 | 190 | 180 | 187 | 178 | 169 | 181 | 179 | 179 | 179 | 179 | 117 | 166 | 143 | 0 | 229 | 235 | 241 | 0 | 0 | 0 | 0 |
| | Senegal | 134 | 652 | 260 | 95 | 59 | 18 | 163 | 455 | 1963 | 1631 | 1506 | 1271 | 1053 | 733 | 1333 | 4874 | 3534</ | | | | | | | | |

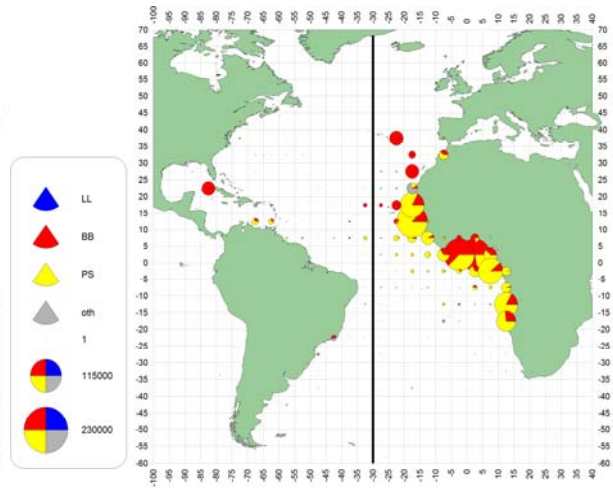
| | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| U.S.A. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| U.S.S.R. | 3635 | 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 | 171 | 24 | 16 | 65 | 55 | 115 | 86 | 294 | 298 | 13 | 64 | 205 | 63 | 63 | 63 | 63 | 88 | 110 | 45 | 15 | 25 | 371 | 29 | 7 | 26 |
| Venezuela | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ATW | | | | | | | | | | | | | | | | | | | | | | | | | |
| Argentina | 106 | 272 | 123 | 50 | 1 | 0 | 1 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 30 | 0 | 0 | 0 | 0 | 3 | 12 | 0 | 0 | 0 | 0 |
| Barbados | 11 | 14 | 5 | 6 | 6 | 6 | 5 | 5 | 10 | 3 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 1 | |
| Belize | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 0 | |
| Brazil | 20130 | 20548 | 18535 | 17771 | 20588 | 16560 | 22528 | 26564 | 23789 | 23188 | 25164 | 24146 | 18338 | 20416 | 23037 | 26388 | 23270 | 24191 | 20846 | 23307 | 20590 | 30563 | 30872 | 26723 | 24873 |
| 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 | 0 | 32 | 26 | 9 | 7 | 2 | 10 | 1 | 2 | 1 | 0 | 1 | 16 | 14 | 27 | 28 | 29 | 2 | 8 | 0 | 2 | 1 | 11 | 8 | 2 |
| Colombia | 0 | 0 | 0 | 2074 | 789 | 1583 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cuba | 1443 | 1596 | 1638 | 1017 | 1268 | 886 | 1000 | 1000 | 651 | 651 | 651 | 0 | 0 | 624 | 545 | 514 | 536 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Curaçao | 40 | 40 | 40 | 45 | 40 | 35 | 30 | 30 | 30 | 30 | 30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dominica | 60 | 38 | 41 | 24 | 43 | 33 | 33 | 33 | 33 | 85 | 86 | 45 | 55 | 51 | 30 | 20 | 28 | 32 | 45 | 25 | 0 | 13 | 0 | 4 | |
| Dominican Republic | 110 | 156 | 135 | 143 | 257 | 146 | 146 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| EU.España | 0 | 1592 | 1120 | 397 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 11 | 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 | 17 | 10 | 0 | 0 | 0 |
| EU.Netherlands | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 9 | 0 | 0 | 23 | 0 | 0 | 0 |
| EU.Portugal | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 1 | 0 | 3 | 3 | 5 | 21 | 11 | 0 | 6 | 0 | 8 | 0 | 0 | 0 | 0 |
| Grenada | 23 | 25 | 30 | 25 | 11 | 12 | 11 | 15 | 23 | 23 | 23 | 15 | 14 | 16 | 21 | 22 | 15 | 26 | 20 | 0 | 0 | 0 | 0 | 0 | 0 |
| Jamaica | 0 | 0 | 0 | 0 | 0 | 0 | 62 | 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 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 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 | 4 | 9 | 8 | 1 | 1 | 0 | 2 | 3 | 6 | 51 | 13 | 54 | 71 | 75 | 9 | 7 | 10 | 7 | 8 | 9 | 7 | 9 | 8 | 5 | 5 |
| Panama | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 543 | 0 |
| St. Vincent and Grenadines | 29 | 27 | 20 | 66 | 56 | 53 | 37 | 42 | 57 | 37 | 68 | 97 | 357 | 92 | 251 | 251 | 355 | 90 | 83 | 54 | 46 | 50 | 0 | 36 | 39 |
| Sta. Lucia | 37 | 51 | 39 | 53 | 86 | 72 | 38 | 100 | 263 | 153 | 216 | 151 | 106 | 132 | 137 | 159 | 120 | 89 | 168 | 0 | 153 | 143 | 109 | 171 | 139 |
| Suriname | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 552 | 0 |
| Trinidad and Tobago | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| U.S.A. | 304 | 858 | 560 | 367 | 99 | 82 | 85 | 84 | 106 | 152 | 44 | 70 | 88 | 79 | 103 | 30 | 61 | 66 | 67 | 119 | 54 | 87 | 112 | 117 | 77 |
| UK.Bermuda | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Venezuela | 3813 | 8146 | 7834 | 11172 | 6697 | 2387 | 3574 | 3834 | 4114 | 2981 | 2890 | 6870 | 2554 | 3247 | 3270 | 1093 | 2008 | 921 | 757 | 2250 | 2119 | 1473 | 1742 | 1002 | 1179 |
| MED | | | | | | | | | | | | | | | | | | | | | | | | | |
| Algerie | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 171 | 43 | 89 | 77 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| EU.España | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 26 | 10 | 15 | 44 | 12 | 0 | 5 | 7 | 56 | 81 | 128 |
| EU.France | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 22 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 2 | 0 | 0 | 0 | 10 |
| EU.Greece | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 102 | 99 | 99 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| EU.Italy | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 29 | 34 | 17 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| EU.Malta | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Maroc | 0 | 0 | 0 | 2 | 0 | 43 | 9 | 4 | 5 | 10 | 1 | 0 | 1 | 1 | 2 | 1 | 5 | 22 | 18 | 5 | 26 | 4 | 2 | 3 | 5 |
| Syria | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 38 | 36 | 0 | 0 | 15 | 17 | 0 | 0 |
| Landings(FP) ATE | | | | | | | | | | | | | | | | | | | | | | | | | |
| Belize | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 114 | 395 | 368 | 179 | 636 | 301 | 0 |
| Cabo Verde | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 419 | 131 | 162 | 276 | 603 | 726 | 411 | 230 | 428 | 1362 |
| Curaçao | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 88 | 171 | 116 | 105 | 917 | 415 | 441 | 545 | 520 | 351 |
| Côte D'Ivoire | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 42 | 562 | 544 | 202 | 0 |
| EU.España | 1888 | 4876 | 4455 | 5959 | 4719 | 2899 | 453 | 1990 | 2562 | 3802 | 3700 | 0 | 1738 | 1907 | 713 | 437 | 366 | 1158 | 1994 | 1394 | 1842 | 983 | 998 | 1623 | 0 |
| EU.France | 2749 | 5094 | 5355 | 8055 | 7573 | 5568 | 2447 | 3414 | 3647 | 4316 | 4740 | 1786 | 1601 | 3484 | 3096 | 918 | 346 | 206 | 287 | 1120 | 743 | 1480 | 1646 | 463 | 440 |
| Guatemala | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 260 | 69 | 66 | 162 | 59 | 136 | 51 | 102 | 72 | 93 |
| Guinée Rep. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 387 | 0 | 330 | 118 | 359 | 614 | 1778 | 2379 | 1670 | 2146 |
| Mixed flags (EU tropical) | 1192 | 5176 | 2959 | 3858 | 3568 | 4543 | 1316 | 2345 | 1508 | 1119 | 2194 | 218 | 65 | 1547 | 2953 | 1708 | 1478 | 2998 | 2624 | 3427 | 2372 | 0 | 0 | 0 | 0 |
| Panama | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 796 | 548 | 977 | 693 | 680 | 354 | 609 | 284 | 962 | 400 |
| Discards | | | | | | | | | | | | | | | | | | | | | | | | | |
| ATE | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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 | 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 | 1 | 0 | 0 | 0 |
| ATW | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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 | 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 |

1. Brazilian Task I catches from 2012 to 2014 are preliminary and under revision.

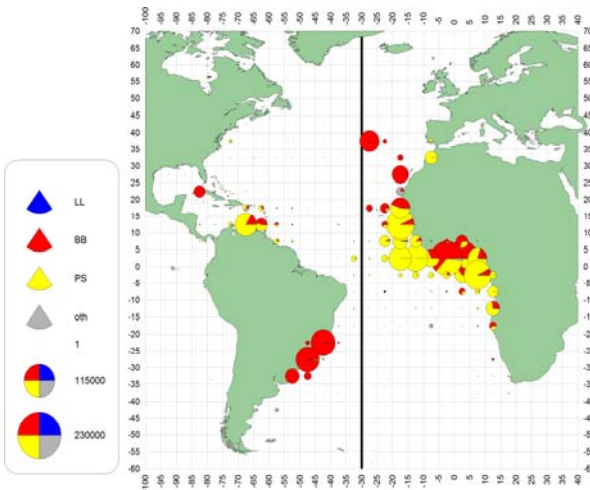
2. Ghanaian Task I catches from 2013 and 2014 are provisional and could be revised.



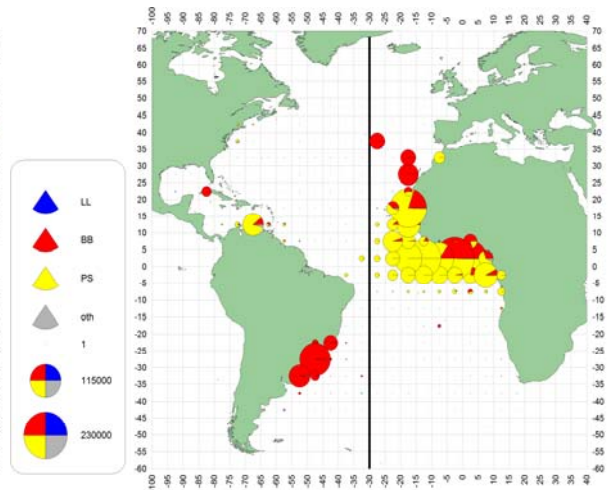
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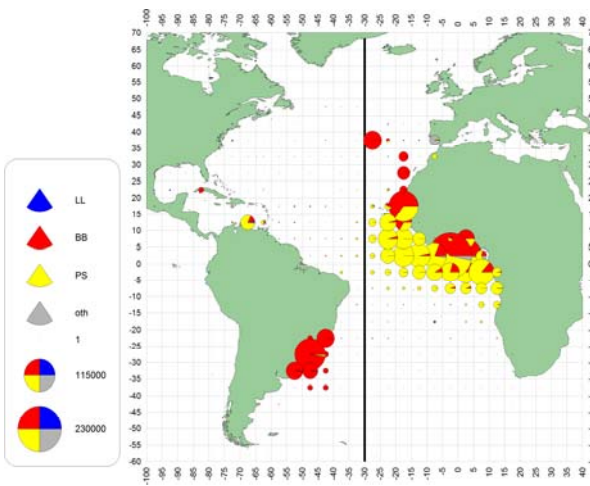
b. SKJ(1970-79)



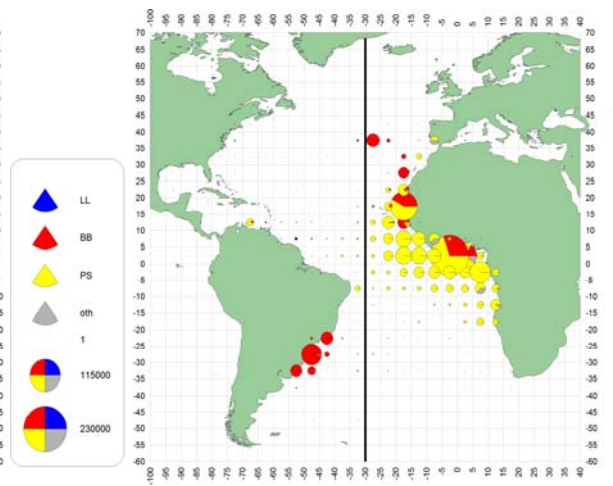
c. SKJ(1980-89)



d. SKJ(1990-99)

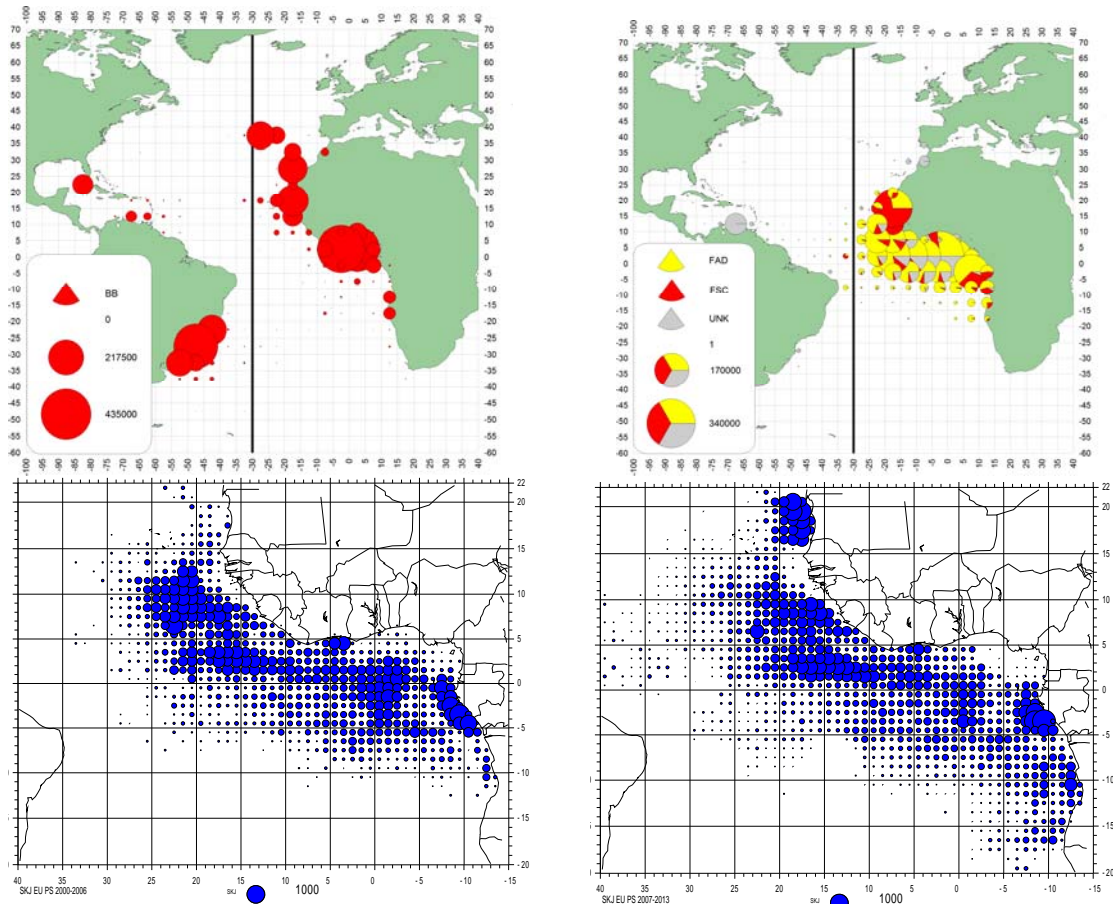


e. SKJ (2000-09)



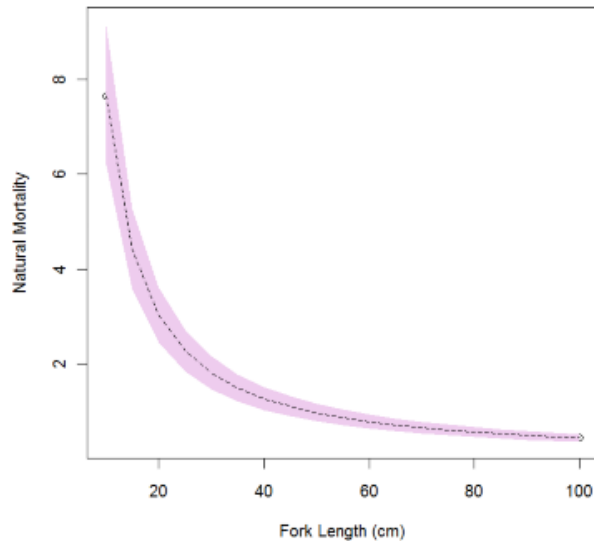
f. SKJ(2010-13)

SKJ-Figure 1A [a-f]. Geographical distribution of the skipjack catch by major gears and decade. The maps are scaled to the maximum catch observed during 1960-2013.

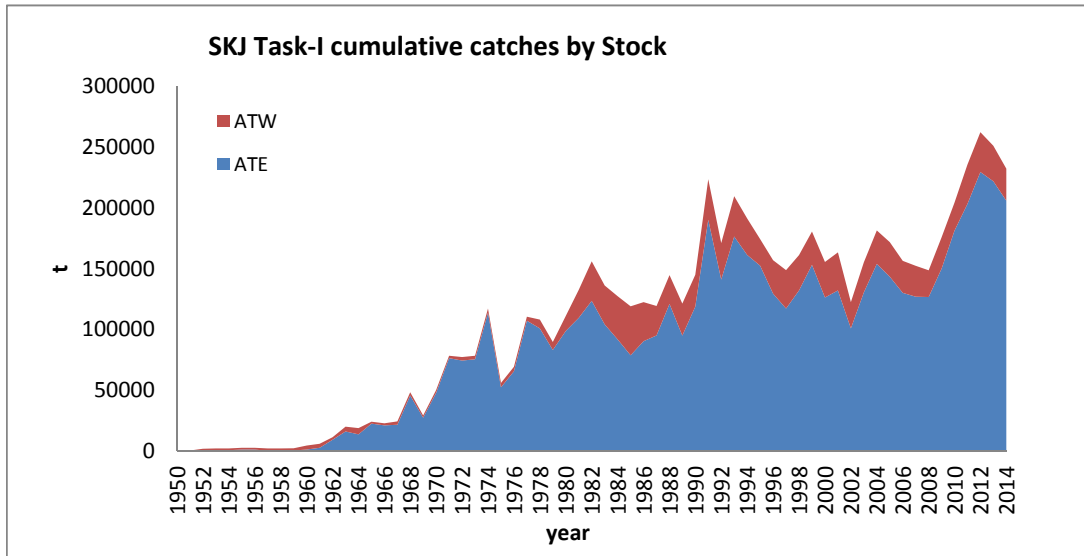


SKJ-Figure 1B. Distribution of skipjack catches in the Atlantic for baitboat (upper left panel) between 1950 and 2014 and for purse seiners (upper right panel) by fishing mode (free schools vs. FADs) between 1991 and 2014. Skipjack catches made by European and associated purse seiners (about 75% of the total catches) between 2000 and 2006 (lower left panel) and between 2007 and 2014 (lower right panel) showing the withdrawal from the Senegal fishing zone on free schools, due to non-renewal of the fishing agreements in 2006, and the appearance of a fishing area under FADs in 2012 North of 15°N latitude.

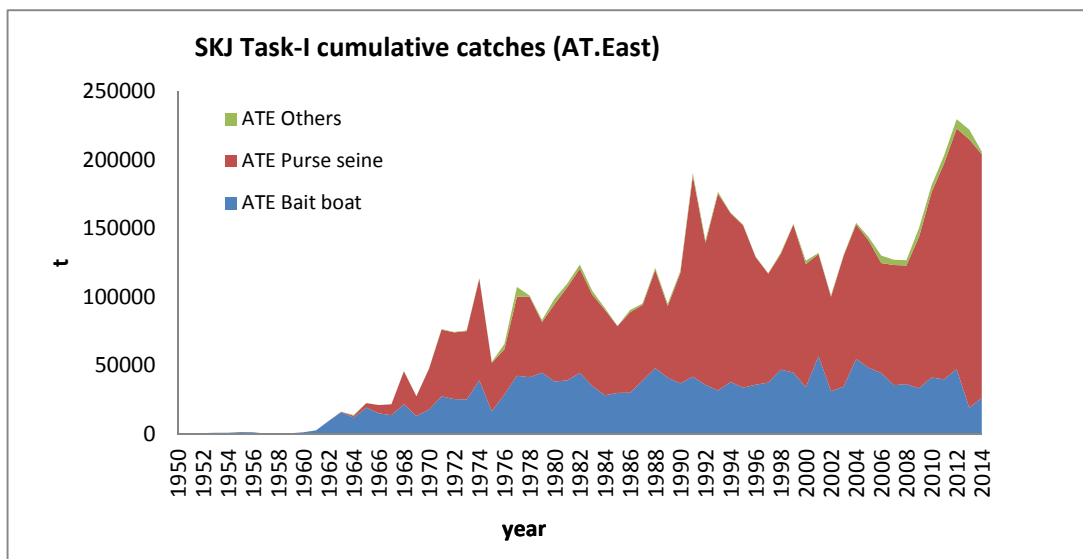
Rescaled M-et-length



SKJ-Figure 2. Estimates of natural mortality by size of Atlantic skipjack calculated by empirical relationships between mortality and some biological parameters (which show different values from those traditionally used in the East).

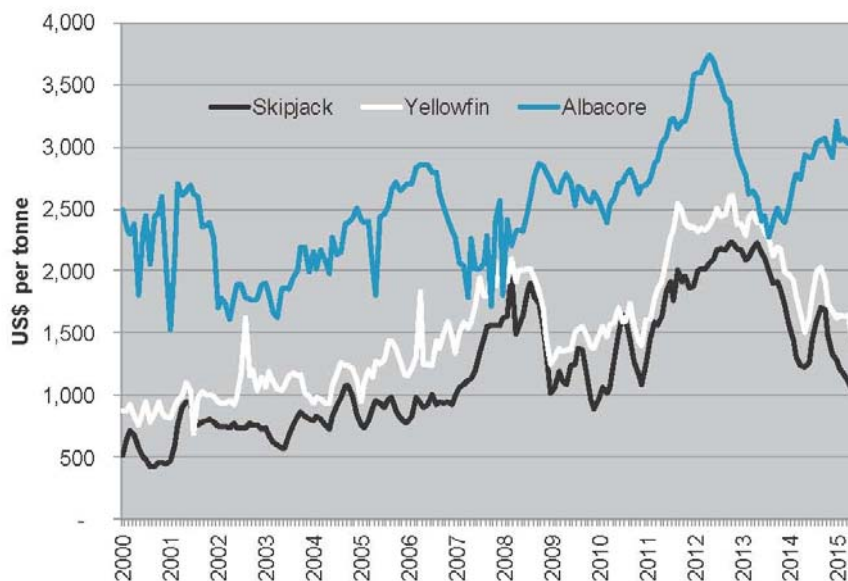


SKJ-Figure 3. Total skipjack catches (t) in the Atlantic and by stock (East and West) between 1950 and 2014. Skipjack estimates in the faux poisson landed in Côte d'Ivoire were included in the skipjack trade catches in the eastern Atlantic. It is possible that skipjack catches taken in the eastern Atlantic in recent years were not reported or were under-estimated in the logbook correction of species composition based on multi-species sampling carried out at the ports. The 2014 figure is still preliminary, in particular for the East Atlantic.

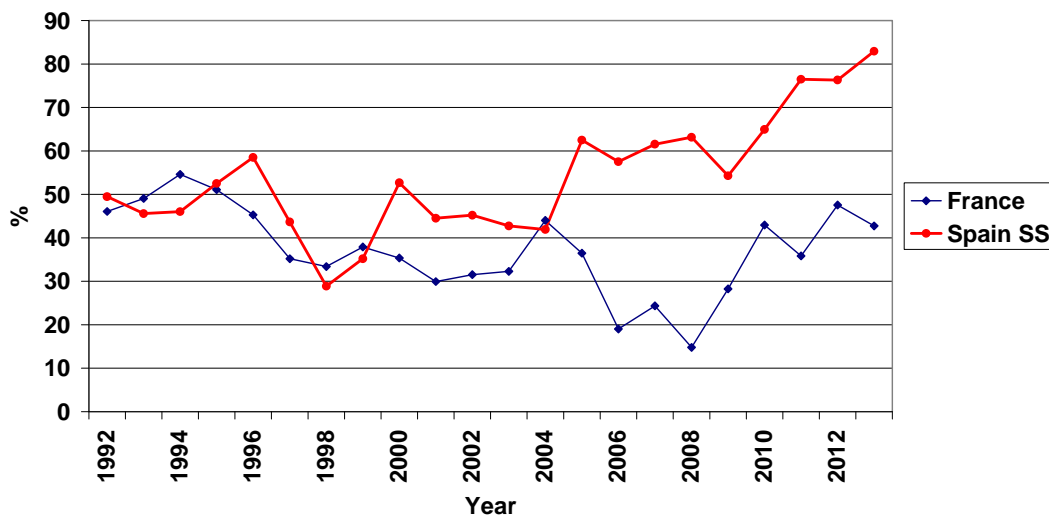


SKJ-Figure 4. Skipjack catches in the eastern Atlantic, by gear (1950-2014), after correction of Ghana's data by species (1996-2012).

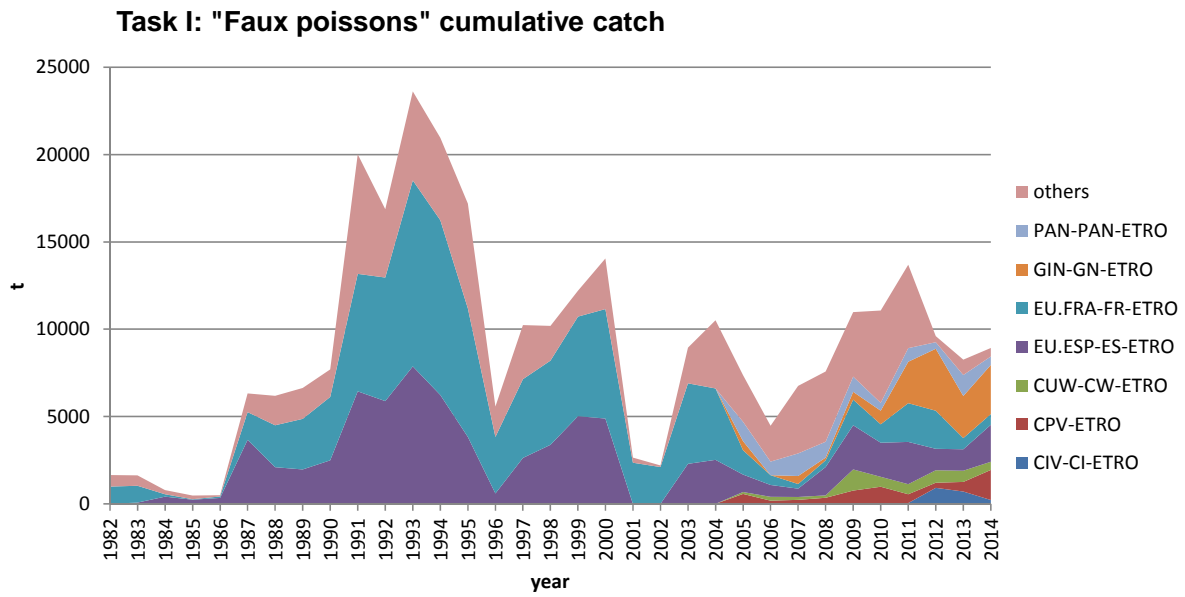
Bangkok canning-grade prices to June 2015²⁹



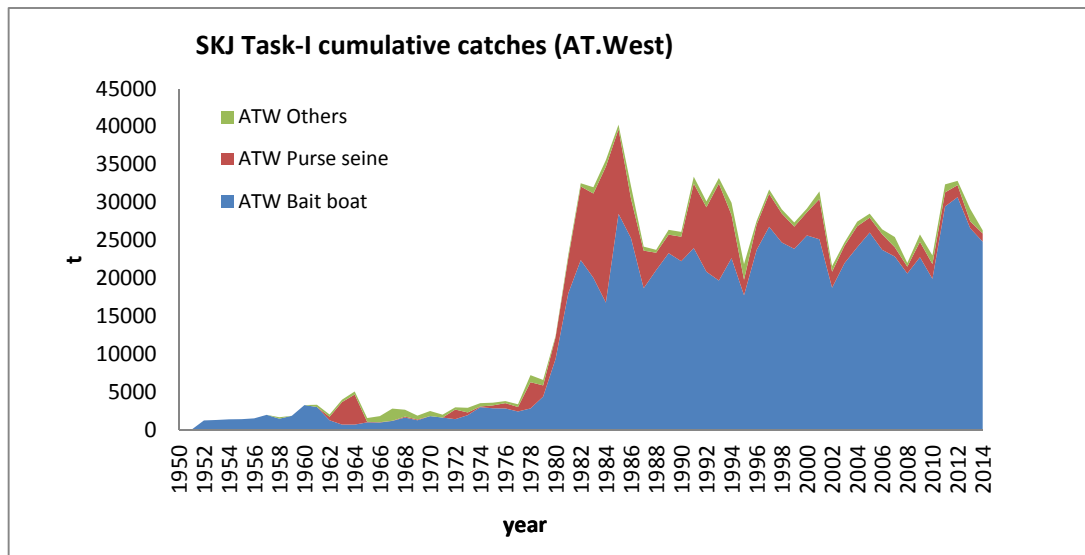
SKJ-Figure 5. Average prices of skipjack and yellowfin in U.S. dollars (adjusted for inflation and converted into the value of the 2013 \$US) in the Bangkok market. Source: FFA.



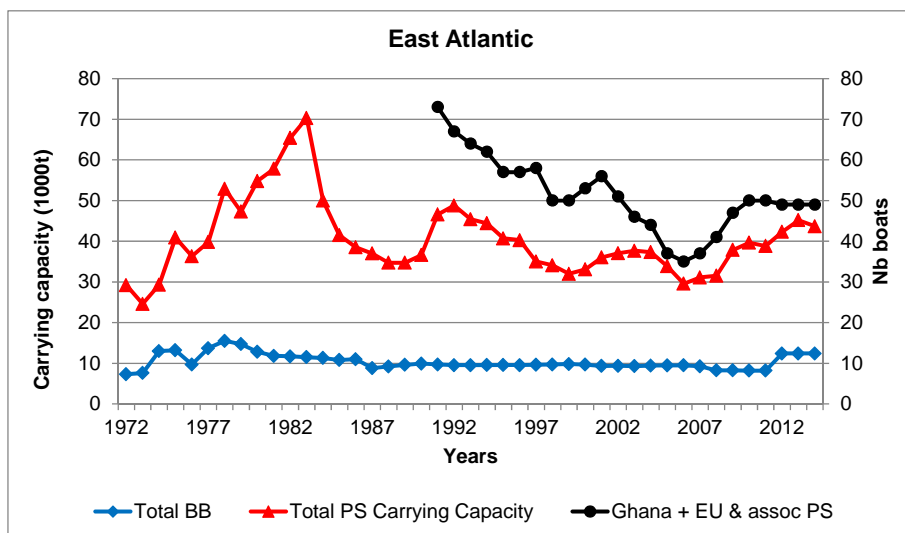
SKJ-Figure 6. Changes in the proportion of skipjack catches made by French and Spanish purse seiners under FADs (1992-2013). The increase in the percentage of catches under FADs coincides with the shift from the Senegal area, known for its seasonal fishing on free schools (see **Figure 1**), and with the increase of skipjack prices.



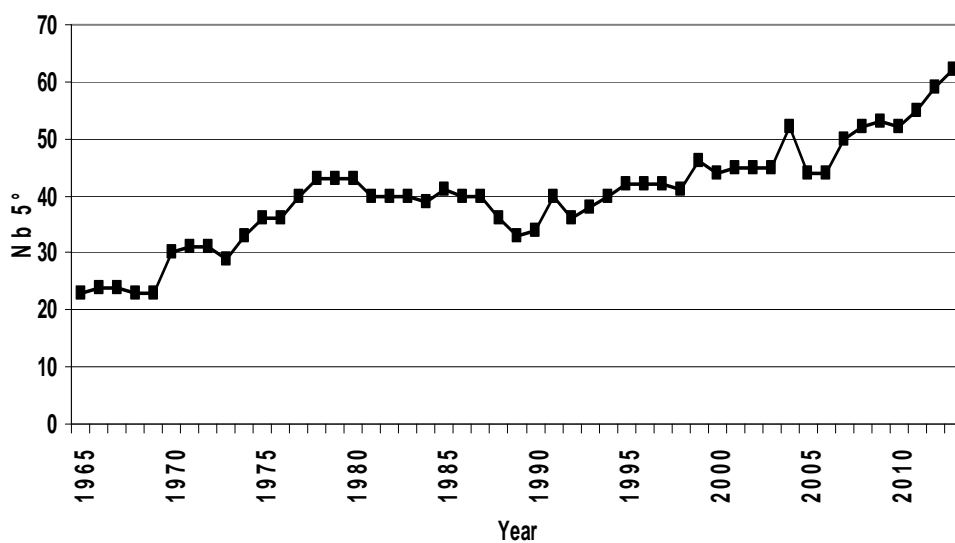
SKJ-Figure 7. Cumulative estimated landings of faux poisson (1981-2014) for the European or associated purse seiners for the three major species of tropical tunas in the local market of Abidjan (Côte d'Ivoire).



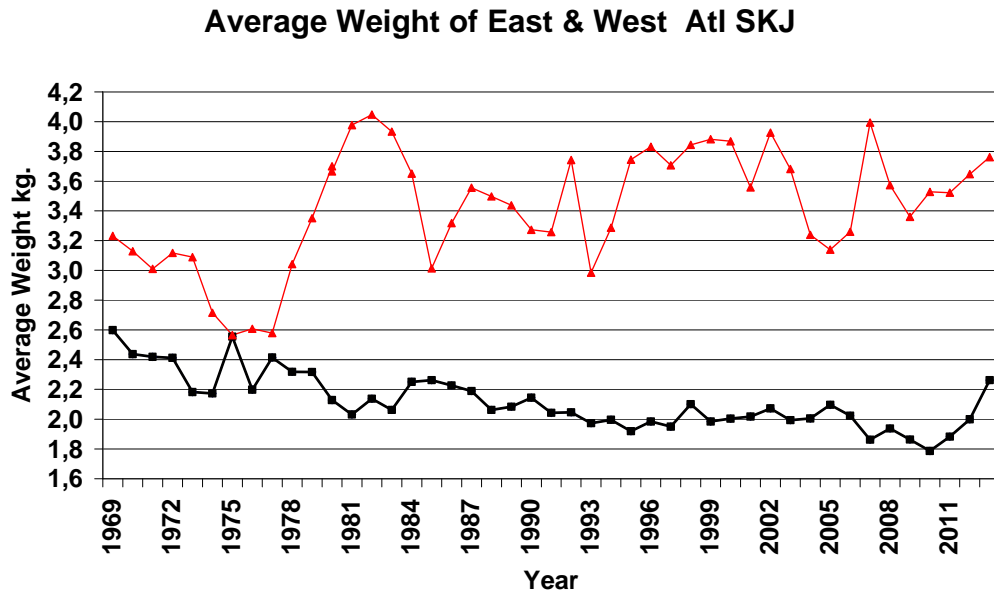
SKJ-Figure 8. Cumulative skipjack catches in the western Atlantic, by gear (1950-2014). The values for 2014 are preliminary.



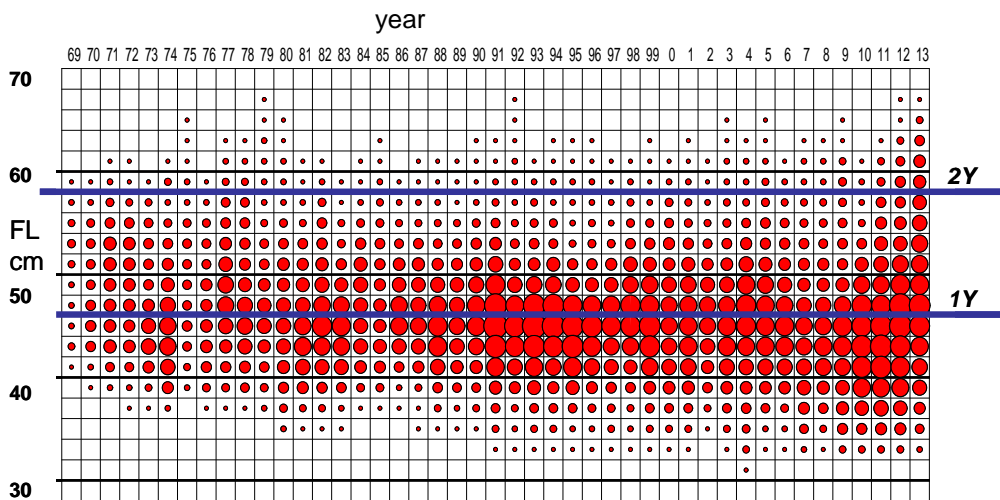
SKJ-Figure 9. Changes over time in the carrying capacity, corrected by the annual percentage of time at sea, for the overall purse seiners and baitboats operating in the eastern Atlantic (1971-2014) and in number of boats for the European purse seiners, associated and Ghanaian fleets (right axis). It is possible that the carrying capacity for some segments of the purse seine fleet was underestimated during recent years.



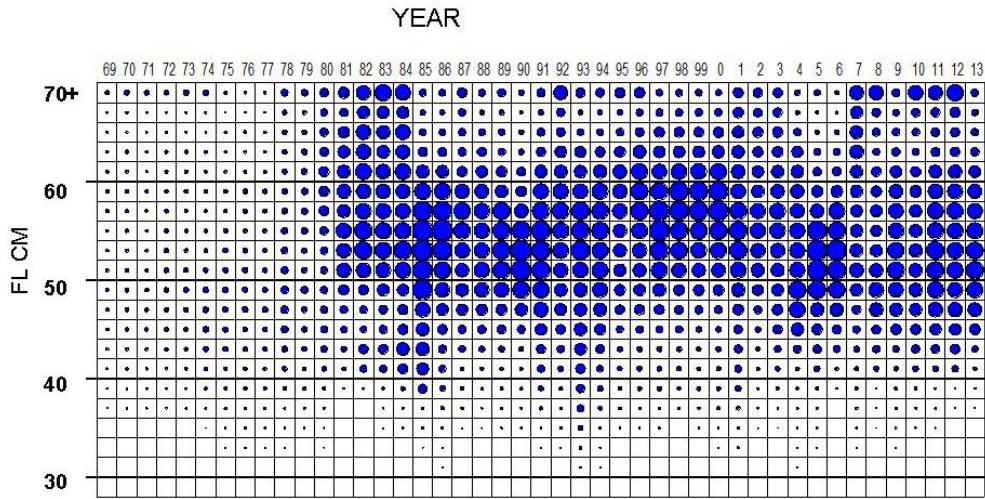
SKJ-Figure 10. Number of 5°x5° squares with annual skipjack catches above 10 t for the European and associated purse seiners operating in the eastern Atlantic (1969-2014). The great increase observed in 1991 could be due to a modification of the species composition correction procedure of the catches 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 Mauritania and Angola.



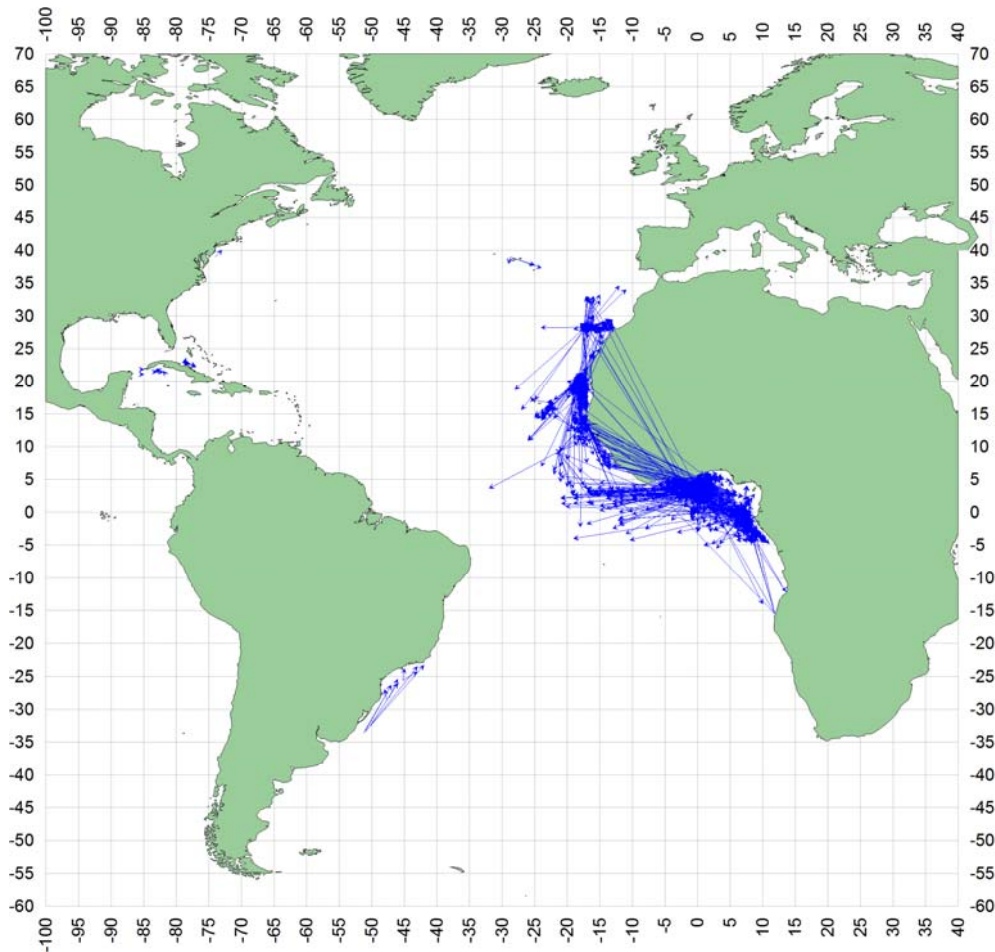
SKJ-Figure 11. Changes in the average weight of skipjack in the eastern (black) and western Atlantic (red).



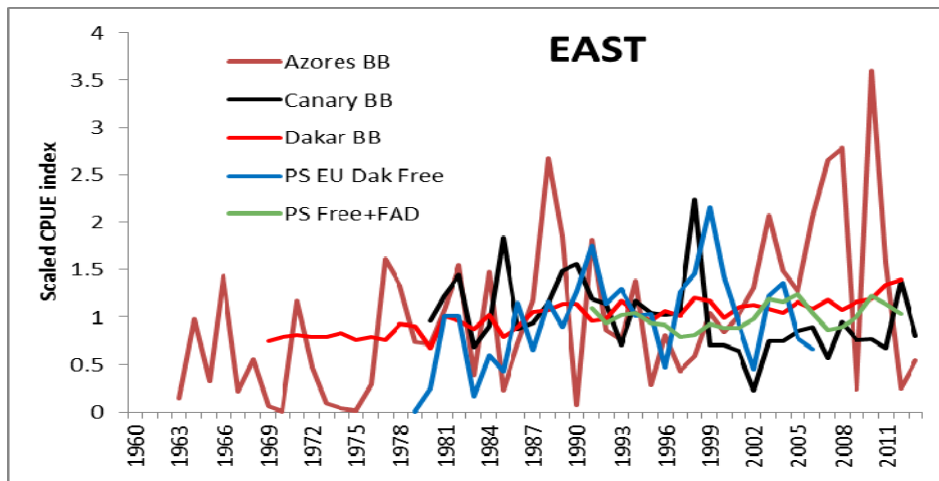
SKJ-Figure 12. Annual catch (in weight) by skipjack size class in the eastern Atlantic and approximate size limits of ages 1 and 2 (blue). The size at first sexual maturity (50%) is estimated at 42 cm.



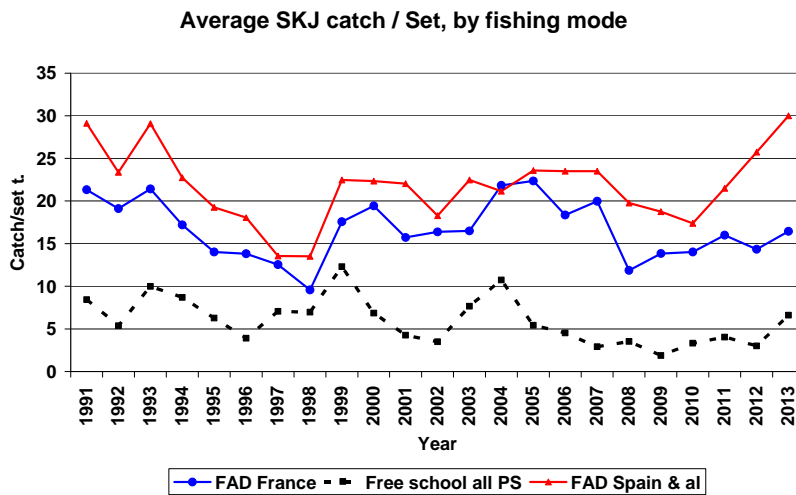
SKJ-Figure 13. Annual catch (in weight) by skipjack size class in the western Atlantic.



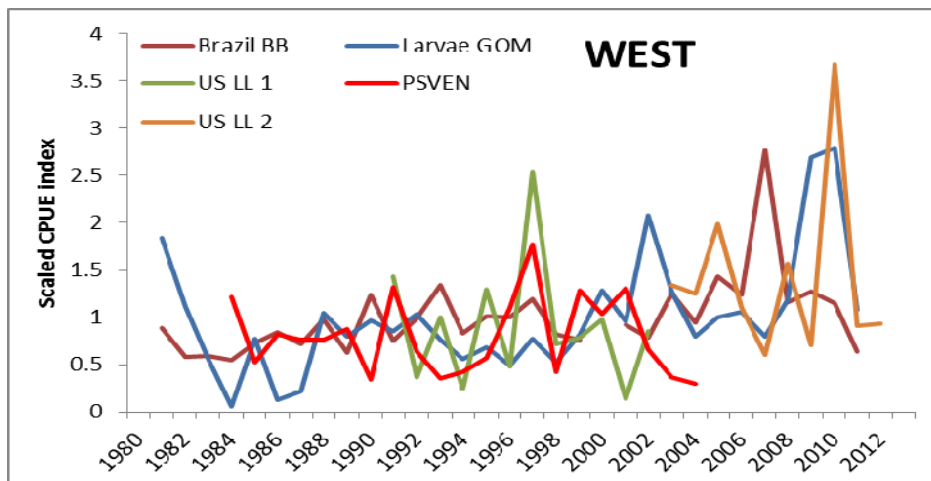
SKJ-Figure 14. Apparent movements (straight line distance between the tagging location and that of recovery) calculated from conventional tagging.



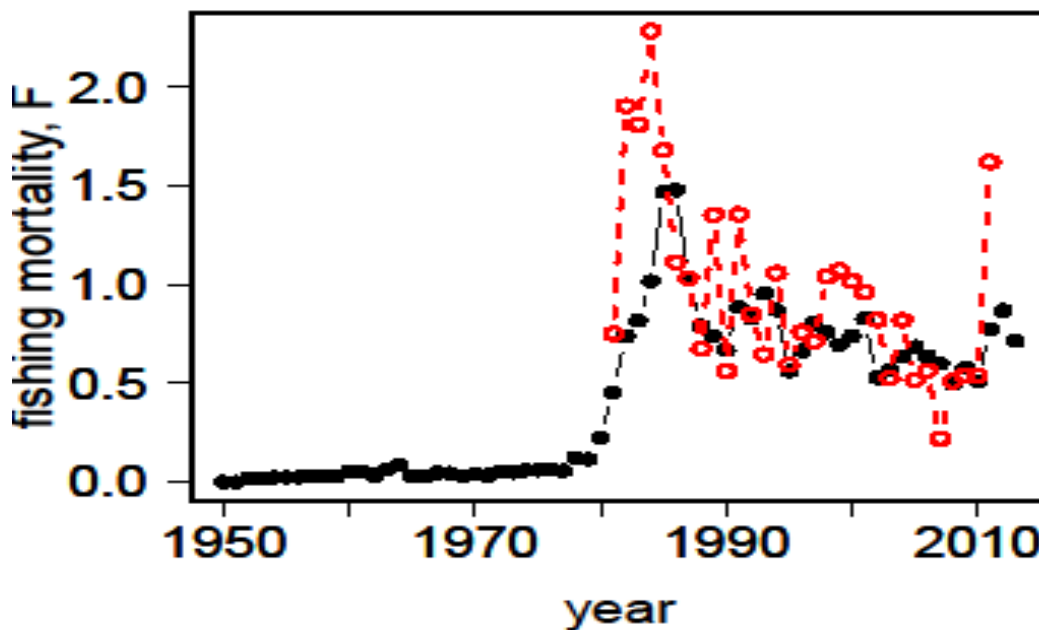
SKJ-Figure 15. Relative abundance indices for the eastern skipjack stock. Each index has been adjusted to its own average level given that to resolve problems regarding scaling, the indices for purse seine have been adjusted to the same level as the Azorean baitboat series.



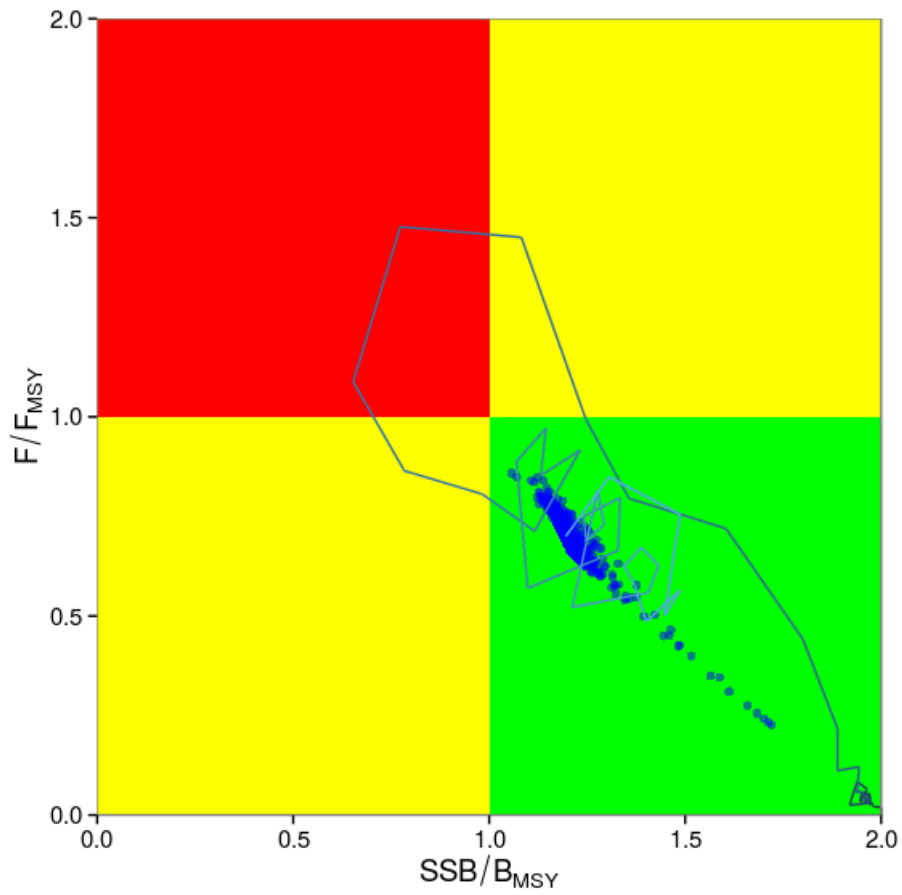
SKJ-Figure 16. Catches by set (t) of eastern Atlantic skipjack and on FADs (France and Spain + associated fleets) and on free schools (all purse seiners).



SKJ-Figure 17. Relative abundance indices for the western skipjack stock. Each index has been adjusted to its own average level given that to resolve problems regarding scaling, the indices for purse seiners and longliners have been adjusted to the level of the larvae index of the Gulf of Mexico.



SKJ-Figure 18. Comparison of coefficient mortality estimates of skipjack fishing in the western Atlantic obtained from a surplus production model (ASPIC black line and solid circles) and by the model based on the average size of catches (so called *Then Hoenig-Gédamke* in red and empty circles).



SKJ-Figure 19. Western skipjack stock status: trajectories of B/B_{MSY} and F/F_{MSY} from the ASPIC surplus production model (Schaefer type).

8.4 ALB – ALBACORE

The status of the North and South Atlantic albacore stocks is based on the most recent analyses conducted in June 2013 by means of applying statistical modelling to the available data up to 2011. Complete information on the assessment can be found in the Report of the 2013 ICCAT Albacore Stock Assessment Meeting (Anon. 2014c).

The status of the Mediterranean albacore stock is based on the 2011 assessment using available data up to 2010. 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 5°N) and a 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 yet sufficiently 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. 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 the late 1980s due to a shift towards targeting on tropical tuna, and 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. Since the 1980s, a significant reduction of the effective albacore area fished was observed for both longline and surface fisheries.

Total reported landings, steadily increased since 1930 to peak above 60,000 t in the early 1960s, declining afterwards, 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 generally decreasing trend of catch is observed in the North Atlantic.

The total catch in 2014 was 26,539 t, and the average catch in the last five years has remained about 23,000 t, above the historical minimum of around 15,000 t recorded in 2009. The higher catch during these last years is mainly due to increasing catch by mid-water trawlers. During this period, the surface fisheries contributed to approximately 80% of the total catch (**ALB-Table 1**). The reported catch in 2014 for EU-Ireland and EU-Spain was similar to the average of the last five years, while for EU-France it was significantly higher.

Longline catch contributed to approximately 20% 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 was taken mainly as by-catch. In both cases, the catch reported in 2014 for Japan and Chinese Taipei was below the last 5 year average.

The trend in mean weight for northern albacore remained stable between 1975 and 2011, ranging between 7 and 11 kg. The mean weight for surface fleets (baitboat and troll) showed a stable trend with an average of 7 kg (range: 4-10), and for longline fleets it showed no clear trend with an average of 19 kg, but some important fluctuations between 15 and 26 kg since the 1990 (**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 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 of Brazil, between 5°S and 20°S, 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.

Albacore landings increased sharply since the mid-1950s to reach values oscillating around 25,000 t between mid-1960s and the 1980s, 35,000 t until the last decade were they oscillated around 20,000 t. However, total reported albacore landings for 2014 decreased to 13681 t, which is among the lowest values in the time series. The Chinese Taipei catch continued to decrease and, in 2014, reached the lowest value of the last decades. In fact, 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 2014 catch for Brazil is lower than catches in the past five years. 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 2014, the estimated South African and Namibian catch (mainly baitboat), was below the average of the last five years. During the last decades, Japan took albacore as by-catch using longline gear, but recently Japan is again targeting albacore and increased the fishing effort in waters off South Africa and Namibia (20-40°S). Thus, catches during the last five years double those in the last few decades.

The trend in mean weight from 1975 to 2011 is shown in **ALB-Figure 3b**. Surface fleets showed a stable trend from 1981 onwards with an average of 13 kg and a maximum and minimum average weight of 17 kg and 10 kg, respectively. Longline fleets showed a relatively stable trend for the mean weight around 17 kg until 1996 where the average weight increased to about 20 kg, oscillating between 16 and 26 kg.

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 2014, the reported landings were 2,373 t, substantially below 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 around 65% of the catch during the last 10 years. In 2014 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 catch rate analyses were improved and updated with new information for the northern albacore fisheries. The base case assessment during the 2013 assessment session was based on similar methods and assumptions as in the previous assessment conducted in 2009 (Anon. 2010c). However, this time, a wider range of assessment methods were considered in sensitivity runs, including some that do not assume that catch-at-age is perfectly known. The approach provided the opportunity to evaluate a range of biological assumptions and 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 2011.

The CPUE trends for the various surface fleets, based upon the most recent available data showed somewhat different patterns from each other. This was also the case for the different longline fleets (**ALB-Figure 4**). The Spanish troll CPUE series showed a rather flat trend compared to the Spanish baitboat CPUE series that showed a more upward trend in the last three decades. For the longline fleets, the general trend in CPUE indices is a decline over time up until the mid-1980s, with varying rates, with some stability afterwards and a slight increase in the last few years. Comparatively, the Japanese CPUE showed steeper declines at the beginning of the series and the Chinese Taipei CPUE showed steeper increasing trends during the last years. 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.

The datasets used for the analyses from 1930 to 2011 were compiled and screened during the April 2013 data preparatory meeting. 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, and the indices to be used in assessments were specified. The definition of the fisheries was also revised and 12 fishery units were agreed for the base case Multifan-CL assessment (compared to 10 fishery units used in the previous assessment). In general, the base case included similar but not exactly the same model specifications and datasets used in 2009. Decisions on the final specifications of the base case model were guided by first principles (e.g. knowledge of the fisheries) and diagnostics (e.g. goodness of fit of the model to the data).

There is substantial uncertainty on current stock status, since different models and assumptions provide a wide range of B/B_{MSY} and F/F_{MSY} estimates (**ALB-Figure 5**). However, most of them agreed on the view that spawning stock biomass decreased since the 1930s and started to recover since the mid-1990s (**ALB-Figure 6**). Most of the model formulations, as well as the base case, concluded that currently the stock is not undergoing overfishing but the spawning stock biomass is overfished. According to the base case assessment which considers catch and effort since the 1930s and size frequency since 1959, the spawning stock size has declined and in 2011 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 (**ALB-Figure 7**).

The assessment indicated that the stock has remained overfished with SSB below SSB_{MSY} since the mid-1980s but has improved since the lowest levels around 30% in the late 1990s, and current SSB_{2011} is approximately 94% of SSB at MSY (**ALB-Figure 8**). Corresponding fishing mortality rates have been above F_{MSY} between the mid-1960s and the mid-2000s. Peak relative fishing mortality levels in the order of 2.5 were observed in the mid-1990s and remained below 1 afterwards, current F_{2011}/F_{MSY} ratio being 0.72 (**ALB-Figure 8**). According to the base case assessment, the probability of the stock being overfished and overfishing (red) is 0.2%, of being neither overfished nor overfishing (green) is 27.4%, and of being overfished or overfishing but not both (yellow) is 72.4% (**ALB-Figure 9**).

South Atlantic

In 2013, a stock assessment of South Atlantic albacore was conducted including catch, effort and size data up until 2011, and considering similar methods as in the previous assessment.

The southern standardized CPUE trends are mainly for longline fisheries, which harvest mostly adult 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 Uruguayan longline CPUE series showed significant decreases since the 1980s (**ALB-Figure 10**).

In the 2013 assessment, the same eight scenarios as in 2011 were considered, but after screening during the data preparatory meeting, less CPUE series were input in the models. Stock status results varied significantly among scenarios (**ALB-Figure 11a, b**). Two different production model forms were considered, each with four scenarios. 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 25,228 t (ranging between 19,109 t and 28,360 t), the median estimate of current B/B_{MSY} was 0.92 (ranging between 0.71 and 1.26) and the median estimate of current F/F_{MSY} was 1.04 (ranging between 0.38 and 1.32). The wide confidence intervals reflect the large uncertainty around the estimates of stock status. Considering all scenarios, there is 57% probability for the stock to be both overfished and experiencing overfishing, 13% probability for the stock to be either overfished or experiencing overfishing but not both, and 30% probability that biomass is above and fishing mortality is below the Convention objectives (**ALB-Figure 11c**).

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 12**). 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 13**).

ALB-4. Outlook

North Atlantic

The stock projected under different scenarios indicates that if catch in the future were on average similar to those observed over the recent five years (about 20,000 t) or around the current TAC (28,000 t), the biomass would continue to increase from its level of 2012 (**ALB-Table 2**). Considering the Commission’s decision framework in Rec. 11-13 (**ALB-Figure 14**), and noting that the Commission requested the SCRS to identify a limit reference point for northern Albacore Rec.11-04, the outlook for stock status under the Commission’s decision guidelines was projected making use of Harvest Control Rule (HCR, **ALB-Figure 15**) options (**ALB-Table 3**) consistent with the policies identified in Rec. 11-13, using an interim biomass limit of $0.4B_{MSY}$ that should be further tested, together with other candidate reference points, using the MSE framework. Projections were constructed in this way to inform the Commission’s choice of ‘high probability’ and ‘short period’ (**ALB-Figure 14**), considering the uncertainty in stock status evaluations that could be quantified and assuming that the indicated strategy could be perfectly implemented.

ALB-Table 4 provides the results of the HCR evaluations and indicates the projected probability of being ‘Green’ within the timeframe indicated. Expected catch along different timeframes are also shown, allowing the Commission to choose appropriate probability and timeframes and weigh tradeoffs with expected catch.

South Atlantic

The projection results differ between the base case scenarios. Since there is not objective information with which to select which scenario is most plausible, the group considered the entire range of scenarios, thus characterizing the range of possible responses to the distinct catch levels projected, as done in 2011. Projections at a level consistent with the 2013 TAC (24,000 t) showed that probabilities of being in the green area of the Kobe plot would be higher than 50% only after 2020. Similar probabilities could be achieved earlier with lower TAC values. Likewise, lower TAC values would provide higher probabilities of being in the green area by 2020 (**ALB-Table 5**). However, larger TACs would not provide larger than 50% probability in the timeframe analyzed.

Projections at F_{MSY} , without considering implementation errors, suggested that the stock biomass would not rebuild with a probability higher than 50% before 2026. Similar probabilities (higher than 50%) of rebuilding could be obtained from 2017 when projected at $0.95 \cdot F_{MSY}$.

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 2013, the Commission established a TAC for 2014-2016 of 28,000 t (Rec. 13-05), but included several provisions that allow the catch to exceed this level.

Furthermore, a 1998 recommendation that limits fishing capacity to the average of 1993-1995 remains in force.

The Committee noted that, since the establishment of the TAC in the year 2001, catch remained substantially below the TAC in all but two years (**ALB-Figure 2**). This might have accelerated rebuilding over the last decade.

South Atlantic

In 2013 the Commission established a new TAC of 24,000 t for 2014-2016 (Rec. 13-06). The Committee noted that, since 2004, reported catches remained below 24,000 t, except in 2006, 2011 and 2012, where 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

Projections at the current TAC level (28,000 t) indicate that the stock would rebuild by 2019 with 53% probability, which would meet the objective of the albacore recovery plan (Rec. 13-05). The recovery of the stock with similar probabilities would be faster (by 2016) if the catches remain at the level of recent catches (around 20,000 t). Higher probabilities of rebuilding would require longer timeframes. For instance, 75% probability of rebuilding would be achieved by 2019 with a constant catch of 20,000 t, and by 2027 with a constant catch of 28,000 t. Catches above 34,000 t would not rebuild the stock with at least 50% probability in the projected timeframes (**ALB-Table 2**).

These projections were complemented by a set of projections under alternative provisional HCRs that could serve the Commission to decide on desired timeframes and probabilities for recovering the North Atlantic stock and which are consistent with the decision framework of Rec. 11-13 in that there is a high probability of $F < F_{MSY}$ in as short a time as possible. A range of timeframes and probability levels for achieving the Commission's goals established in Rec. 11-13 are provided in **ALB-Table 4**. Longer timeframes provide more options for HCR parameters that project higher probabilities of being 'Green'. The HCR projections indicate, for example, should the Commission wish to have a 'high probability' of 75% within a 10 year timeframe, then the HCR with a Biomass Threshold at B_{MSY} paired with a Target F of $.9 F_{MSY}$ would provide the highest expected 10 year cumulative catch amongst options and the average catch expected from 2014-2016 would be approximately 26,260 t. Should the Commission consider a 'high probability' of 60% sufficient within a five year timeframe, then the HCR with a Biomass Threshold at B_{MSY} paired with a Target F of $.9 F_{MSY}$ would also meet that objective and provide the highest expected cumulative catch amongst options that would provide at least 60% probability within five years and the average catch from 2014-2016 would remain approximately 26,260 t. Unlike the constant catch projections, the HCR projections imply increasing catch as the population biomass increases resulting in higher cumulative catch over time to achieve equivalent conservation objectives of a constant catch policy. This can be evaluated by comparing **ALB-Tables 2** and **4**. Consideration of implementation and other uncertainties in these projections would likely change the probability level estimates.

South Atlantic

Results indicate that, most probably, the South Atlantic albacore stock is around the spawning biomass and the fishing mortality that can sustain the maximum sustainable levels. However, 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.

Projections at a level consistent with the 2013 TAC (24,000 t) showed that probabilities of being in the green area would exceed 50% only after 2020. Similar probabilities could be achieved earlier with lower TAC values.

With catches around 20,000 t, probabilities of 50% would be exceeded by 2015, and probabilities of 60% would be exceeded by 2018. Lower catches (as in 2013 and specially in 2014) 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 5**).

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 the 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 |
|---|--|---|----------------------------------|
| Maximum Sustainable Yield | 31,680 t | 25,228 t (19,109-28,360) ¹ | Unknown |
| Current (2015) TAC | 28,000 t | 24,000 t | None |
| Current (2014) Yield | 26,539 t | 13,681 t | 2,373 t |
| Yield in last year of assessment (2011) | 20,039 t | 24,129 t | |
| Yield in last year of assessment (2010) | | | 2,124 t |
| SSB _{MSY} | 81,110 t | | |
| B _{MSY} | | 216,807 t (88,380-595,953) ¹ | |
| F _{MSY} | 0.1486 | 0.176 (0.063-0,481) ¹ | |
| SSB _{cur} /SSB _{MSY} ² | 0.94 (0.74-1.14) ² | | Not estimated |
| SSB _{cur} /Blim | 2.4 ³ | | |
| B ₂₀₁₂ /B _{MSY} ¹ | | 0.92 (0.71-1.26) ¹ | |
| F _{cur} /F _{MSY} ² | 0.72 (0.55-0.89) ² | | <=1 ⁴ |
| F ₂₀₁₁ /F _{MSY} ¹ | | 1.04 (0.38-1.32) ¹ | |
| Stock Status | Overfished: Yes Overfishing: No | Overfished: Yes Overfishing: Yes | Overfished: ? Overfishing: No |
| Management measures in effect: | [Rec. 98-08]: Limit number of vessels to 1993-1995 average. [Rec. 13-05] TAC of 28,000 t for 2014-2016. | [Rec. 13-06]: TAC of 24,000 t for 2014-2016 | None |

¹ Median range and 80% CI calculated for the whole range of the 8 base cases.

² Average for the last three years, with base case 95% confidence interval.

³ The proposed interim Blim is 0.4.

⁴ Estimated with length converted catch curve analysis, taking M as a proxy for F_{MSY}.

| | | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|----------------------------|--------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|-------|-------|-------|------|------|
| ATS | Angola | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 168 | 0 | 5 | |
| | Argentina | 151 | 60 | 306 | 0 | 2 | 0 | 0 | 120 | 9 | 52 | 0 | 0 | 0 | 12 | 18 | 0 | 0 | 0 | 0 | 0 | 130 | 43 | 0 | 0 | |
| | Belize | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 8 | 2 | 0 | 0 | 0 | 0 | 0 | 54 | 32 | 31 | 213 | 303 | 365 | 171 | 87 | 98 |
| | Brazil | 514 | 1113 | 2710 | 3613 | 1227 | 923 | 819 | 652 | 3418 | 1872 | 4411 | 6862 | 3228 | 2647 | 522 | 556 | 361 | 535 | 487 | 202 | 271 | 1269 | 1857 | 1743 | 438 |
| | Cambodia | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cabo Verde | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 46 | 24 | 0 | 5 | 0 | 5 | 0 | 0 | 0 |
| | China PR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 39 | 89 | 26 | 30 | 26 | 112 | 95 | 100 | 35 | 25 | 89 | 97 | 80 | 61 | 65 | 34 |
| | Chinese Taipei | 21369 | 19883 | 23063 | 19400 | 22573 | 18351 | 18956 | 18165 | 16106 | 17377 | 17221 | 15833 | 17321 | 17351 | 13288 | 10730 | 12293 | 13146 | 9966 | 8678 | 10975 | 13032 | 12812 | 8519 | 6675 |
| | Cuba | 2 | 17 | 5 | 3 | 0 | 0 | 0 | 0 | 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 | 9 | 192 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 21 | 4 | 4 | 24 | 0 |
| | Côte D'Ivoire | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 47 | 43 | 45 | 50 | 0 | 0 |
| | EU.España | 0 | 280 | 1943 | 783 | 831 | 457 | 184 | 256 | 193 | 1027 | 288 | 573 | 836 | 376 | 81 | 285 | 367 | 758 | 933 | 1061 | 294 | 314 | 351 | 369 | 259 |
| | EU.France | 0 | 50 | 449 | 564 | 129 | 82 | 190 | 38 | 40 | 13 | 23 | 11 | 18 | 63 | 16 | 478 | 347 | 12 | 50 | 60 | 109 | 53 | 161 | 73 | 38 |
| | EU.Portugal | 732 | 81 | 184 | 483 | 1185 | 655 | 494 | 256 | 124 | 232 | 486 | 41 | 433 | 415 | 9 | 43 | 8 | 13 | 49 | 254 | 84 | 44 | 11 | 1 | 3 |
| | EU.United Kingdom | 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 |
| | Ghana | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 10 | 14 | 25 | 0 | 0 | 0 | 0 |
| | Guatemala | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 40 | 0 | 0 | 0 | 56 | 0 | 0 | 15 | 0 |
| | Guinée Rep. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 7 | 74 | 0 | 0 |
| | Honduras | 0 | 0 | 29 | 0 | 0 | 2 | 0 | 7 | 1 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Japan | 587 | 654 | 583 | 467 | 651 | 389 | 435 | 424 | 418 | 601 | 554 | 341 | 231 | 322 | 509 | 312 | 316 | 238 | 1370 | 921 | 973 | 1194 | 2903 | 3106 | 1133 |
| | Korea Rep. | 19 | 31 | 5 | 20 | 3 | 3 | 18 | 4 | 7 | 14 | 18 | 1 | 0 | 5 | 37 | 42 | 66 | 56 | 88 | 374 | 130 | 70 | 89 | 33 | 2 |
| | Maroc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | NEI (ETRO) | 4 | 8 | 122 | 68 | 55 | 63 | 41 | 5 | 27 | 0 | 0 | 10 | 14 | 53 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | NEI (Flag related) | 0 | 149 | 262 | 146 | 123 | 102 | 169 | 47 | 42 | 38 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Namibia | 0 | 0 | 0 | 0 | 1111 | 950 | 982 | 1199 | 1429 | 1162 | 2418 | 3419 | 2962 | 3152 | 3328 | 2344 | 5100 | 1196 | 1958 | 4936 | 1320 | 3791 | 2420 | 848 | 1057 |
| | Panama | 0 | 240 | 482 | 318 | 458 | 228 | 380 | 53 | 60 | 14 | 0 | 0 | 0 | 0 | 0 | 17 | 0 | 87 | 5 | 6 | 1 | 0 | 12 | 3 | 0 |
| Philippines | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 4 | 0 | 0 | 0 | 0 | 0 | 52 | 0 | 13 | 79 | 45 | 95 | 96 | 203 | 415 | 18 | |
| 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 | 0 | |
| South Africa | 5280 | 3410 | 6360 | 6881 | 6931 | 5214 | 5634 | 6708 | 8412 | 5101 | 3610 | 7236 | 6507 | 3469 | 4502 | 3198 | 3735 | 3797 | 3468 | 5043 | 4147 | 3380 | 3553 | 3510 | 3719 | |
| St. Vincent and Grenadines | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2116 | 4292 | 44 | 0 | 0 | 65 | 160 | 71 | 51 | 31 | 94 | 92 | 97 | 110 | 0 | |
| U.S.A. | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 5 | 1 | 1 | 1 | 2 | 8 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| U.S.S.R. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| UK.Sta Helena | 1 | 5 | 28 | 38 | 5 | 82 | 47 | 18 | 1 | 1 | 58 | 12 | 2 | 0 | 0 | 0 | 62 | 46 | 94 | 81 | 3 | 120 | 2 | 2 | 0 | |
| Uruguay | 55 | 34 | 31 | 28 | 16 | 49 | 75 | 56 | 110 | 90 | 90 | 135 | 111 | 108 | 120 | 32 | 93 | 34 | 53 | 97 | 24 | 37 | 12 | 209 | 0 | |
| Vanuatu | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 684 | 1400 | 96 | 131 | 64 | 104 | 85 | 35 | 83 | 91 | |
| MED | EU.Croatia | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 7 | 12 | 20 | 30 |
| | EU.Cyprus | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 12 | 30 | 255 | 425 | 507 | 712 | 209 | 223 | 206 | 222 | 315 | 350 | 350 |
| | EU.España | 84 | 548 | 227 | 298 | 218 | 475 | 429 | 380 | 126 | 284 | 152 | 200 | 209 | 1 | 138 | 189 | 382 | 516 | 238 | 204 | 277 | 343 | 389 | 244 | 283 |
| | EU.France | 121 | 140 | 11 | 64 | 23 | 3 | 0 | 5 | 5 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 1 | 2 | 0 | 0 | 1 |
| | EU.Greece | 500 | 500 | 500 | 1 | 1 | 0 | 952 | 741 | 1152 | 2005 | 1786 | 1840 | 1352 | 950 | 773 | 623 | 402 | 448 | 191 | 116 | 125 | 126 | 126 | 165 | 287 |
| | EU.Italy | 1191 | 1191 | 1464 | 1275 | 1107 | 1109 | 1769 | 1414 | 1414 | 2561 | 3630 | 2826 | 4032 | 6912 | 3671 | 2248 | 4584 | 4017 | 2104 | 2724 | 1109 | 2494 | 1117 | 615 | 1353 |
| | EU.Malta | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 6 | 4 | 4 | 2 | 5 | 10 | 15 | 18 | 1 | 5 | 1 | 2 | 5 | 19 | 29 | 62 |
| | 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 | 0 |
| | Japan | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Korea Rep. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 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 | 120 | 0 | 0 | 0 | 0 |
| | NEI (MED) | 0 | 0 | 0 | 500 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Syria | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19 | 14 | 0 | 0 | 0 | 1 | 1 | 0 |
| Turkey | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 27 | 30 | 73 | 852 | 208 | 631 | 402 | 1396 | 62 | 71 | |
| 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 | 0 | |
| Discards | ATN 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 | 1 |
| | Venezuela | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 93 | 179 |
| ATS | Chinese Taipei | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| | Korea Rep. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | South Africa | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| MED | EU.Cyprus | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 25 | 6 | 7 | 8 |

1. Brazilian Task I catches from 2012 to 2014 are preliminary and under revision.

ALB-Table 2. North Atlantic albacore estimated probabilities (in %) that the fishing mortality is below F_{MSY} (a), spawning stock biomass is above SSB_{MSY} (b) and both (c). Projections for constant catch levels are shown.

| (a) Probability $F < F_{MSY}$ | | | | | | | | | | | | | | | | | | |
|-----------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| TAC | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
| 0 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 20000 | 96 | 97 | 98 | 98 | 98 | 98 | 98 | 98 | 98 | 98 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 |
| 22000 | 93 | 94 | 95 | 96 | 96 | 97 | 97 | 97 | 97 | 97 | 97 | 98 | 98 | 98 | 98 | 98 | 98 | 98 |
| 24000 | 87 | 89 | 91 | 92 | 93 | 94 | 94 | 95 | 95 | 95 | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 97 |
| 26000 | 79 | 82 | 84 | 86 | 87 | 89 | 90 | 90 | 91 | 91 | 92 | 92 | 93 | 93 | 93 | 93 | 94 | 94 |
| 28000 | 68 | 72 | 74 | 77 | 78 | 80 | 81 | 83 | 84 | 85 | 85 | 86 | 87 | 87 | 88 | 88 | 89 | 89 |
| 30000 | 57 | 61 | 63 | 66 | 68 | 70 | 72 | 73 | 75 | 76 | 77 | 78 | 78 | 79 | 80 | 81 | 81 | 82 |
| 32000 | 48 | 49 | 52 | 54 | 56 | 58 | 60 | 61 | 63 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 71 | 72 |
| 34000 | 39 | 40 | 42 | 44 | 45 | 47 | 49 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 57 | 58 | 59 | 59 |
| 36000 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 47 | 48 | 48 |
| 38000 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 33 | 34 | 35 | 35 | 36 | 36 | 37 | 38 |
| 40000 | 17 | 17 | 18 | 18 | 19 | 20 | 20 | 21 | 22 | 22 | 23 | 23 | 23 | 24 | 24 | 25 | 26 | 27 |
| (b) Probability $SSB > SSB_{MSY}$ | | | | | | | | | | | | | | | | | | |
| TAC | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
| 0 | 38 | 56 | 74 | 86 | 91 | 94 | 96 | 97 | 98 | 98 | 99 | 99 | 99 | 99 | 100 | 100 | 100 | 100 |
| 20000 | 29 | 38 | 45 | 54 | 63 | 69 | 75 | 79 | 83 | 85 | 87 | 89 | 90 | 92 | 93 | 93 | 94 | 95 |
| 22000 | 28 | 36 | 43 | 50 | 58 | 64 | 70 | 75 | 78 | 81 | 84 | 85 | 87 | 89 | 89 | 91 | 92 | 92 |
| 24000 | 27 | 35 | 40 | 46 | 53 | 59 | 64 | 69 | 73 | 76 | 79 | 81 | 83 | 84 | 86 | 87 | 88 | 89 |
| 26000 | 26 | 33 | 38 | 43 | 49 | 54 | 59 | 63 | 67 | 70 | 73 | 76 | 78 | 79 | 81 | 83 | 84 | 84 |
| 28000 | 25 | 31 | 36 | 39 | 44 | 49 | 53 | 57 | 61 | 63 | 66 | 69 | 71 | 73 | 75 | 76 | 77 | 79 |
| 30000 | 24 | 29 | 34 | 37 | 39 | 43 | 47 | 50 | 54 | 56 | 59 | 61 | 63 | 65 | 66 | 68 | 69 | 71 |
| 32000 | 23 | 27 | 31 | 34 | 36 | 39 | 41 | 43 | 47 | 49 | 51 | 53 | 55 | 57 | 58 | 59 | 61 | 62 |
| 34000 | 22 | 25 | 27 | 30 | 33 | 35 | 36 | 38 | 40 | 42 | 43 | 45 | 47 | 48 | 50 | 51 | 52 | 53 |
| 36000 | 22 | 23 | 24 | 26 | 28 | 30 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 41 | 42 |
| 38000 | 21 | 21 | 22 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 29 | 30 | 31 | 31 | 32 | 32 | 32 |
| 40000 | 21 | 20 | 19 | 19 | 19 | 19 | 19 | 19 | 19 | 20 | 20 | 20 | 20 | 20 | 21 | 21 | 21 | 21 |

(c) Probability of green status ($SSB > SSB_{MSY}$ and $F < F_{MSY}$)

| TAC | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | Average catch over: | Cumulative Catch over: | | | |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|---------------------|------------------------|----------|----------|----------|
| | | | | | | | | | | | | | | | | | | | 3 years | 5 years | 10 years | 15 years | 20 years |
| 0 | 38 | 56 | 74 | 86 | 91 | 94 | 96 | 97 | 98 | 98 | 99 | 99 | 99 | 99 | 100 | 100 | 100 | 100 | 0 | 0 | 0 | 0 | 0 |
| 20000 | 29 | 38 | 45 | 54 | 63 | 69 | 75 | 79 | 83 | 85 | 87 | 89 | 90 | 92 | 93 | 93 | 94 | 95 | 20,000 | 100,000 | 200,000 | 300,000 | 400,000 |
| 22000 | 28 | 36 | 43 | 50 | 58 | 64 | 70 | 75 | 78 | 81 | 84 | 85 | 87 | 89 | 89 | 91 | 92 | 92 | 22,000 | 110,000 | 220,000 | 330,000 | 440,000 |
| 24000 | 27 | 35 | 40 | 46 | 53 | 59 | 64 | 69 | 73 | 76 | 79 | 81 | 83 | 84 | 86 | 87 | 88 | 89 | 24,000 | 120,000 | 240,000 | 360,000 | 480,000 |
| 26000 | 26 | 33 | 38 | 43 | 49 | 54 | 59 | 63 | 67 | 70 | 73 | 76 | 78 | 79 | 81 | 83 | 84 | 84 | 26,000 | 130,000 | 260,000 | 390,000 | 520,000 |
| 28000 | 25 | 31 | 36 | 39 | 44 | 49 | 53 | 57 | 61 | 63 | 66 | 69 | 71 | 73 | 75 | 76 | 77 | 79 | 28,000 | 140,000 | 280,000 | 420,000 | 560,000 |
| 30000 | 24 | 29 | 34 | 37 | 39 | 43 | 47 | 50 | 54 | 57 | 59 | 61 | 63 | 65 | 66 | 68 | 69 | 71 | 30,000 | 150,000 | 300,000 | 450,000 | 600,000 |
| 32000 | 23 | 27 | 31 | 34 | 36 | 39 | 41 | 44 | 47 | 49 | 51 | 53 | 55 | 57 | 58 | 59 | 61 | 62 | 32,000 | 160,000 | 320,000 | 480,000 | 640,000 |
| 34000 | 22 | 24 | 27 | 30 | 32 | 34 | 36 | 38 | 40 | 41 | 43 | 45 | 47 | 48 | 49 | 50 | 52 | 52 | 34,000 | 170,000 | 340,000 | 510,000 | 680,000 |
| 36000 | 21 | 22 | 23 | 25 | 27 | 29 | 31 | 32 | 33 | 34 | 35 | 36 | 38 | 39 | 40 | 40 | 41 | 42 | 36,000 | 180,000 | 360,000 | 540,000 | 720,000 |
| 38000 | 18 | 19 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 30 | 31 | 31 | 32 | 38,000 | 190,000 | 380,000 | 570,000 | 760,000 |
| 40000 | 16 | 16 | 16 | 16 | 16 | 16 | 17 | 17 | 17 | 18 | 18 | 18 | 18 | 19 | 19 | 19 | 19 | 20 | 40,000 | 200,000 | 400,000 | 600,000 | 800,000 |

ALB-Table 3. Levels of Target F, and Biomass threshold levels in combination with an interim Biomass limit of $0.4B_{MSY}$ in HCR parameterization consistent with Rec. 11-13 to inform the Commission in support of identifying ‘high probability’ and ‘short period’.

FTarget: $.75F_{MSY}, .8F_{MSY}, .85F_{MSY}, .9F_{MSY}, .95F_{MSY}, F_{MSY}$

BThreshold: $.6B_{MSY}, .8B_{MSY}, B_{MSY}$

ALB-Table 4. North Atlantic albacore estimated probabilities (in %) that the fishing mortality is below F_{MSY} and spawning stock biomass is above SSB_{MSY} (green status). Projections conducted with different Harvent Control Rules (as combinations of Bthresh and Ftarget values, all assuming $Blim=0.4SSB_{MSY}$) are shown (see also **ALB-Figure 14** and **ALB-Figure 15**).

| Kobe II Strategy matrix. Future probability of $SSB > SSB_{MSY}$ and $F < F_{MSY}$ for different combinations of Bthreshold and Ftarget values | | | | | | | | | | | | | | | | | | | | Average catch over | | Cumulative catch over: | | |
|--|----------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|--------------------|---------|------------------------|----------|----------|
| Bthreshold | Ftarget | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 3 years | 5 years | 10 years | 15 years | 20 years |
| .6Bmsy | 0.75Fmsy | 29 | 32 | 36 | 49 | 54 | 57 | 61 | 65 | 68 | 70 | 73 | 75 | 77 | 78 | 80 | 81 | 82 | 84 | 26.969 | 139.100 | 293.575 | 454.716 | 620.434 |
| .6Bmsy | 0.8Fmsy | 29 | 31 | 35 | 45 | 52 | 55 | 58 | 61 | 64 | 67 | 69 | 71 | 74 | 75 | 77 | 78 | 79 | 80 | 28.458 | 146.274 | 306.335 | 472.388 | 642.668 |
| .6Bmsy | 0.85Fmsy | 29 | 31 | 33 | 42 | 47 | 52 | 55 | 57 | 59 | 62 | 64 | 67 | 69 | 71 | 72 | 74 | 76 | 77 | 29.911 | 153.211 | 318.349 | 488.666 | 662.774 |
| .6Bmsy | 0.9Fmsy | 29 | 30 | 30 | 39 | 42 | 46 | 50 | 52 | 54 | 56 | 58 | 60 | 62 | 64 | 66 | 68 | 70 | 71 | 31.330 | 159.918 | 329.637 | 503.591 | 680.809 |
| .6Bmsy | 0.95Fmsy | 29 | 29 | 20 | 36 | 37 | 39 | 42 | 44 | 48 | 50 | 51 | 52 | 54 | 55 | 56 | 58 | 60 | 61 | 32.715 | 166.398 | 340.221 | 517.205 | 696.835 |
| .8Bmsy | 0.75Fmsy | 29 | 32 | 42 | 51 | 55 | 59 | 63 | 67 | 70 | 72 | 75 | 76 | 78 | 80 | 81 | 83 | 86 | 88 | 25.260 | 133.581 | 289.167 | 451.760 | 618.642 |
| .8Bmsy | 0.8Fmsy | 29 | 32 | 41 | 50 | 53 | 56 | 59 | 62 | 66 | 69 | 71 | 73 | 75 | 77 | 78 | 80 | 81 | 83 | 26.655 | 140.496 | 301.820 | 469.532 | 641.152 |
| .8Bmsy | 0.85Fmsy | 29 | 31 | 39 | 48 | 50 | 53 | 56 | 58 | 61 | 63 | 67 | 69 | 71 | 73 | 75 | 76 | 77 | 79 | 28.016 | 147.185 | 313.734 | 485.931 | 661.571 |
| .8Bmsy | 0.9Fmsy | 29 | 30 | 35 | 46 | 48 | 50 | 51 | 54 | 56 | 58 | 60 | 62 | 64 | 67 | 69 | 70 | 72 | 73 | 29.346 | 153.654 | 324.930 | 500.996 | 679.954 |
| .8Bmsy | 0.95Fmsy | 29 | 29 | 23 | 45 | 45 | 46 | 47 | 48 | 49 | 51 | 52 | 54 | 55 | 56 | 58 | 59 | 61 | 63 | 30.643 | 159.905 | 335.420 | 514.759 | 696.359 |
| Bmsy | 0.75Fmsy | 29 | 35 | 47 | 58 | 62 | 68 | 72 | 75 | 78 | 80 | 82 | 84 | 87 | 90 | 92 | 94 | 95 | 96 | 22.639 | 123.151 | 277.783 | 441.651 | 610.569 |
| Bmsy | 0.8Fmsy | 29 | 34 | 46 | 56 | 61 | 66 | 71 | 73 | 76 | 78 | 80 | 82 | 85 | 87 | 90 | 92 | 94 | 95 | 23.877 | 129.456 | 289.836 | 458.946 | 632.882 |
| Bmsy | 0.85Fmsy | 29 | 33 | 45 | 55 | 59 | 63 | 69 | 71 | 74 | 77 | 78 | 80 | 82 | 84 | 87 | 89 | 91 | 93 | 25.083 | 135.543 | 301.142 | 474.839 | 653.068 |
| Bmsy | 0.9Fmsy | 29 | 33 | 42 | 54 | 56 | 60 | 66 | 68 | 71 | 74 | 76 | 77 | 79 | 81 | 83 | 85 | 87 | 89 | 26.260 | 141.416 | 311.703 | 489.342 | 671.130 |
| Bmsy | 0.95Fmsy | 29 | 32 | 32 | 52 | 54 | 57 | 62 | 64 | 67 | 70 | 72 | 73 | 76 | 77 | 78 | 80 | 81 | 83 | 27.407 | 147.079 | 321.520 | 502.449 | 687.030 |

ALB-Table 5. South Atlantic albacore estimated probabilities (in %) that the South Atlantic albacore stock fishing mortality is below F_{MSY} (a), biomass is above B_{MSY} (b) and both (c). Projections for constant F and constant catch levels are shown.

(a) Probability $F < F_{MSY}$

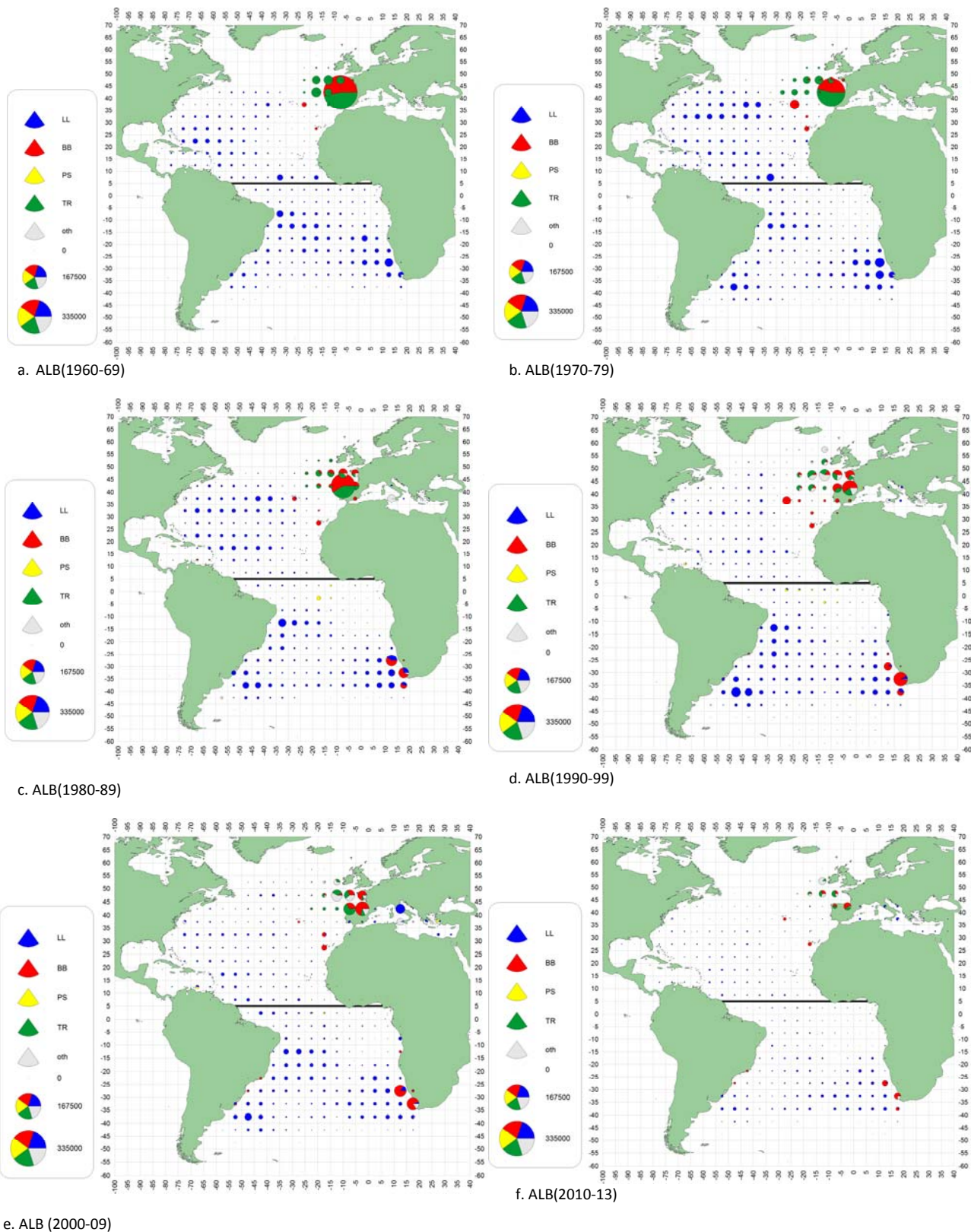
| Harvest | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 14000 | 0.909 | 0.914 | 0.919 | 0.922 | 0.923 | 0.924 | 0.926 | 0.928 | 0.929 | 0.929 | 0.930 | 0.932 | 0.931 |
| 16000 | 0.857 | 0.863 | 0.871 | 0.874 | 0.878 | 0.882 | 0.887 | 0.892 | 0.895 | 0.897 | 0.899 | 0.901 | 0.902 |
| 18000 | 0.799 | 0.808 | 0.819 | 0.825 | 0.830 | 0.834 | 0.838 | 0.841 | 0.843 | 0.846 | 0.848 | 0.851 | 0.852 |
| 20000 | 0.680 | 0.698 | 0.708 | 0.719 | 0.728 | 0.740 | 0.746 | 0.753 | 0.759 | 0.765 | 0.772 | 0.776 | 0.781 |
| 22000 | 0.590 | 0.603 | 0.610 | 0.618 | 0.626 | 0.634 | 0.637 | 0.644 | 0.648 | 0.654 | 0.656 | 0.659 | 0.662 |
| 24000 | 0.506 | 0.511 | 0.519 | 0.526 | 0.530 | 0.534 | 0.537 | 0.540 | 0.541 | 0.542 | 0.545 | 0.547 | 0.550 |
| 26000 | 0.414 | 0.413 | 0.414 | 0.414 | 0.415 | 0.415 | 0.417 | 0.418 | 0.419 | 0.419 | 0.420 | 0.419 | 0.418 |
| 28000 | 0.339 | 0.332 | 0.325 | 0.322 | 0.316 | 0.311 | 0.306 | 0.304 | 0.301 | 0.299 | 0.292 | 0.287 | 0.284 |
| 30000 | 0.286 | 0.272 | 0.261 | 0.247 | 0.236 | 0.227 | 0.221 | 0.213 | 0.207 | 0.200 | 0.193 | 0.188 | 0.185 |
| 32000 | 0.240 | 0.220 | 0.206 | 0.192 | 0.182 | 0.175 | 0.170 | 0.166 | 0.161 | 0.157 | 0.154 | 0.149 | 0.148 |
| 34000 | 0.201 | 0.182 | 0.171 | 0.165 | 0.157 | 0.151 | 0.144 | 0.140 | 0.133 | 0.129 | 0.126 | 0.124 | 0.123 |

(b) Probability $B > B_{MSY}$

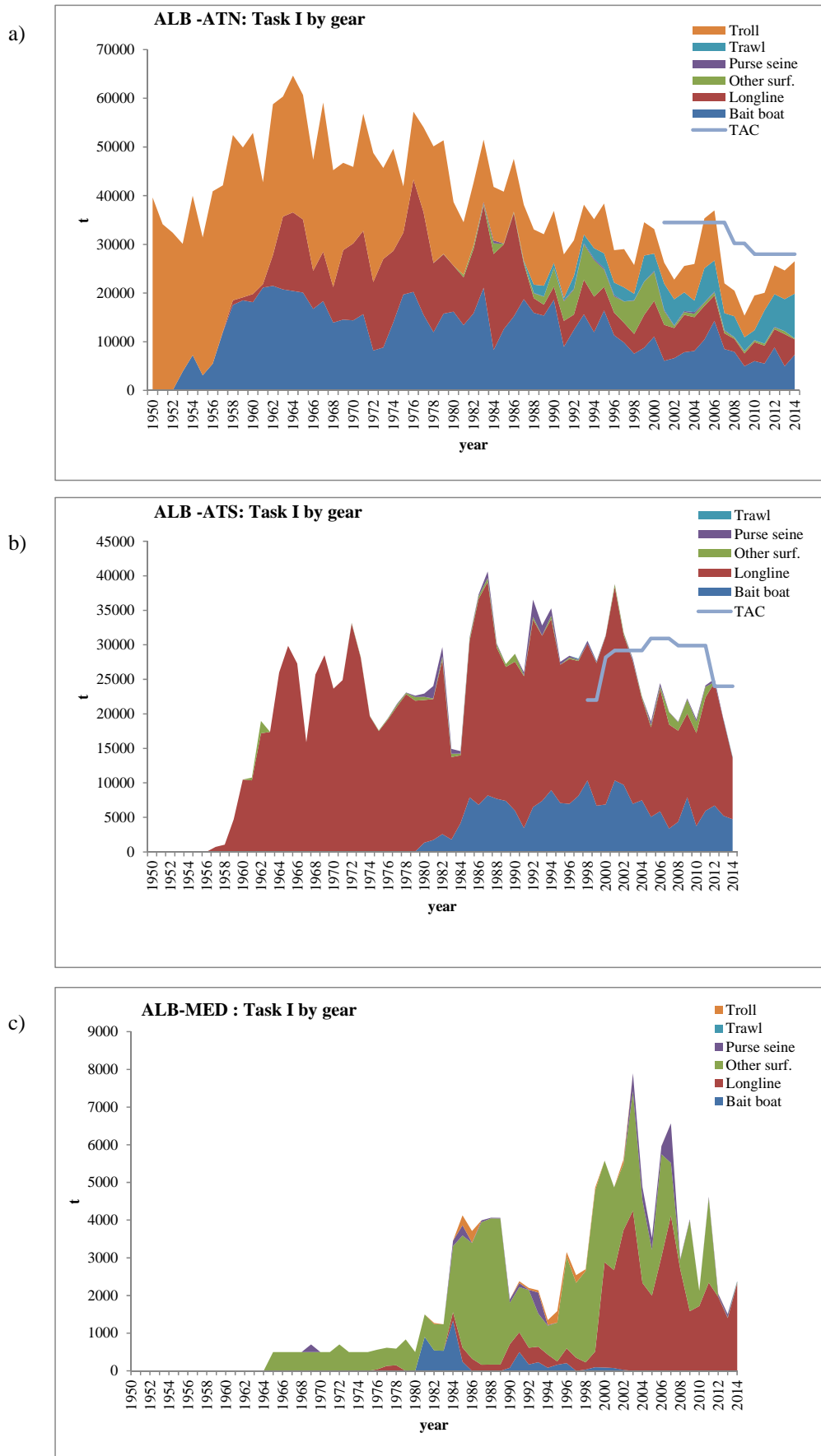
| Harvest | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 |
|----------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 0.75 Fmsy | 0.470 | 0.539 | 0.598 | 0.637 | 0.678 | 0.700 | 0.728 | 0.753 | 0.778 | 0.809 | 0.824 | 0.841 | 0.851 |
| 0.8 Fmsy | 0.465 | 0.526 | 0.576 | 0.610 | 0.641 | 0.675 | 0.693 | 0.717 | 0.735 | 0.755 | 0.782 | 0.796 | 0.810 |
| 0.85 Fmsy | 0.464 | 0.510 | 0.547 | 0.584 | 0.609 | 0.634 | 0.658 | 0.676 | 0.696 | 0.712 | 0.723 | 0.738 | 0.757 |
| 0.9 Fmsy | 0.459 | 0.490 | 0.522 | 0.548 | 0.570 | 0.592 | 0.610 | 0.625 | 0.642 | 0.658 | 0.671 | 0.681 | 0.694 |
| 0.95 Fmsy | 0.457 | 0.475 | 0.493 | 0.513 | 0.526 | 0.542 | 0.557 | 0.568 | 0.581 | 0.591 | 0.600 | 0.609 | 0.618 |
| 1.0 Fmsy | 0.451 | 0.459 | 0.464 | 0.471 | 0.475 | 0.480 | 0.482 | 0.487 | 0.490 | 0.493 | 0.496 | 0.499 | 0.500 |
| 14000 | 0.477 | 0.581 | 0.643 | 0.696 | 0.734 | 0.762 | 0.790 | 0.815 | 0.836 | 0.848 | 0.855 | 0.864 | 0.872 |
| 16000 | 0.472 | 0.562 | 0.615 | 0.660 | 0.700 | 0.724 | 0.750 | 0.767 | 0.788 | 0.802 | 0.822 | 0.833 | 0.840 |
| 18000 | 0.471 | 0.541 | 0.590 | 0.623 | 0.650 | 0.678 | 0.703 | 0.719 | 0.737 | 0.750 | 0.763 | 0.775 | 0.787 |
| 20000 | 0.465 | 0.519 | 0.564 | 0.592 | 0.610 | 0.627 | 0.644 | 0.658 | 0.671 | 0.680 | 0.688 | 0.696 | 0.709 |
| 22000 | 0.463 | 0.495 | 0.529 | 0.549 | 0.570 | 0.583 | 0.591 | 0.599 | 0.606 | 0.615 | 0.623 | 0.628 | 0.635 |
| 24000 | 0.460 | 0.475 | 0.488 | 0.501 | 0.511 | 0.522 | 0.524 | 0.534 | 0.538 | 0.542 | 0.544 | 0.548 | 0.551 |
| 26000 | 0.455 | 0.453 | 0.451 | 0.449 | 0.449 | 0.444 | 0.443 | 0.443 | 0.439 | 0.436 | 0.437 | 0.437 | 0.438 |
| 28000 | 0.454 | 0.432 | 0.412 | 0.398 | 0.384 | 0.372 | 0.361 | 0.352 | 0.347 | 0.337 | 0.327 | 0.321 | 0.316 |
| 30000 | 0.447 | 0.409 | 0.373 | 0.350 | 0.326 | 0.308 | 0.285 | 0.269 | 0.253 | 0.242 | 0.231 | 0.226 | 0.218 |
| 32000 | 0.445 | 0.386 | 0.342 | 0.307 | 0.265 | 0.239 | 0.221 | 0.209 | 0.201 | 0.193 | 0.187 | 0.182 | 0.176 |
| 34000 | 0.442 | 0.368 | 0.308 | 0.257 | 0.224 | 0.205 | 0.191 | 0.182 | 0.175 | 0.169 | 0.160 | 0.155 | 0.151 |

(c) Probability of green status ($B > B_{MSY}$ y $F < F_{MSY}$).

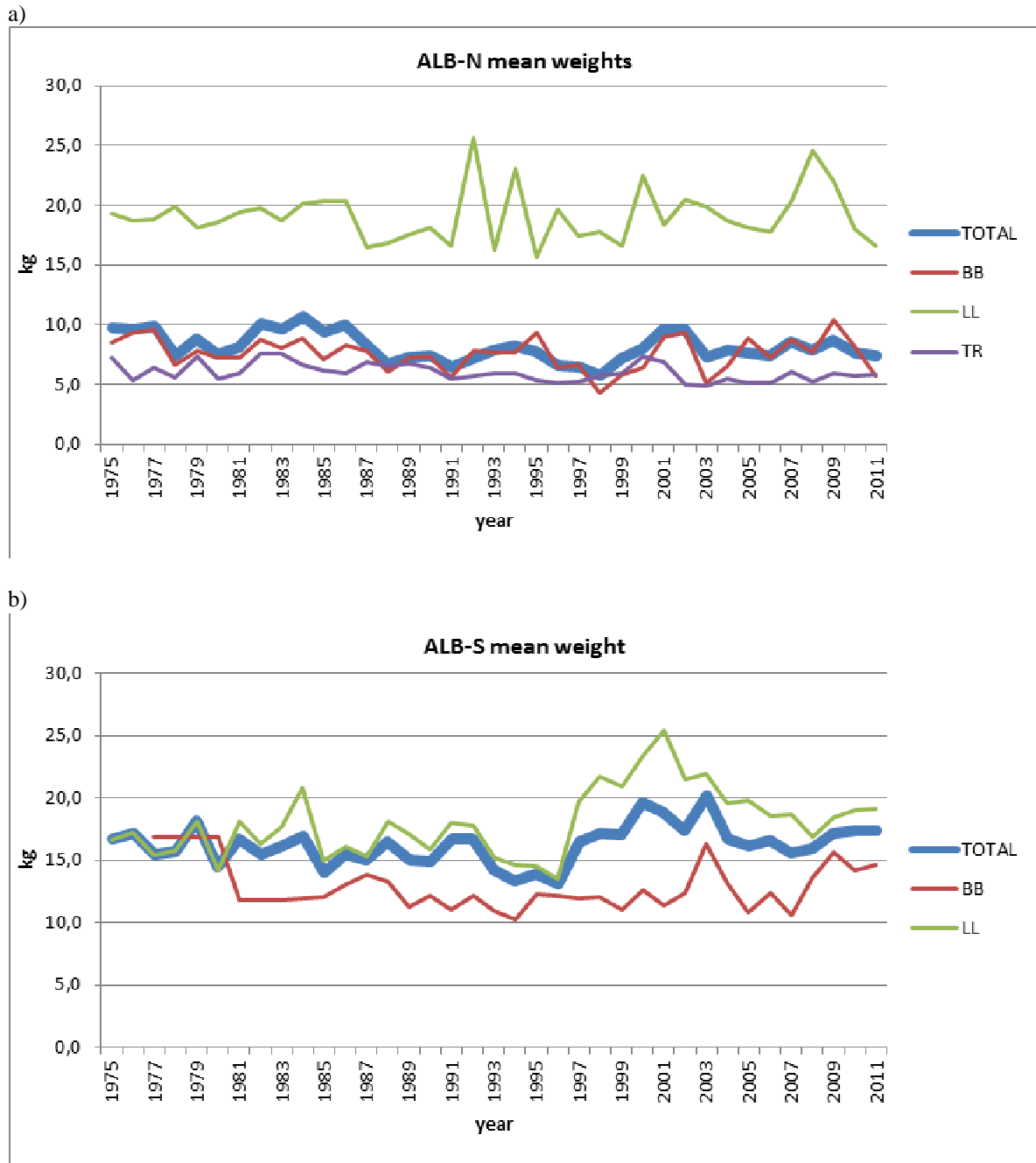
| Harvest | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 |
|----------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 0.75 Fmsy | 0.469 | 0.538 | 0.597 | 0.637 | 0.677 | 0.699 | 0.728 | 0.753 | 0.778 | 0.809 | 0.824 | 0.841 | 0.851 |
| 0.8 Fmsy | 0.465 | 0.525 | 0.575 | 0.610 | 0.641 | 0.675 | 0.693 | 0.717 | 0.735 | 0.755 | 0.782 | 0.796 | 0.810 |
| 0.85 Fmsy | 0.464 | 0.509 | 0.547 | 0.583 | 0.609 | 0.634 | 0.658 | 0.676 | 0.696 | 0.712 | 0.723 | 0.738 | 0.757 |
| 0.9 Fmsy | 0.458 | 0.489 | 0.522 | 0.547 | 0.570 | 0.592 | 0.610 | 0.625 | 0.642 | 0.658 | 0.671 | 0.681 | 0.694 |
| 0.95 Fmsy | 0.456 | 0.474 | 0.492 | 0.513 | 0.526 | 0.541 | 0.557 | 0.568 | 0.581 | 0.591 | 0.600 | 0.609 | 0.618 |
| 1.0 Fmsy | 0.160 | 0.169 | 0.174 | 0.181 | 0.186 | 0.190 | 0.193 | 0.197 | 0.201 | 0.203 | 0.207 | 0.209 | 0.211 |
| 14000 | 0.474 | 0.578 | 0.641 | 0.693 | 0.731 | 0.760 | 0.788 | 0.812 | 0.833 | 0.846 | 0.853 | 0.861 | 0.868 |
| 16000 | 0.468 | 0.557 | 0.610 | 0.656 | 0.695 | 0.720 | 0.746 | 0.763 | 0.785 | 0.798 | 0.819 | 0.829 | 0.837 |
| 18000 | 0.463 | 0.533 | 0.583 | 0.615 | 0.642 | 0.672 | 0.697 | 0.713 | 0.730 | 0.744 | 0.757 | 0.770 | 0.783 |
| 20000 | 0.454 | 0.508 | 0.553 | 0.581 | 0.601 | 0.618 | 0.635 | 0.650 | 0.663 | 0.673 | 0.682 | 0.692 | 0.704 |
| 22000 | 0.446 | 0.480 | 0.514 | 0.536 | 0.558 | 0.572 | 0.580 | 0.590 | 0.598 | 0.608 | 0.615 | 0.620 | 0.627 |
| 24000 | 0.428 | 0.445 | 0.459 | 0.475 | 0.484 | 0.496 | 0.503 | 0.513 | 0.517 | 0.521 | 0.526 | 0.529 | 0.532 |
| 26000 | 0.394 | 0.395 | 0.399 | 0.400 | 0.402 | 0.403 | 0.405 | 0.406 | 0.407 | 0.409 | 0.411 | 0.412 | 0.413 |
| 28000 | 0.336 | 0.329 | 0.324 | 0.321 | 0.315 | 0.309 | 0.305 | 0.302 | 0.300 | 0.298 | 0.291 | 0.285 | 0.283 |
| 30000 | 0.286 | 0.272 | 0.261 | 0.247 | 0.236 | 0.227 | 0.221 | 0.213 | 0.207 | 0.200 | 0.193 | 0.188 | 0.185 |
| 32000 | 0.240 | 0.220 | 0.206 | 0.192 | 0.182 | 0.175 | 0.170 | 0.166 | 0.161 | 0.157 | 0.154 | 0.149 | 0.148 |
| 34000 | 0.201 | 0.182 | 0.171 | 0.165 | 0.157 | 0.151 | 0.144 | 0.140 | 0.133 | 0.129 | 0.126 | 0.124 | 0.123 |



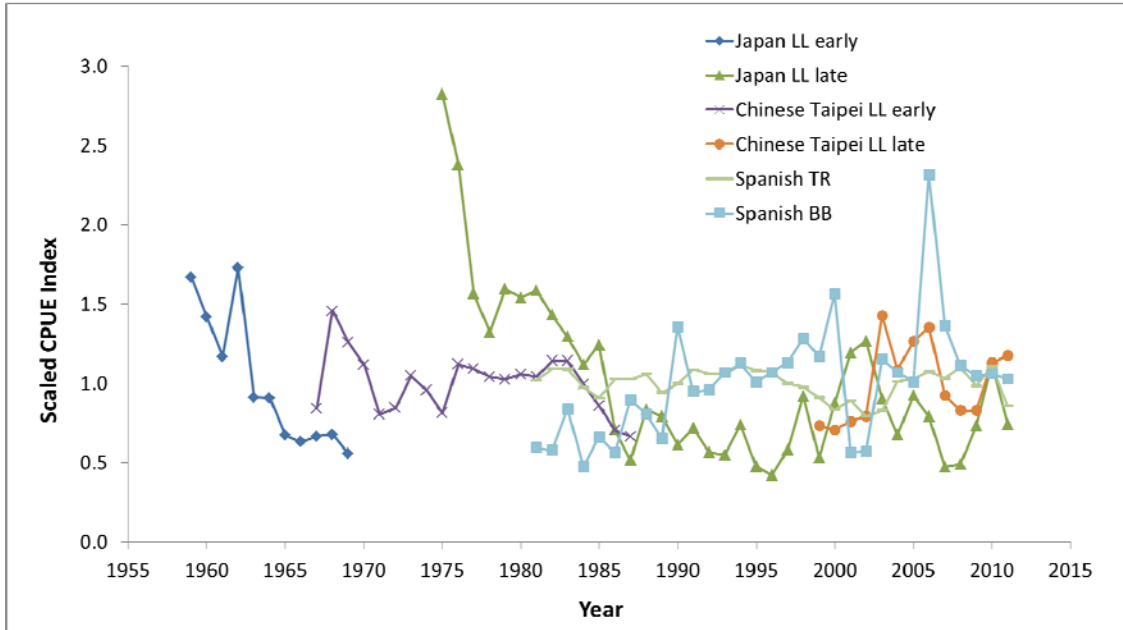
ALB-Figure 1. Geographic distribution of albacore accumulated catch by major gears and decade (1960-2013). Baitboat and troll catches prior to the 1990s, these catches were assigned to only one 5°x5° stratum in the Bay of Biscay. Plots are scaled to the maximum catch observed from 1960 to 2013.



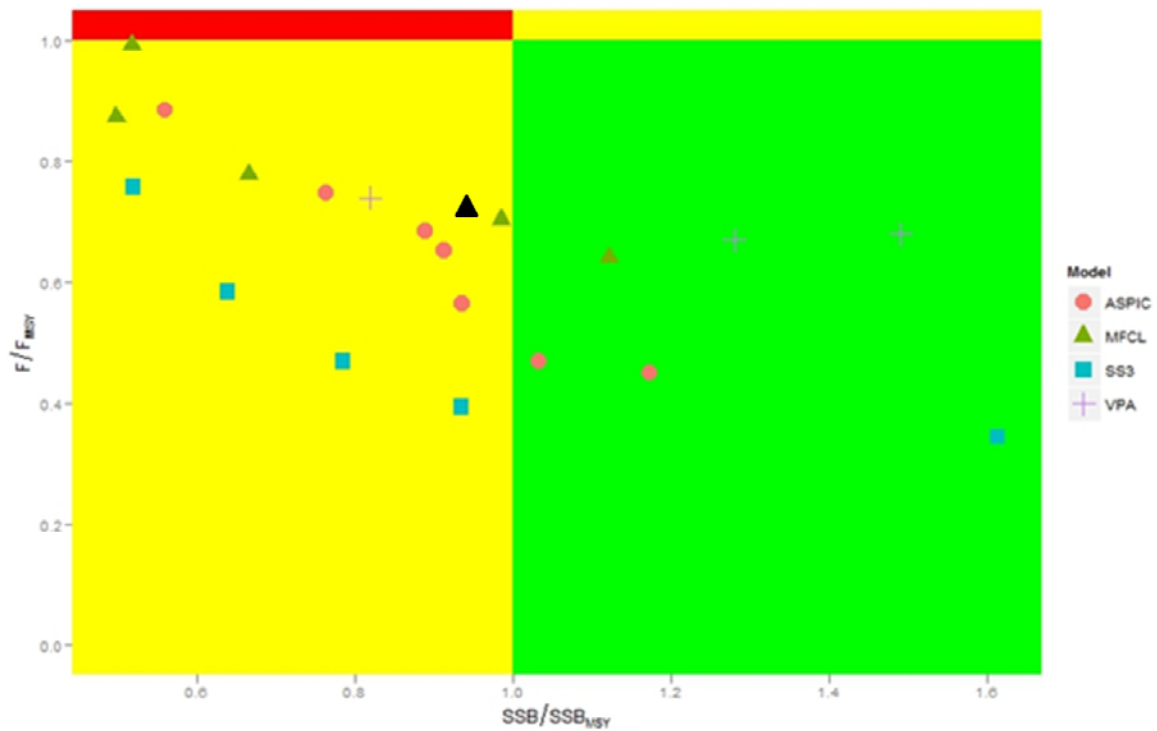
ALB-Figure 2a, b, c. Total albacore catches reported to ICCAT (Task I) by gear for the northern, southern Atlantic stocks including TAC, and the Mediterranean stock.



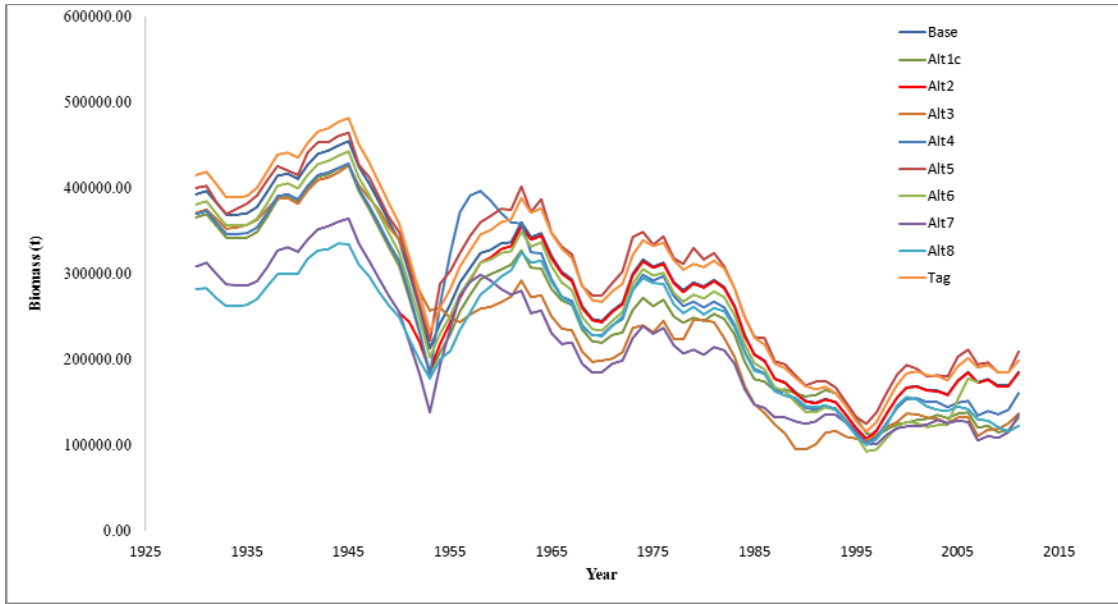
ALB-Figure 3a, b. North Atlantic and South Atlantic albacore. Mean weight trend by surface and longline fisheries in North Atlantic (a) and South Atlantic (b) stocks.



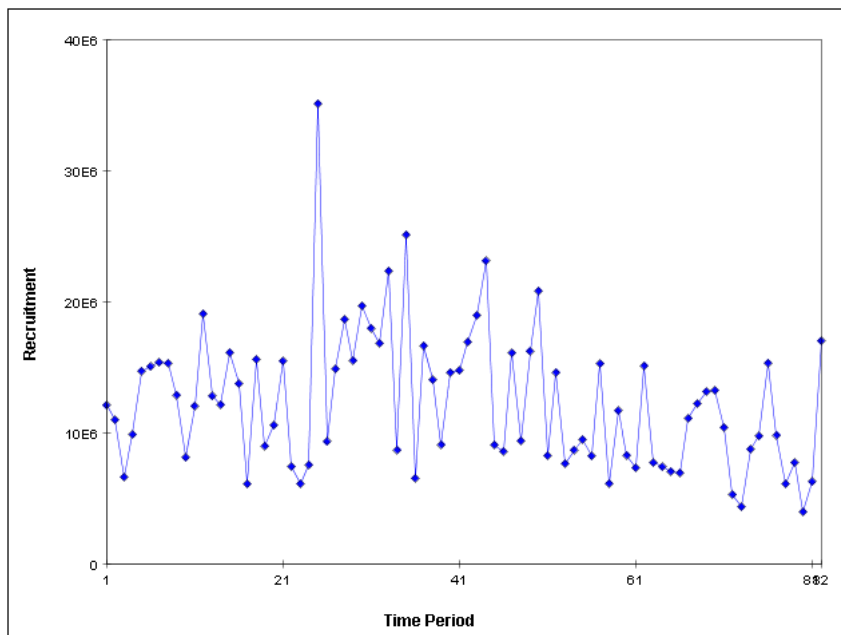
ALB-Figure 4. Standardized catch rate indices used in the 2013 northern albacore stock assessment from the surface fisheries, which take mostly juvenile fish, and from the longline fisheries, which take mostly adult fish.



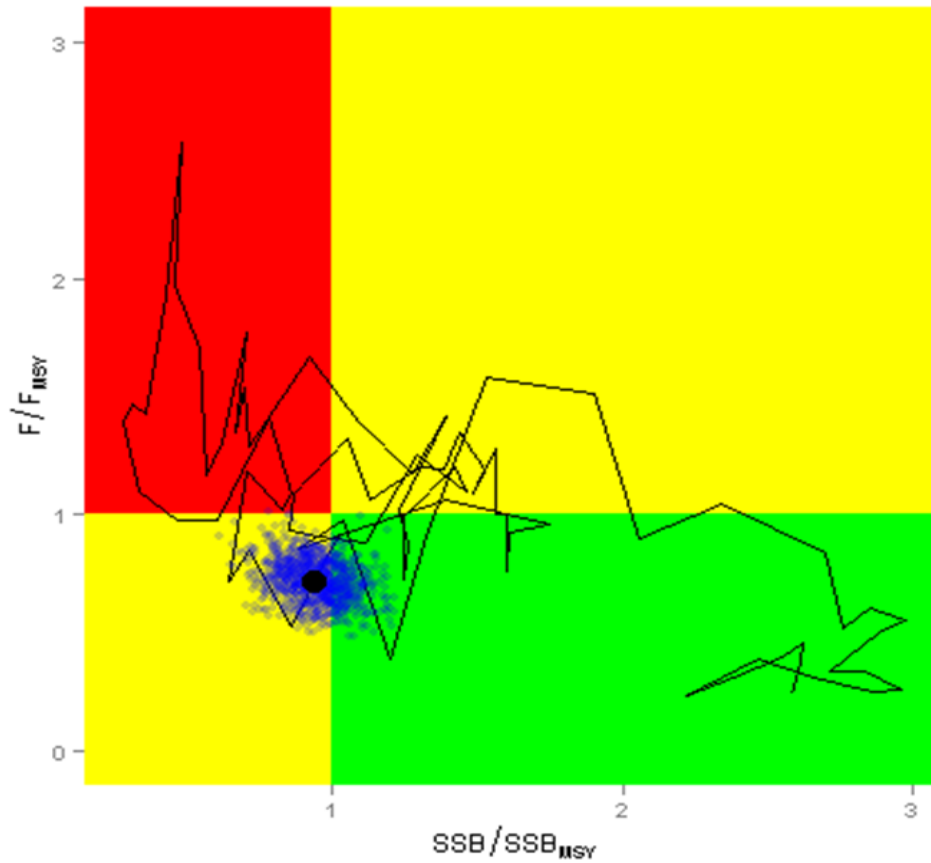
ALB-Figure 5. Stock status of northern albacore tuna according to base case (black triangle) as well as different models and runs considered during the assessment.



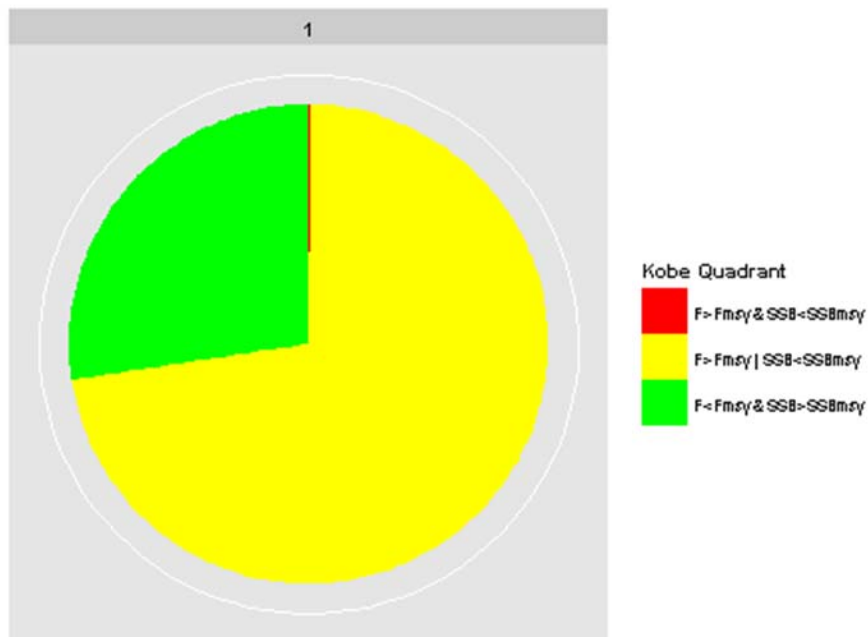
ALB-Figure 6. Estimates of northern Atlantic albacore spawning stock size between 1930-2011 according to the Multifan-CL Base Case and the different sensitivity runs considered in the assessment.



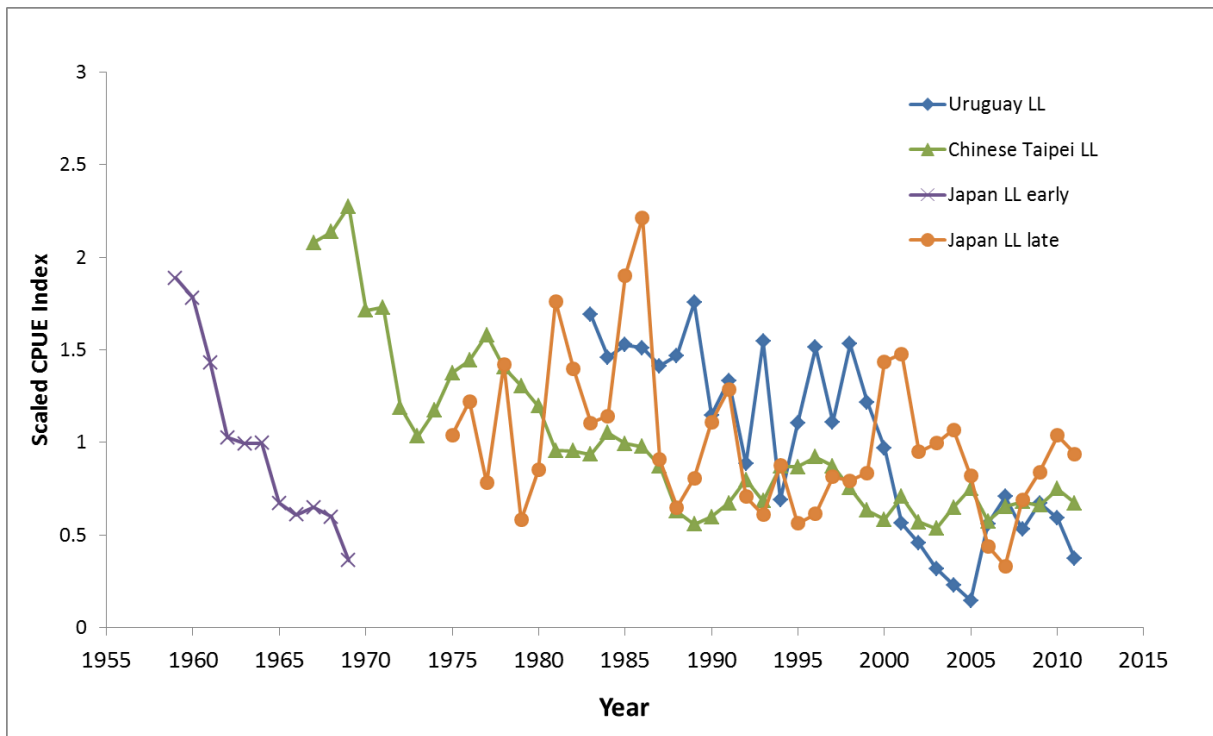
ALB-Figure 7. Estimates of northern Atlantic albacore recruitment (age 1) between 1930-2011 from Multifan-CL base case. Uncertainty in the estimates has not been characterized, but the uncertainty in recent recruitment levels is considered to be higher than in the past.



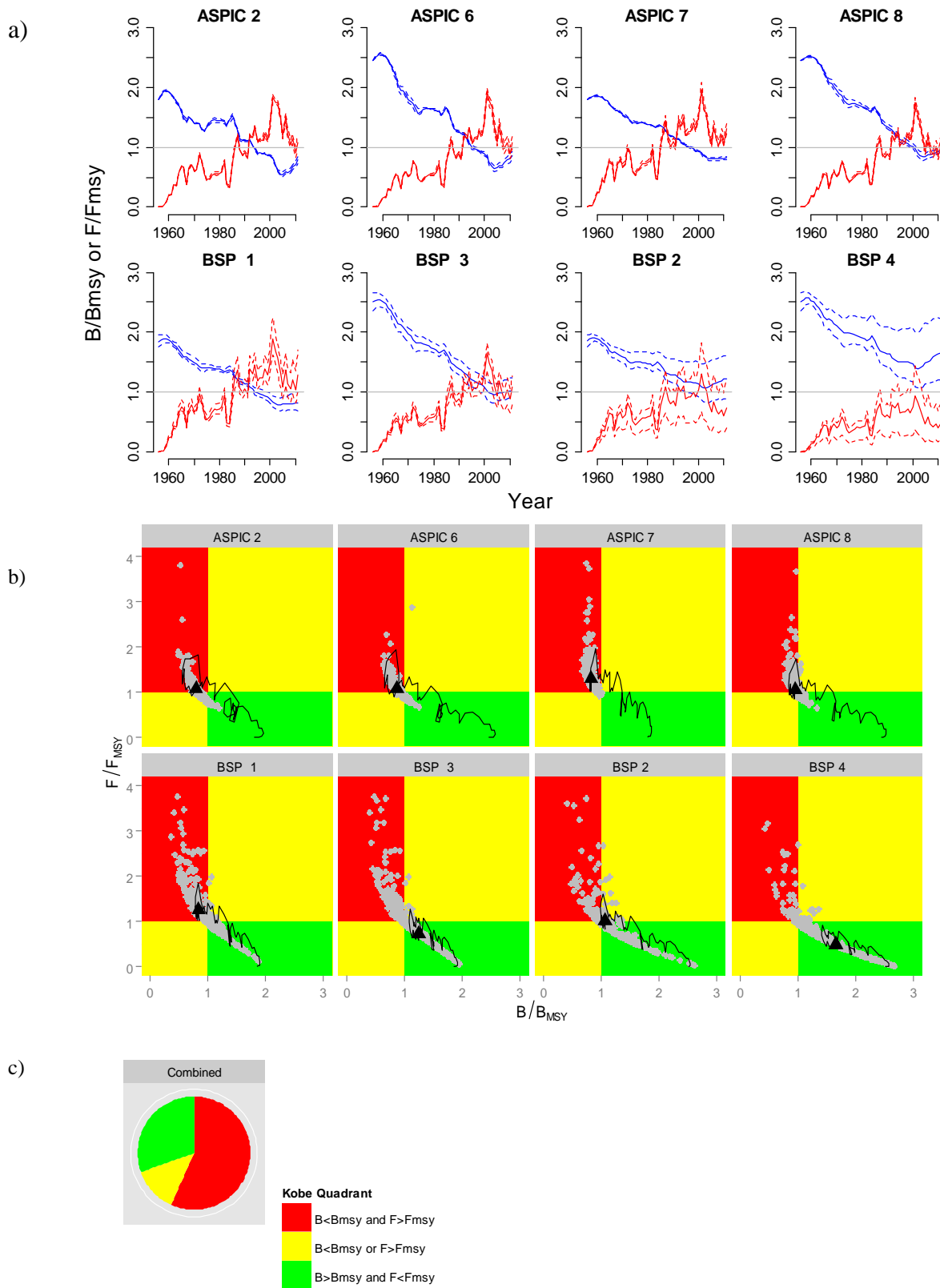
ALB-Figure 8. Joint trajectories of SSB/SSB_{MSY} and F/F_{MSY} over time and current stock status of northern albacore according to the estimated Multifan-CL Base Case. The black point represents the stock status in 2011, and the blue points represent the uncertainty on the current stock status.



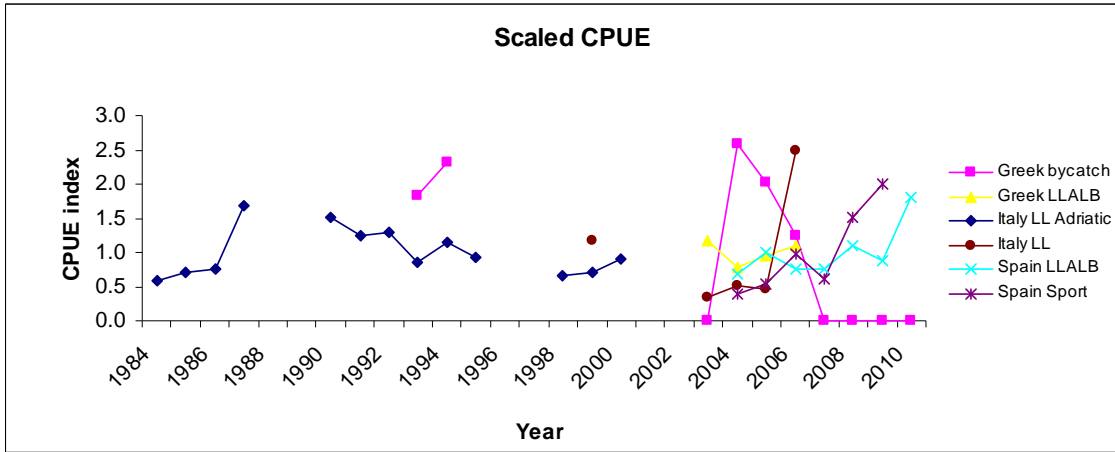
ALB-Figure 9. North Atlantic albacore probability of being overfished and overfishing (red, 0.2%), of being neither overfished nor overfishing (green, 27.4%), and of being overfished or overfishing, but not both (yellow, 72.4%), according to the Multifan-CL Base Case.



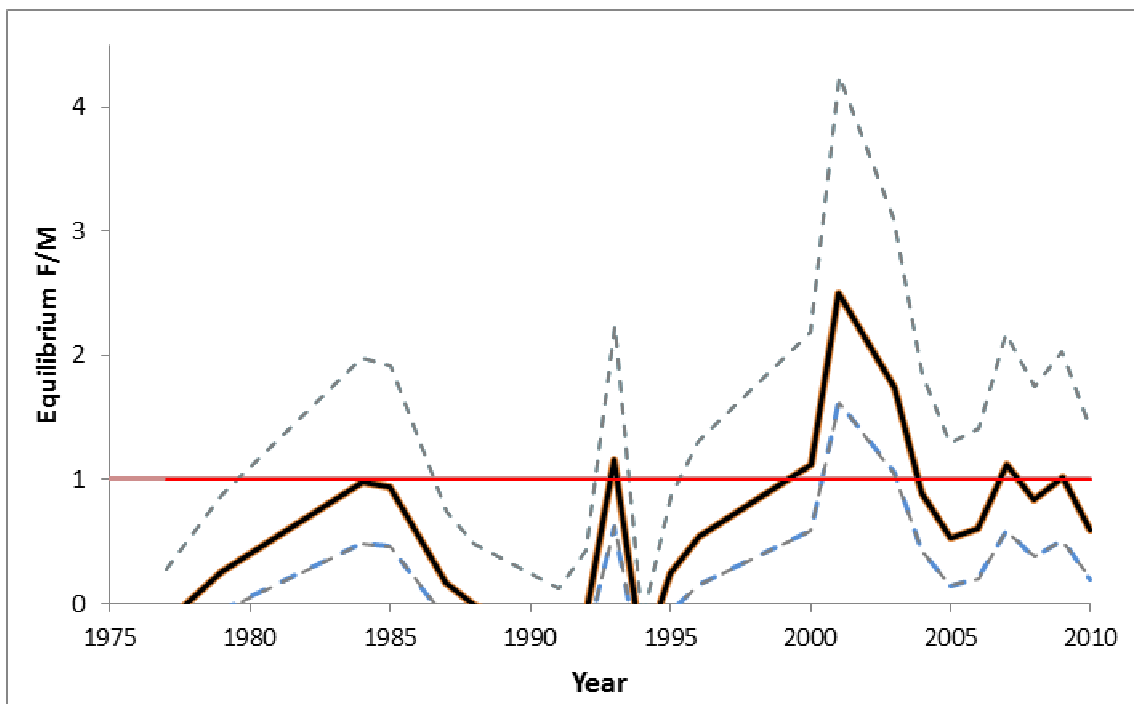
ALB-Figure 10. Standardized catch rates used in the 2013 southern albacore stock assessment.



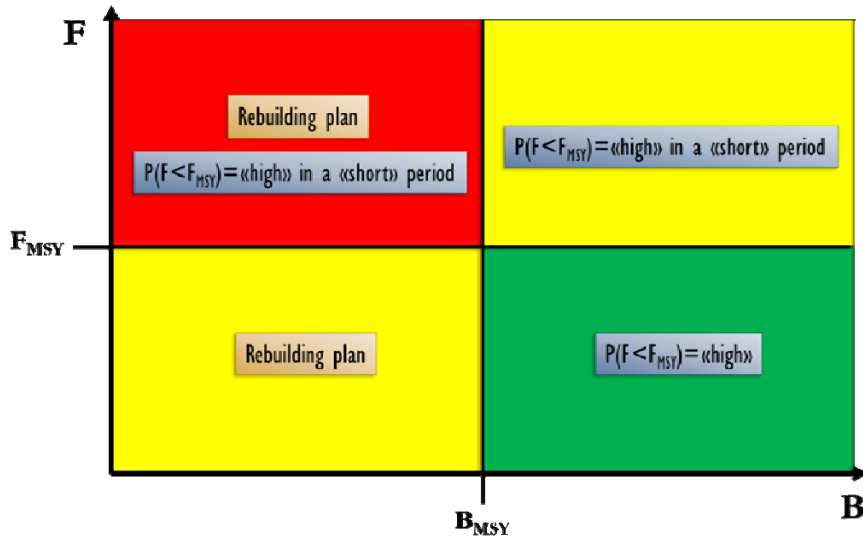
ALB-Figure 11. South Atlantic albacore. a) Median biomass (in blue) and fishing mortality rates (in red) relative to MSY levels, with 50% credibility intervals, for the 4 base case Bayesian Surplus Production (BSP) models and the point estimate biomass and 50% credibility intervals for the 4 base case ASPIC Production models. (b) 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, 2, 3 and 4). (c) Combined probability of being overfished and overfishing (red, 57%), of being neither overfished nor overfishing (green (30%), and of being overfished or overfishing, but not both (yellow, 13%).



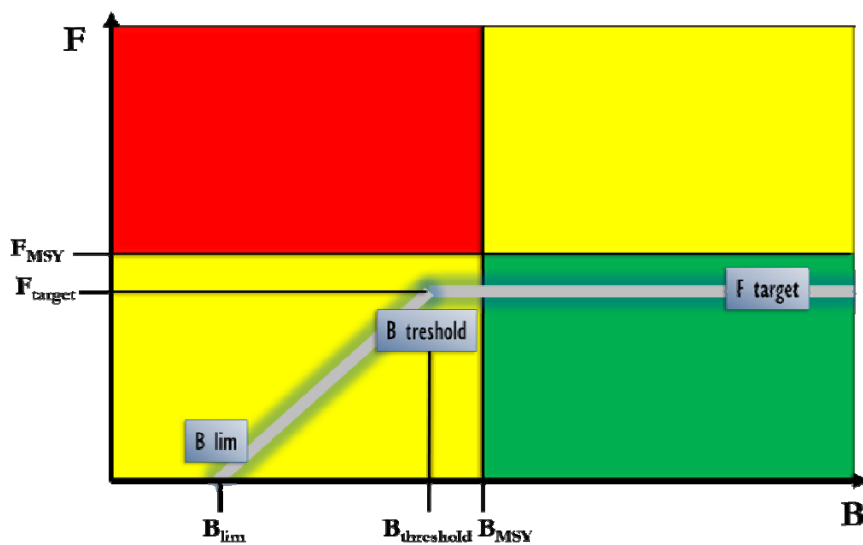
ALB-Figure 12. Set of standardized and nominal CPUEs used in the assessment of the Mediterranean albacore stock. The “Greek by-catch” indicates the probability of albacore by-catch in the swordfish fishery, practically null in some years. This series is the only one that is not included in the base case Bayesian production model.



ALB-Figure 13. 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 14. Schematic representation of the key elements of the *Recommendation by ICCAT on the principles of decision making for ICCAT conservation and management measures* (Rec. 11-13).



ALB-Figure 15. Generic form of the HCR recommended by SCRS (Anon. 2011a). Blim is the limit biomass reference point, BThreshold is the biomass point at which increasingly strict management actions should be taken as biomass decreases and Ftarget, the target fishing mortality rate to be applied such that it is lower than F_{MSY} with 'high probability' (Rec. 11-13).

8.5 BFT – ATLANTIC BLUEFIN TUNA

In 2014, the SCRS conducted an update of the 2012 assessment of Atlantic bluefin tuna (Anon. 2013c). In this update, the available data included catch, effort and size statistics through 2013. 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, nonetheless, most of the data limitations that have plagued previous assessments remain and will require new approaches in order to improve the scientific advice the Committee can offer. The 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 however been made over the last years and therefore the Committee investigated in 2013-2014 the size data retrieved from the observer on board of cages programmes (see Anon. 2014b). There was a considerable quantity of information that were analyzed and compared to current catch at size. These data appeared to be of good quality and the Committee recommended the integration of this new valuable source of information in the Task II database prior to the next stock assessment (work to be completed during the 2015 bluefin tuna data working group). 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 last studies showed that this technique can provide precise catch composition when it is used with a proper and well defined protocol (see Anon. 2013d).

The Atlantic-wide Research Programme 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 programme. 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 2015, the SCRS 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 programs about the aerial survey, tagging, data mining, biological sampling, stock mixing and new modeling approaches.

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 can frequently dive to depths of more than 1,000 m. 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, 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. 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 and can reach 330 cm (SFL) and weight up to 725 kg.

The Committee evaluated information from the bluefin meeting on biological parameters held in 2013 and bluefin species group meetings in 2014 and 2015. New contributions have been presented from GBYP and national research projects on reproduction, direct age estimations, population structure, spawning areas and larval studies.

New length-weight relationships modeling has been conducted using a comprehensive dataset to reflect the timing and area of spawning which the Committee feels adequate for stock assessment and these new relationships have been adopted. Further investigations on length-weight relationships were presented and differences to the relationships used by SCRS were underlined. Further analyses have to be performed to improve the adopted relationship but future assessment will rely on the adopted relationships. Sensitivity analyses will be carried out to analyze the impact of these new relationships on the stock assessment. Substantial progress has been made in estimating regional mixing levels for Atlantic bluefin tuna from otolith stable isotope analysis. Research on larval ecology of Atlantic bluefin tuna has advanced in recent years through oceanographic habitat suitability models. Direct age estimations have been calibrated between readers from several institutions.

An important electronic and conventional tagging activity on both juveniles and adult fish has been performed in recent years in the East Atlantic and Mediterranean by GBYP, national programmes and NGOs. These ongoing efforts have started to provide significant insight into bluefin tuna stock structure, mixing and migrations and would possibly help in estimating fishing mortality rates. The creation of a common database coordinated with GBYP was requested to gather and make available the data necessary for age and stock identification.

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 of the resource, which will be investigated during the next stock assessment.

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 between 2010 and 2014 was 11,155 t, 9,774 t, 10,934 t, 13,244 t and 13,243 t for the East Atlantic and Mediterranean, of which 6,842 t, 5,790 t, 7,100 t, 9,081 t, and 9,330 t was declared for the Mediterranean for those same years (**BFT-Table 1**).

Information available has demonstrated that catch 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 under-reporting of the catch as a major cause of stock decline over that period. The Committee has estimated that realized catch during this period could have been in 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 result in estimates that are significantly lower than the corresponding reported Task I data (see Report of the 2010 ICCAT Bluefin Tuna Data Preparatory Meeting, 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.

Recent regulatory measures have affected significantly all the CPUE indices through the change of operational patterns, length of the fishing season and target sizes; thus it is difficult to distinguish the effect of these changes on CPUEs from the effects of changes in abundance. Nonetheless, recent tendencies in the indicators are partly a reflection of positive outcomes from recent management measures. However, the indices for large fish showed very rapid increases in the most recent years and the Committee questioned if these rates of increase were biologically plausible, as indicators of the stock biomass as a whole, and noted that many factors may have contributed to the increase in the index. Fisheries-independent indicators (e.g. aerial, acoustic and larval surveys) and a large-scale tagging programme are nonetheless needed to provide more reliable stock status indicators. It is also noteworthy that no recent abundance indices from the Mediterranean part of the stock were used for the stock assessment.

The only indicator used in the assessment for young fish is from the Bay of Biscay baitboat fisheries. It shows a general increasing trend over the time period, with substantial variability since late 1980s (**BFTE-Figure 2**). This CPUE index covers the longest period of any index (1952-2014), during which several changes in selectivity have taken place, often due to management regulations. Since 2012, the Spanish baitboat fishery has sold most of its quota so that this index now comes from only four vessels in the French baitboat fishery.

Indicators from Moroccan and Spanish traps targeting large fish (spawners) are standardized catch per unit of effort (CPUE) up to 2012 and include released individuals, which represent more than 10,000 individuals in 2012. The Moroccan trap index was further updated to 2014 including 25,000 released individuals during that year. CPUE of Moroccan and Spanish traps showed a substantial increasing trend over the last years and large fluctuations, with periods 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**). Due to changes in operational practices in the Spanish trap fishery, it has not been possible to maintain the Spanish trap index. In the absence of CPUE data from the Spanish traps, the combined index can be maintained but only includes data from the Moroccan trap fishery since 2013.

Indicators from Japanese longliners targeting large fish (spawners) in the East Atlantic (South of 40°N) 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 40°N) in recent years. Indicators from Japanese longliners targeting medium to large fish in the northeast Atlantic were available since 1990 and have been updated to 2014. This index showed a strong increasing trend since 2010 and has remained at a substantially high level over the last four years (**BFTE-Figure 2**). This index becomes more valuable since the major part of Japanese catch comes from this fishing ground in recent years. The size of bluefin caught in this area showed a large contribution of the 2003 year class. The combined effects of this high proportion of the 2003 year class, the contraction of the spatial coverage of the Japanese longliners in recent years in response to a lower number of boats, and management regulations may affect the ability of this index to track changes in bluefin tuna abundance. However, the method used to standardize this index does not show irregularities and the continuity of this index seems to be ensured.

In addition to the indices used in the 2014 stock assessment, there exist a variety of fishery dependent and independent indicators which may be considered by the Committee for use in future assessments. The Committee acknowledged the importance of the fishery independent indices, particularly in light of the difficulty updating the indices used in the assessment. The Committee encouraged the continuation of these fishery-independent surveys to maintain time series and further method refinement for some of them. The Committee will further review all available indicators at the data preparatory meeting in early 2016.

BFTE-3. State of the stock

The quality and the representativeness of catch statistics is the most crucial element of the bluefin tuna stock assessment. In spite of recent improvements in the data quantity and quality for the past few years, there remained important data limitations for the 2014 updated stock assessment (Anon. 2015c). 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, in 2014, the Committee has updated the 2012 stock assessment (Anon. 2013c) as requested by the Commission, applying the same methodologies and hypotheses adopted by the Committee in 2012. The pilot assessment using new historical and recent information about catch was not fully evaluated due to time constraints. Instead, a comparison of the continuity run using these new data was carried out and results were only presented in the detailed reports (section 6.1.1 and Figures 12-14 of Bonhommeau *et al.*, 2015). The Committee believes that while substantial improvements in catch and effort statistics are necessary in the future for more robust stock assessment, it appears unlikely that such substantial improvements can be made regarding historical fishery performance.

The updated assessment results indicated that the spawning stock biomass (SSB) peaked over 300,000 t in the late 1950s and early 1970s and then declined to about 150,000 t until the mid-2000s. In the most recent period, the SSB showed clear signs of sharp increase in all the runs that have been investigated by the Committee, up to almost 585,000 t in 2013 for the update of the 2012 Base Case which corresponds to the maximum estimated SSB over the period (see Report of the 2014 bluefin stock assessment, Anon. 2015c, **BFTE-Figure 3**). However, the magnitude and the speed of the SSB increase vary substantially among the runs (an SSB between 439,000 t and 647,000 t in 2013) and are, therefore, still rather uncertain (Report of the 2014 bluefin stock assessment, section 6, Anon. 2015c). This increase corresponds to a 4-fold increase in SSB over the past decade and ranges from 3 to 4.5-fold across the sensitivities examined. 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 were consistent with those obtained during the 2012 stock assessment. For the 1995-2007 years, Fs for older fish were 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. While the reduction in catch less than the minimum size improves the yield per recruit, it makes recent recruitments more difficult to estimate, especially without a recruitment index. The Committee noted that this is the first assessment to estimate extraordinarily large year classes in 2004-2007 (over 40% higher than the highest observed recruitments in the rest of the 64 year time series), and that these high estimates were driven mostly by the recent trends in the two fishery dependent indices for older fish. Therefore, caution is warranted until the very high estimates of recruitment for these year classes can be confirmed.

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. In addition to those uncertainties, the current perception of the stock status was also closely related to the assumptions made about stock structure and migratory behavior, which remain poorly known. Nonetheless, the perception of the stock status derived from the 2014 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. F_{2013} 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: $F_{2013}/F_{0.1} = 0.4$ and 0.36 for the reported and inflated catch scenarios, respectively. If F_{2013} is found to be consistent with the Convention objectives, current SSB is most likely to be above the level expected at $F_{0.1}$: $SSB_{2013}/SSB_{0.1} = 1.10$ and 1.11 for reported and inflated catch scenario when considering medium recruitment. In the reported catch scenario, the median of the SSB is about 67% (high recruitment scenario) to 160% (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 55% (high recruitment) to 174% (low recruitment, **BFTE-Figures 4 and 5**).

BFTE- 4. Outlook

In 2014, the Committee performed a set of projections using similar technical specifications as in 2012, i.e. using three mean recruitment levels and two catch scenarios (reported and inflated) and the same periods to calculate the selectivity patterns as in 2012 (computed as the geometric means over the 2007-2009 and 2009-2011 partial Fs, (see Kell *et al.*, 2013 for more details). According to the 2014 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, and the probability to achieve $SSB_{F_{0.1}}$ (i.e. the equilibrium SSB resulting in fishing at $F_{0.1}$) by the end of 2022, with at least 60% of probabilities, is also reached (**BFTE-Tables 1 and 2**).

Projections are known to be impaired by various sources of uncertainties that have not yet been fully quantified. One of these is that the Kobe matrix was only calculated for the continuity run in the time available. 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**), key modeling parameters for bluefin tuna productivity, the current and future recruitment levels, the stock structure within the Mediterranean and eastern Atlantic stock and the level of IUU catch (although it is clear to the Committee that the level of IUU has strongly decreased since 2008). Some of these uncertainties, as those reflected above, have not been taken into account in the Kobe matrices. Acknowledging these limitations, the 2014 updated stock assessment indicated that the rebuilding of eastern bluefin tuna at $SSB_{F_{0.1}}$ level with a probability of at least 60% could be achieved before 2022 with the different TACs examined (up to 30,000t, **BFTE-Table 3**). While most of the updated fisheries indicators are consistent with the estimation of stock rebuilding, there still remain key uncertainties regarding current and future recruitment levels and the speed and magnitude of the rebuilding of the SSB. The results from the projections thus need to be further 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 eastern 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) TACs at levels sufficient to rebuild the stock to B_{MSY} by 2022 with at least 60% probability. The 2011, 2012, and 2013 TACs were set at 12,900 t, 12,900 t, and 13,500 t respectively by Rec. 10-04 and Rec. 12-03, at 13,500 t in 2014 (Rec. 13-07), and 16,142 t in 2015 (Rec. 14-04).

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 (11,148 t), 2011 (9,774 t), 2012 (10,852 t), and 2013 (13,133 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 has not assessed the current fishing capacity and remains concerned about current capacity which could easily harvest catch volumes well in excess of the rebuilding strategy adopted by the Commission. This specific point will be investigated during the next data preparatory meeting in 2016 to follow Rec. 14.04; see bluefin tuna work plan and responses to Commission].

Recent analyses from the reported catch-at-size and catch-at-age displayed important changes in selectivity patterns over the last 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.

An important source of uncertainty originated from the reduction in TAC and the unexpected high level of strong year class, which has strongly affected all the index calculations for different reasons (see Report of the 2014 Bluefin Stock Assessment, Anon. 2015c). The difficulties to update the Spanish baitboat, Spanish trap and Japanese indices since 2013 could be highly problematic for the coming years, as those indices are crucial for stock assessment. It also worth noting that the transfer of quotas from one fisheries to another may also affect stock assessment outcomes, as such transfers have implications for the repartition of the fishing effort and thus for selectivity patterns, which are known to impact the references points. Therefore, the Committee reiterates the importance to continue effort, through national programs and GBYP, to improve the quality of currently used abundance indices and obtain robust fisheries-independent indicators. It notes however that necessary decisions regarding management of the stock have often the side effect of adding uncertainties to stock assessment, e.g., by changing fleet behavior and fisheries selection pattern.

BFTE-6. Management recommendations

In Recs. 09-06, 10-04, 12-03, and 13-07 the Commission established a total allowable catch for eastern Atlantic and Mediterranean bluefin tuna between 12,900 t and 13,400 t since 2010. This TAC has increased by 20.5 % in 2015 (16,142 t) (Rec. 14-04). Additionally, in Rec. 09-06 the Commission required that the SCRS provide the scientific basis for the Commission to establish a recovery plan with the goal of achieving B_{MSY} through 2022 with at least 60% of probability.

In 2014, the Kobe matrices were presented indicating the probabilities of *i*) $F < F_{MSY}$ (**BFTE-Table 1**) *ii*) $SSB > SSB_{MSY}$ (**BFTE-Table 2**) and *iii*) ($F < F_{MSY}$ and $SSB > SSB_{MSY}$) (**BFTE-Table 3**) for quotas from 0 to 30,000 t for 2014 through 2022. Shading in **BFTE-Table 3** corresponds to the probabilities of being in the ranges of 50-59%, 60-69%, 70-79%, 80-89% and greater or equal to 90%. It should be kept in mind, however, that the Kobe matrices cannot integrate some important sources of uncertainties that currently remain unquantified as mentioned in section **BFTE-4** and the Report of the 2014 bluefin stock assessment, Anon. 2015c.

The implementation of recent regulations through Recs. 13-07, 12-03, 10-04, 09-06, and previous recommendations has clearly resulted in reductions in catch and fishing mortality rates, and in a substantial increase in the spawning stock biomass for the continuity run and the 7 sensitivity analyses of the updated assessment. Large fish CPUE indices show increasing trends in the most recent years. However, the Committee notes that the 2014 assessment was an update of the 2012 assessment which relies only on a continuity model and seven sensitivity analyses. This update showed lack of the stability of VPA results to slight changes in data inputs and model specifications.

In the light of the results of the updated assessment in 2014, there are continuing positive signs of the success of the rebuilding plan and the efficiency of the management measures taken by the Commission. Noting that the goal of achieving B_{MSY} (through 2022) with at least 60% probability might already have been, or will soon be reached, the Commission should consider adding a new phase to the current recovery plan.

The Committee was not able to provide the Commission with a robust advice on an upper bound for the TAC in 2014 because of differing views about the implications of the uncertainties associated with the assessment. Similarly in 2015, no agreement was reached about the upper limit for such an increase that would not jeopardize the recovery of the stock. In equivalent situations, other scientific fora have similarly recommended moderate increases of the TAC, in a precautionary approach. To this end, and among other possible targets (e.g. $F_{0.1}$, F_{max} , etc.), a gradual increase (in steps over e.g. 2 or three years) of the catch to the level of the most precautionary MSY estimate would allow the population to increase even in the most conservative scenario (low recruitment scenario), noting the Commission's desire to maintain the stock in the green zone (Rec. 13-07). The SCRS scientists were not able to reach a consensus on the number of steps to complete the rebuilding plan, or on the management strategies. Rec. 14-04 defined three yearly steps to reach a final TAC of 23,155 t in 2017. Such stepped increases should be reviewed annually by the Commission on the advice of the SCRS (such reviews should consider stock indicators but would not necessarily extend to update stock assessment).

Having considered the stock indicators, the Committee advises that catches not exceeding TACs in Rec. 14-04 are not expected to undermine the success of the rebuilding plan and are consistent with the goal of achieving F_{MSY} and B_{MSY} through 2022 with at least 60% of probability.

The Committee reiterates the importance of establishing a scientific research quota to facilitate required research to improve the science, assessments, and management advice, and therefore recommends the development of a formal process for implementing such scientific research quotas. Any research quota should be accommodated within the TAC. Research plans/projects funded/facilitated by such quotas should be vetted by the SCRS.

EAST ATLANTIC AND MEDITERRANEAN BLUEFIN TUNA SUMMARY

| | | |
|---|--------------------------------|-----------------------|
| Current reported yield (2014) | 13,243 t* | |
| | Reported catch | Inflated catch |
| Maximum Sustainable Yield ¹ | | |
| Low recruitment scenario (1970s) | 23,256 t | 23,473 t |
| Medium recruitment scenario (1950-2006) | 33,662 t | 36,835 t |
| High recruitment scenario (1990s) | 55,860 t | 74,248 t |
| $F_{0.1}$ ^{2,3} | 0.07yr ⁻¹ | 0.07 yr ⁻¹ |
| $F_{2013}/F_{0.1}$ | 0.40 | 0.36 |
| $SSB_{F_{0.1}}$ | | |
| Low recruitment scenario (1970s) | 351,500 t | 354,600 t |
| Medium recruitment scenario (1950-2006) | 508,700 t | 556,600 t |
| High recruitment scenario (1990s) | 843,800 t | 1,121,000 t |
| $SSB_{2013}/SSB_{F_{0.1}}$ | | |
| Low recruitment scenario (1970s) | 1.60 | 1.74 |
| Medium recruitment scenario (1950-2006) | 1.10 | 1.11 |
| High recruitment scenario (1990s) | 0.67 | 0.55 |
| Stock Status: | | |
| Overfished | | |
| Low recruitment scenario | No | |
| Medium recruitment scenario | No | |
| High recruitment scenario | Yes | |
| Overfishing | No | |
| TAC (2013 - 2015) | 13,400 t – 13,400 t – 16,142 t | |
| TAC (2016-2017) | 19,296 t – 23,155 t | |

¹ Approximated as the average of the potential longterm yield that is expected at a $F_{0.1}$ strategy. The levels of these yields have been computed using the selectivity pattern over 2009-2011 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 $F_{0.1}$.

* As of 25 September 2015.

BFT-Table 1. Estimated catches (t) of northern bluefin tuna (*Thunnus thynnus*) by area, gear and flag. (v2, 2015-09-28)

| | | | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | |
|-----------------|-----|--------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----|
| TOTAL | | | 26037 | 29360 | 34132 | 36528 | 48861 | 49713 | 53335 | 52810 | 43121 | 35201 | 36564 | 37400 | 37093 | 33480 | 33517 | 37618 | 32520 | 36170 | 25861 | 21744 | 13031 | 11781 | 12688 | 14730 | 14870 | |
| BFT-E | | | 23257 | 26440 | 31851 | 34161 | 46748 | 47288 | 50821 | 50476 | 40464 | 32430 | 33789 | 34616 | 33775 | 31175 | 31392 | 35862 | 30708 | 34533 | 23862 | 19765 | 11155 | 9774 | 10934 | 13244 | 13243 | |
| | ATE | | 6040 | 6556 | 7619 | 9251 | 6931 | 9646 | 12674 | 16856 | 11739 | 9596 | 10547 | 10086 | 10347 | 7362 | 7410 | 9036 | 7535 | 8037 | 7645 | 6684 | 4313 | 3984 | 3834 | 4163 | 3913 | |
| | MED | | 17218 | 19884 | 24232 | 24910 | 39818 | 37642 | 38147 | 33619 | 28725 | 22834 | 23242 | 24530 | 23428 | 23813 | 23983 | 26826 | 23173 | 26495 | 16217 | 13080 | 6842 | 5790 | 7100 | 9081 | 9330 | |
| BFT-W | | | 2780 | 2920 | 2282 | 2367 | 2113 | 2425 | 2514 | 2334 | 2657 | 2772 | 2775 | 2784 | 3319 | 2305 | 2125 | 1756 | 1811 | 1638 | 2000 | 1980 | 1876 | 2007 | 1754 | 1486 | 1626 | |
| Landings | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | ATE | Bait boat | 1993 | 1648 | 1418 | 3884 | 2284 | 3093 | 5369 | 7215 | 3139 | 1554 | 2032 | 2275 | 2567 | 1371 | 1790 | 2018 | 1116 | 2032 | 1794 | 1260 | 646 | 636 | 283 | 243 | 95 | |
| | | Longline | 1496 | 3197 | 3817 | 2717 | 2176 | 4388 | 4788 | 4534 | 4300 | 4020 | 3736 | 3303 | 2896 | 2750 | 2074 | 2713 | 2448 | 1706 | 2491 | 1960 | 1194 | 1157 | 1166 | 1193 | 1216 | |
| | | Other surf. | 262 | 143 | 557 | 995 | 627 | 555 | 273 | 135 | 395 | 404 | 510 | 712 | 701 | 560 | 402 | 1014 | 1047 | 502 | 187 | 298 | 143 | 36 | 49 | 141 | 210 | |
| | | Purse seine | 54 | 46 | 462 | 24 | 213 | 458 | 323 | 828 | 692 | 726 | 1147 | 150 | 884 | 490 | 1078 | 871 | 332 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 0 | |
| | | Sport (HL+RR) | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 162 | 28 | 33 | 126 | 61 | 63 | 109 | 87 | 11 | 4 | 10 | 6 | 2 | 23 | 19 | 25 | 21 | 16 | |
| | | Traps | 2234 | 1522 | 1365 | 1631 | 1630 | 1152 | 1921 | 3982 | 3185 | 2859 | 2996 | 3585 | 3235 | 2082 | 1978 | 2408 | 2588 | 3788 | 3166 | 3164 | 2307 | 2137 | 2311 | 2564 | 2376 | |
| | MED | Bait boat | 25 | 148 | 158 | 48 | 0 | 206 | 5 | 4 | 11 | 4 | 0 | 0 | 1 | 9 | 17 | 5 | 0 | 0 | 0 | 38 | 0 | 0 | 2 | 11 | | |
| | | Longline | 1026 | 2869 | 2599 | 2342 | 7048 | 8475 | 8171 | 5672 | 3131 | 2463 | 3317 | 3750 | 2614 | 2476 | 2564 | 3101 | 2202 | 2656 | 2254 | 1344 | 875 | 869 | 587 | 605 | 586 | |
| | | Other surf. | 1216 | 1409 | 1894 | 1615 | 3226 | 1044 | 1200 | 1040 | 1882 | 2978 | 1069 | 1101 | 994 | 2539 | 1107 | 484 | 307 | 699 | 1022 | 0 | 275 | 223 | 26 | 72 | 81 | |
| | | Purse seine | 11250 | 13245 | 17807 | 19297 | 26083 | 23588 | 26021 | 24178 | 21291 | 14910 | 16195 | 17174 | 17656 | 17167 | 18785 | 22475 | 20020 | 22952 | 12641 | 11395 | 5057 | 4293 | 6172 | 7974 | 8181 | |
| | | Sport (HL+RR) | 1559 | 742 | 952 | 1238 | 2257 | 3556 | 2149 | 2340 | 1336 | 1627 | 1922 | 1327 | 1647 | 1401 | 1351 | 646 | 515 | 95 | 149 | 160 | 353 | 226 | 177 | 189 | 239 | |
| | | Traps | 2142 | 1471 | 821 | 370 | 1204 | 772 | 601 | 385 | 1074 | 852 | 739 | 1177 | 515 | 221 | 159 | 115 | 129 | 95 | 152 | 144 | 281 | 165 | 125 | 222 | 232 | |
| | ATW | Longline | 739 | 894 | 674 | 695 | 539 | 468 | 547 | 382 | 764 | 914 | 858 | 610 | 729 | 186 | 644 | 425 | 565 | 420 | 606 | 366 | 529 | 743 | 478 | 474 | 497 | |
| | | Other surf. | 536 | 578 | 509 | 406 | 307 | 384 | 432 | 293 | 342 | 281 | 284 | 202 | 108 | 140 | 97 | 89 | 85 | 63 | 82 | 121 | 126 | 148 | 117 | 121 | 119 | |
| | | Purse seine | 384 | 237 | 300 | 295 | 301 | 249 | 245 | 250 | 249 | 248 | 275 | 196 | 208 | 265 | 32 | 178 | 4 | 28 | 0 | 11 | 0 | 0 | 2 | 29 | 38 | |
| | | Sport (HL+RR) | 1004 | 1083 | 586 | 854 | 804 | 1114 | 1029 | 1181 | 1108 | 1124 | 1120 | 1649 | 2035 | 1398 | 1139 | 924 | 1005 | 1023 | 1130 | 1251 | 1009 | 887 | 917 | 692 | 810 | |
| | | Traps | 2 | 0 | 1 | 29 | 79 | 72 | 90 | 59 | 68 | 44 | 16 | 16 | 28 | 84 | 32 | 8 | 3 | 4 | 23 | 23 | 39 | 26 | 17 | 11 | 20 | |
| 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 | 13 | 12 | 9 | 11 | |
| | ATW | Longline | 115 | 128 | 211 | 88 | 83 | 138 | 167 | 155 | 123 | 160 | 222 | 105 | 211 | 232 | 181 | 131 | 149 | 100 | 159 | 207 | 174 | 202 | 224 | 145 | 139 | |
| | | Other surf. | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | 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 | 14 | 4 |
| | | Sport (HL+RR) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 3 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Landings | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | ATE | Cabo 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 | 0 | |
| | | China PR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 85 | 103 | 80 | 68 | 39 | 19 | 41 | 24 | 42 | 72 | 119 | 42 | 38 | 36 | 36 | 38 | 33 | |
| | | Chinese Taipei | 0 | 0 | 0 | 6 | 20 | 4 | 61 | 226 | 350 | 222 | 144 | 304 | 158 | 0 | 0 | 10 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | EU.Denmark | 0 | 0 | 0 | 37 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | EU.España | 3557 | 2272 | 2319 | 4962 | 3137 | 3819 | 6186 | 9519 | 4163 | 3328 | 3493 | 3633 | 4089 | 2138 | 2801 | 3102 | 2033 | 3276 | 2938 | 2409 | 1483 | 1483 | 1329 | 1553 | 1282 | |
| | | EU.France | 510 | 565 | 894 | 1099 | 336 | 725 | 563 | 269 | 613 | 588 | 542 | 629 | 755 | 648 | 561 | 818 | 1218 | 629 | 253 | 366 | 228 | 135 | 148 | 223 | 212 | |
| | | 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 | 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 | 14 | 21 | 52 | 22 | 8 | 15 | 3 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 2 | 4 | 10 | 13 | 19 |
| | | EU.Poland | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | EU.Portugal | 27 | 117 | 38 | 25 | 240 | 35 | 199 | 712 | 323 | 411 | 441 | 404 | 186 | 61 | 27 | 79 | 97 | 29 | 36 | 53 | 58 | 180 | 223 | 235 | 243 | |
| | | EU.Sweden | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | EU.United Kingdom | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | |
| | | Faroe Islands | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 67 | 104 | 118 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Guinée Rep. | 0 | 0 | 0 | 0 | 330 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | ICCAT (RMA) | 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 | |
| | | Iceland | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 27 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 5 | 4 | 30 | |
| | | Japan | 1464 | 2981 | 3350 | 2484 | 2075 | 3971 | 3341 | 2905 | 3195 | 2690 | 2895 | 2425 | 2536 | 2695 | 2015 | 2598 | 1896 | 1612 | 2351 | 1904 | 1155 | 1089 | 1093 | 1129 | 1134 | |
| | | Korea Rep. | 0 | 0 | 0 | 0 | 4 | 205 | 92 | 203 | 0 | 0 | 6 | 1 | 0 | 0 | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Libya | 0 | 0 | 312 | 0 | 0 | 0 | 576 | 477 | 511 | 450 | 487 | 0 | 0 | 0 | 0 | 0 | 47 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Maroc | 408 | 531 | 562 | 415 | 720 | 678 | 1035 | 2068 | 2341 | 1591 | 2228 | 2497 | 2565 | 1797 | 1961 | 2405 | 2196 | 2418 | 1947 | 1909 | 1348 | 1055 | 990 | 960 | 959 | |
| | | NEI (ETRO) | 74 | 4 | 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 | 85 | 144 | 223 | 68 | 189 | 71 | 208 | 66 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |

| | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|--------------------------|------|------|------|------|-------|------|-------|------|------|------|------|------|------|------|------|------|------|-------|------|------|------|------|------|------|------|
| Norway | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Panama | 0 | 0 | 0 | 0 | 1 | 19 | 550 | 255 | 0 | 13 | 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 | 6 |
| Seychelles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sierra Leone | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 93 | 118 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| U.S.A. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 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 | 50 | 0 | 0 | 0 | 9 | 34 |
| Algerie | 782 | 800 | 1104 | 1097 | 1560 | 156 | 156 | 157 | 1947 | 2142 | 2330 | 2012 | 1710 | 1586 | 1208 | 1530 | 1038 | 1511 | 1311 | 0 | 0 | 0 | 69 | 244 | 244 |
| China PR | 0 | 0 | 0 | 0 | 97 | 137 | 93 | 49 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Chinese Taipei | 0 | 0 | 0 | 328 | 709 | 494 | 411 | 278 | 106 | 27 | 169 | 329 | 508 | 445 | 51 | 267 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| EU.Croatia | 0 | 1418 | 1076 | 1058 | 1410 | 1220 | 1360 | 1105 | 906 | 970 | 930 | 903 | 977 | 1139 | 828 | 1017 | 1022 | 825 | 834 | 619 | 389 | 371 | 369 | 384 | 385 |
| EU.Cyprus | 10 | 10 | 10 | 14 | 10 | 10 | 10 | 10 | 21 | 31 | 61 | 85 | 91 | 79 | 105 | 149 | 110 | 1 | 132 | 2 | 3 | 10 | 18 | 17 | 17 |
| EU.España | 1822 | 1392 | 2165 | 2018 | 2741 | 4607 | 2588 | 2209 | 2000 | 2003 | 2772 | 2234 | 2215 | 2512 | 2353 | 2758 | 2689 | 2414 | 2465 | 1769 | 942 | 942 | 1064 | 948 | 1164 |
| EU.France | 4713 | 4620 | 7376 | 6995 | 11843 | 9604 | 9171 | 8235 | 7122 | 6156 | 6794 | 6167 | 5832 | 5859 | 6471 | 8638 | 7663 | 10157 | 2670 | 3087 | 1754 | 805 | 791 | 2191 | 2207 |
| EU.Greece | 201 | 175 | 447 | 439 | 886 | 1004 | 874 | 1217 | 286 | 248 | 622 | 361 | 438 | 422 | 389 | 318 | 255 | 285 | 350 | 373 | 224 | 172 | 176 | 178 | 161 |
| EU.Italy | 4117 | 3787 | 5006 | 5329 | 6882 | 7062 | 10006 | 9548 | 4441 | 3283 | 3847 | 4383 | 4628 | 4981 | 4697 | 4853 | 4708 | 4638 | 2247 | 2749 | 1060 | 1783 | 1788 | 1938 | 1946 |
| EU.Malta | 85 | 113 | 81 | 259 | 580 | 590 | 402 | 396 | 409 | 449 | 378 | 224 | 244 | 258 | 264 | 350 | 270 | 334 | 296 | 263 | 136 | 142 | 137 | 155 | 160 |
| EU.Portugal | 0 | 278 | 320 | 183 | 428 | 446 | 274 | 37 | 54 | 76 | 61 | 64 | 0 | 2 | 0 | 0 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Egypt | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 64 | 77 | 155 |
| ICCAT (RMA) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 4 | 1 |
| Iceland | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 50 | 0 | 0 | 0 | 0 | 0 |
| Israel | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Japan | 172 | 85 | 123 | 793 | 536 | 813 | 765 | 185 | 361 | 381 | 136 | 152 | 390 | 316 | 638 | 378 | 556 | 466 | 80 | 18 | 0 | 0 | 0 | 0 | 0 |
| Korea Rep. | 0 | 0 | 0 | 0 | 684 | 458 | 591 | 410 | 66 | 0 | 0 | 0 | 0 | 0 | 700 | 1145 | 26 | 276 | 335 | 102 | 0 | 0 | 77 | 80 | 0 |
| Libya | 328 | 370 | 425 | 635 | 1422 | 1540 | 812 | 552 | 820 | 745 | 1063 | 1941 | 638 | 752 | 1300 | 1091 | 1280 | 1358 | 1318 | 1082 | 645 | 0 | 756 | 929 | 933 |
| Maroc | 1149 | 925 | 205 | 79 | 1092 | 1035 | 586 | 535 | 687 | 636 | 695 | 511 | 421 | 760 | 819 | 92 | 190 | 641 | 531 | 369 | 205 | 182 | 223 | 309 | 310 |
| NEI (Flag related) | 0 | 0 | 0 | 0 | 427 | 639 | 171 | 1066 | 825 | 140 | 17 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NEI (MED) | 360 | 1799 | 1398 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NEI (combined) | 0 | 0 | 0 | 0 | 773 | 211 | 0 | 101 | 1030 | 1995 | 109 | 571 | 508 | 610 | 709 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Panama | 74 | 287 | 484 | 467 | 1499 | 1498 | 2850 | 236 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Serbia & Montenegro | 0 | 0 | 0 | 0 | 0 | 2 | 4 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Syria | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 50 | 41 | 0 | 34 | 0 | 0 | 0 | 0 |
| Tunisie | 406 | 1366 | 1195 | 2132 | 2773 | 1897 | 2393 | 2200 | 1745 | 2352 | 2184 | 2493 | 2528 | 791 | 2376 | 3249 | 2545 | 2622 | 2679 | 1932 | 1042 | 852 | 1017 | 1057 | 1047 |
| Turkey | 2059 | 2459 | 2817 | 3084 | 3466 | 4219 | 4616 | 5093 | 5899 | 1200 | 1070 | 2100 | 2300 | 3300 | 1075 | 990 | 806 | 918 | 879 | 665 | 409 | 519 | 536 | 551 | 555 |
| Yugoslavia Fed. | 940 | 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 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19 | 0 | 0 | 0 |
| Brazil | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 5 | 0 |
| Canada | 438 | 485 | 443 | 459 | 392 | 576 | 597 | 503 | 595 | 576 | 549 | 524 | 604 | 557 | 537 | 600 | 733 | 491 | 575 | 530 | 505 | 474 | 477 | 480 | 463 |
| Chinese Taipei | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 2 | 0 | 0 | 0 | 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 | 74 | 11 | 19 | 27 | 19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| EU.Poland | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| EU.Portugal | 0 | 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 | 0 |
| FR.St Pierre et Miquelon | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 1 | 10 | 5 | 0 | 4 | 3 | 2 | 8 | 0 | 0 | 0 | 0 |
| ICCAT (RMA) | 0 | 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 | 550 | 688 | 512 | 581 | 427 | 387 | 436 | 322 | 691 | 365 | 492 | 506 | 575 | 57 | 470 | 265 | 376 | 277 | 492 | 162 | 353 | 578 | 289 | 317 | 302 |
| Korea Rep. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 52 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mexico | 0 | 0 | 0 | 0 | 4 | 0 | 19 | 2 | 8 | 14 | 29 | 10 | 12 | 22 | 9 | 10 | 14 | 7 | 7 | 10 | 14 | 14 | 51 | 23 | 51 |
| NEI (ETRO) | 24 | 23 | 17 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NEI (Flag related) | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 429 | 270 | 49 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Norway | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Panama | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | | |
|----------|---------------------------|------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-----|----|
| | Sta. Lucia | 14 | 14 | 14 | 2 | 43 | 9 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| | Trinidad and Tobago | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| | U.S.A. | 1636 | 1582 | 1085 | 1237 | 1163 | 1311 | 1285 | 1334 | 1235 | 1213 | 1212 | 1583 | 1840 | 1426 | 899 | 717 | 468 | 758 | 764 | 1068 | 803 | 738 | 713 | 502 | 667 | | |
| | UK.Bermuda | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | | |
| | UK.British Virgin Islands | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 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 | | |
| 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 | | |
| | | EU.Croatia | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 5 | 5 | 2 |
| | | Libya | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 4 | |
| | | Tunisie | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 |
| | | Turkey | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 |
| | ATW | Canada | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 16 | 11 | 46 | 13 | 37 | 14 | 15 | 0 | 2 | 0 | 1 | 3 | 25 | 36 | 17 | 0 | 0 | |
| | | Japan | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Mexico | 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 | |
| | | U.S.A. | 115 | 128 | 211 | 88 | 83 | 138 | 171 | 155 | 110 | 149 | 176 | 98 | 174 | 218 | 167 | 131 | 147 | 100 | 158 | 204 | 150 | 166 | 206 | 159 | 143 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

1. During the meeting two updates were officially reported to BFT Task I catches for 2014: Korea (BFT-E PS, 80.5 t) and China PR (BFT-E LL, 37.6 t).

BFTE-Table 1. The probabilities of $F < F_{MSY}$ for quotas from 0 to 30,000 t for 2014 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%.

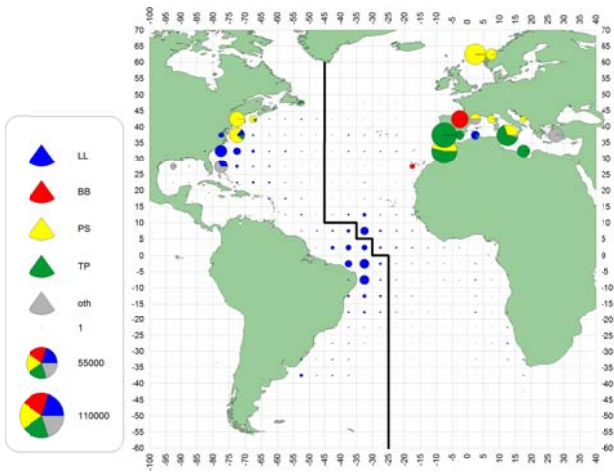
| TAC | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|-------|------|------|------|------|------|------|------|------|------|
| 0 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 2000 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 4000 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 6000 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 8000 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 10000 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 12000 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 13500 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 14000 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 15000 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 16000 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 18000 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 20000 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 22000 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 24000 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 26000 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 28000 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 30000 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

BFTE-Table 2. The probabilities of $SSB > SSB_{MSY}$ for quotas from 0 to 30000 t for 2014 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%.

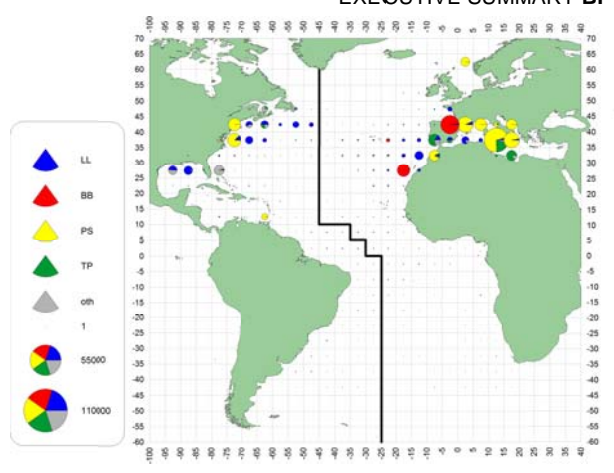
| TAC | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|-------|------|------|------|------|------|------|------|------|------|
| 0 | 63 | 67 | 73 | 80 | 89 | 94 | 98 | 99 | 100 |
| 2000 | 63 | 67 | 73 | 80 | 88 | 94 | 97 | 99 | 100 |
| 4000 | 63 | 67 | 72 | 79 | 87 | 93 | 97 | 99 | 100 |
| 6000 | 63 | 67 | 72 | 79 | 87 | 93 | 97 | 99 | 100 |
| 8000 | 63 | 67 | 72 | 79 | 86 | 92 | 96 | 98 | 99 |
| 10000 | 63 | 67 | 72 | 78 | 86 | 92 | 96 | 98 | 99 |
| 12000 | 63 | 67 | 72 | 78 | 85 | 91 | 95 | 98 | 99 |
| 13500 | 63 | 67 | 71 | 77 | 84 | 91 | 94 | 97 | 99 |
| 14000 | 63 | 67 | 71 | 77 | 84 | 90 | 94 | 97 | 99 |
| 15000 | 63 | 67 | 71 | 77 | 84 | 90 | 94 | 97 | 99 |
| 16000 | 63 | 67 | 71 | 77 | 83 | 90 | 94 | 97 | 99 |
| 18000 | 63 | 67 | 71 | 76 | 83 | 89 | 93 | 96 | 98 |
| 20000 | 63 | 67 | 71 | 76 | 82 | 88 | 93 | 96 | 98 |
| 22000 | 63 | 67 | 70 | 76 | 82 | 88 | 92 | 95 | 97 |
| 24000 | 63 | 67 | 70 | 75 | 81 | 87 | 91 | 94 | 97 |
| 26000 | 63 | 67 | 70 | 75 | 80 | 86 | 90 | 94 | 96 |
| 28000 | 63 | 67 | 70 | 75 | 80 | 85 | 89 | 93 | 95 |
| 30000 | 63 | 67 | 70 | 74 | 79 | 85 | 89 | 92 | 95 |

BFTE-Table 3. The probabilities of $F < F_{MSY}$ and $SSB > SSB_{MSY}$ for quotas from 0 to 30000 t for 2014 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%.

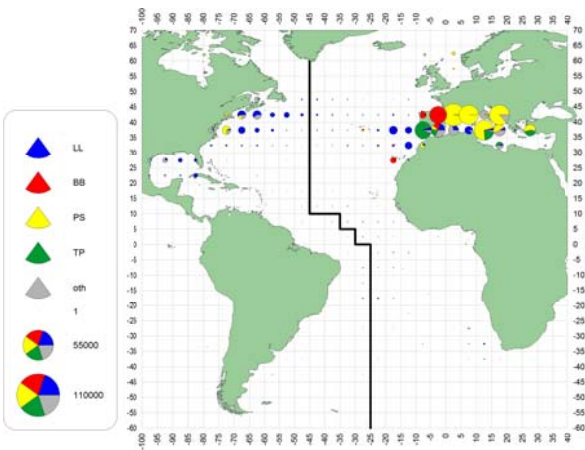
| TAC | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|-------|------|------|------|------|------|------|------|------|------|
| 0 | 63 | 67 | 73 | 80 | 89 | 94 | 98 | 99 | 100 |
| 2000 | 63 | 67 | 73 | 80 | 88 | 94 | 97 | 99 | 100 |
| 4000 | 63 | 67 | 72 | 79 | 87 | 93 | 97 | 99 | 100 |
| 6000 | 63 | 67 | 72 | 79 | 87 | 93 | 97 | 99 | 100 |
| 8000 | 63 | 67 | 72 | 79 | 86 | 92 | 96 | 98 | 99 |
| 10000 | 63 | 67 | 72 | 78 | 86 | 92 | 96 | 98 | 99 |
| 12000 | 63 | 67 | 72 | 78 | 85 | 91 | 95 | 98 | 99 |
| 13500 | 63 | 67 | 71 | 77 | 84 | 91 | 94 | 97 | 99 |
| 14000 | 63 | 67 | 71 | 77 | 84 | 90 | 94 | 97 | 99 |
| 15000 | 63 | 67 | 71 | 77 | 84 | 90 | 94 | 97 | 99 |
| 16000 | 63 | 67 | 71 | 77 | 83 | 90 | 94 | 97 | 99 |
| 18000 | 63 | 67 | 71 | 76 | 83 | 89 | 93 | 96 | 98 |
| 20000 | 63 | 67 | 71 | 76 | 82 | 88 | 93 | 96 | 98 |
| 22000 | 63 | 67 | 70 | 76 | 82 | 88 | 92 | 95 | 97 |
| 24000 | 63 | 67 | 70 | 75 | 81 | 87 | 91 | 94 | 97 |
| 26000 | 63 | 67 | 70 | 75 | 80 | 86 | 90 | 94 | 96 |
| 28000 | 63 | 67 | 70 | 75 | 80 | 85 | 89 | 93 | 95 |
| 30000 | 63 | 66 | 69 | 74 | 79 | 84 | 89 | 92 | 95 |



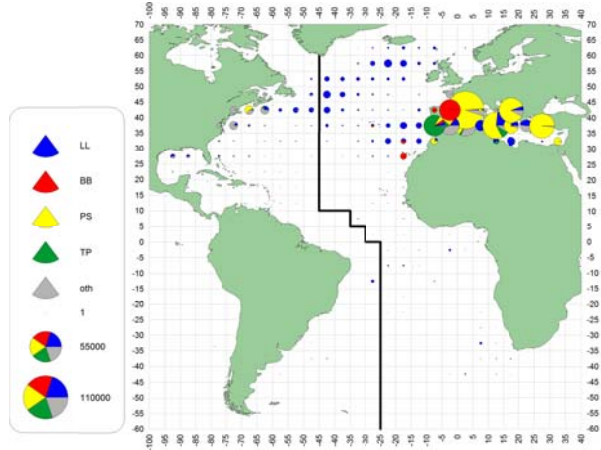
a. BFT (1960-69)



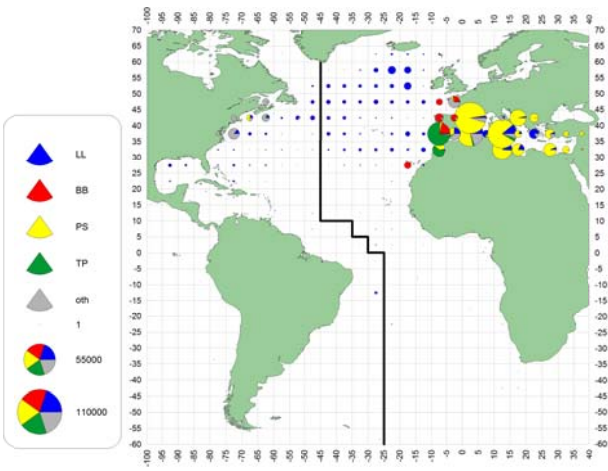
b. BFT (1970-79)



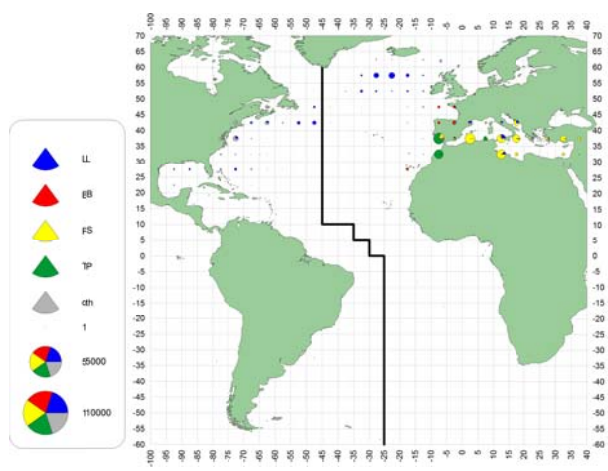
c. BFT (1980-89)



d. BFT (1990-99)

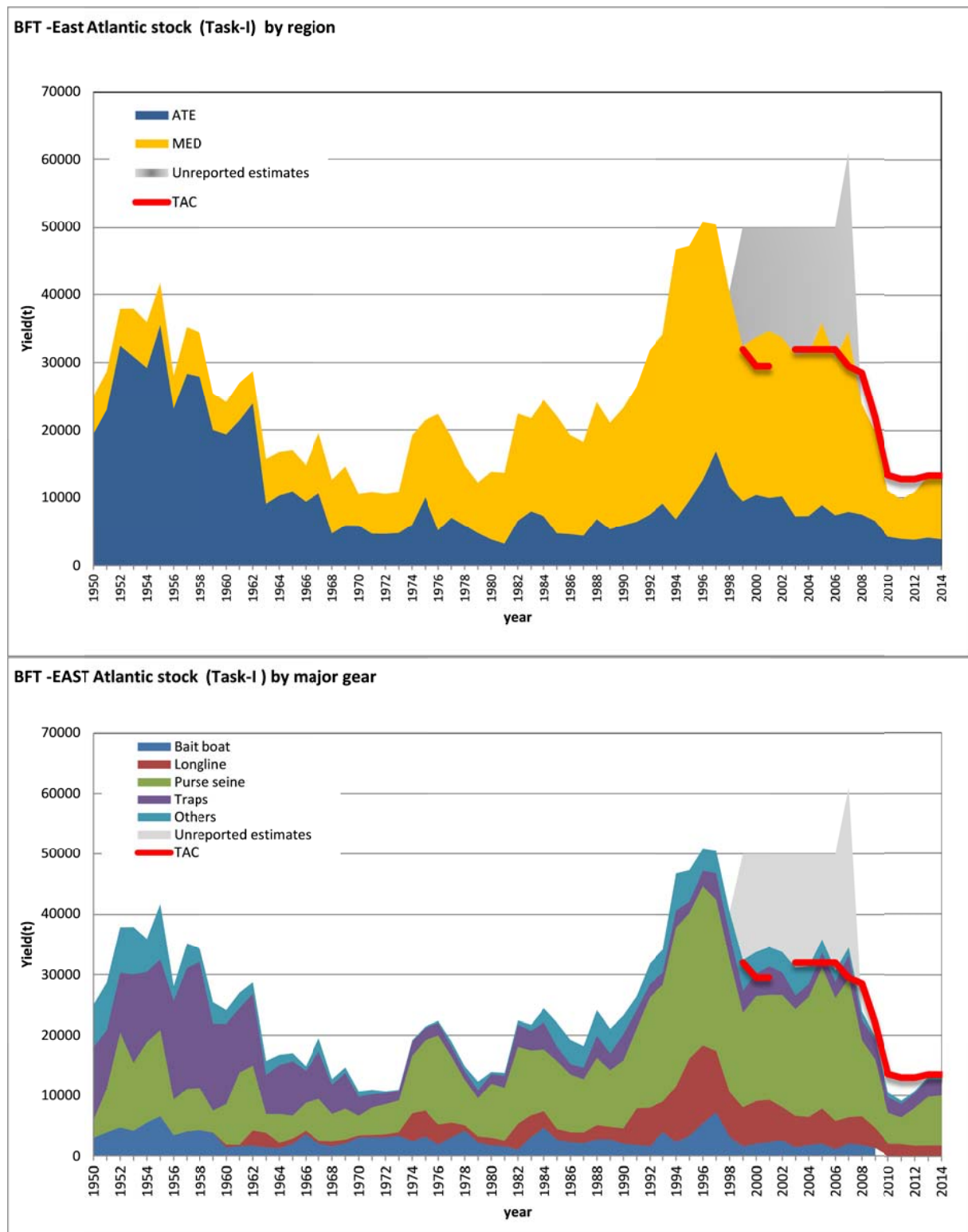


e. BFT (2000-09)

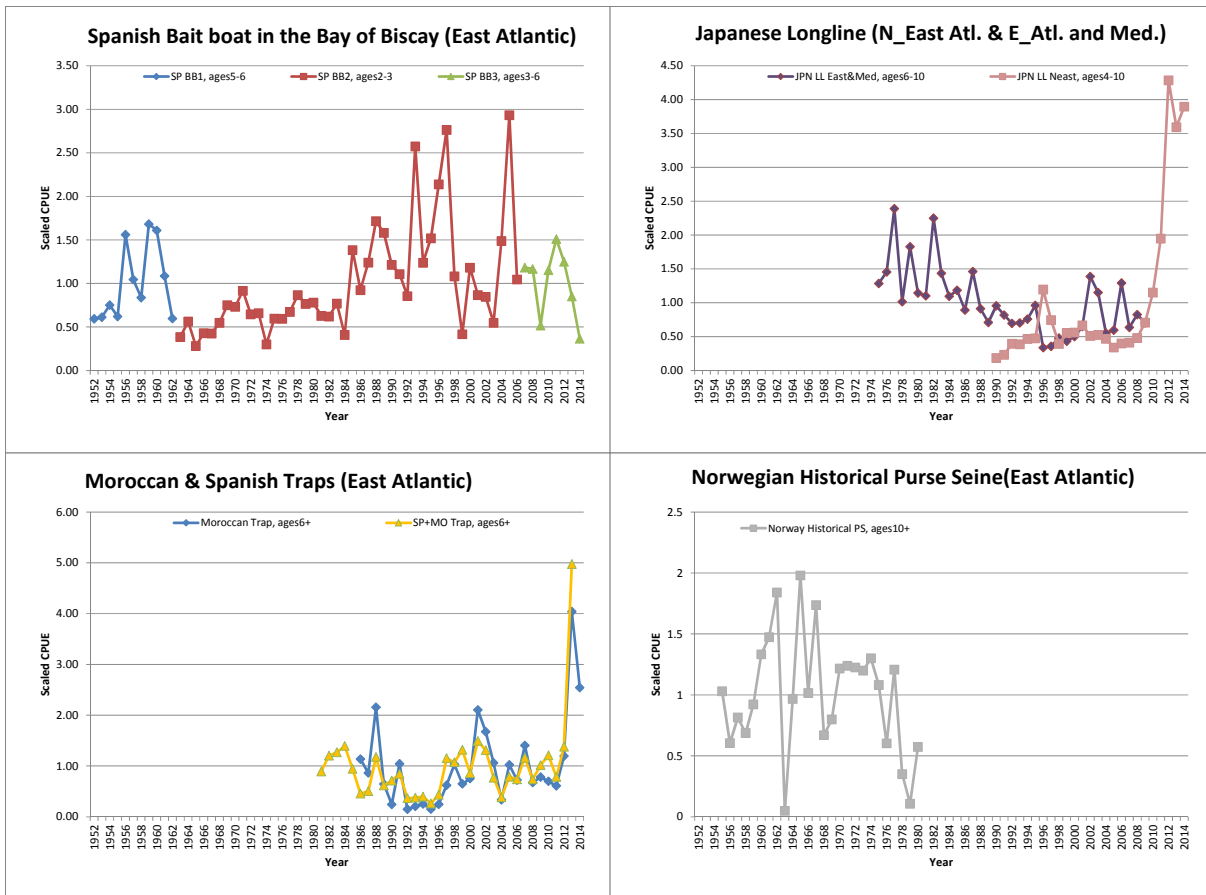


f. BFT (2010-13)

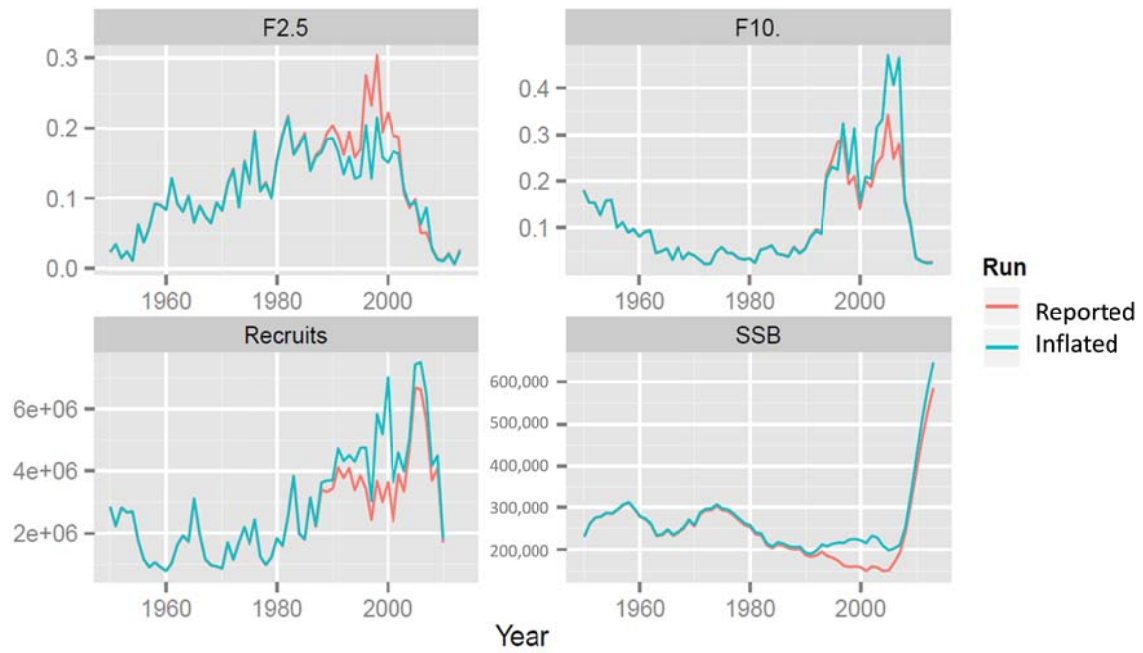
BFT-Figure 1. Geographic distribution of bluefin tuna catches per 5x5 degrees and per main gears from 1950 to 2013.



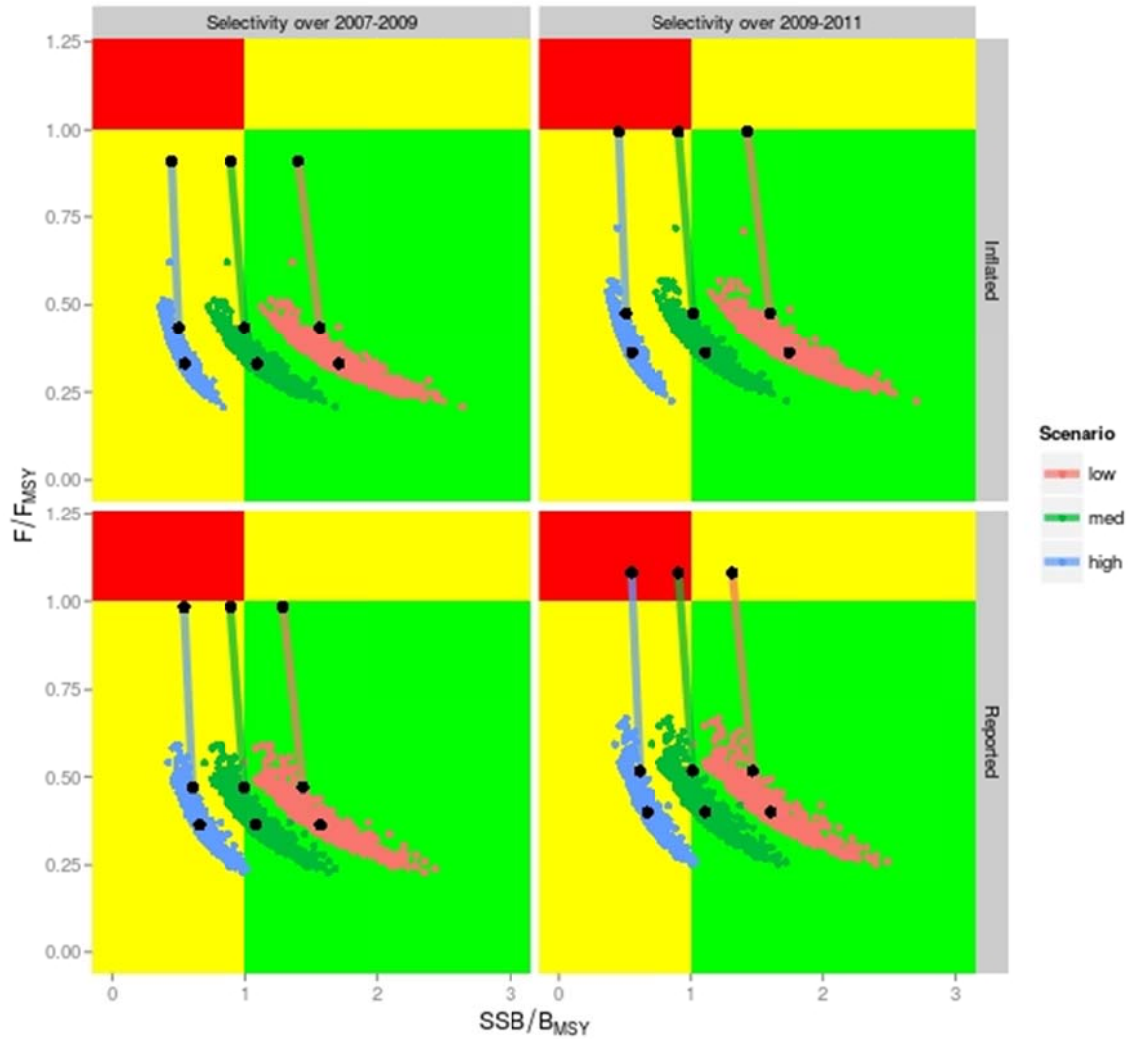
BFTE-Figure 1. Reported catch for the East Atlantic and Mediterranean from Task I data from 1950 to 2014 split by main geographic areas (top panel) and by gears (bottom panel) together with unreported catch estimated by the SCRS (using fishing capacity information and mean catch rates over the last decade) from 1998 to 2007 (the SCRS did not detect unreported catch using fishing capacity information since 2008) and TAC levels since 1998.



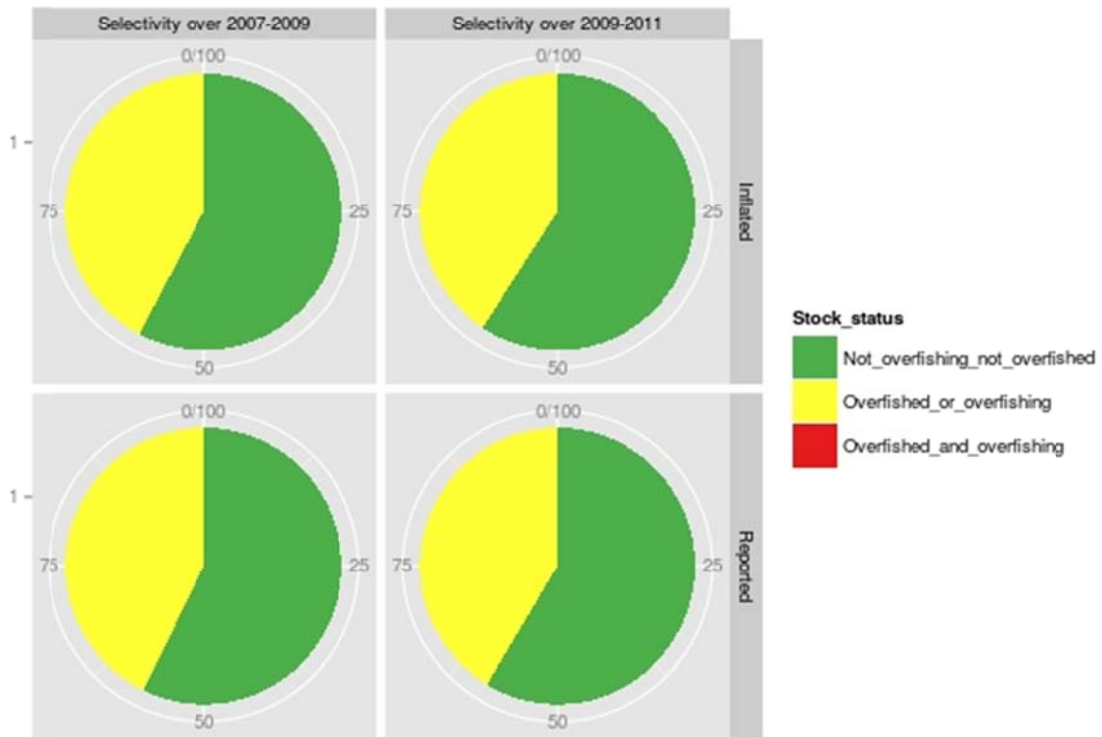
BFTE-Figure 2. Plots of the updated CPUE time series fishery indicators for the East Atlantic and Mediterranean bluefin tuna stock. All CPUE series are standardized series except the nominal Norway PS index. The Spanish BB series (top left panel) was split in three series to account for changes in selectivity patterns, and the latest series in 2014 was updated using French BB data due to the sale of the quota by the Spanish fleet. The Japanese Longlines CPUE for the Northeast Atlantic has been updated until 2014. The Moroccan-Spanish traps CPUE was not updated. The Moroccan CPUE up to 2013 was used only for the sensitivity analysis, and has been updated in 2014.



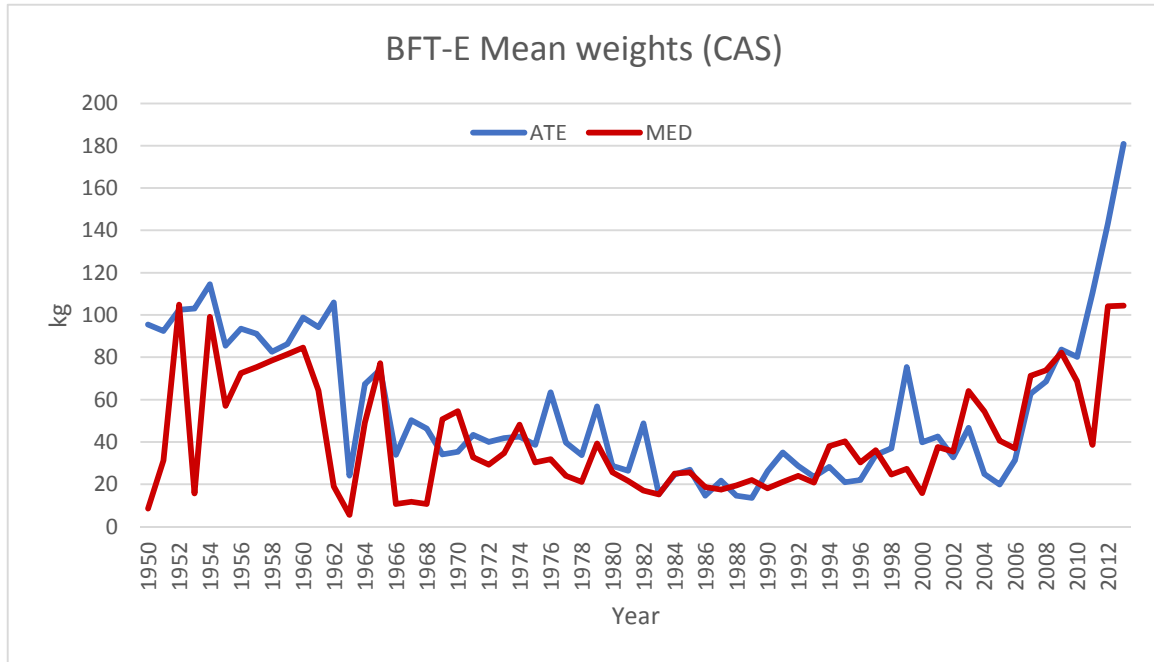
BFTE-Figure 3. Fishing mortality (for ages 2 to 5 and 10+), spawning stock biomass (in metric ton) and recruitment (in number of fish) estimates from VPA continuity run (considered as the base case in the 2014 stock assessment). Red line: reported catch; blue line: inflated (from 1998 to 2007) catch.



BFTE-Figure 4. Stock status from 2011 to the terminal year (2013) 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 (selectivity over 2007-2009): 2013 SSB and F relative to reference points calculated with the selectivity pattern over 2007-2009 which was same period as the 2010 stock assessment. Right Panel (selectivity over 2009-2011): 2013 SSB and F relative to the reference points with the selectivity pattern over 2009-2011 which was same period as the 2012 stock assessment.



BFTE-Figure 5. Pie chart showing the proportion of the VPA continuity run results for the terminal year (2013) 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 (selectivity patterns were estimated over 2007-2009 or over 2009-2011).



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 2013 used in the 2014 stock assessment.

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 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 1,638 t in 2007 and then increased in 2008 and 2009 to 2,000 t and 1,980 t, respectively. The catch in 2013 was 1,486 t and 1,626 in 2014 (**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 (735 t in 2006); the 2006 catch was the highest recorded since 1977 (972 t). The 2014 Canadian catch was 463 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 considerably higher than previous at 578 t, while catches in 2013 and 2014 were 317 t and 302 t, respectively.

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 a catch level of 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 1,273 t and since that time catches have remained around 900 t with catch in 2014 of 810 t.

The indices of abundance used in the 2014 assessment were updated through 2014 (**BFTW-Figure 3**). Updated abundance indices (Japanese longline and U.S. longline in the Gulf of Mexico, **BFTW-Figure 3**) showed some declines from recent higher levels. The catch rates of juvenile bluefin tuna in the U.S. rod and reel fishery fluctuate with little apparent longterm trend, but exhibit a pattern that is consistent with the strong year-classes estimated for 2002 and 2003 and showed small decreases in 2012 and 2013. The catch rates of adults in the U.S. rod and reel fishery showed decreases between 2011 and 2013. Catch rates of the Japanese longline fishery north of 30°N has fluctuated substantially over time with peak in the 2012; the highest value of the time series. The Japanese longline CPUE indices declined in 2013 and 2014 but remain higher than the average in the 1990s and early 2000s, as well as in the 1970s when estimated stock size was substantially higher than in 2013. The catch rate series from the U.S. Gulf of Mexico longline fishery was split after 1991 due to management related impacts upon the indices and was also adjusted for the effects of 'weak' hook regulations implemented in 2011. The early time period (1987-1991) shows no clear trend while the later time period shows a generally increasing trend since the early 1990s. Indices for the Gulf of St. Lawrence increased rapidly since 2004 and the catch rates in 2011-2013 were the highest among the data points used in the 2014 assessment. The Committee questioned if the rate of increase was biologically plausible for the stock as a whole, and noted that many factors may have contributed to the increase in the index, including changes in stock distribution, management regulations, fishing behaviour and the environment, and may not have been fully accounted for in the standardization. Catch rates in southwest Nova Scotia have shown a recent decrease since 2008. The Gulf of Mexico larval survey (the only fishery independent indicator) continues to fluctuate around the low levels observed since the 1980s but 2011 and 2013 were relatively high. The general increasing trends for several indices indicate an increasing relative abundance, however conflicting trends between several of the indices (e.g. Canada Gulf of St. Lawrence and U.S. rod and reel) and the potential influence of unaccounted factors described above make the magnitude of this increase uncertain.

The Committee reviewed new indices developed in response to recommendations made by the Working Group of Fisheries Managers and Scientists in Support of the Western Bluefin Stock Assessment. Two new collaborative indices were constructed during a joint U.S.-Canada data workshop. The first index was a combined U.S.-Canada pelagic longline observer index for the northwest Atlantic. A combined U.S.-Canada rod and reel, handline and harpoon index was presented that merged data from three previous indices, including the U.S. rod and reel adult index, the Gulf of St. Lawrence index, and Southwest Nova Scotia index. The collaborative analyses have been developed to provide more comprehensive indices of the entire range of the stock. In addition, a fishery independent index based on a herring acoustic survey that also observed bluefin tuna in the Gulf of St. Lawrence was presented that showed consistent trends with fishery dependent indices in the region. These indices are being further developed for the 2016 data preparatory meeting.

BFTW-3. State of the stock

The 2014 update assessment included information through 2013 (Anon. 2015c). 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 (**BFTW-Figure 4**). 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. Assessment results were sensitive to certain assumptions and data treatments, including the abundance indices. Exclusion of the Canadian GSL index decreased the biomass estimate by 33%, whereas exclusion of the US large RR index increased biomass by about 25%. However both indices were included as the Committee felt they captured the potential redistribution of the stock within the management area.

The 2014 assessment estimated trends that are consistent with previous analyses in that spawning stock biomass (SSB) declined steadily from 1970 to 1992 and then fluctuated around 25 to 30% the 1970 level for about the next decade (**BFTW-Figure 5**). In recent years, however, there appears to have been a gradual increase in SSB from about 32% of the 1970 level in 2003 to an estimated 55% in 2013. Since 1998, when the rebuilding plan was adopted, the SSB has increased by 70%. The stock has experienced different levels of fishing mortality (F) over time, depending on the size of fish targeted by various fleets (**BFTW-Figure 5**). Fishing mortality on spawners (ages 9 and older) declined markedly after 2003.

Estimates of recruitment were very high in the early 1970s (**BFTW-Figure 5**). Since 1977, recruitment has varied from year to year without trend with the exception of strong year-classes in 2002 and 2003. The current assessment suggests that both the 2002 and 2003 year classes were large; but the estimate of a strong 2002 year class may be an artefact 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. Under the current maturity assumptions (age 9 and older) the 2002/2003 year classes started to contribute to the spawning biomass in 2011/2012.

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 (2010-2013) is 36% of F_{MSY} and SSB_{2013} is about 225% of SSB_{MSY} (**BFTW-Figure 6**, **BFTW-Figure 7**). In contrast, estimates of stock status are more pessimistic with respect to spawning biomass if a high recruitment potential scenario is considered, with $F = 88\%$ of F_{MSY} and $SSB_{2013} = 48\%$ of SSB_{MSY} . However, the Committee notes that this is the first assessment where the stock was estimated to not be undergoing overfishing under both recruitment scenarios.

Compared to the 2012 assessment, the 2014 assessment estimated higher levels of SSB for all years dating back to the late 1990s, largely due to a rapid increase in one index and corrections to account for regulatory changes in another. In addition, the SSB_{MSY} currently estimated under the high recruitment potential scenario is updated to be 33% lower than had been estimated during the 2012 assessment due to revised estimates of the high recruitment potential (**BFTW-Figure 4**) scenario, and the SSB_{MSY} currently estimated under the low recruitment potential scenario is updated to be 2% higher than had been estimated during the 2012 assessment. The re-estimation of the SSB_{MSY} values resulted in a more optimistic perception of stock status, even under the high recruitment hypothesis. The increase in SSB between 2011 and 2013 estimated in the 2014 assessment is 5%.

The Committee recognizes that the large uncertainty in stock status is exacerbated by the lack of appropriate information/data and scientific surveys, and suggests using a scientific research quota (as recommended previously by the SCRS) to help support the improvement of stock abundance indices for western Atlantic bluefin tuna and overcome this standstill situation. However, the Committee also points out that the collection of the information mentioned above is a longterm endeavour.

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 in 2014. Future recruitment was assumed to fluctuate under two scenarios: (i) average levels observed for 1976-2010 (96,500 fish, the low recruitment potential scenario) and (ii) levels that increase as the stock rebuilds (MSY level of 212,000 fish, the high recruitment potential scenario). The Committee has insufficient evidence to favour either scenario over the other and notes that both are plausible (but not extreme) lower and upper bounds on rebuilding potential. A preliminary analysis conducted after the 2014 assessment meeting indicated an improved fit of assessment outputs by the low recruitment potential hypothesis (Anon. 2015d), however, a more comprehensive analysis (SCRS/2015/190) suggested the results were sensitive to the analysis assumptions, and that the conclusions were not robust to alternative assumptions. Therefore, the Committee is not in the position to favour one of the two scenarios. As is it unlikely that the conflicting scenarios will be resolved, the Committee considers that a more fruitful course may be to move away from the current high/low recruitment dichotomy and focus instead on adopting certain biological reference points and developing management procedures that are robust to these recruitment and other sources of uncertainty.

The outlook for bluefin tuna in the West Atlantic is summarized in **BFTW-Figure 8 and BFTW-Tables 1-3**. The low recruitment potential 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 2,250 t would result in a short-term minor decrease but with 2019 SSB approximately equal to that in 2013. If the high recruitment potential scenario is correct, then the western stock will not rebuild by 2019 even with no catch, although catches less than 2,500 t are predicted to prevent overfishing. In addition, the Committee noted that the available information from the updated abundance indices remains consistent with the estimated rebuilding from the 2014 stock assessment.

The Committee reiterates that the effects of mixing and management measures on the eastern stock remains a considerable source of uncertainty for the outlook of the western stock.

BFTW-5. Effect of current regulations

The Committee previously noted that Recommendations 08-04, 10-03 and 12-02 were expected to result in a rebuilding of the stock towards the Convention objective. The 2014 assessment estimates that the spawning biomass has increased substantially in recent years, which is consistent with these expectations. The Committee also noted that Recommendation 14-05, which was implemented in 2015, is expected to result in a rebuilding of the stock towards the Convention objective, but that there has not yet been enough time to detect the population response to the measure.

BFTW-6. Management recommendations

In 1998, the Commission initiated a 20-year rebuilding plan designed to achieve SSB_{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, 2012, 2013 and 2014 (Rec. 10-03, Rec. 12-02, Rec. 13-09) and 2,000 t in 2015 and 2016 (Rec. 14-05).

The 2014 assessment indicates similar historical trends in abundance as in previous assessments, but a more rapid increase in recent years. The strong 2002/2003 year classes and recent reduction in fishing mortality have contributed to this in recent years.

Future stock productivity, as with prior assessments, is based upon two hypotheses about future recruitment: a “high recruitment potential scenario” in which future recruitment has the potential to achieve levels that occurred in the early 1970s and a “low recruitment potential scenario” in which future recruitment is expected to remain near present levels (even if stock size increases). The results of 2014 assessment have shown that longterm implications of future biomass are different between the two hypotheses and the issue of identifying one of these two hypotheses, or an alternative one, as being the more realistic remains unresolved.

The Committee considered that the new information received this year did not warrant any change to the advice given last year regarding the implications of various catch levels.

Probabilities of achieving SSB_{MSY} within the Commission rebuilding period were projected for alternative catch levels (**BFTW-Table 1**). The “low recruitment potential scenario” suggests that spawning biomass is currently above SSB_{MSY} , whereas the “high recruitment potential scenario” suggests that SSB_{MSY} has a very low probability of being achieved within the rebuilding period. Despite this large uncertainty about the longterm future productivity of the stock, under either recruitment scenario catches of less than 2,250 t are estimated to allow the spawning biomass to be at or above current levels by 2019 (with 50% probability) and this level of catch should not be exceeded. While the Committee prefer to move away from current recruitment dichotomy, continued stock growth may allow one to determine if the average recruitment will increase.

The Committee reiterates the importance of establishing a scientific research quota to facilitate required research to improve the science, assessments, and management advice and therefore recommends the development of a formal process for implementing such scientific research quotas. Any research quota should be accommodated within the TAC. Research plans/projects funded/facilitated by such quotas should be vetted by the SCRS.

As noted previously by the Committee, both the productivity of western Atlantic bluefin tuna and western Atlantic bluefin tuna 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 (2014) Catch (including discards) | 1,626 t | |
| Assumed recruitment | Low potential | High potential |
| Maximum Sustainable Yield (MSY) | 3,050 (2807-3307) ¹ | 5,316 (4,442-5863) ¹ |
| SSB_{MSY} | 13,226 (12,969-13,645) ¹ | 63,102 (50,096-72,921) ¹ |
| SSB_{2013}/SSB_{MSY} | 2.25 (1.92-2.68) ¹ | 0.48 (0.35-0.72) ¹ |
| F_{MSY} | 0.20 (0.17-0.24) ¹ | 0.08 (0.07-0.10) ¹ |
| $F_{0.1}$ | 0.12 (0.11-0.13) ¹ | 0.12 (0.11-0.13) ¹ |
| $F_{2010-2012}/F_{MSY}$ ² | 0.36 (0.28-0.43) ¹ | 0.88 (0.64-1.08) ¹ |
| $F_{2010-2012}/F_{0.1}$ ² | 0.60 (0.50-0.72) ¹ | 0.60 (0.50-0.72) ¹ |
| Stock status | Overfished: No | Overfished: Yes |
| | Overfishing: No | Overfishing: No |
| Management Measures: | [Rec. 08-04] TAC of 1,900 t in 2009 and 1,800 t in 2010, including dead discards. | |
| | [Rec. 10-03, 12-02, 13-09] TAC of 1,750 t in 2011-2014, including dead discards. | |
| | [Rec. 14-05] TAC of 2,000 t in 2015-2016, including dead discards. | |

¹ Median and approximate 80% confidence interval from bootstrapping from the assessment.

² $F_{2010-2012}$ refers to the geometric mean of the estimates for 2010-2012 (a proxy for recent F levels).

BFTW-Table 1. Kobe II matrices (updated during the 2014 stock assessment) giving the probability that the spawning stock biomass will exceed the level that will produce MSY ($SSB > SSB_{MSY}$, not overfished) in any given year for various constant catch levels under the low recruitment and high recruitment scenarios. The current TAC of 2,000 t (Rec. 14-05) is indicated in bold.

Low Recruitment

| TAC (mt) | 2015 | 2016 | 2017 | 2018 | 2019 |
|-------------|---------------|---------------|---------------|---------------|---------------|
| 0 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 1500 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 1700 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 1750 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 1800 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 2000 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 2250 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 2500 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 2750 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 3000 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 3250 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 3500 | 100.0% | 100.0% | 100.0% | 100.0% | 99.8% |

High Recruitment

| TAC (mt) | 2015 | 2016 | 2017 | 2018 | 2019 |
|-------------|-------------|-------------|-------------|-------------|-------------|
| 0 | 1.2% | 1.4% | 1.4% | 1.6% | 6.0% |
| 1500 | 1.2% | 1.2% | 1.2% | 1.2% | 1.6% |
| 1700 | 1.2% | 1.2% | 1.2% | 1.2% | 1.6% |
| 1750 | 1.2% | 1.2% | 1.0% | 1.2% | 1.6% |
| 1800 | 1.2% | 1.2% | 1.0% | 1.2% | 1.6% |
| 2000 | 1.2% | 1.2% | 1.0% | 1.2% | 1.4% |
| 2250 | 1.2% | 1.2% | 0.8% | 0.4% | 1.2% |
| 2500 | 1.2% | 1.2% | 0.6% | 0.4% | 1.2% |
| 2750 | 1.2% | 1.0% | 0.4% | 0.4% | 1.2% |
| 3000 | 1.2% | 0.8% | 0.4% | 0.4% | 0.8% |
| 3250 | 1.2% | 0.8% | 0.4% | 0.2% | 0.8% |
| 3500 | 1.2% | 0.8% | 0.4% | 0.2% | 0.6% |

BFTW-Table 2. Kobe II matrices (updated during the 2014 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 and high recruitment scenarios. The current TAC of 2,000 t (Rec. 14-05) is indicated in bold.

Low Recruitment

| TAC (mt) | 2015 | 2016 | 2017 | 2018 | 2019 |
|-----------------|---------------|---------------|---------------|---------------|---------------|
| 0 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 1500 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 1700 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 1750 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 1800 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 2000 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 2250 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 2500 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 2750 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 3000 | 100.0% | 100.0% | 100.0% | 100.0% | 99.6% |
| 3250 | 100.0% | 99.8% | 99.6% | 99.4% | 98.4% |
| 3500 | 99.6% | 99.4% | 98.6% | 97.6% | 96.4% |

High Recruitment

| TAC (mt) | 2015 | 2016 | 2017 | 2018 | 2019 |
|-----------------|--------------|--------------|--------------|--------------|--------------|
| 0 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 1500 | 99.8% | 99.8% | 100.0% | 100.0% | 100.0% |
| 1700 | 98.0% | 98.2% | 98.6% | 98.8% | 99.2% |
| 1750 | 97.2% | 97.8% | 98.2% | 98.8% | 99.0% |
| 1800 | 96.6% | 97.4% | 97.8% | 98.2% | 98.6% |
| 2000 | 89.2% | 91.6% | 93.2% | 94.8% | 96.0% |
| 2250 | 73.6% | 79.2% | 83.0% | 85.6% | 88.2% |
| 2500 | 54.4% | 59.8% | 64.6% | 69.0% | 71.8% |
| 2750 | 34.6% | 40.0% | 44.8% | 50.2% | 51.6% |
| 3000 | 22.0% | 24.2% | 27.6% | 30.6% | 32.0% |
| 3250 | 13.8% | 15.2% | 17.0% | 18.4% | 19.2% |
| 3500 | 7.8% | 9.0% | 9.8% | 10.0% | 9.8% |

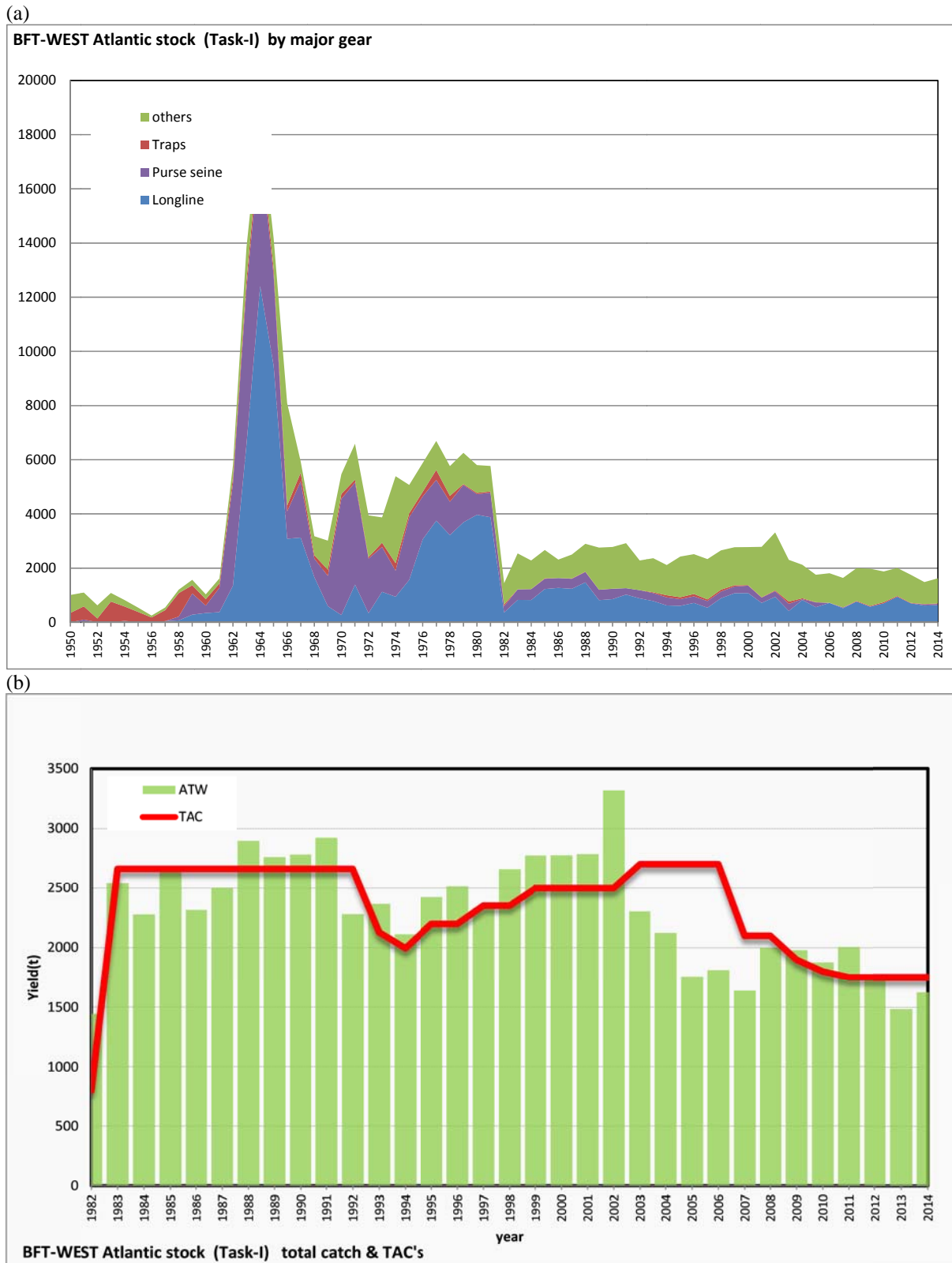
BFTW-Table 3. Kobe II matrices (updated during the 2014 stock assessment) giving the joint probability that the fishing mortality rate will be less than the level that will produce MSY ($F < F_{MSY}$) and the spawning stock biomass (SSB) will exceed the level that will produce MSY ($B > B_{MSY}$) in any given year for various constant catch levels under the low recruitment and high recruitment scenarios. The current TAC of 2,000 t (Rec. 14-05) is indicated in bold.

Low Recruitment

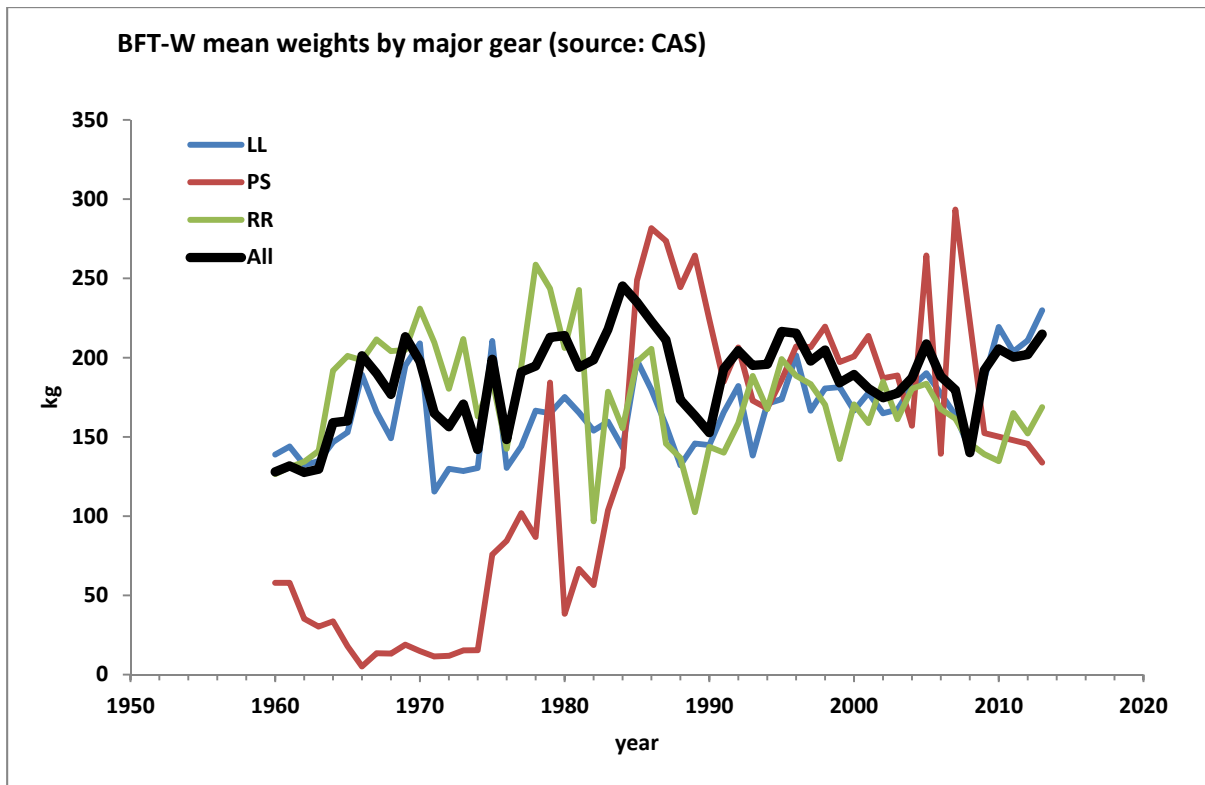
| TAC (mt) | 2015 | 2016 | 2017 | 2018 | 2019 |
|-------------|---------------|---------------|---------------|---------------|---------------|
| 0 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 1500 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 1700 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 1750 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 1800 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 2000 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 2250 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 2500 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 2750 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 3000 | 100.0% | 100.0% | 100.0% | 100.0% | 99.6% |
| 3250 | 100.0% | 99.8% | 99.6% | 99.4% | 98.4% |
| 3500 | 99.6% | 99.4% | 98.6% | 97.6% | 96.4% |

High Recruitment

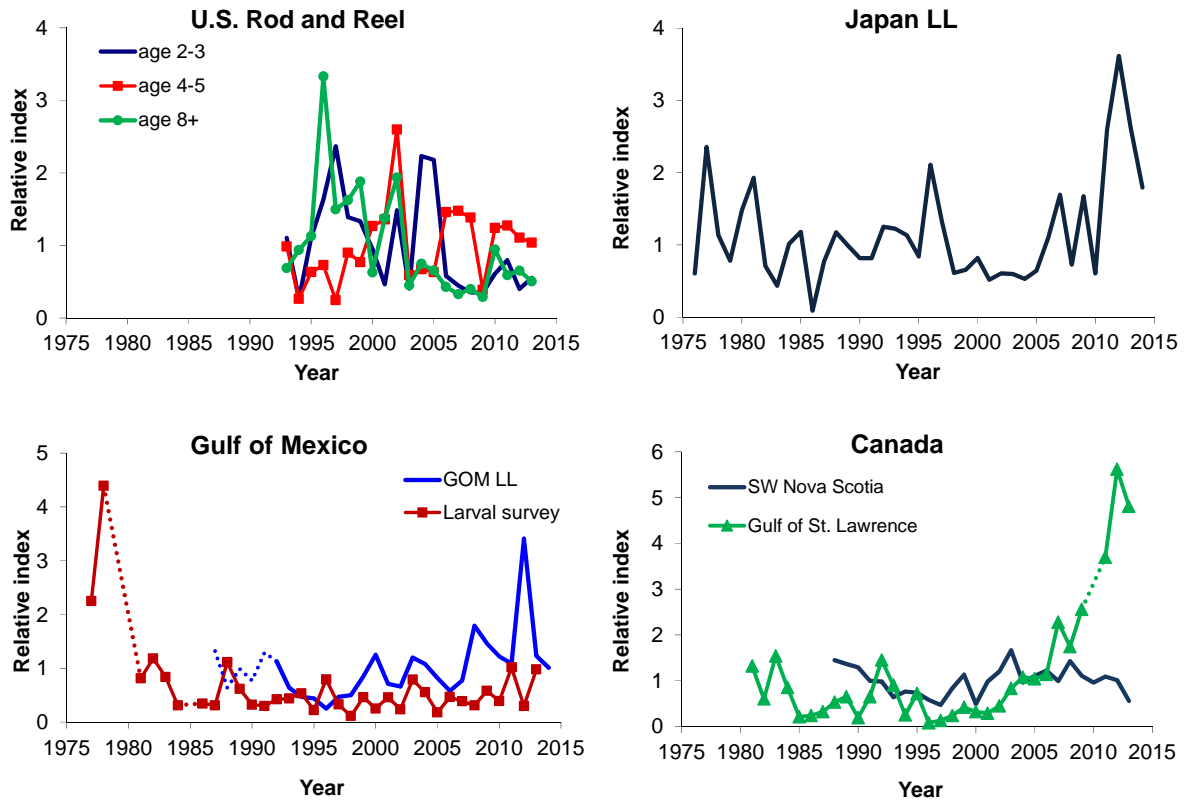
| TAC (mt) | 2015 | 2016 | 2017 | 2018 | 2019 |
|-------------|-------------|-------------|-------------|-------------|-------------|
| 0 | 1.2% | 1.4% | 1.4% | 1.6% | 6.0% |
| 1500 | 1.2% | 1.2% | 1.2% | 1.2% | 1.6% |
| 1700 | 1.2% | 1.2% | 1.2% | 1.2% | 1.6% |
| 1750 | 1.2% | 1.2% | 1.0% | 1.2% | 1.6% |
| 1800 | 1.2% | 1.2% | 1.0% | 1.2% | 1.6% |
| 2000 | 1.2% | 1.2% | 1.0% | 1.2% | 1.4% |
| 2250 | 1.2% | 1.2% | 0.8% | 0.4% | 1.2% |
| 2500 | 1.2% | 1.2% | 0.6% | 0.4% | 1.2% |
| 2750 | 1.2% | 1.0% | 0.4% | 0.4% | 1.2% |
| 3000 | 1.2% | 0.8% | 0.4% | 0.4% | 0.8% |
| 3250 | 1.2% | 0.8% | 0.4% | 0.2% | 0.8% |
| 3500 | 1.0% | 0.6% | 0.2% | 0.2% | 0.6% |



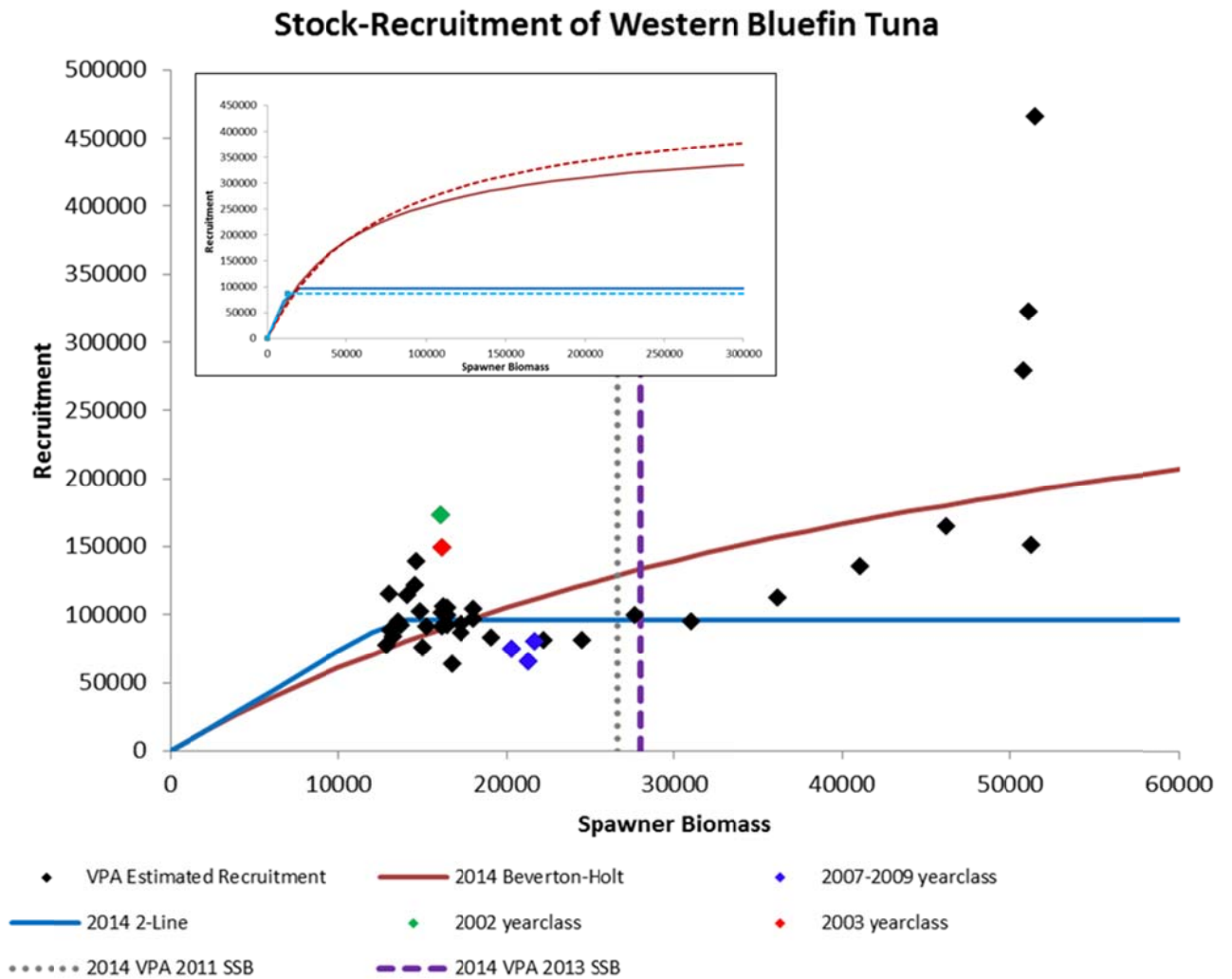
BFTW-Figure 1. Historical catches of western bluefin tuna: (a) by gear type and (b) in comparison to TAC levels agreed by the Commission.



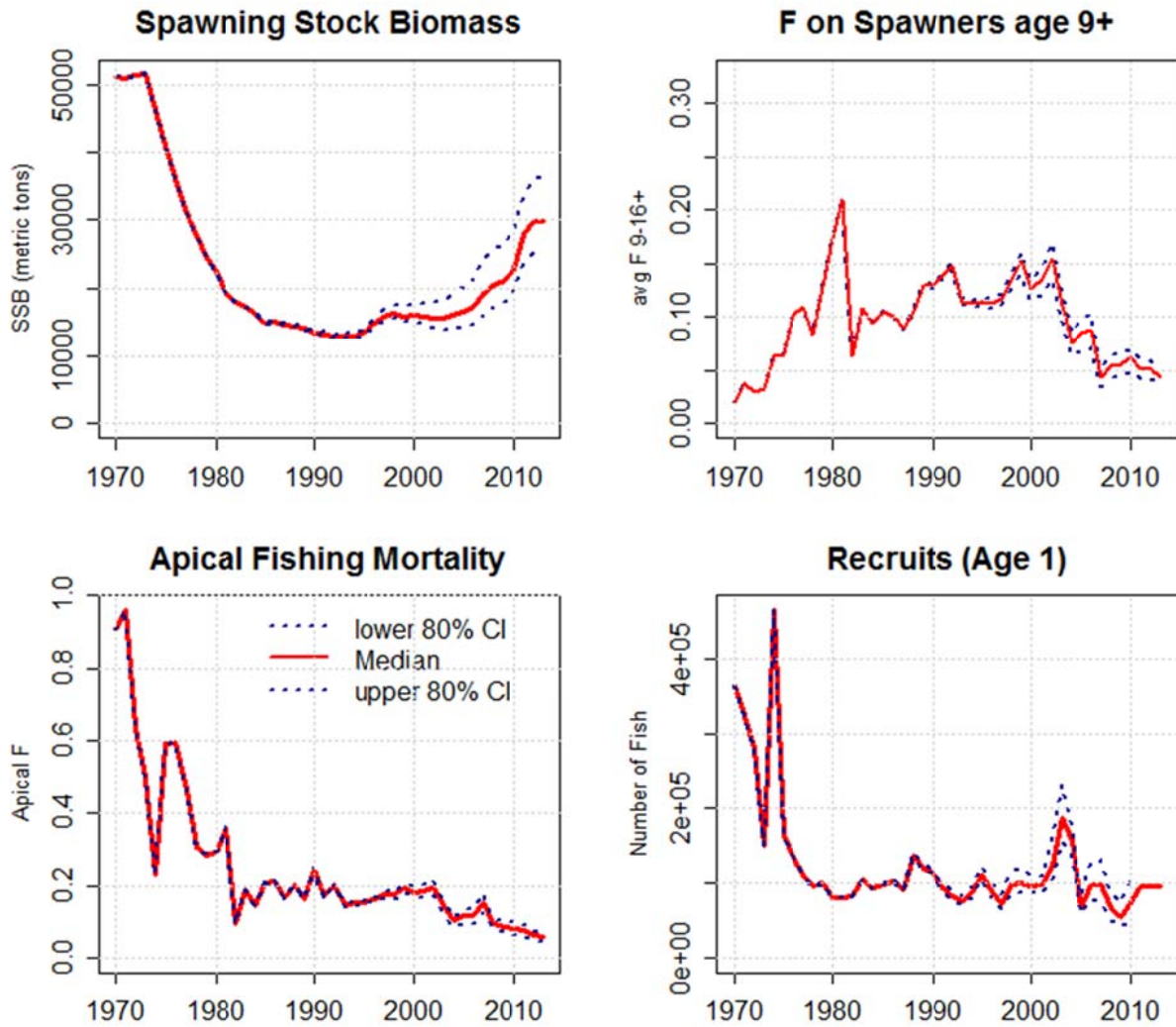
BFTW-Figure 2. Mean weight of western bluefin tuna catches by purse seine, longline, rod and reel, and all gears combined (estimated from the catch-at-size compiled information).



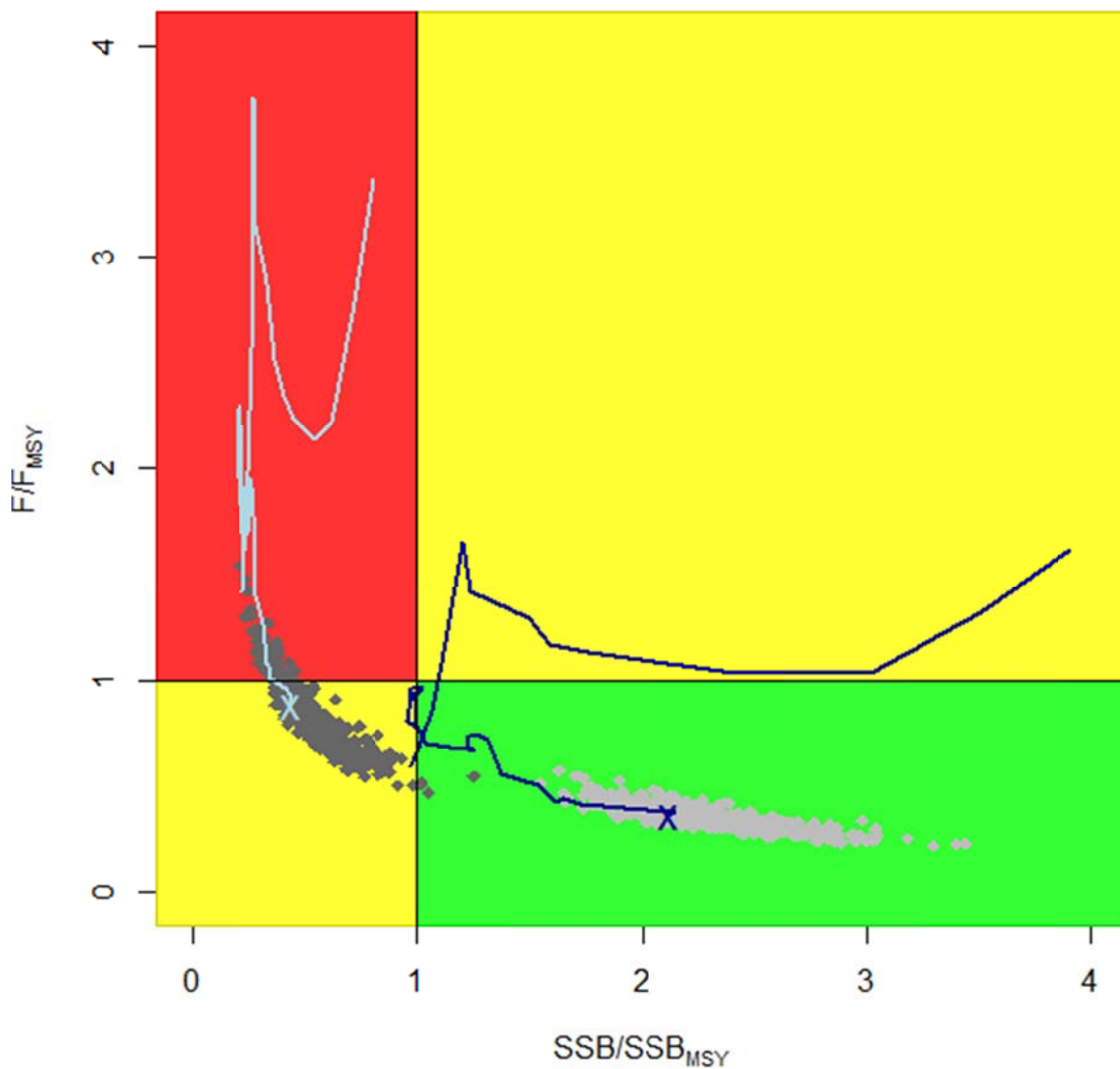
BFTW-Figure 3. Updated indices of abundance for western bluefin tuna. The dashed portions of the larval survey, U.S. Gulf of Mexico, and Canada Gulf of St. Lawrence indices bridge the gaps between years where data were missing or otherwise considered unreliable by the SCRS. The U.S. longline in the Gulf of Mexico and Japanese longline were updated.



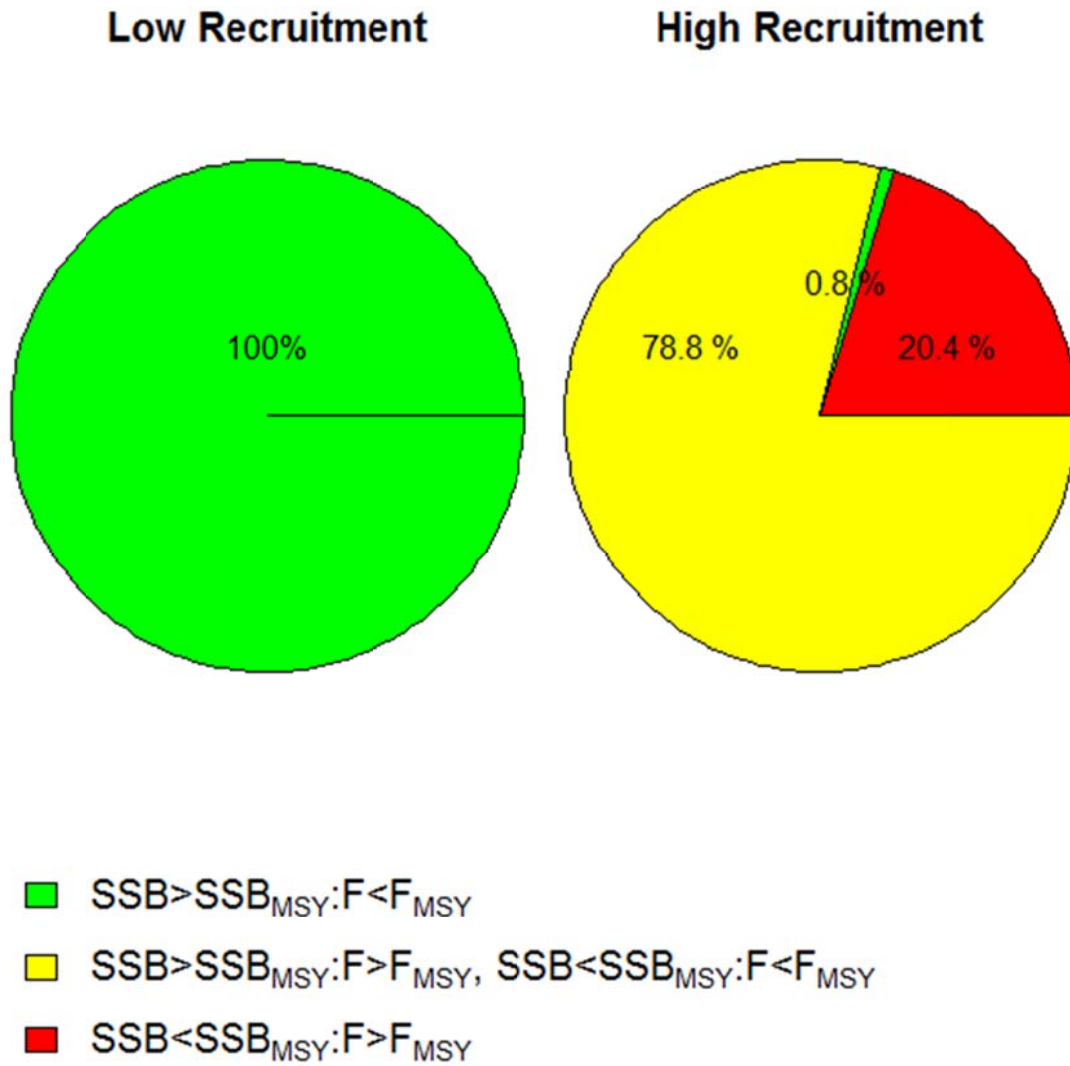
BFTW-Figure 4. Recruitment scenario derived from the 2014 stock assessment. The low recruitment potential scenario (2-line) implies future recruitment will remain near present levels even if stock size increases. The “high recruitment potential scenario” (Beverton-Holt) implies future recruitment increases with stock size and has the potential to achieve levels that occurred in the early 1970s. Points represent the estimates from the 2014 base assessment, with the 2002, 2003, and recent year class estimates (2008-2010) highlighted. The two vertical lines represent SSB estimates from the 2014 assessment for 2011 (leftmost) and 2013 (rightmost). The inset graph shows the corresponding relationships estimated for the 2012 (dashed lines) and 2014 (solid lines) assessments illustrating the difference in the estimated stock recruitment relationship between 2012 and 2014.



BFTW-Figure 5. 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.

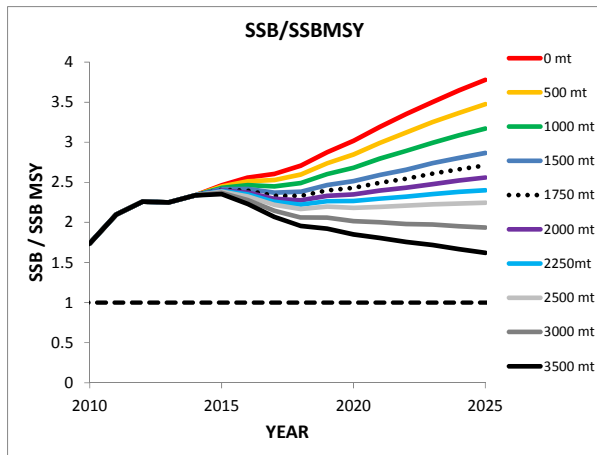


BFTW-Figure 6. Estimated status of stock relative to the Convention objectives (MSY) by year (1973 to 2013) and recruitment scenario (light blue=high recruitment potential, dark blue=low recruitment potential). The light gray dots represent the status estimated for 2013 under the low recruitment scenario, corresponding to bootstrap estimates of uncertainty. The dark blue lines give the historical point estimates for the low recruitment, and the light blue gives the historic trend for the high recruitment.

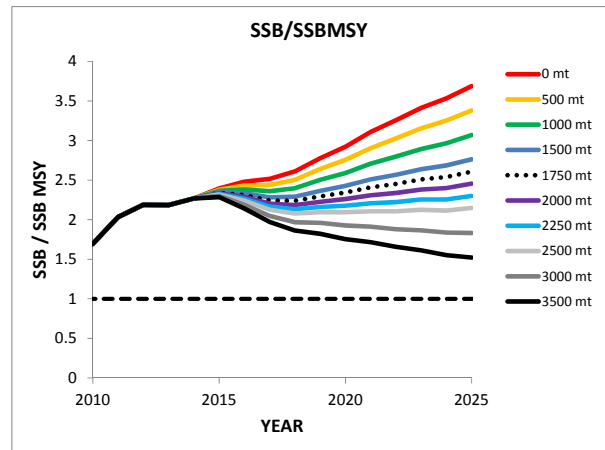


BFTW-Figure 7. Pie chart summarizing stock status, showing the proportion of model outputs that are not overfished and not undergoing overfishing (green), either overfished or undergoing overfishing (yellow) and both overfished and undergoing overfishing (red).

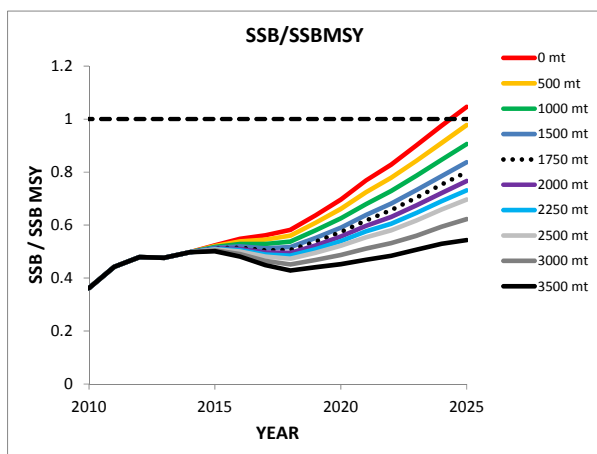
A) 50% probability
Low recruitment potential



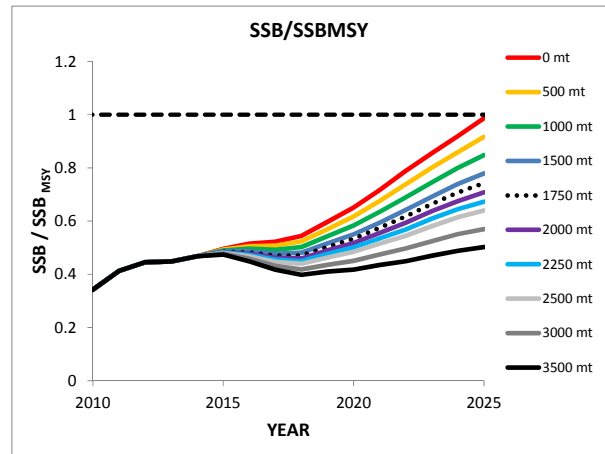
B) 60% probability
Low recruitment potential



C) 50% probability
High Recruitment potential



D) 60% probability
High recruitment potential



BFTW-Figure 8. Projections of spawning stock biomass (SSB) for the Base Case assessment under low recruitment potential (top panels) and high recruitment potential (bottom panels) with an assumed catch of 1,750 t in 2014 and various levels of constant catch starting in 2015. 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 BUM – 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 32°-34° N. 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 inhabit the upper parts of the open ocean. Blue marlin spend the majority of their time in the mixed surface layer (58% of daylight and 84% of nighttime hours), however, they regularly make short-duration dives 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 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. Although historical catches from some Antillean artisanal fleets have been recently included in Task I there still an unknown number of Antillean artisanal fleets that may have unreported catches of blue marlin caught around MFADs. It is important that the amount of these catches be documented. 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 2014 were 1,981 t, compared to 1,352 t reported for 2013. Task I catches of blue marlin for 2014 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, 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 indicate that, the declining trend in biomass had partially stabilized, current results indicated 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; BUM-Table 2**). The current management plan has the potential of recovering the blue marlin stock to the B_{MSY} level if properly conducted.

BUM-5. Effect of current regulations

A 2006 recommendation (Rec. 06-09) established that the annual amount 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. Furthermore, in 2012, the Commission established a TAC for 2013, 2014, and 2015 of 2,000 t (Rec. 12-04), placed additional catch and commerce restrictions in recreational fisheries for blue marlin and white marlin, and requested methods for estimating live and dead discards of blue marlin and white marlin/spearfish.

The Committee is concerned with the significant increase in the contribution from non-industrial fisheries to the total blue marlin harvest and that these fisheries are not fully accounted for in the current ICCAT database. The Committee expressed its serious concern over this limitation on data for future assessments. Such data limitation precludes any analysis of the current regulations.

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

In 2012, the Commission implemented Rec. 12-04, intended to reduce the total harvest to 2,000 t in 2013, 2014, and 2015 to allow the rebuilding of the blue marlin stock from the overfished condition. The Committee expressed its concern on the effectiveness of such measure in light of severe under reporting currently occurring in some fisheries. Therefore, the Committee alerts the Commission that unless such non-compliance issues are properly addressed the adoption of additional measures might be rendered ineffective.

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. 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. Currently, four ICCAT Contracting Parties (Brazil, Canada, Mexico and the United States) already mandate or encourage the use of circle hooks on their pelagic longline fleets. The Committee considers the use of non-offset circle hooks can reduce billfish mortality in most fisheries and recommends the Commission consider this approach. In addition, the Commission should consider actions to reduce fishing mortality of blue marlin from non-industrial fisheries.

ATLANTIC BLUE MARLIN SUMMARY

Maximum Sustainable Yield 2,837 t (2,343 – 3,331 t)¹

Current (2014) Yield 1,981 t²

Relative Biomass
(SSB₂₀₀₉/SSB_{MSY}) 0.67 (0.53 – 0.81)¹

Relative Fishing Mortality
(F₂₀₀₉/F_{MSY}) 1.63 (1.11 – 2.16)¹

Stock Status Overfished: Yes

Overfishing: Yes

Conservation and Management Recommendation [Rec. 12-04].
Measures in Effect: Reduce the total harvest to 2,000 t in 2013, 2014, and 2015.

¹ Stock Synthesis version 3.2.0.b model results. Values correspond to median estimates, 95% confidence interval values are provided in parenthesis.

² 2014 yield should be considered provisional.

BUM-Table 1. Estimated catches (t) of Atlantic blue marlin (*Makaira nigricans*) by area, gear and flag. (v2, 2015-09-25)

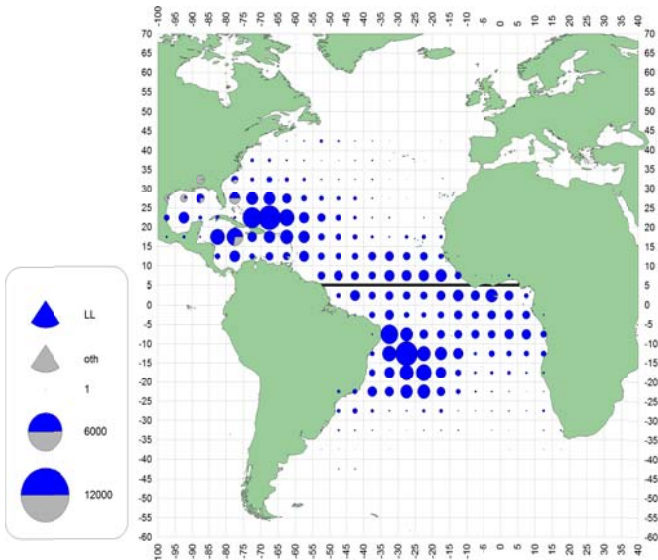
| | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | | |
|----------------------------|----------|----------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-----|-----|
| TOTAL | 4650 | 4269 | 3142 | 3223 | 4318 | 4260 | 5451 | 5787 | 5791 | 5456 | 5377 | 4446 | 3733 | 4320 | 2854 | 3298 | 2948 | 3978 | 4497 | 3497 | 3207 | 2376 | 2185 | 1352 | 1981 | | |
| ATN | 2055 | 1528 | 1237 | 1250 | 1728 | 1757 | 2213 | 2310 | 2827 | 2387 | 2553 | 1735 | 1525 | 1642 | 1245 | 1286 | 1302 | 1539 | 1958 | 1701 | 1541 | 1337 | 1389 | 871 | 1080 | | |
| ATS | 2595 | 2741 | 1905 | 1974 | 2590 | 2503 | 3238 | 3478 | 2963 | 3069 | 2824 | 2711 | 2208 | 2678 | 1609 | 2011 | 1646 | 2439 | 2539 | 1796 | 1667 | 1038 | 796 | 480 | 901 | | |
| Landings | ATN | Longline | 1692 | 1080 | 740 | 792 | 1279 | 1188 | 1591 | 1712 | 1633 | 1448 | 1368 | 920 | 920 | 976 | 968 | 1031 | 982 | 1061 | 1496 | 1352 | 1212 | 972 | 965 | 616 | 742 |
| Other surf. | 155 | 245 | 261 | 217 | 220 | 343 | 363 | 440 | 1088 | 820 | 1089 | 694 | 466 | 625 | 212 | 212 | 221 | 316 | 227 | 217 | 199 | 179 | 207 | 161 | 210 | | |
| Sport (HL+RR) | 49 | 62 | 90 | 113 | 118 | 73 | 64 | 60 | 56 | 38 | 36 | 97 | 90 | 22 | 31 | 18 | 62 | 120 | 197 | 90 | 110 | 132 | 174 | 38 | 76 | | |
| ATS | Longline | 1958 | 2286 | 1490 | 1419 | 1767 | 1679 | 2194 | 2545 | 2068 | 1977 | 1776 | 1465 | 901 | 1234 | 909 | 1010 | 807 | 1400 | 1051 | 944 | 822 | 586 | 496 | 259 | 592 | |
| Other surf. | 634 | 453 | 414 | 553 | 821 | 822 | 1041 | 863 | 893 | 1090 | 1049 | 1245 | 1308 | 1444 | 701 | 1000 | 836 | 1030 | 1484 | 847 | 839 | 443 | 258 | 189 | 281 | | |
| Sport (HL+RR) | 2 | 1 | 0 | 1 | 2 | 2 | 2 | 28 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 9 | 3 | 5 | 6 | 7 | 13 | 2 | | | |
| Discards | ATN | Longline | 159 | 142 | 146 | 127 | 111 | 153 | 196 | 97 | 49 | 81 | 60 | 22 | 37 | 19 | 34 | 24 | 36 | 42 | 37 | 40 | 19 | 53 | 42 | 56 | 51 |
| Other surf. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 11 | 0 | 1 | 1 | 0 | 0 | 1 | 2 | 0 | 0 | 1 | 0 | | |
| ATS | Longline | 0 | 0 | 0 | 0 | 0 | 1 | 42 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 2 | 28 | 30 | 28 | | |
| Landings | ATN | Barbados | 18 | 12 | 18 | 21 | 19 | 31 | 25 | 30 | 25 | 19 | 19 | 18 | 11 | 11 | 0 | 25 | 0 | 0 | 0 | 9 | 13 | 14 | 11 | 12 | |
| Belize | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 3 | 4 | 8 | | |
| Brazil | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Canada | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| China PR | 0 | 0 | 0 | 0 | 41 | 48 | 41 | 51 | 79 | 133 | 9 | 31 | 15 | 17 | 10 | 49 | 0 | 4 | 2 | 26 | 47 | 35 | 38 | 24 | 12 | | |
| Chinese Taipei | 937 | 716 | 336 | 281 | 272 | 187 | 170 | 355 | 80 | 44 | 64 | 65 | 48 | 66 | 104 | 38 | 35 | 30 | 16 | 25 | 13 | 25 | 18 | 17 | 22 | | |
| Cuba | 112 | 127 | 135 | 69 | 39 | 85 | 43 | 53 | 12 | 38 | 55 | 56 | 34 | 3 | 4 | 7 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| Curaçao | 50 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 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 | 64 | 69 | 75 | 36 | 44 | 55 | 58 | 106 | 76 | 76 | 60 | 0 | 0 | 0 | | | |
| Dominican Republic | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 41 | 71 | 29 | 19 | 23 | 0 | 207 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| EU.España | 5 | 1 | 6 | 7 | 6 | 2 | 25 | 5 | 36 | 15 | 25 | 8 | 1 | 6 | 27 | 12 | 23 | 14 | 23 | 6 | 14 | 2 | 4 | 4 | 12 | | |
| EU.France | 85 | 98 | 115 | 179 | 191 | 197 | 252 | 299 | 333 | 370 | 397 | 428 | 443 | 443 | 450 | 470 | 470 | 461 | 585 | 498 | 344 | 461 | 395 | 212 | 393 | | |
| EU.Portugal | 1 | 4 | 2 | 15 | 11 | 10 | 7 | 3 | 47 | 8 | 20 | 17 | 2 | 31 | 27 | 24 | 36 | 56 | 56 | 26 | 56 | 16 | 23 | 10 | 11 | | |
| FR.St Pierre et Miquelon | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| Grenada | 52 | 64 | 52 | 58 | 52 | 50 | 26 | 47 | 60 | 100 | 87 | 104 | 69 | 72 | 45 | 42 | 33 | 49 | 54 | 45 | 45 | 45 | 0 | 0 | | | |
| Jamaica | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| Japan | 250 | 145 | 193 | 207 | 532 | 496 | 798 | 625 | 656 | 427 | 442 | 155 | 125 | 148 | 174 | 251 | 199 | 221 | 489 | 477 | 460 | 197 | 242 | 114 | 111 | | |
| Korea Rep. | 240 | 34 | 11 | 2 | 16 | 16 | 41 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 14 | 30 | 43 | 28 | 53 | 44 | 26 | 17 | 6 | | |
| Liberia | 0 | 0 | 0 | 0 | 0 | 87 | 148 | 148 | 701 | 420 | 712 | 235 | 158 | 115 | 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 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| Mexico | 0 | 0 | 0 | 3 | 13 | 13 | 13 | 13 | 27 | 35 | 68 | 37 | 50 | 70 | 90 | 86 | 64 | 91 | 81 | 93 | 89 | 68 | 106 | 86 | 67 | | |
| Mixed flags (FR+ES) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 34 | 71 | 35 | 38 | 65 | 37 | 29 | 43 | 26 | 39 | 45 | 49 | 0 | 0 | | | |
| NEI (BIL) | 18 | 20 | 38 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 52 | 164 | 254 | 151 | 28 | 0 | 49 | 68 | 82 | 45 | 0 | 0 | 0 | 0 | | | |
| NEI (ETRO) | 0 | 0 | 0 | 71 | 134 | 149 | 178 | 225 | 330 | 312 | 202 | 112 | 7 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| Panama | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| Philippines | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 38 | 38 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | | | |
| Senegal | 1 | 4 | 8 | 0 | 9 | 0 | 2 | 5 | 0 | 0 | 11 | 24 | 32 | 11 | 1 | 5 | 91 | 114 | 61 | 41 | 64 | 155 | 45 | 63 | | | |
| St. Vincent and Grenadines | 0 | 0 | 1 | 2 | 2 | 2 | 0 | 1 | 0 | 0 | 0 | 19 | 0 | 0 | 0 | 0 | 1 | 3 | 2 | 1 | 0 | 0 | 2 | 0 | | | |
| Sta. Lucia | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 1 | 0 | 10 | 5 | 0 | 18 | 17 | 21 | 53 | 46 | 70 | 72 | 58 | 64 | 119 | 99 | | | |
| Trinidad and Tobago | 11 | 6 | 1 | 2 | 16 | 28 | 14 | 49 | 15 | 20 | 51 | 17 | 16 | 9 | 11 | 7 | 14 | 16 | 34 | 26 | 22 | 25 | 46 | 48 | | | |
| U.S.A. | 29 | 33 | 51 | 80 | 88 | 43 | 43 | 46 | 50 | 37 | 24 | 16 | 17 | 19 | 26 | 16 | 17 | 9 | 13 | 6 | 4 | 6 | 14 | 9 | | | |
| 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 | 17 | 18 | 19 | 11 | 15 | 15 | 3 | 5 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 0 | 1 | 2 | 2 | | | |
| UK.British Virgin Islands | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 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 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| Ukraine | 0 | 15 | 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 | 2 | 1 | 0 | 0 | 0 | 0 | 6 | 8 | 5 | 3 | | | |
| Venezuela | 70 | 49 | 66 | 74 | 122 | 106 | 137 | 130 | 205 | 220 | 108 | 72 | 76 | 84 | 83 | 138 | 131 | 206 | 120 | 107 | 136 | 96 | 138 | 108 | | | |
| ATS | Angola | 0 | 0 | 0 | 0 | 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 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 2 | 3 | 43 | 15 | | | |
| Benin | 6 | 6 | 6 | 6 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| Brazil | 52 | 61 | 125 | 147 | 81 | 180 | 331 | 193 | 486 | 509 | 452 | 780 | 387 | 577 | 195 | 612 | 298 | 262 | 182 | 150 | 133 | 63 | 48 | 16 | | | |
| China PR | 0 | 0 | 0 | 0 | 21 | 25 | 21 | 27 | 41 | 68 | 15 | 61 | 73 | 72 | 49 | 47 | 0 | 61 | 11 | 51 | 54 | 64 | 24 | 21 | | | |
| Chinese Taipei | 767 | 956 | 488 | 404 | 391 | 280 | 490 | 1123 | 498 | 442 | 421 | 175 | 246 | 253 | 211 | 113 | 64 | 203 | 132 | 170 | 140 | 174 | 115 | 61 | | | |
| Cuba | 90 | 62 | 69 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| Côte D'Ivoire | 88 | 105 | 79</ | | | | | | | | | | | | | | | | | | | | | | | | |

| | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|----------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Korea Rep. | 84 | 503 | 13 | 11 | 40 | 40 | 103 | 40 | 2 | 3 | 1 | 1 | 0 | 0 | 1 | 4 | 19 | 33 | 47 | 8 | 32 | 13 | 8 | 7 | 4 |
| Mixed flags (FR+ES) | 199 | 137 | 116 | 146 | 133 | 126 | 96 | 82 | 80 | 83 | 113 | 80 | 96 | 110 | 106 | 112 | 108 | 92 | 113 | 125 | 133 | 0 | 0 | 0 | 0 |
| NEI (BIL) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 20 | 4 | 16 | 61 | 7 | 110 | 141 | 123 | 133 | 0 | 0 | 0 | 0 | 0 |
| NEI (ETRO) | 0 | 0 | 0 | 103 | 192 | 214 | 256 | 323 | 474 | 449 | 290 | 162 | 10 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Namibia | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 10 | 0 | 8 | 36 |
| Panama | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 38 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Philippines | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 33 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 3 | 3 | 0 | 0 | 0 |
| Russian Federation | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S. Tomé e Príncipe | 17 | 18 | 21 | 25 | 28 | 33 | 36 | 35 | 33 | 30 | 32 | 32 | 32 | 32 | 9 | 21 | 26 | 0 | 68 | 70 | 72 | 72 | 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 | 9 | 0 | 9 |
| South Africa | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 4 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| St. Vincent and Grenadines | 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 |
| Togo | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 0 | 73 | 53 | 141 | 103 | 775 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| U.S.S.R. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| U.K.Sta Helena | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 2 | 12 | 2 | 1 |
| Uruguay | 0 | 0 | 0 | 0 | 3 | 1 | 1 | 26 | 23 | 0 | 0 | 0 | 1 | 5 | 3 | 2 | 8 | 5 | 0 | 6 | 0 | 0 | 0 | 0 | 0 |
| Vanuatu | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 |
| Discards | | | | | | | | | | | | | | | | | | | | | | | | | |
| ATN | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chinese Taipei | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 1 | 2 |
| Korea Rep. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 1 |
| 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. | 159 | 142 | 146 | 127 | 111 | 153 | 196 | 97 | 50 | 81 | 60 | 25 | 49 | 19 | 35 | 25 | 36 | 42 | 38 | 42 | 19 | 50 | 39 | 55 | 49 |
| ATS | | | | | | | | | | | | | | | | | | | | | | | | | |
| Brazil | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Chinese Taipei | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 28 | 30 | 28 |
| Korea Rep. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 |
| U.S.A. | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 42 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

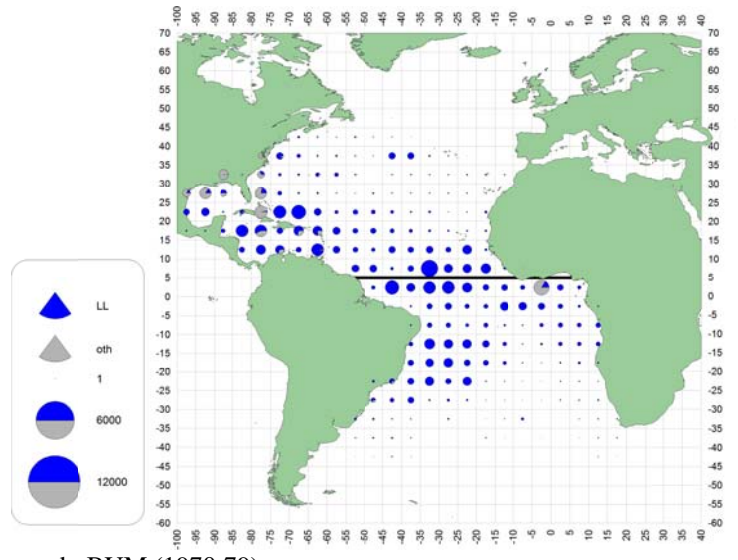
1. Brazilian Task I catches from 2012 to 2014 are preliminary and under revision.

BUM Table 2. Kobe II Strategy Matrix (K2SM). Percent values indicate the probability of achieving the goal of $SSB_{yr} \geq SSB_{MSY}$ and $F_{yr} < F_{MSY}$ for each year (yr) under different constant catch scenarios (TAC t).

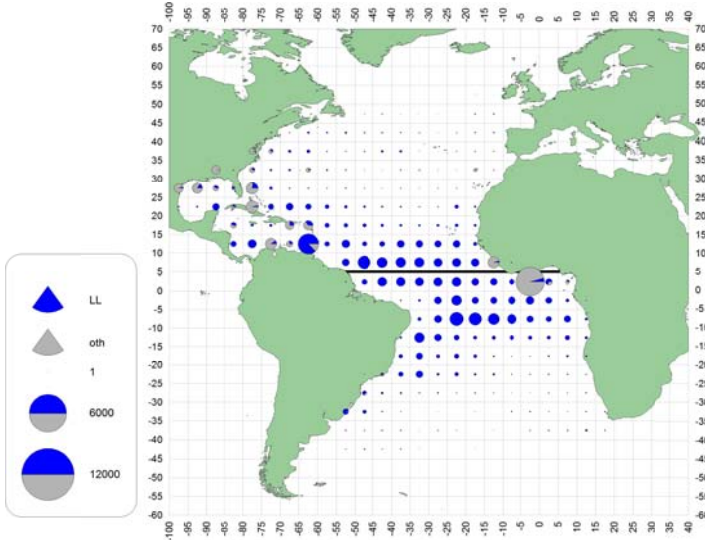
| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0 | 0 | 2 | 9 | 19 | 33 | 49 | 63 | 74 | 81 | 87 | 92 | 94 | 96 | 97 | 98 |
| 500 | 0 | 2 | 6 | 13 | 23 | 35 | 47 | 58 | 67 | 74 | 80 | 84 | 88 | 91 | 93 |
| 1000 | 0 | 1 | 4 | 9 | 15 | 22 | 31 | 40 | 49 | 56 | 63 | 68 | 73 | 77 | 81 |
| 1500 | 0 | 1 | 3 | 6 | 9 | 13 | 18 | 24 | 30 | 36 | 41 | 46 | 57 | 55 | 59 |
| 2000 | 0 | 1 | 2 | 3 | 5 | 7 | 10 | 12 | 16 | 18 | 21 | 24 | 20 | 29 | 32 |
| 2500 | 0 | 1 | 1 | 2 | 3 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 3000 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 |
| 3500 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |



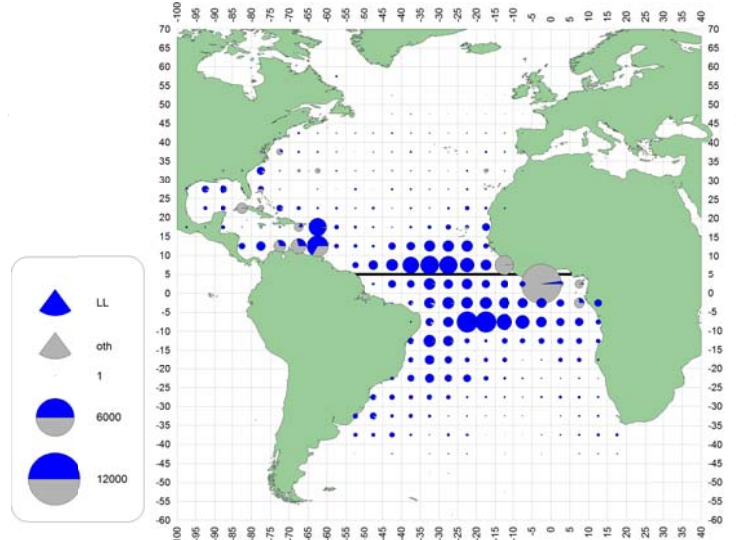
a. BUM (1960-69)



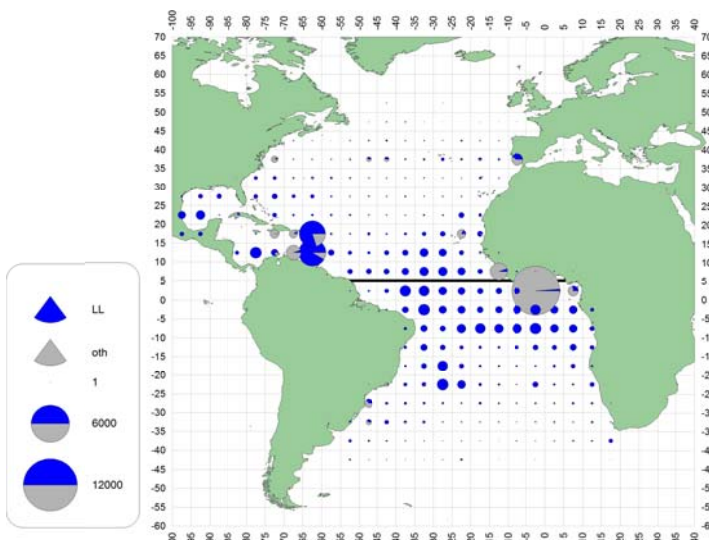
b. BUM (1970-79)



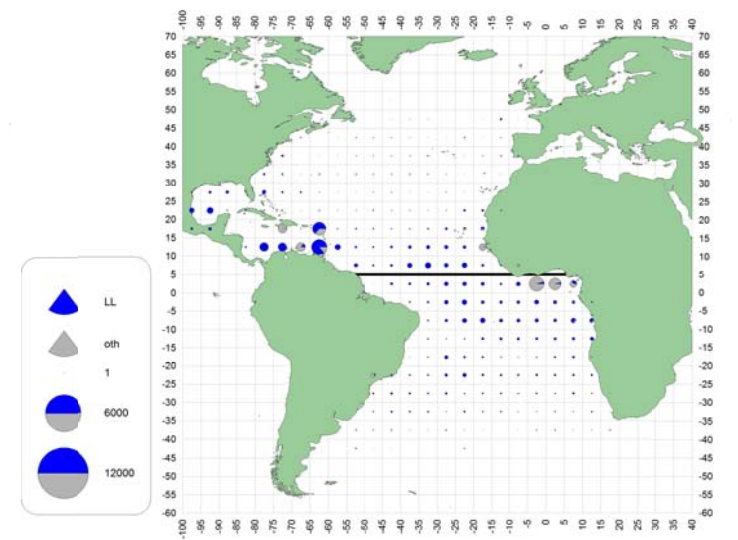
c. BUM (1980-89)



d. BUM (1990-99)

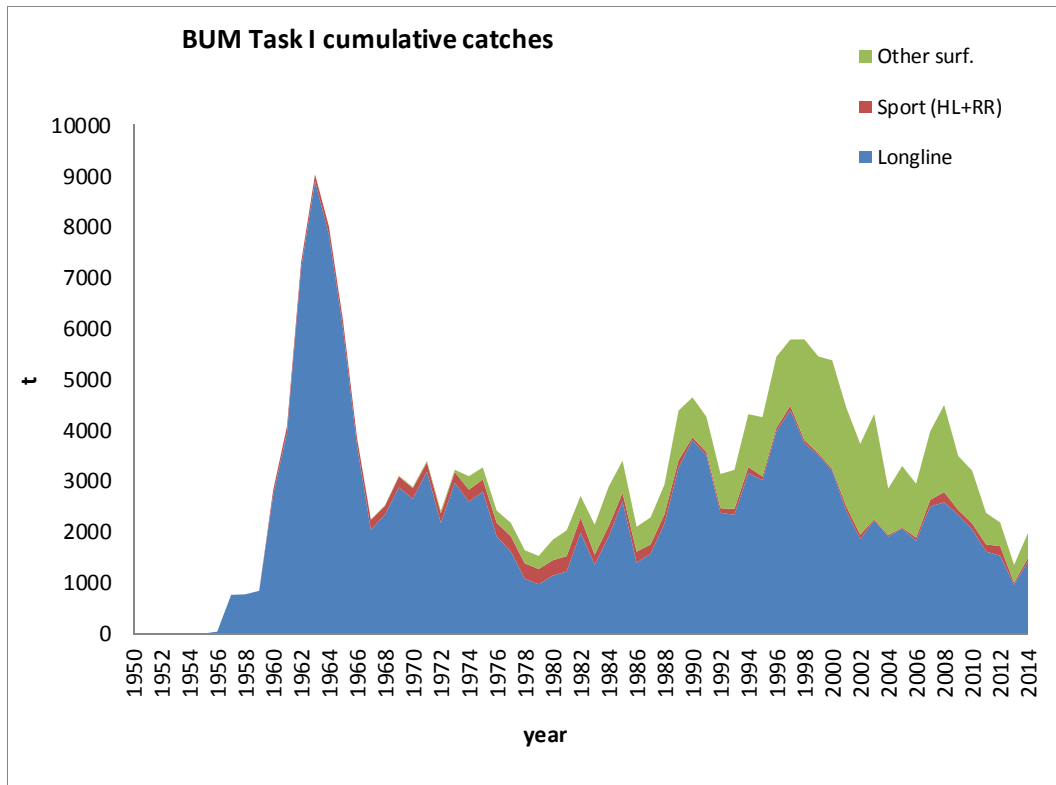


e. BUM (2000-09)

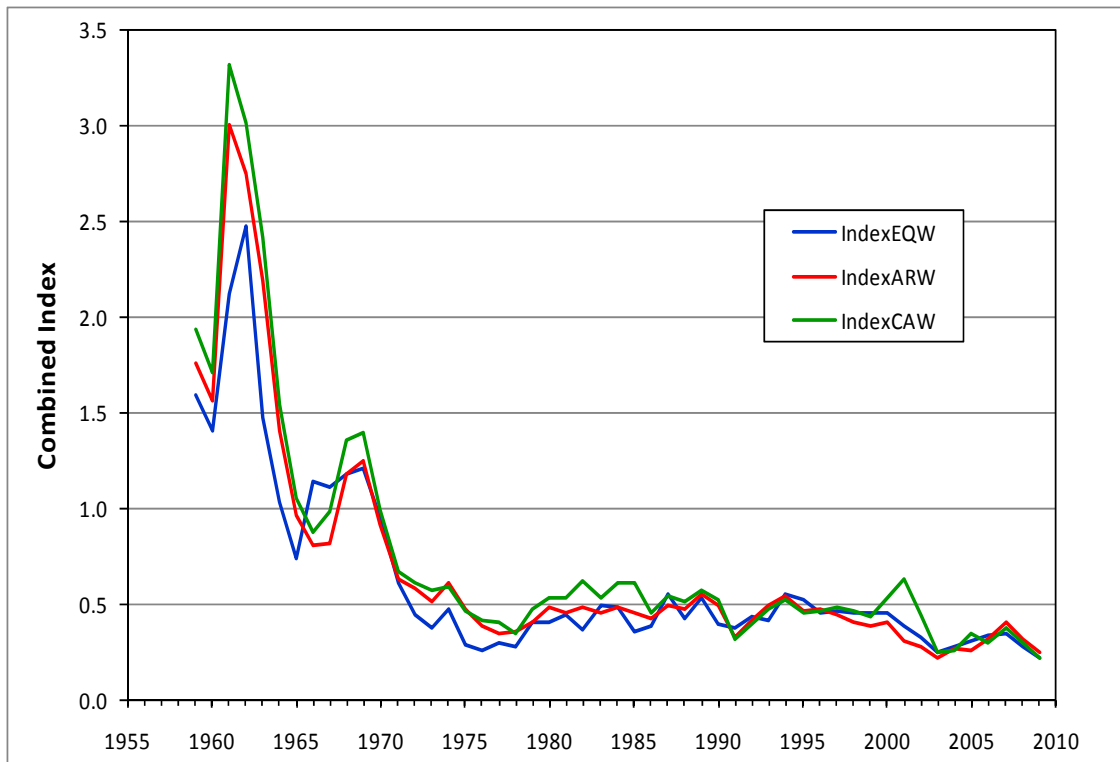


f. BUM (2010-13)

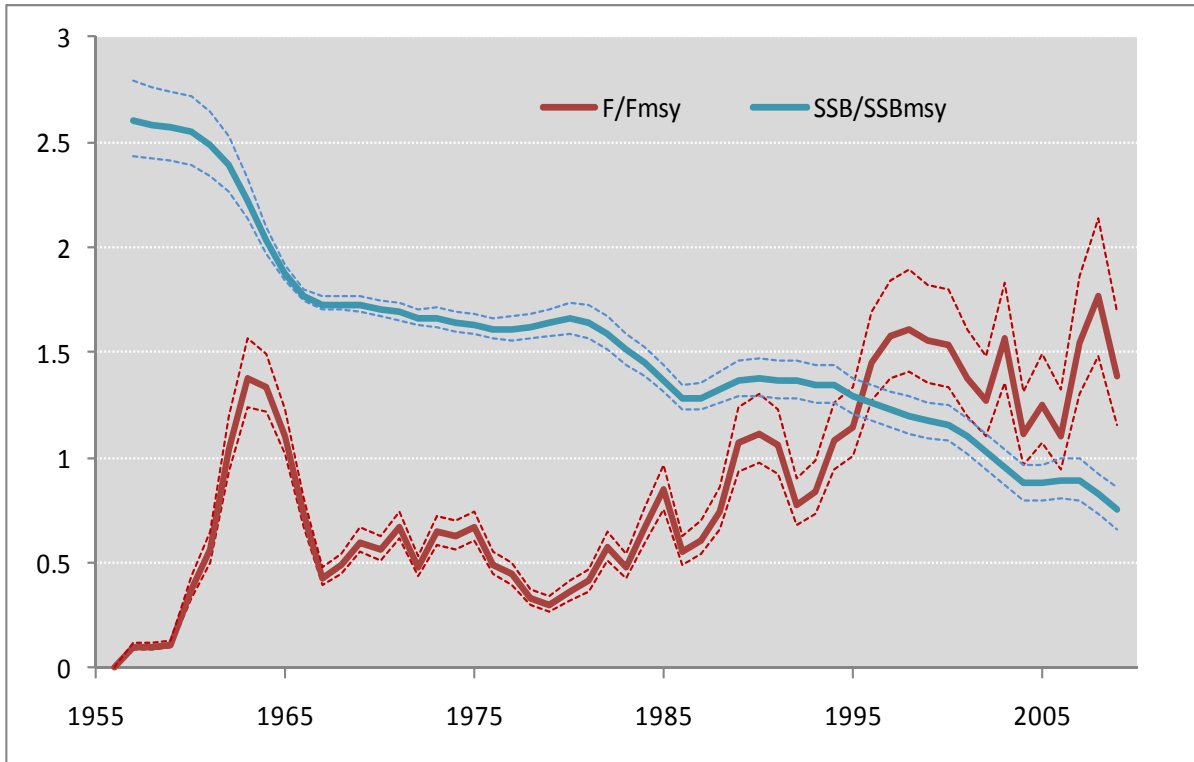
BUM-Figure 1. Geographic distribution of mean blue marlin catch by major gears and decade.



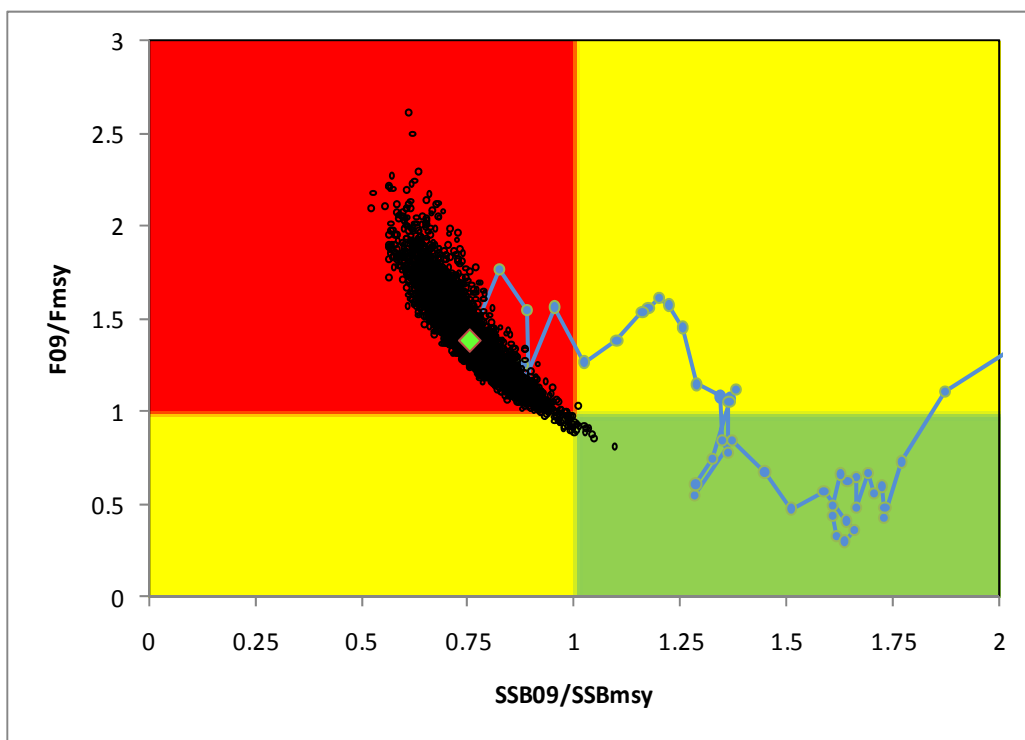
BUM-Figure 2. Total catch of blue marlin reported in Task I.



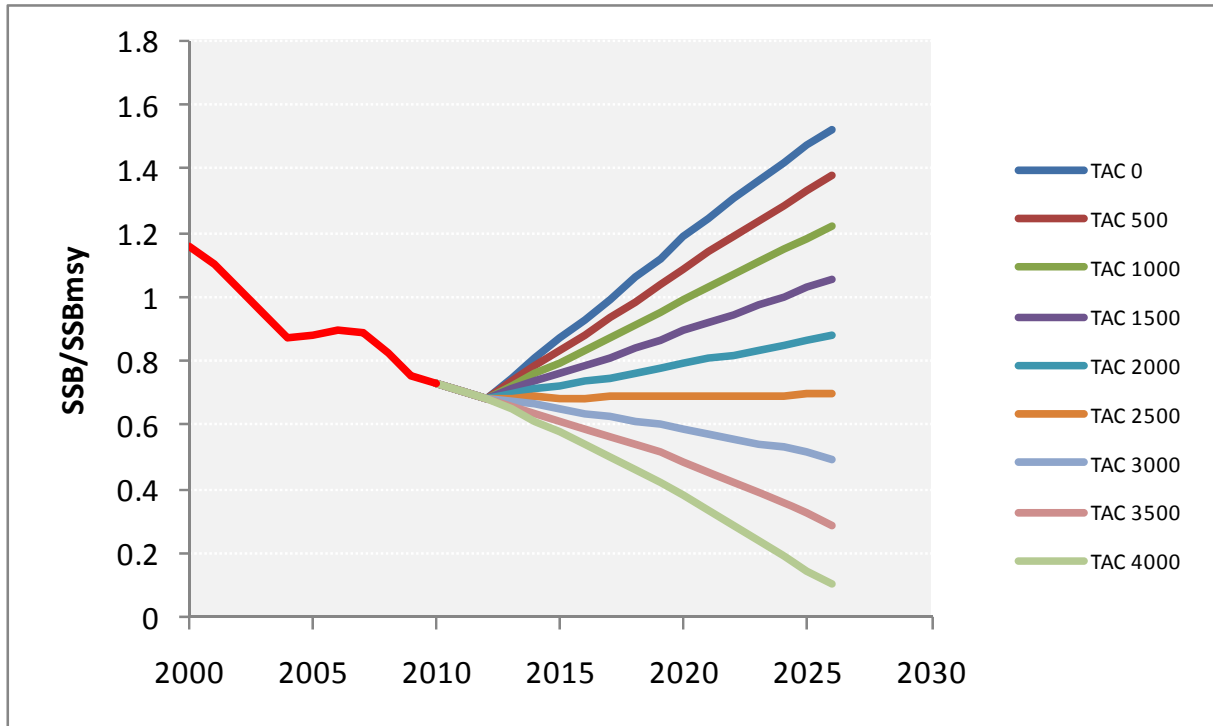
BUM-Figure 3. Blue marlin standardized combined CPUE indices estimated using equal weighting for all CPUE series (EQW), weighting the CPUE series by area (ARW) and by catch (CAW).



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 (Anon. 2013a). 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 to 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 about 50% of daylight hours and 81% of nighttime hours in the warmer waters of the mixed surface layer, they do explore temperatures ranging 7.8-29.6°C. However, a negligible amount of time is spent at temperatures less than 7 °C below the mixed surface layer. 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 2013 and 2014 were 376 t and 361 t, respectively (**WHM-Table 2**). Task I catches of white marlin for 2014 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 those used in the 2011 blue marlin assessment. As recommended by the working group 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 led 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 (**WHM-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 (**WHM-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} remains 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

A 2006 recommendation (Rec. 06-09) established that the annual amount 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. Furthermore, in 2012, the Commission established a TAC for 2013, 2014, and 2015 of 400 t (Rec. 12-04), placed additional catch and commerce restrictions in recreational fisheries for blue marlin and white marlin, and requested methods for estimating live and dead discards of blue marlin and white marlin/spearfish.

The Committee is concerned with the significant increase in the contribution from non-industrial fisheries to the total white marlin harvest and that these fisheries are not fully accounted for in the current ICCAT database. The Committee expressed its serious concern over this limitation on data for future assessments. Such data limitation precludes any analysis of the current regulations. In addition the Committee expressed concern of the status of white marlin due to the misidentification of spearfishes in the white marlin catches. This situation adds uncertainty to the stock assessment results.

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

In 2012, the Commission implemented Rec. 12-04, intended to reduce the total harvest to 400 t in 2013, 2014, and 2015 to allow the rebuilding of the white marlin stock from the overfished condition. The Committee expressed its concern on the effectiveness of such measure in light of the misidentification of spearfishes in the white marlin catches, which causes uncertainty in stock assessment results and enforcement related problems.

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. Currently, four ICCAT Contracting Parties (Brazil, Canada, Mexico and the United States) already mandate or encourage the use of circle hooks on their pelagic longline fleets. The Committee considers the use of non-offset circle hooks can reduce billfish mortality in most fisheries and recommends the Commission consider this approach. In addition, the Commission should consider actions to reduce fishing mortality of white marlin from non-industrial fisheries.

ATLANTIC WHITE MARLIN SUMMARY

| | |
|---|--|
| MSY | 874 t ¹ - 1604 t ² |
| Current (2014) Yield | 361 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 |
| Catch _{recent} ⁶ /Catch ₁₉₉₆ Longline and Purse seine | 0.30 |
| Stock Status | Overfished: Yes |
| | Overfishing: Not likely ⁷ |
| Conservation and Management Measure in Effect: | Recommendation [Rec. 12-04] Reduce the total harvest to 400 t in 2013, 2014, and 2015 |

¹ ASPIC estimates.

² SS3 estimates.

³ 2014 yield should be considered provisional.

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 2009-2011.

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. (v2, 2015-09-25)

| | | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|----------|----------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| TOTAL | | 1659 | 1627 | 1462 | 1544 | 2114 | 1761 | 1573 | 1430 | 1682 | 1569 | 1368 | 978 | 905 | 1762 | 742 | 655 | 447 | 601 | 634 | 656 | 433 | 385 | 378 | 378 | 361 |
| | ATN | 407 | 239 | 610 | 543 | 660 | 639 | 669 | 483 | 529 | 492 | 484 | 431 | 293 | 253 | 257 | 287 | 196 | 162 | 136 | 203 | 217 | 198 | 259 | 188 | 228 |
| | ATS | 1252 | 1388 | 853 | 1002 | 1454 | 1122 | 905 | 947 | 1152 | 1077 | 883 | 547 | 612 | 478 | 485 | 368 | 251 | 438 | 498 | 453 | 215 | 187 | 119 | 190 | 132 |
| Landings | ATN Longline | 266 | 108 | 466 | 413 | 531 | 473 | 554 | 431 | 475 | 399 | 408 | 381 | 230 | 204 | 204 | 252 | 161 | 123 | 105 | 164 | 192 | 152 | 214 | 160 | 196 |
| | Other surf. | 40 | 21 | 35 | 34 | 57 | 48 | 31 | 5 | 17 | 29 | 34 | 30 | 24 | 32 | 24 | 17 | 23 | 30 | 19 | 23 | 12 | 7 | 20 | 13 | 16 |
| | Sport (HL+RR) | 21 | 19 | 21 | 30 | 30 | 18 | 20 | 14 | 6 | 6 | 2 | 4 | 6 | 1 | 1 | 1 | 2 | 1 | 2 | 2 | 6 | 3 | 3 | 4 | 3 |
| | ATS Longline | 1152 | 1328 | 805 | 950 | 1420 | 1086 | 860 | 853 | 979 | 1021 | 827 | 475 | 497 | 425 | 454 | 325 | 202 | 404 | 417 | 381 | 161 | 146 | 113 | 66 | 127 |
| | Other surf. | 96 | 60 | 48 | 52 | 33 | 31 | 40 | 57 | 173 | 55 | 56 | 71 | 116 | 53 | 31 | 43 | 48 | 15 | 80 | 72 | 53 | 39 | 2 | 123 | 1 |
| | Sport (HL+RR) | 4 | 0 | 0 | 0 | 0 | 4 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 4 |
| Discards | ATN Longline | 81 | 90 | 88 | 66 | 42 | 100 | 64 | 33 | 31 | 57 | 41 | 16 | 29 | 17 | 27 | 17 | 9 | 8 | 9 | 13 | 8 | 36 | 21 | 10 | 12 |
| | Other surf. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 0 | 0 |
| | ATS Longline | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 37 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 19 | 1 | 0 | 2 | 2 | 2 | 0 | 0 |
| Landings | ATN Barbados | 39 | 17 | 24 | 29 | 26 | 43 | 15 | 41 | 33 | 25 | 25 | 24 | 15 | 15 | 0 | 0 | 33 | 0 | 0 | 0 | 6 | 3 | 5 | 6 | 6 |
| | Brazil | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Canada | 0 | 0 | 0 | 0 | 4 | 4 | 8 | 8 | 8 | 5 | 5 | 3 | 2 | 1 | 2 | 5 | 3 | 2 | 2 | 1 | 2 | 1 | 2 | 3 | 5 |
| | China PR | 0 | 0 | 0 | 0 | 6 | 7 | 6 | 7 | 10 | 20 | 1 | 7 | 4 | 2 | 1 | 4 | 1 | 0 | 1 | 3 | 4 | 1 | 2 | 1 | 1 |
| | Chinese Taipei | 85 | 13 | 92 | 123 | 270 | 181 | 146 | 62 | 105 | 80 | 59 | 68 | 61 | 15 | 45 | 19 | 16 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 |
| | Costa Rica | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 14 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cuba | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | EU.España | 12 | 9 | 18 | 15 | 25 | 17 | 97 | 89 | 91 | 74 | 118 | 43 | 4 | 19 | 19 | 48 | 28 | 32 | 10 | 8 | 50 | 3 | 21 | 19 | 48 |
| | EU.France | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | EU.Portugal | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 5 | 11 | 30 | 3 | 2 | 0 | 1 | 2 | 1 | 18 | 10 | 4 |
| | Grenada | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 15 | 8 | 14 | 33 | 10 | 12 | 11 | 17 | 14 | 0 | 0 | 0 | 0 | 0 |
| | Japan | 34 | 45 | 180 | 33 | 41 | 31 | 80 | 29 | 39 | 25 | 66 | 15 | 10 | 21 | 23 | 28 | 27 | 10 | 22 | 27 | 31 | 18 | 31 | 13 | 3 |
| | Korea Rep. | 39 | 1 | 9 | 4 | 23 | 3 | 7 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 8 | 19 | 19 | 0 | 0 | 0 | 0 |
| | Liberia | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 3 | 8 | 4 | 3 | 4 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Mexico | 0 | 0 | 0 | 2 | 8 | 8 | 3 | 5 | 6 | 11 | 18 | 44 | 15 | 15 | 28 | 25 | 16 | 13 | 14 | 19 | 20 | 28 | 36 | 30 | 20 |
| | Mixed flags (FR+ES) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 5 | 3 | 3 | 5 | 3 | 2 | 2 | 2 | 3 | 3 | 0 | 0 | 0 | 0 |
| | NEI (BIL) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 34 | 72 | 4 | 8 | 0 | 26 | 9 | 14 | 18 | 20 | 0 | 0 | 0 | 0 | 0 |
| | NEI (ETRO) | 0 | 0 | 0 | 23 | 43 | 47 | 57 | 72 | 105 | 100 | 64 | 36 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Panama | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Philippines | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | St. Vincent and Grenadines | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 44 | 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 | 2 | 1 | 1 |
| | Trinidad and Tobago | 6 | 3 | 0 | 1 | 11 | 18 | 8 | 32 | 10 | 13 | 4 | 2 | 5 | 12 | 6 | 6 | 5 | 12 | 10 | 11 | 15 | 14 | 39 | 33 | 38 |
| | U.S.A. | 17 | 13 | 11 | 19 | 13 | 7 | 12 | 8 | 5 | 5 | 1 | 3 | 6 | 1 | 1 | 1 | 1 | 0 | 2 | 2 | 2 | 26 | 1 | 4 | 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 | 0 |
| | UK.Bermuda | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 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 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Vanuatu | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Venezuela | 79 | 47 | 187 | 226 | 148 | 171 | 164 | 90 | 80 | 61 | 25 | 72 | 110 | 55 | 55 | 60 | 26 | 52 | 26 | 70 | 54 | 47 | 79 | 56 | 89 |
| Landings | ATS Argentina | 9 | 6 | 0 | 0 | 0 | 0 | 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 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Brazil | 205 | 377 | 211 | 301 | 91 | 105 | 75 | 105 | 217 | 158 | 105 | 172 | 407 | 266 | 80 | 244 | 90 | 52 | 55 | 53 | 36 | 60 | 71 | 152 | 49 |
| | Cambodia | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | China PR | 0 | 0 | 0 | 0 | 3 | 4 | 3 | 4 | 5 | 10 | 1 | 13 | 19 | 6 | 6 | 4 | 5 | 10 | 3 | 5 | 4 | 2 | 2 | 1 | 1 |
| | Chinese Taipei | 810 | 790 | 506 | 493 | 1080 | 726 | 420 | 379 | 401 | 385 | 378 | 84 | 117 | 89 | 127 | 37 | 28 | 53 | 38 | 27 | 19 | 28 | 14 | 6 | 28 |
| | Cuba | 6 | 10 | 10 | 0 | 0 | 0 | 0 | 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 | 1 | 2 | 1 | 5 | 1 | 2 | 2 | 3 | 1 | 1 | 1 | 1 | 3 | 2 | 0 | 1 | 0 | 1 | 1 |
| | EU.España | 0 | 17 | 6 | 12 | 2 | 19 | 54 | 4 | 10 | 45 | 68 | 18 | 2 | 3 | 45 | 10 | 23 | 14 | 21 | 8 | 62 | 2 | 13 | 17 | 45 |
| | EU.Portugal | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 19 | 0 | 35 | 39 | 9 | 16 | 7 | 0 | 5 |
| | Gabon | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Ghana | 31 | 17 | 14 | 22 | 1 | 2 | 1 | 3 | 7 | 6 | 8 | 21 | 2 | 1 | 1 | 1 | 0 | 0 | 4 | 4 | 0 | 1 | 1 | 1 | 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 | 0 |
| | Japan | 92 | 77 | 68 | 49 | 51 | 26 | 32 | 29 | 17 | 15 | 17 | 41 | 5 | 12 | 13 | 6 | 11 | 11 | 12 | 16 | 10 | 13 | 11 | 11 | 4 |
| | Korea Rep. | 42 | 56 | 1 | 4 | 20 | 20 | 52 | 18 | 0 | 0 | 0 | 0 | 0 | 11 | 40 | 3 | 0 | 113 | 96 | 70 | 24 | 0 | 0 | 0 | 0 |
| | Mixed flags (FR+ES) | 37 | 11 | 10 | 12 | 11 | 9 | 7 | 7 | 9 | 8 | 9 | 8 | 9 | 10 | 8 | 8 | 8 | 7 | 8 | 9 | 9 | 37 | 0 | 0 | 0 |
| | NEI (BIL) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 21 | 134 | 16 | 27 | 156 | 186 | 179 | 0 | 0 | 0 | 0 | 0 | 0 |
| | NEI (ETRO) | 0 | 0 | 0 | 91 | 171 | 190 | 228 | 288 | 421 | 399 | 258 | 144 | 9 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Panama | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Philippines | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 2 | 0 | 0 | 0 |
| | S. Tomé e Príncipe | 19 | 26 | 24 | 17 | 21 | 21 | 30 | 45 | 40 | 36 | 37 | 37 | 37 | 37 | 21 | 33 | 29 | 0 | 36 | 37 | 38 | 0 | 0 | 0 | 0 |
| | South Africa | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | | | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | | | |
|----------|-----|----------------|--------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|----------|---|---|
| | | Togo | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| | | U.S.S.R. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| | | Uruguay | 1 | 1 | 3 | 0 | 3 | 0 | 1 | 24 | 22 | 0 | 0 | 0 | 1 | 9 | 2 | 5 | 9 | 3 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Discards | ATN | 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 | 0 | 0 | 0 | |
| | | Mexico | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | U.S.A. | 81 | 90 | 88 | 66 | 42 | 100 | 64 | 33 | 32 | 57 | 41 | 17 | 33 | 17 | 27 | 17 | 10 | 8 | 10 | 14 | 8 | 36 | 21 | 10 | 12 | | | |
| | | 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 | 0 | 0 | 0 |
| | | ATS | Brazil | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 19 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Chinese Taipei | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 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 | 2 | 2 | 0 | 0 | 0 | 0 | | |
| | | U.S.A. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 37 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |

1. Brazilian Task I catches from 2012 to 2014 are preliminary and under revision.

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 $SSB_{yr} \geq SSB_{MSY}$ and $F_{yr} < F_{MSY}$ for each year (yr) under different constant catch scenarios (TAC tons).

F < F_{MSY}

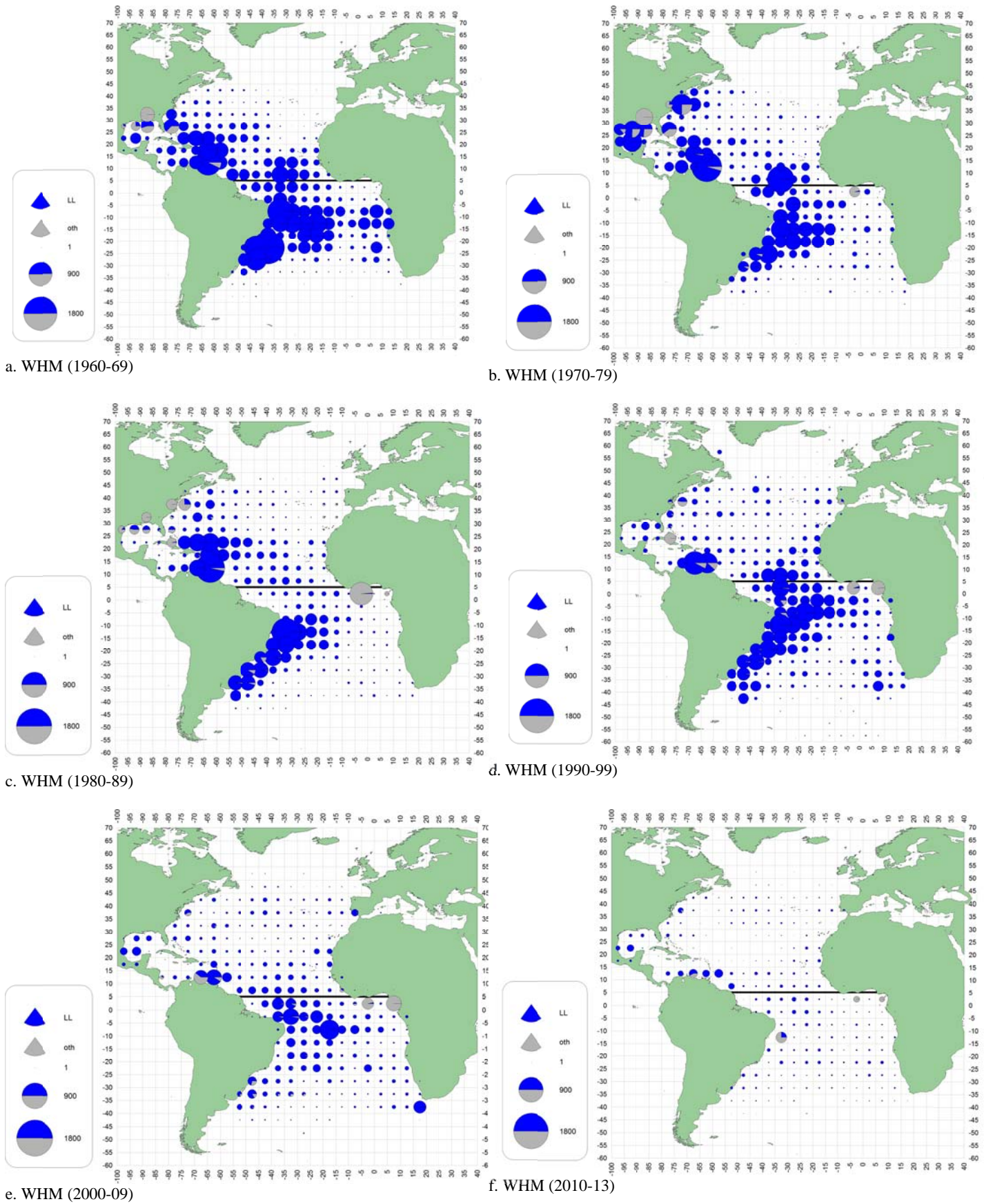
| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|-------------|------|------|------|------|------|------|------|------|------|------|
| 0 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 200 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 400 | 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 > B_{MSY}

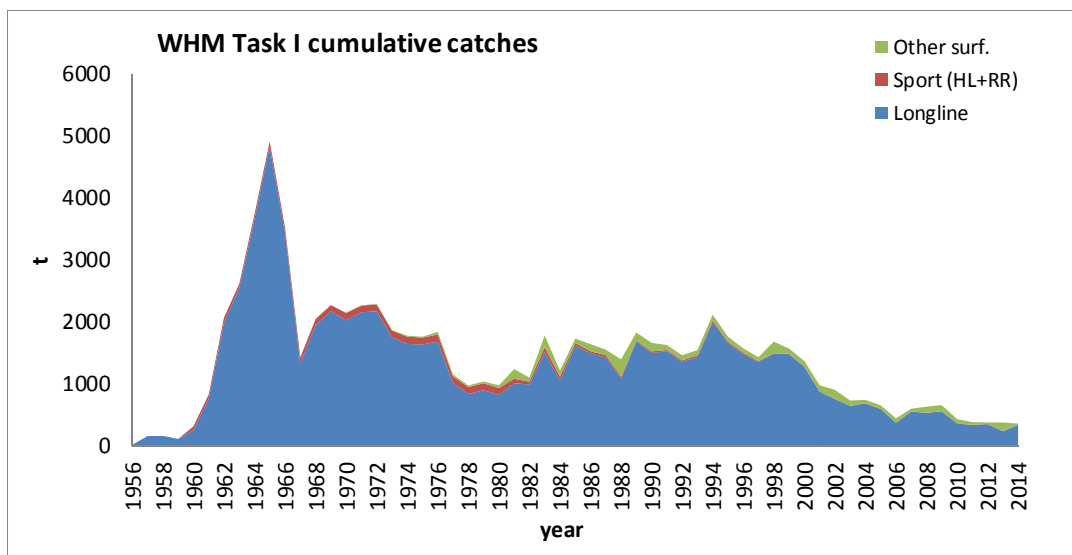
| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|-------------|------|------|------|------|------|------|------|------|------|------|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 |
| 200 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| 400 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 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 < F_{MSY} and
B > B_{MSY}**

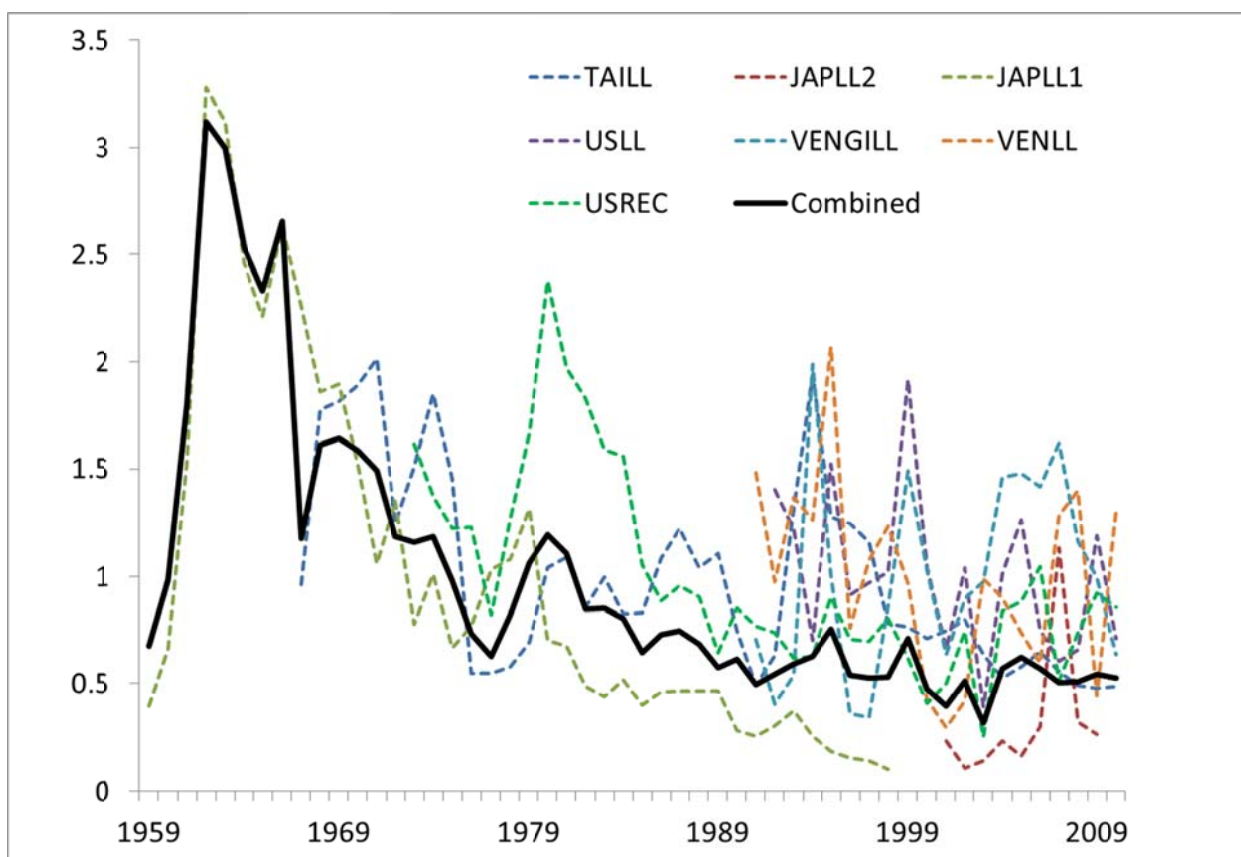
| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|-------------|------|------|------|------|------|------|------|------|------|------|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 |
| 200 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| 400 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 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 |



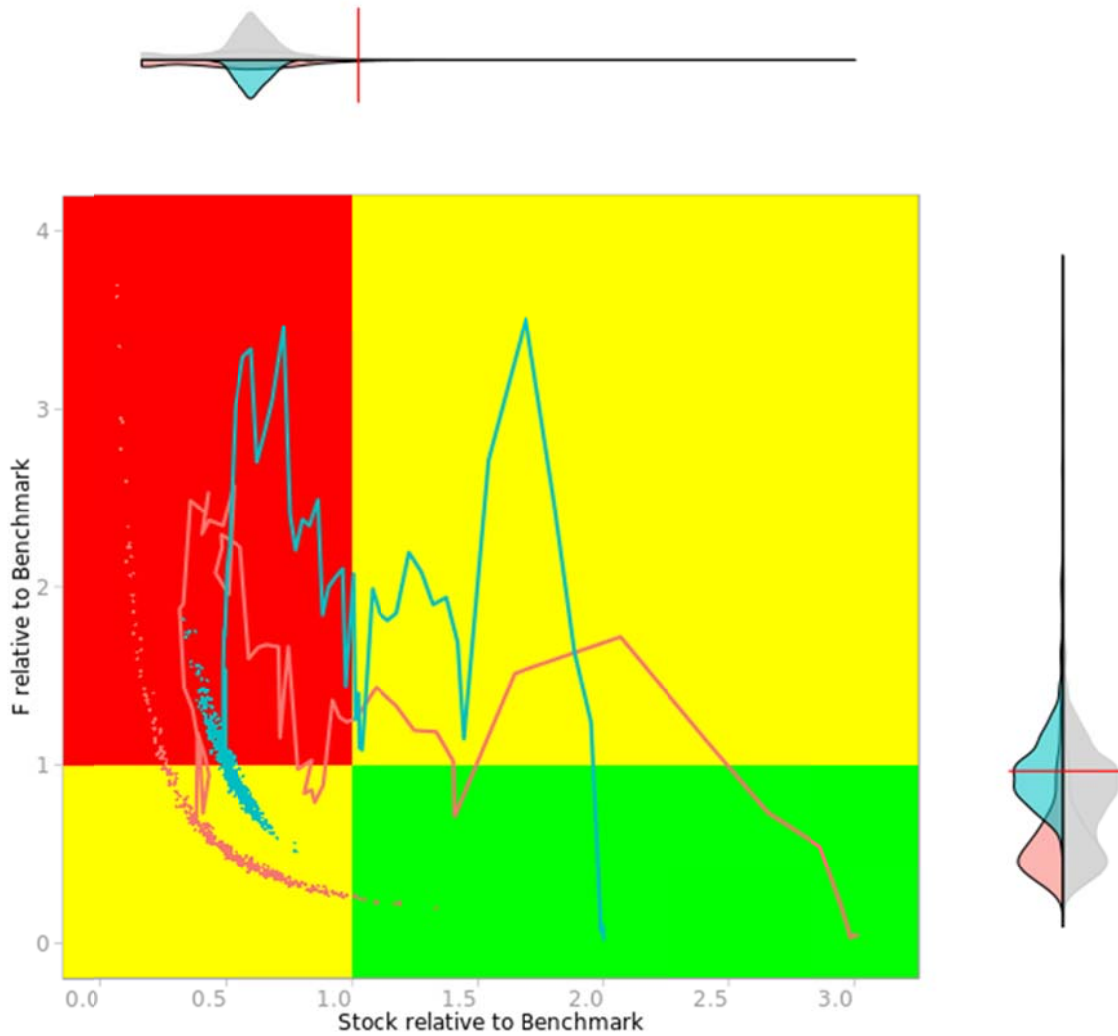
WHM-Figure 1. Geographic distribution of mean white marlin catch by major gears and decade.



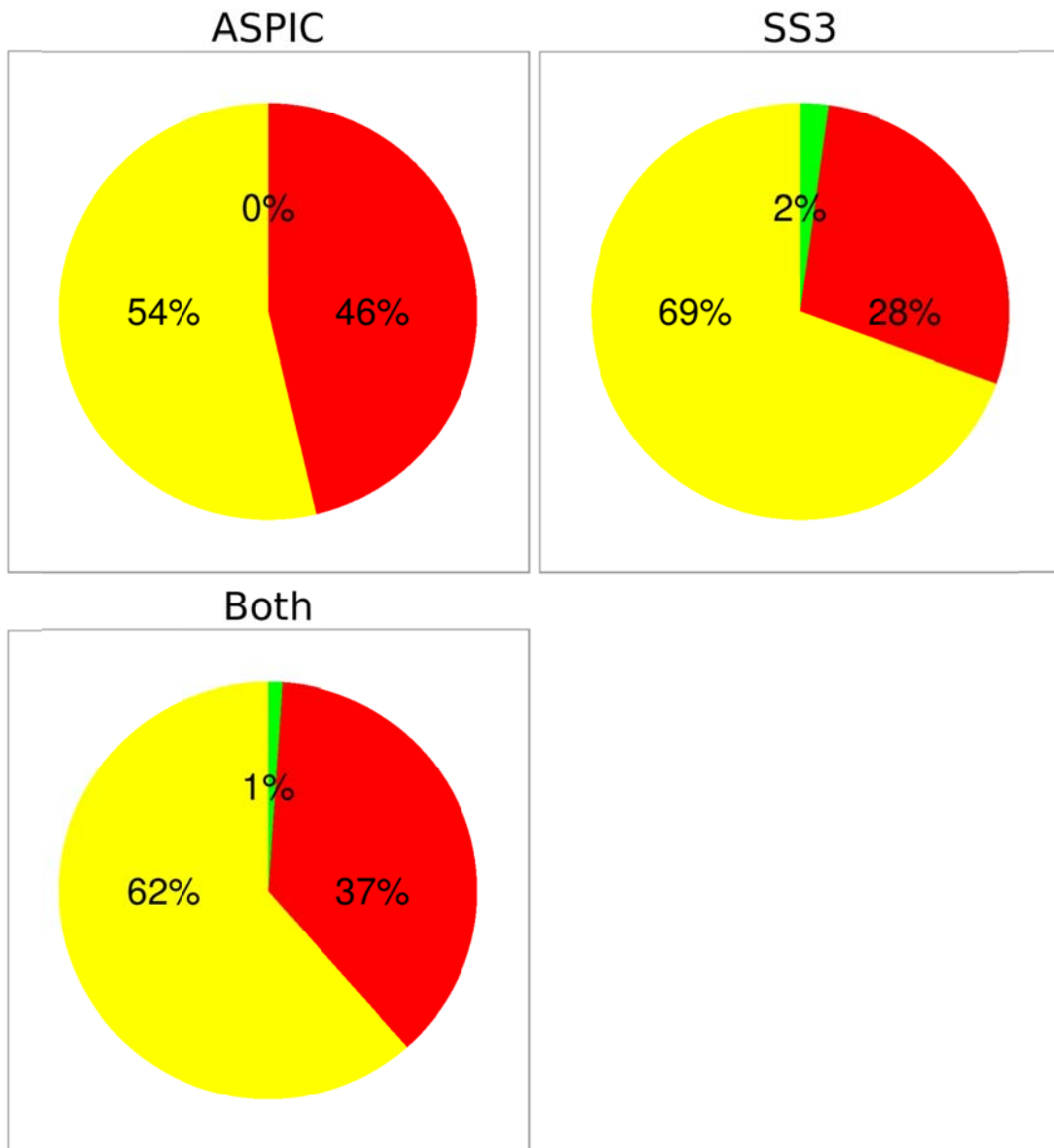
WHM-Figure 2. Total catch of white marlin reported in Task I for the period 1956-2014.



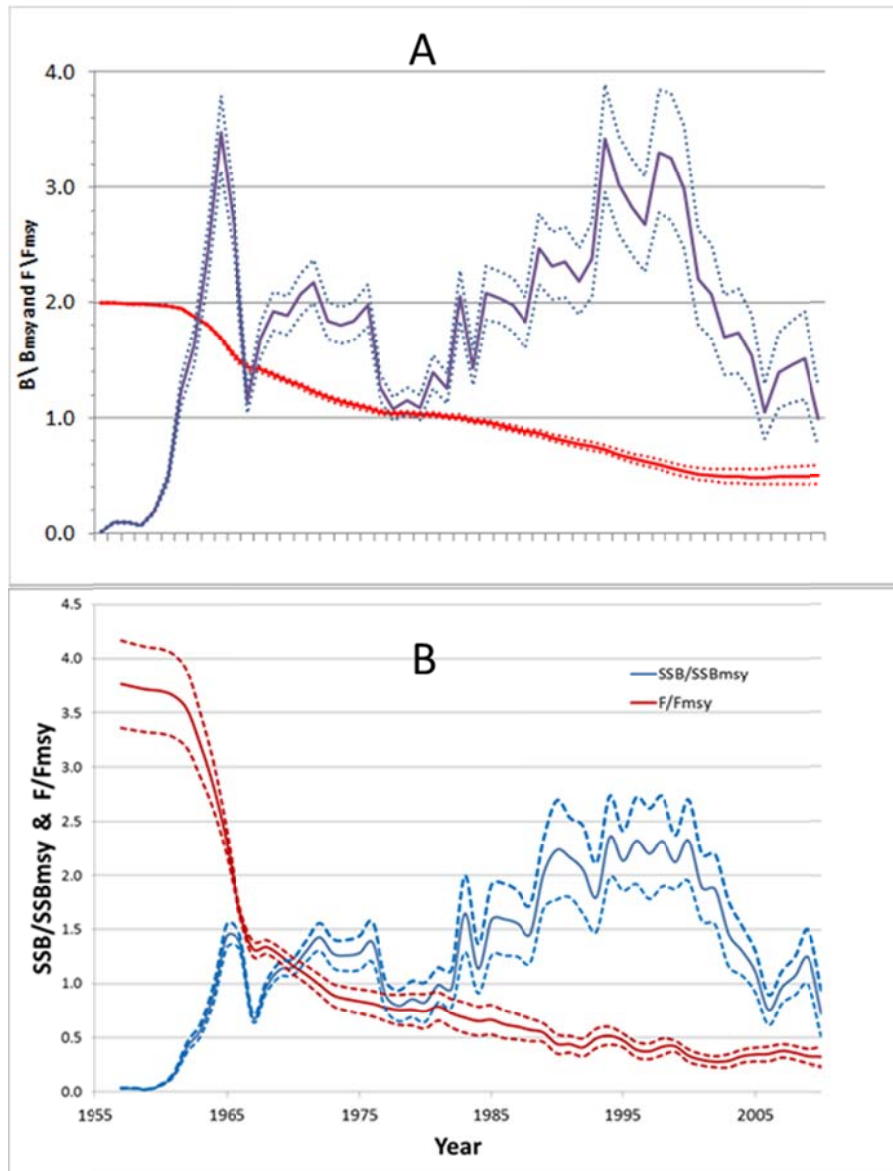
WHM-Figure 3. White marlin indices of abundance presented and selected during the meeting. For graphing purposes the indices were scaled to their respective mean value for the period 1990-2010.



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 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 Straits 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. A new L50 has been estimated for West Atlantic female sailfish (146.12 cm LJFL), the previous L50 value used for western males remains at 135.7 cm LJFL. No values are currently available for eastern Atlantic sailfish.

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 has been confirmed by genetic identification of larvae present off the southern coast of Brazil between 20° and 27°S. Additional spawning areas occur in the eastern 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 and third quarter of the year, while in the southwestern Atlantic they spawn during the austral summer.

SAI-2. Fisheries indicators

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 unreported 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 2014 was 786 t and 666 t for the East and West stocks, respectively (**SAI-Figure 3**). Task I catches of sailfish for 2014 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, based on spawning activity, that suggests an alternative stock structure splitting the western stock north and south 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 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**). New available CPUE indices for west sailfish appear to fluctuate without trend after the last sailfish stock assessment, although some show a declining trend in the last few years of the series (**SAI-Figure 5**), this may be a reflection of the steady decline in total catches for west sailfish. Examination of available length frequencies for a range of fleets show that average length and length distributions do not show clear trends during the period where there are observations. A similar result was obtained in the past for marlins. Although it is possible that, like in the case of the marlins, this reflects the fact that mean length is not a good indicator of fishing pressure for billfish it could also reflect a pattern of high fishing pressure over the period of observation.

SAI-4. Outlook

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

SAI-5. Effect of current regulations

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

SAI-6. Management recommendations

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

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

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. Currently, four ICCAT Contracting Parties (Brazil, Canada, Mexico, and the United States) already mandate or encourage the use of circle hooks on their pelagic longline fleets. The Committee considers the use of non-offset circle hooks can reduce billfish mortality in most fisheries and recommends the Commission consider this approach. In addition, the Commission should consider actions to reduce fishing mortality of sailfish from non-industrial fisheries.

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 t ¹ | 1,250-1,950 t ¹ |
| 2014 Catches (Provisional) | 666 t | 786 t |
| B_{2007}/B_{MSY} | Possibly < 1.0 | Likely < 1.0 |
| F_{2007}/F_{MSY} | Possibly > 1.0 | Likely > 1.0 |
| Stock Status | Overfished: Possibly Overfishing: Possibly | Overfished: Likely Overfishing: 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. (v2, 2015-09-25)

| | | | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | | |
|-----------|--------------------|----------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-----|---|
| TOTAL | | | 3475 | 2591 | 3105 | 3093 | 2231 | 2358 | 2923 | 2500 | 2709 | 2724 | 3798 | 4480 | 4294 | 3943 | 3984 | 3629 | 2997 | 3837 | 3734 | 3498 | 2553 | 2053 | 2036 | 1515 | 1452 | | |
| | ATE | | 2315 | 1476 | 1780 | 1815 | 1172 | 1234 | 1881 | 1337 | 1362 | 1342 | 1978 | 2761 | 2313 | 2625 | 2587 | 2194 | 1901 | 2542 | 2196 | 2062 | 1797 | 1238 | 1131 | 900 | 786 | | |
| | ATW | | 1160 | 1115 | 1325 | 1278 | 1059 | 1124 | 1041 | 1163 | 1346 | 1382 | 1820 | 1719 | 1981 | 1318 | 1397 | 1435 | 1096 | 1295 | 1537 | 1437 | 756 | 815 | 905 | 615 | 666 | | |
| Landings | ATE | Longline | 109 | 47 | 104 | 256 | 151 | 189 | 196 | 206 | 275 | 273 | 195 | 269 | 354 | 322 | 261 | 294 | 566 | 555 | 596 | 555 | 483 | 454 | 485 | 431 | 458 | | |
| | | Other surf. | 1249 | 1000 | 983 | 1111 | 954 | 910 | 1504 | 644 | 859 | 883 | 1231 | 1725 | 1862 | 2022 | 2106 | 1756 | 1289 | 1798 | 1488 | 927 | 871 | 643 | 583 | 348 | 318 | | |
| | | Sport (HL+RR) | 957 | 429 | 692 | 448 | 67 | 135 | 182 | 488 | 228 | 186 | 551 | 767 | 98 | 282 | 219 | 143 | 46 | 189 | 113 | 580 | 443 | 141 | 58 | 117 | 9 | | |
| | ATW | Longline | 316 | 159 | 357 | 484 | 346 | 338 | 260 | 323 | 499 | 533 | 1097 | 1245 | 1265 | 873 | 747 | 1062 | 646 | 830 | 1018 | 965 | 658 | 694 | 711 | 510 | 540 | | |
| | Other surf. | 514 | 521 | 599 | 498 | 468 | 410 | 482 | 433 | 553 | 615 | 602 | 402 | 603 | 440 | 642 | 368 | 442 | 452 | 502 | 457 | 92 | 101 | 154 | 86 | 106 | | | |
| | Sport (HL+RR) | 267 | 371 | 333 | 233 | 217 | 348 | 230 | 350 | 267 | 163 | 76 | 60 | 106 | 0 | 0 | 0 | 2 | 6 | 7 | 4 | 2 | 10 | 19 | 7 | 9 | | | |
| 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 | 5 | 4 | 1 | | |
| | ATW | Longline | 62 | 64 | 36 | 63 | 28 | 29 | 69 | 57 | 27 | 72 | 45 | 11 | 7 | 5 | 7 | 3 | 5 | 8 | 9 | 10 | 4 | 10 | 20 | 13 | 11 | | |
| | | Other surf. | 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 | | |
| Landings | ATE | Belize | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 24 | 0 | 0 | 0 | 0 | | |
| | | Benin | 21 | 20 | 21 | 20 | 20 | 19 | 6 | 4 | 5 | 5 | 12 | 2 | 2 | 5 | 3 | 3 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Cabo 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 | 0 | 0 | 0 |
| | | China PR | 0 | 0 | 0 | 0 | 3 | 3 | 3 | 3 | 5 | 9 | 4 | 5 | 11 | 4 | 4 | 8 | 16 | 8 | 1 | 4 | 5 | 2 | 4 | 1 | 1 | 1 | |
| | | Chinese Taipei | 5 | 4 | 80 | 157 | 38 | 58 | 24 | 56 | 44 | 66 | 45 | 50 | 62 | 49 | 15 | 25 | 36 | 109 | 121 | 80 | 21 | 51 | 54 | 42 | 42 | 51 | |
| | | Cuba | 61 | 184 | 200 | 77 | 83 | 72 | 533 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Côte D'Ivoire | 58 | 38 | 69 | 40 | 54 | 66 | 91 | 65 | 35 | 80 | 45 | 47 | 65 | 121 | 73 | 93 | 78 | 52 | 448 | 74 | 0 | 108 | 192 | 80 | 99 | 99 | |
| | | EU.España | 0 | 13 | 3 | 42 | 8 | 13 | 42 | 38 | 15 | 20 | 8 | 150 | 210 | 183 | 148 | 177 | 200 | 192 | 206 | 280 | 174 | 154 | 201 | 203 | 302 | 302 | |
| | | EU.Portugal | 0 | 0 | 1 | 2 | 1 | 2 | 1 | 2 | 27 | 53 | 11 | 3 | 8 | 13 | 19 | 31 | 136 | 43 | 49 | 103 | 170 | 121 | 70 | 109 | 33 | 33 | |
| | | EU.United Kingdom | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Gabon | 0 | 0 | 0 | 3 | 3 | 110 | 218 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Ghana | 395 | 463 | 297 | 693 | 450 | 353 | 303 | 196 | 351 | 305 | 275 | 568 | 592 | 566 | 521 | 542 | 282 | 420 | 342 | 358 | 417 | 299 | 201 | 220 | 191 | 191 | |
| | | 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 | 0 | 1 | 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 | 0 | 0 | 0 |
| | | Japan | 31 | 6 | 15 | 27 | 45 | 52 | 47 | 19 | 58 | 16 | 26 | 6 | 20 | 22 | 70 | 50 | 62 | 144 | 199 | 94 | 115 | 142 | 157 | 71 | 59 | 59 | |
| | | Korea Rep. | 12 | 22 | 2 | 2 | 5 | 11 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 5 | 0 | 6 | 10 | 10 | |
| | | Liberia | 0 | 0 | 0 | 0 | 0 | 33 | 85 | 43 | 136 | 122 | 154 | 56 | 133 | 127 | 106 | 122 | 118 | 115 | 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 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Mixed flags (FR+ES) | 595 | 174 | 150 | 182 | 160 | 128 | 97 | 110 | 138 | 131 | 353 | 400 | 365 | 413 | 336 | 264 | 274 | 205 | 251 | 308 | 265 | 56 | 0 | 0 | 0 | 0 | 0 |
| | | NEI (BIL) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 28 | 269 | 408 | 213 | 55 | 1 | 105 | 43 | 20 | 11 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | NEI (ETRO) | 0 | 0 | 0 | 27 | 51 | 57 | 69 | 86 | 127 | 120 | 77 | 43 | 3 | 2 | 16 | 7 | 8 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Panama | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Russian Federation | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | S. Tomé e Príncipe | 97 | 84 | 78 | 81 | 88 | 92 | 96 | 139 | 141 | 141 | 136 | 136 | 136 | 136 | 515 | 346 | 292 | 384 | 114 | 119 | 121 | 121 | 0 | 0 | 0 | 0 | 0 |
| | | Senegal | 1040 | 466 | 860 | 462 | 162 | 167 | 240 | 560 | 260 | 238 | 786 | 953 | 240 | 673 | 567 | 463 | 256 | 737 | 446 | 630 | 484 | 174 | 247 | 165 | 37 | 37 | |
| | | Sierra Leone | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 |
| | | South Africa | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | St. Vincent and Grenadines | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 1 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Togo | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 22 | 36 | 23 | 62 | 55 | 95 | 135 | 47 | 31 | 71 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| U.S.A. | 0 | 2 | 4 | 1 | 1 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| U.S.S.R. | 0 | 0 | 0 | 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 | Aruba | 13 | 9 | 5 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| | Barbados | 45 | 29 | 42 | 50 | 46 | 74 | 25 | 71 | 58 | 44 | 44 | 42 | 26 | 27 | 26 | 42 | 58 | 42 | 0 | 0 | 18 | 36 | 36 | 39 | 44 | 44 | | |
| | Belize | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 12 | 0 | 0 | 52 | 8 | 0 | 4 | 4 | 4 | | |
| | Brazil | 301 | 90 | 351 | 243 | 129 | 245 | 310 | 137 | 184 | 356 | 598 | 412 | 547 | 585 | 534 | 416 | 139 | 123 | 268 | 433 | 78 | 137 | 108 | 25 | 57 | 57 | | |
| | China PR | 0 | 0 | 0 | 0 | 3 | 3 | 3 | 3 | 3 | 9 | 4 | 3 | 1 | 0 | 1 | 0 | 0 | 1 | 2 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | | |
| | Chinese Taipei | 42 | 37 | 17 | 112 | 117 | 19 | 19 | 2 | 65 | 17 | 11 | 33 | 31 | 13 | 8 | 21 | 5 | 14 | 10 | 11 | 6 | 9 | 26 | 6 | 9 | 9 | | |
| | Cuba | 126 | 83 | 70 | 42 | 46 | 37 | 37 | 40 | 28 | 196 | 208 | 68 | 32 | 18 | 50 | 72 | 47 | 56 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | Curaçao | 10 | 10 | 10 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 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 | 5 | 3 | 0 | 1 | 0 | 3 | 3 | 4 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | Dominican Republic | 40 | 31 | 98 | 50 | 90 | 40 | 40 | 101 | 89 | 27 | 67 | 81 | 260 | 91 | 144 | 165 | 133 | 147 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | EU.España | 0 | 8 | 13 | 13 | 19 | 36 | 5 | 30 | 42 | 7 | 14 | 354 | 449 | 196 | 181 | 113 | 148 | 248 | 393 | 451 | 306 | 233 | 239 | 229 | 244 | 244 | | |
| | EU.Portugal | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 2 | 12 | 12 | 110 | 19 | 53 | 101 | 48 | 19 | 9 | 4 | 0 | 0 | 0 | | |
| | Grenada | 218 | 316 | 310 | 246 | 151 | 119 | 56 | 83 | 151 | 148 | 164 | 187 | 151 | 171 | 112 | 147 | 159 | 174 | 216 | 183 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | Japan | 12 | 27 | 0 | 1 | 8 | 2 | 4 | 17 | 3 | 10 | 12 | 3 | 3 | 10 | 5 | 22 | 4 | 1 | 33 | 43 | 36 | 13 | 16 | 7 | 11 | 11 | | |
| | Korea Rep. | 16 | 1 | 2 | 3 | 4 | 4 | 12 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 45 | 4 | 1 | 1 | 1 | | |
| | Mexico | 0 | 0 | 0 | 2 | 19 | 19 | 10 | 9 | 65 | 40 | 118 | 36 | 34 | 45 | 51 | 55 | 41 | 46 | 45 | 48 | 34 | 32 | 51 | 63 | 42 | 42 | | |
| NEI (BIL) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 297 | 268 | 0 | 0 | 0 | 0 | 68 | 81 | 252 | 17 | 0 | 0 | 0 | 0 | 0 | 0 | | |

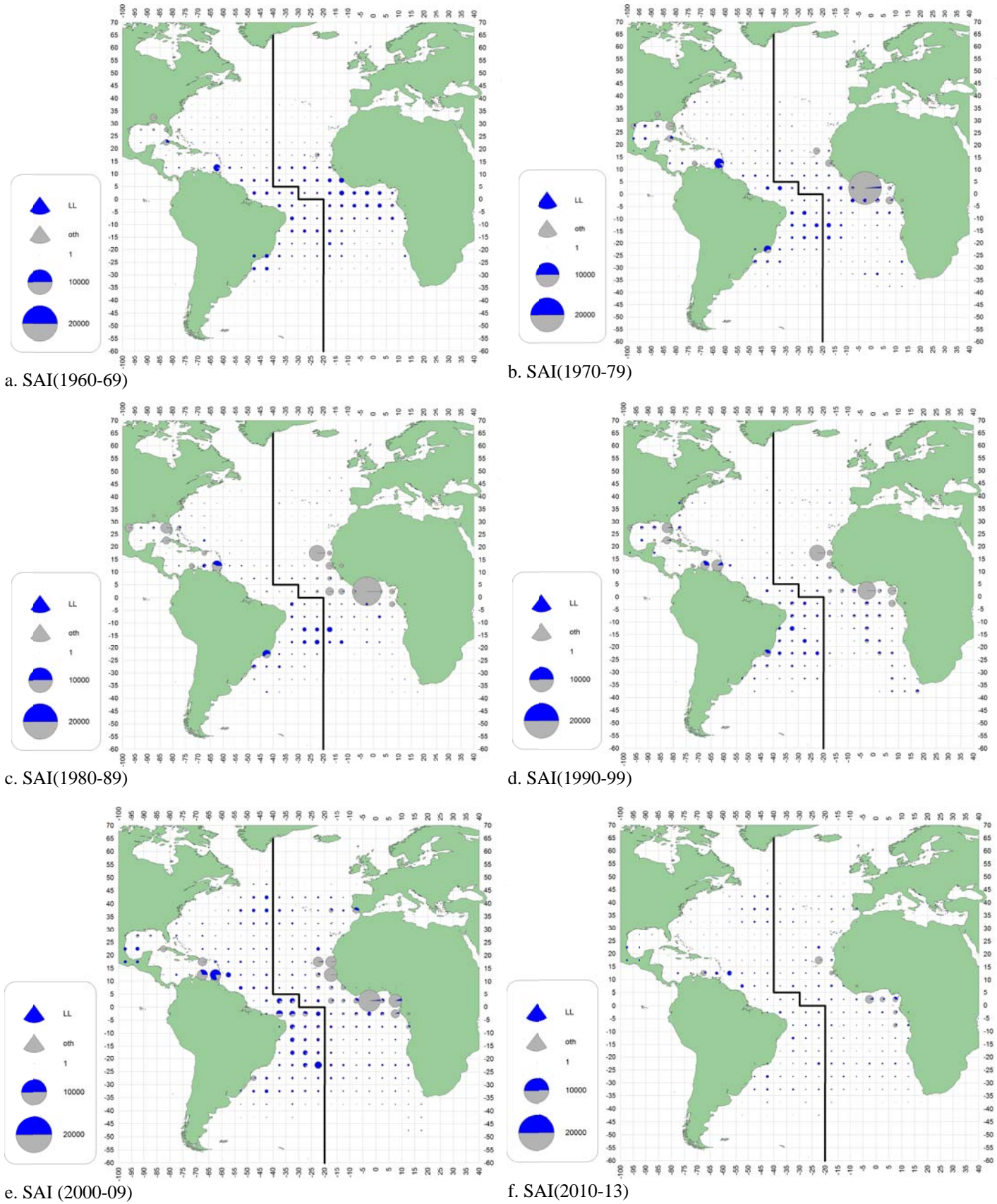
| | | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|----------|----------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| | NEI (ETRO) | 0 | 0 | 0 | 15 | 27 | 30 | 36 | 46 | 67 | 64 | 41 | 23 | 1 | 1 | 9 | 4 | 4 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Panama | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Seychelles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | St. Vincent and Grenadines | 2 | 1 | 4 | 4 | 4 | 2 | 1 | 3 | 0 | 1 | 0 | 2 | 164 | 3 | 86 | 73 | 59 | 18 | 13 | 8 | 7 | 4 | 4 | 3 | 4 |
| | Sta. Lucia | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 2 | 2 | 3 | 2 | 3 |
| | Trinidad and Tobago | 7 | 3 | 3 | 1 | 2 | 1 | 4 | 10 | 25 | 37 | 3 | 7 | 6 | 8 | 10 | 9 | 17 | 13 | 32 | 16 | 16 | 38 | 72 | 34 | 29 |
| | U.S.A. | 242 | 343 | 294 | 202 | 179 | 345 | 231 | 349 | 267 | 163 | 76 | 58 | 103 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 0 | 0 | 7 | 3 | 2 |
| | 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 | 24 | 65 | 71 | 206 | 162 | 93 | 155 | 175 | 248 | 169 | 83 | 126 | 159 | 133 | 158 | 178 | 184 | 248 | 154 | 162 | 178 | 235 | 314 | 186 | 210 |
| Discards | ATE | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Chinese Taipei | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 4 | 1 |
| | Korea Rep. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ATW | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Brazil | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Chinese Taipei | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| | Korea Rep. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 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. | 62 | 64 | 36 | 63 | 28 | 29 | 69 | 57 | 27 | 72 | 45 | 11 | 7 | 5 | 7 | 4 | 5 | 7 | 10 | 10 | 4 | 10 | 19 | 11 | 11 |

1. Brazilian Task I catches from 2012 to 2014 are preliminary and under revision

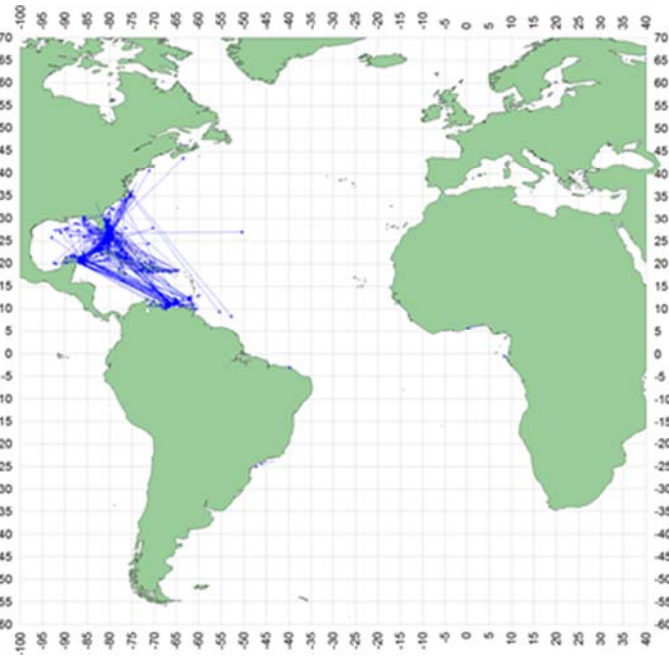
SPF-Table 1. Estimated catches (t) of longbill spearfish (*Tetrapturus pfluegeri*) by area, gear and flag. (v2, 2015-09-25)

| | | | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | | |
|---------------------|-----|------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|---|---|
| TOTAL | | | 481 | 214 | 273 | 540 | 320 | 240 | 165 | 201 | 266 | 306 | 278 | 188 | 179 | 133 | 188 | 169 | 340 | 167 | 166 | 140 | 245 | 147 | 229 | 134 | 71 | | |
| | ATE | | 417 | 131 | 255 | 419 | 198 | 207 | 128 | 194 | 192 | 255 | 178 | 79 | 84 | 50 | 51 | 68 | 75 | 66 | 60 | 78 | 110 | 66 | 169 | 95 | 16 | | |
| | ATW | | 64 | 83 | 19 | 121 | 122 | 33 | 37 | 7 | 74 | 51 | 100 | 110 | 95 | 84 | 137 | 101 | 265 | 102 | 106 | 62 | 135 | 81 | 60 | 39 | 55 | | |
| Landings | ATE | Longline | 44 | 24 | 163 | 307 | 100 | 129 | 69 | 126 | 106 | 174 | 118 | 78 | 84 | 50 | 51 | 68 | 75 | 66 | 60 | 78 | 110 | 66 | 169 | 95 | 15 | | |
| | | Other surf. | 373 | 107 | 92 | 112 | 98 | 78 | 59 | 68 | 86 | 81 | 60 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | ATW | Longline | 64 | 83 | 19 | 121 | 122 | 26 | 34 | 7 | 74 | 51 | 100 | 110 | 95 | 84 | 137 | 101 | 265 | 102 | 106 | 62 | 135 | 81 | 60 | 39 | 48 | | |
| | | Other surf. Sport (HL+RR) | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | |
| 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 | 0 | 0 | 0 | 0 | 0 | 6 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Landings | ATE | China PR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Chinese Taipei | 8 | 6 | 135 | 263 | 63 | 97 | 41 | 94 | 73 | 112 | 75 | 52 | 62 | 25 | 15 | 25 | 37 | 22 | 2 | 6 | 15 | 7 | 6 | 1 | 1 | | |
| | | EU.España | 0 | 0 | 0 | 12 | 0 | 5 | 1 | 1 | 9 | 29 | 14 | 7 | 5 | 0 | 0 | 3 | 3 | 0 | 2 | 7 | 29 | 19 | 17 | 8 | 13 | | |
| | | EU.Portugal | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 8 | 2 | 6 | 25 | 9 | 18 | 0 | 0 | | |
| | | Japan | 32 | 10 | 27 | 31 | 36 | 26 | 25 | 30 | 22 | 33 | 29 | 20 | 16 | 25 | 36 | 40 | 21 | 36 | 53 | 59 | 35 | 31 | 127 | 85 | 2 | | |
| | | Korea Rep. | 4 | 8 | 1 | 1 | 1 | 1 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Mixed flags (FR+ES) | 373 | 107 | 92 | 112 | 98 | 78 | 59 | 68 | 86 | 81 | 60 | 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 | 6 | 0 | 0 | 0 | 0 | |
| | | South Africa | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 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 | 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 | 12 | 3 | 0 | 0 | 0 | |
| | | Brazil | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 27 | 56 | 39 | 3 | 0 | 0 | 5 | 4 | 0 | 0 | 0 | 24 | 4 | 11 | 6 | 0 | |
| | | Chinese Taipei | 41 | 36 | 16 | 111 | 116 | 19 | 18 | 2 | 64 | 16 | 11 | 24 | 39 | 12 | 11 | 20 | 17 | 20 | 0 | 0 | 6 | 14 | 3 | 0 | 20 | | |
| | | EU.España | 0 | 0 | 0 | 5 | 0 | 1 | 0 | 0 | 0 | 24 | 50 | 22 | 5 | 25 | 0 | 5 | 14 | 0 | 2 | 5 | 3 | 4 | 3 | 10 | 11 | 0 | |
| | | EU.Portugal | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 35 | 15 | 44 | 10 | 10 | 0 | 3 | 0 | 0 | | |
| | | Japan | 13 | 46 | 1 | 1 | 2 | 3 | 4 | 1 | 8 | 11 | 11 | 3 | 12 | 40 | 41 | 58 | 54 | 25 | 45 | 26 | 71 | 20 | 19 | 3 | 2 | | |
| | | Korea Rep. | 9 | 0 | 1 | 2 | 4 | 4 | 10 | 4 | 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 | 1 | 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 | 82 | 0 | 135 | 23 | 13 | 7 | 8 | 5 | 4 | 3 | 3 | |
| Trinidad and Tobago | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| U.S.A. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| Venezuela | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 4 | 0 | 3 | 3 | 17 | 5 | 15 | 3 | 14 | 24 | 12 | 24 | 11 | 13 | 0 | | | |
| Discards | ATE | 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 | 0 | | |
| | ATW | 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 | 0 | | |
| | | U.S.A. | 0 | 0 | 0 | 0 | 0 | 6 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |

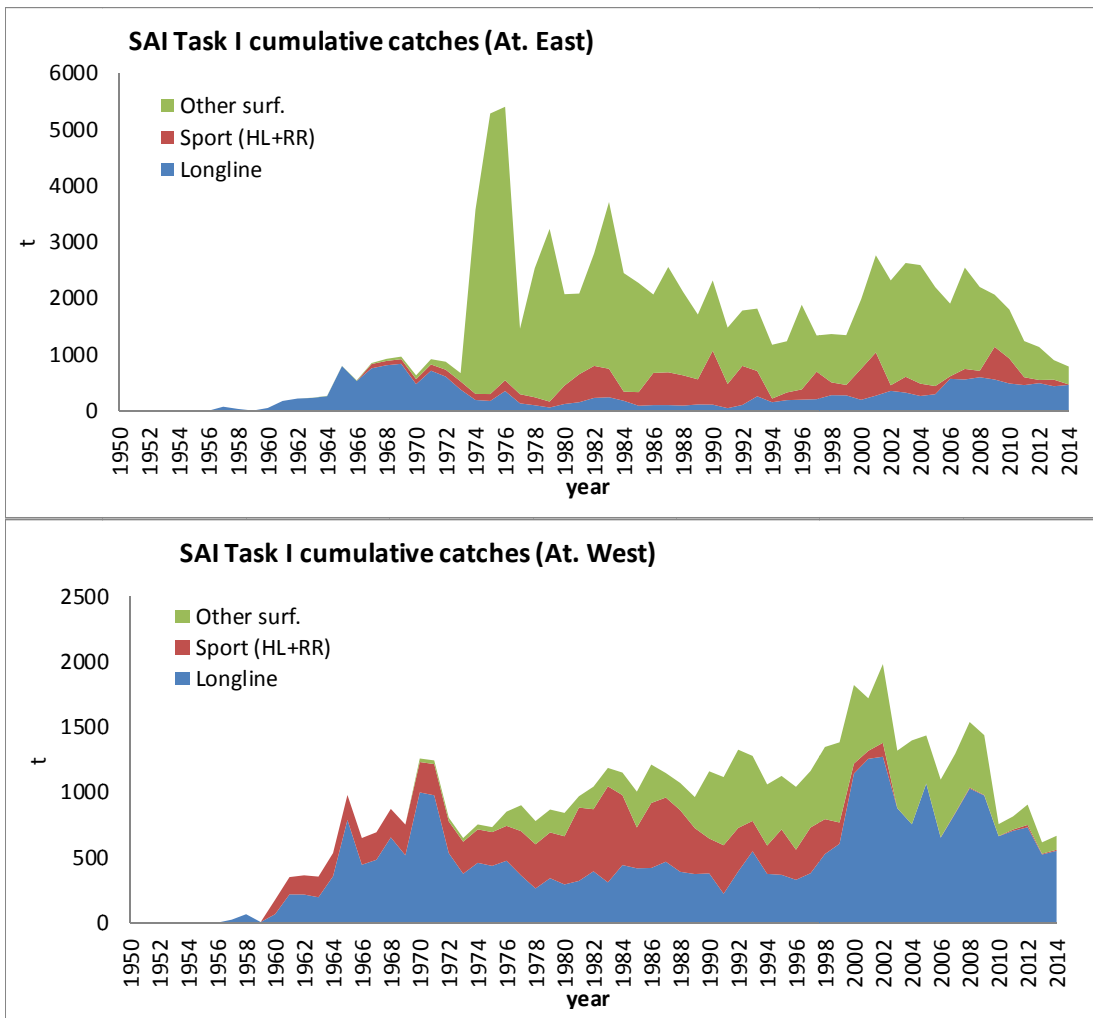
1. Brazilian Task I catches from 2012 to 2014 are preliminary and under revision.



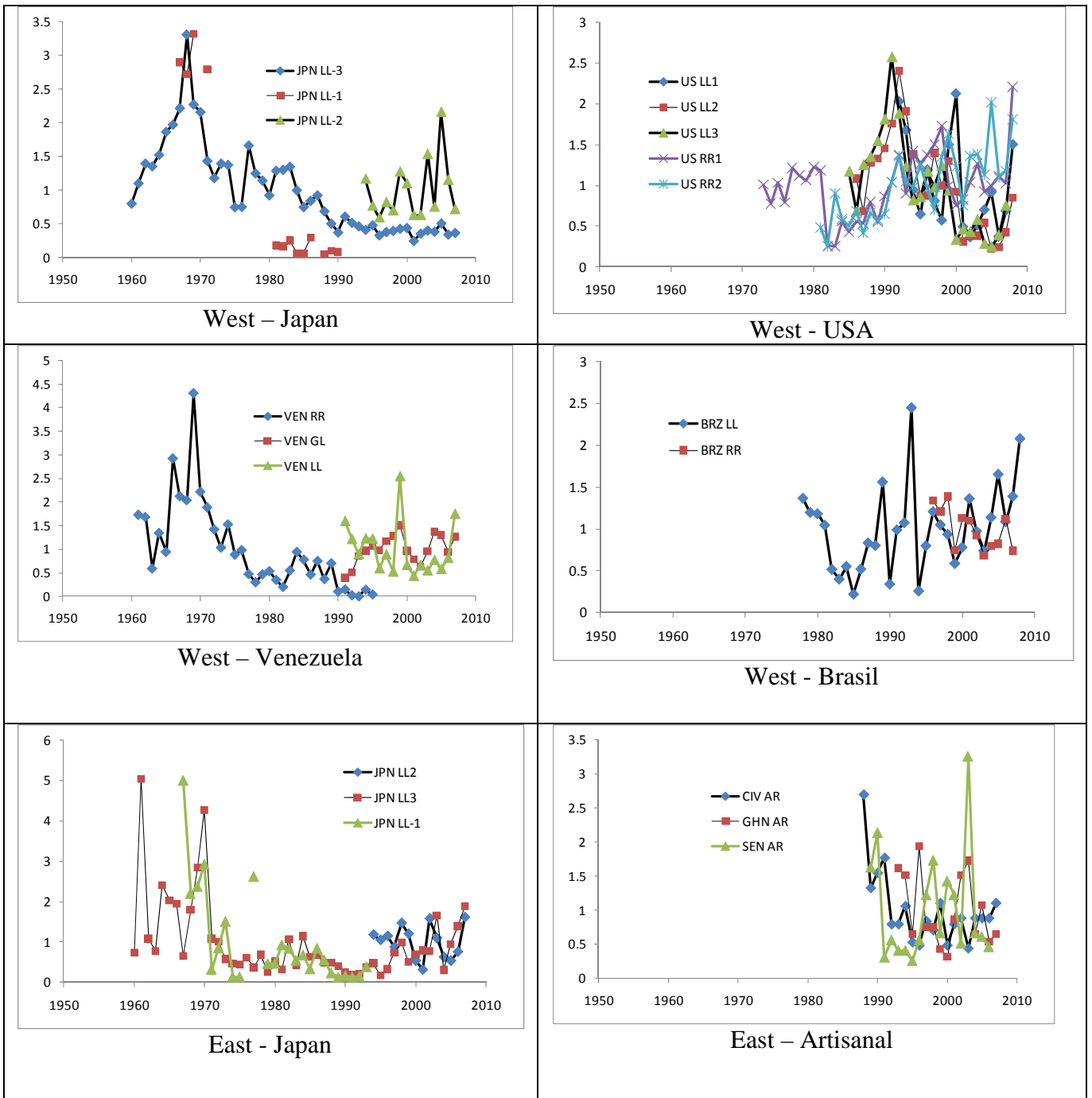
SAI-Figure 1. Geographic distribution of mean catches of sailfish by major gears and by decade. The dark line denotes the separation between stocks.



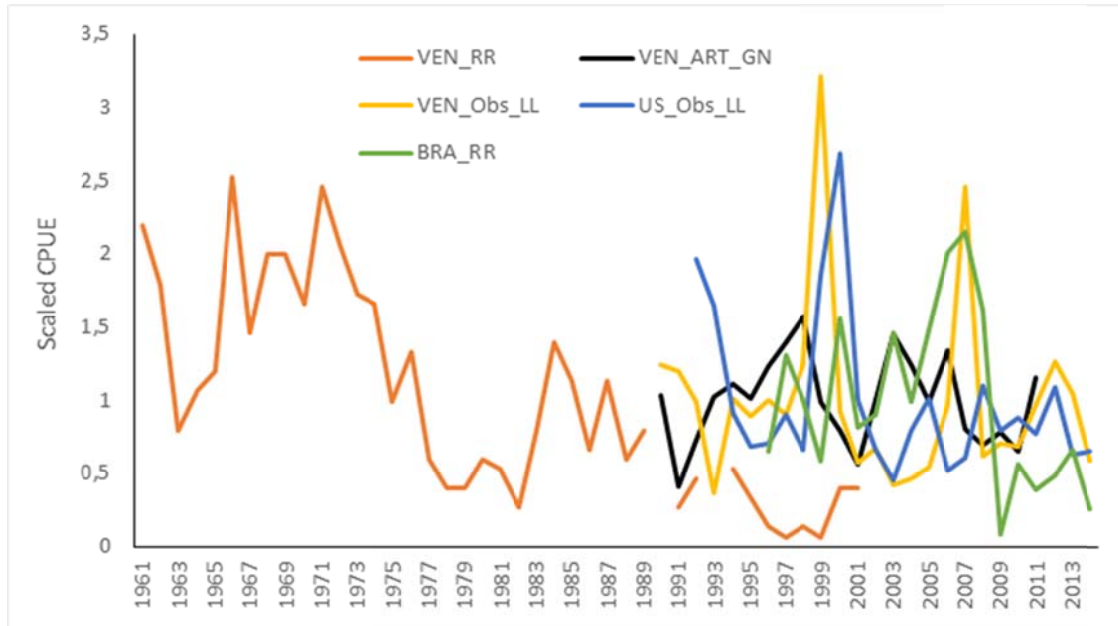
SAI-Figure 2. Conventional tag returns for Atlantic sailfish. Lines join the locations of release and recapture.



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.



SAI-Figure 5. New relative abundance indices of SAI-west 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 status of the North and South Atlantic swordfish stocks was assessed in September 2013, by means of applying statistical modelling to the available data up to 2011. Complete information on the assessment can be found in the Report of the 2013 ICCAT Swordfish Stock Assessment Meeting (Anon. 2014d). Other information relevant to Atlantic swordfish is presented in the Report of the Sub-Committee on Statistics, included as **Appendix 8** 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. New genetic information was reviewed that indicated that the existing stock boundaries should be refined, particularly between the Atlantic and Mediterranean stocks. The new information also indicated that along the coast of Africa, the southern stock occurred considerably to the north of the current boundary. While recognizing the importance of the work, the Committee noted that the stock boundaries are approximations, and the possible impacts of seasonal changes in resource distribution need to be fully understood.

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 180 cm. However, the most recent information indicates a smaller length and age at maturity.

New length-weight relationships proposed for both the North and South Atlantic were proposed in 2013, these will be considered interim until the analysis are finished.

In 2013 the Committee reviewed the analysis of the horizontal movements evidencing seasonal patterns with fish generally moving south by winter and returning to the temperate foraging grounds in spring. Broader areas of mixing between some eastern and western areas were also suggested. These new results obtained by pop-up satellite tags fully confirm the previous knowledge that was available from fishery data: deep longline catch swordfish during the day-time as a by-catch, while shallow longliners target swordfish at night in very shallow waters.

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 50°N to 45°S), 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 Committee was presented with an update of the possible geographic redistribution of north Atlantic swordfish. The presentation used area specific CPUE information (rather than flag specific) to demonstrate that several area specific residual patterns had significant relationships with the Atlantic Multidecadal Oscillation (AMO). These relationships of the eastern Atlantic were opposite to those in the western Atlantic. This pattern mimicked very closely the spatial mapping of the AMO as well as that of the North Atlantic Oscillation (NAO). Including the AMO as a covariate to area specific catchability within the assessment model helped reduce the conflicting directions of the various CPUE trends. Further analysis and hypothesis testing was recommended to determine if the relationship was due to a swordfish temperature preference, a change in prey distribution, or perhaps both. To support this hypothesis testing the Group encouraged a group of swordfish scientists to work towards uniting the available North Atlantic swordfish CPUE data into a single dataset so that a more refined, area specific CPUE analysis could be conducted.

For both the North and South Atlantic many of the indices of abundance were affected by changes in gear technology and management that could not be accounted for in the CPUE standardization, and therefore had to be split. Splitting the indices reduces the abundance signal and, to the degree possible, continuity of the indices can be maintained, which will increase the reliability of the assessment results.

Total Atlantic

The total Atlantic estimated catch (landings plus dead discards) of swordfish (North and South, including reported dead discards) in 2014 (20,686 t) is on the levels of (+3%) of the reported catch in 2013 (20,127 t). As a small number of countries have not yet reported their 2014 catches and because of unknown unreported catches, this value should be considered provisional and subject to further revision.

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

North Atlantic

For the past decade, the North Atlantic estimated catch (landings plus dead discards) has averaged about 12,000 t per year (**SWO-ATL-Table 1** and **SWO-ATL-Figure 4**). The catch in 2014 (10,801 t) represents a 47% 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.

Available catch per unit effort (CPUE) series were evaluated by the Committee and certain indices were identified as suitable for use in assessment models (Japan, EU-Portugal, Morocco, Canada, EU-Spain and USA). Trends in standardized CPUE series 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 combined index is shown in **SWO-ATL-Figure 6**, rescaled to the final fishery specific indices.

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 in 1987). 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 was partly due to a shift to other oceans and target species. In 2014, the 9,885 t reported catches were about 55% 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.

Six data sets of relative abundance indices (Brazil, Japan, Spain, Uruguay, South Africa and Chinese Taipei) were made available to the Committee. These CPUE indices were standardized using various analytical approaches. The standardized CPUE series presented show different trends and high variability which indicates that at least some are not depicting trends in the abundances of the stock. The available indices are illustrated in Figure **SWO-ATL-Figure 6**. Two combined indices were produced (**SWO-ATL-Figure 7**), one excluding Brazil and the other excluding both Brazil and Chinese Taipei data series.

Discards

Since 1991, several fleets have reported dead discards (see **SWO-ATL-Table 1**). The volume of Atlantic-wide reported discards has ranged from a minimum of 157 t in 2009 to a maximum of 1,139 t in 2000, with 198 t reported for 2014). The Committee expressed concern due to the low percentage of fleets that have reported annual dead discards (in t) in recent years.

SWO-ATL-3. State of the stocks

North Atlantic

Two stock assessment platforms were used to provide estimates of stock status for the North Atlantic swordfish stock, non-equilibrium surplus production model (ASPIC) and Bayesian Surplus Production Model (BSP2).

Results from the North Atlantic base case ASPIC model are shown in **SWO-ATL-Figure 8**. The estimated relative biomass trend shows a consistent increase since 1997. The bias corrected deterministic outcome indicates that the stock is at or above B_{MSY} (**SWO-ATL-Figure 9**). The relative trend in fishing mortality shows that the level of fishing peaks in 1995, followed by a decrease until 2001, followed by small increase in the 2002-2005 period and downward trend since then (**SWO-ATL-Figure 8**). Fishing mortality has been below F_{MSY} since 2000. The estimate of stock status in 2011 is relatively similar to the estimated status in the 2009 assessment, and suggests that there is a greater than 90% probability that the stock is at or above B_{MSY} . However, it is important to note that for the first time since 2002 the reported catches in 2012 (13,875 t) exceeded the TAC of 13,700 t. The most recent estimate of stock productivity is very consistent with previous estimates. The absolute biomass trajectory showed a consistent upturn from the estimated 1997 value, and the biomass values for the most recent years are near the level estimated in the mid 1980s (**SWO-ATL-Figure 10**). The high value in 1963 is not well fit as in prior evaluations. Trends in both fishing mortality and biomass are consistent with those produced by the BSP2 model, with the latter model estimating larger stock biomass and lower fishing mortality across the entire time series (**SWO-ATL-Figure 10**). Estimates of stock status from the BSP2 model are consistent with ASPIC results (**SWO-ATL-Figure 11**).

The stock is considered rebuilt, consistent with the 2009 evaluation. Compared with the 2009 ASPIC base case model, the trajectory of biomass and F ratios are similar until the late 1990s, thereafter the current model predicted slightly lower fishing mortality rates and higher relative biomass, but certainly within the estimated 80% confidence bounds (**SWO-ATL-Figure 12**).

South Atlantic

In 2009, evaluation of the status of the South Atlantic swordfish stock was assessed using a ‘Catch only’ model. During the 2013 stock assessment two platforms were used to provide stock status advice for the South Atlantic swordfish stock (i.e. ASPIC and BSP2).

The results of both models indicated that there was a conflicting signal for several of the indices used and substantial conflict between the landings history and the indices. Consequently the Committee had low confidence in the estimation of the absolute productivity level of the stock or on MSY-related benchmarks. Both models had similar difficulties estimating these quantities but both offered useful status advice. Consequently each platform provided a reference model on which the stock status was based.

Both models had similar trajectories of fishing mortality and biomass (**SWO-ATL-Figures 13 and 14**) but differed in their absolute levels and their status relative to benchmarks (**SWO-ATL-Figure 15**). Hence the two models differ in their view of current stock status, with ASPIC estimating the stock to be overfished ($B_{2011}/B_{MSY} = 0.98$) but not undergoing overfishing ($F_{2011}/F_{MSY} = 0.84$), and BSP, neither overfished ($B_{2011}/B_{MSY} = 1.38$), nor overfishing ($F_{2011}/F_{MSY} = 0.47$). Though, it should be noted that there is considerable uncertainty around any of these point estimates.

The groups choose to base stock status determination on a combination of model output and ancillary information, of which two pieces of information are informative. First, total removals (1950-2011) for the South Atlantic stock have been only 73% of the total removals for the North Atlantic stock for the same time period. Second the mean weight for the South (**SWO-ATL-Figure 16**) is larger than for the North. Assuming similar production dynamics, both indicators would suggest a lower exploitation rate for the South stock than for the North. Hence, while the Committee does not believe it can estimate the absolute productivity of the stock without improved scientific information, the Committee believes that the stock is not overfished.

SWO-ATL-4. Outlook

North Atlantic

Based on the currently available information to the Committee, the ASPIC base model was projected to the year 2021 under constant TAC scenarios of 8 to 20 thousand tons. Projections used reported catch as of September 5, 2013 for 2012. For those CPCs whose reported catch was not yet available, their catch was assumed to be the average of the last three years (2009-2011), giving a total catch of 14,038 t. Median trajectories for biomass and fishing mortality rate for all of the future TAC scenarios are plotted in **SWO-ATL-Figure 17**. Results from the 2013 assessment indicated that there is a greater than 90% probability that the northern swordfish stock has rebuilt to or above B_{MSY} (**SWO-ATL-Figure 9**), therefore the Commission's rebuilding plan goal has been achieved.

Future TACs above 15,000 t are projected to result in 50% or lower probabilities of the stock biomass remaining above B_{MSY} over the next decade (**SWO-ATL-Table 2**) as the resulting probability of F exceeding F_{MSY} for these scenarios would trend above 50% within four years. A TAC of 13,700 t would have an 83% probability of maintaining the stock and fishing mortality at a level consistent with the Convention objective over the next decade. Projections with BSP2 also used similar specifications for 2012 and 2013 yields and projected over the same time frame. Both models provide very consistent advice that TAC levels of 13,700 t would maintain the stock at a level consistent with the Convention objectives over the next decade.

South Atlantic

The Committee considered that the ASPIC and BSP estimated benchmarks were unreliable due to the conflicting signal between the catch data and the CPUE time series available to the Committee. Hence, it is unknown whether it is possible to obtain substantially higher yields from the stock as BSP suggests or whether the stock is fully exploited as suggested by ASPIC. Until improved scientific information is available in the form of more consistent indices, tagging studies to estimate fishing mortality or abundance or other improved information, this uncertainty may remain.

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 North and South Atlantic, the most recent recommendations can be found in Recs. 13-02 and 13-03, which establish a three year management plan for that stocks.

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 11,811 t and did not exceed the TAC in any year. In 2010, the TAC was reduced to 13,700 t, compared with 2012 catches of 13,875 t, 2013 catches of 12,018 t and 2014 catches of 10,801 t. Reports for 2014 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 13,618 t, and did not exceed the TAC in any year. In 2010, the TAC was reduced to 15,000 t, compared with 2012 catches of 10,595 t, 2013 catches of 8,109 t and 2014 catches of 9,885. Reports for 2014 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 the 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.

SWO-ATL-6. Management recommendations

North Atlantic

For continuity of advice relative to previous assessments, ASPIC results are provided in **SWO-ATL-Table 2**, which shows the ranges of total catch limits and associated probabilities associated with stock status by year. The current TAC of 13,700 t has an 83% probability of maintaining the North Atlantic swordfish stock in a rebuilt condition by 2021 almost maintaining the level of biomass. This TAC would be in accordance with Rec. 11-13, adopted by the Commission that indicates that 'For stocks that are not overfished and not subject to overfishing (i.e. stocks in the green quadrant of the Kobe plot), management measures shall be designed to result in a high probability of maintaining the stock within this quadrant'. However, the Committee acknowledges that without better direction from the Commission with regard to what constitutes a 'high probability', it cannot provide more specific advice. TACs up to 14,300 t would still have a higher than 50% probability of maintaining the stock in a rebuilt condition by 2021 but would be expected to lead to greater biomass declines.

South Atlantic

Considering the unquantified uncertainties and the lack of signal in the data for the southern Atlantic swordfish stock, and until sufficiently more research has been conducted to reduce the high uncertainty in stock status, the Committee did not have sufficient confidence in the assessment results to change the previous recommendation to limit catches to no more than 15,000 t.

ATLANTIC SWORDFISH SUMMARY

| | <i>North Atlantic</i> | <i>South Atlantic</i> |
|--|---|---|
| Maximum Sustainable Yield ¹ | 13,660 t (13,250-14,080) ³ | Unknown |
| Current (2014) TAC | 13,700 t | 15,000 t |
| Current (2014) Yield ² | 10,801 t | 9,885 t |
| Yield in last year used in assessment (2011) | 12,834 t ⁴ | 11,055 t ⁴ |
| B _{MSY} | 65,060 (54,450-76,700) | Unknown |
| F _{MSY} | 0.21 (0.17-0.26) | Unknown |
| Relative Biomass (B ₂₀₁₁ /B _{MSY}) | 1.14 (1.05-1.24) | Unknown, but likely above 1 ⁵ |
| Relative Fishing Mortality (F ₂₀₁₁ /F _{MSY}) ¹ | 0.82 (0.73-0.91) | Unknown, but likely below 1 ⁵ |
| Stock Status | Overfished: NO Overfishing: NO | Overfished: NO ⁵ Overfishing: NO |
| Management Measures in Effect | Country-specific TACs [Rec. 13-02]; 125/119 cm LJFL minimum size | Country-specific TACs [Rec. 13-03]; 125/119 cm LJFL minimum size |

¹ Base Case production model (Logistic) results based on catch data 1950-2011.

² Provisional and subject to revision.

³ Point estimate, 80% bias corrected confidence intervals are shown.

⁴ As of 5 September 2013.

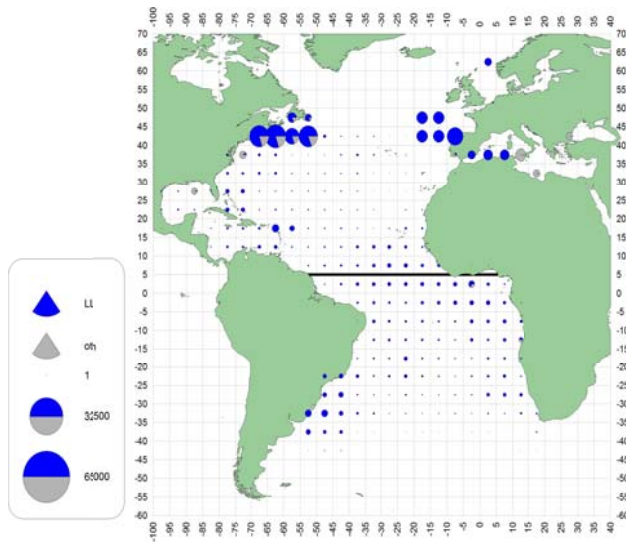
⁵ This determination is based on the models and the ancillary information (e.g. catch trends, mean weight trends).

SWO-ATL-Table 1. Estimated catches (t) of Atlantic swordfish (*Xiphias gladius*) by gear and flag, (v2, 2015-09-25)

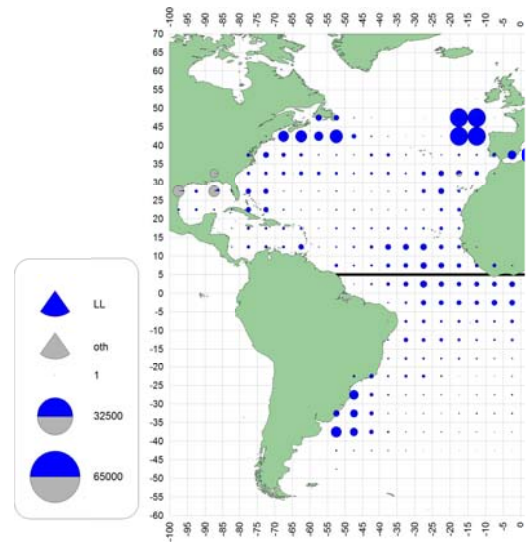
| | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| TOTAL | 32976 | 28826 | 29207 | 32868 | 34459 | 38803 | 33511 | 31567 | 26251 | 27123 | 27180 | 25139 | 23758 | 24075 | 25252 | 25643 | 25718 | 27932 | 23596 | 24761 | 24209 | 23918 | 24470 | 20127 | 20686 |
| ATN | 15672 | 14934 | 15394 | 16738 | 15501 | 16872 | 15222 | 13025 | 12223 | 11622 | 11453 | 10011 | 9654 | 11442 | 12175 | 12480 | 11473 | 12302 | 11050 | 12081 | 11553 | 12523 | 13875 | 12018 | 10801 |
| ATS | 17304 | 13893 | 13813 | 16130 | 18958 | 21930 | 18289 | 18542 | 14027 | 15502 | 15728 | 15128 | 14104 | 12633 | 13077 | 13162 | 14245 | 15630 | 12546 | 12679 | 12655 | 11395 | 10595 | 8109 | 9885 |
| Landings | | | | | | | | | | | | | | | | | | | | | | | | | |
| ATN | 14026 | 14208 | 14288 | 15641 | 14315 | 15764 | 13808 | 12181 | 10939 | 10666 | 9837 | 8676 | 8799 | 10333 | 11406 | 11527 | 10840 | 11475 | 10341 | 11439 | 10964 | 11610 | 12914 | 11278 | 10130 |
| Other surf. | 1646 | 511 | 723 | 689 | 478 | 582 | 826 | 393 | 800 | 426 | 478 | 433 | 240 | 487 | 449 | 620 | 409 | 546 | 465 | 485 | 437 | 511 | 559 | 580 | 515 |
| ATS | 16705 | 13287 | 13176 | 15547 | 17387 | 20806 | 17799 | 18239 | 13748 | 14823 | 15448 | 14302 | 13576 | 11712 | 12485 | 12915 | 13723 | 14967 | 11761 | 12106 | 11920 | 10833 | 10242 | 7889 | 9761 |
| Other surf. | 599 | 606 | 637 | 583 | 1571 | 1124 | 489 | 282 | 269 | 672 | 278 | 825 | 527 | 920 | 591 | 248 | 522 | 572 | 779 | 574 | 587 | 488 | 214 | 147 | 83 |
| Discards | | | | | | | | | | | | | | | | | | | | | | | | | |
| ATN | 0 | 215 | 383 | 408 | 708 | 526 | 562 | 439 | 476 | 525 | 1137 | 896 | 607 | 618 | 313 | 323 | 215 | 273 | 235 | 151 | 148 | 392 | 391 | 160 | 157 |
| Other surf. | 0 | 0 | 0 | 0 | 0 | 0 | 26 | 12 | 9 | 4 | 1 | 6 | 8 | 5 | 7 | 10 | 8 | 8 | 9 | 7 | 5 | 9 | 10 | 0 | 0 |
| ATS | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 21 | 10 | 6 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 91 | 6 | 0 | 147 | 74 | 140 | 72 | 42 |
| 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 |
| Landings | | | | | | | | | | | | | | | | | | | | | | | | | |
| ATN | | | | | | | | | | | | | | | | | | | | | | | | | |
| Barbados | 0 | 0 | 0 | 0 | 0 | 0 | 33 | 16 | 16 | 12 | 13 | 19 | 10 | 21 | 25 | 44 | 39 | 27 | 39 | 20 | 13 | 23 | 21 | 16 | 21 |
| Belize | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 1 | 112 | 106 | 184 | 141 | 142 | 76 |
| Brazil | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 117 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Canada | 911 | 1026 | 1547 | 2234 | 1676 | 1610 | 739 | 1089 | 1115 | 1119 | 968 | 1079 | 959 | 1285 | 1203 | 1558 | 1404 | 1348 | 1334 | 1300 | 1346 | 1551 | 1489 | 1505 | 1604 |
| China PR | 0 | 0 | 0 | 73 | 86 | 104 | 132 | 40 | 337 | 304 | 22 | 102 | 90 | 316 | 56 | 108 | 72 | 85 | 92 | 92 | 73 | 75 | 59 | 96 | 60 |
| Chinese Taipei | 270 | 577 | 441 | 127 | 507 | 489 | 521 | 509 | 286 | 285 | 347 | 299 | 310 | 257 | 30 | 140 | 172 | 103 | 82 | 89 | 88 | 192 | 166 | 115 | 192 |
| Cuba | 47 | 23 | 27 | 16 | 50 | 86 | 7 | 7 | 7 | 7 | 0 | 0 | 10 | 3 | 3 | 2 | 2 | 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 | 25 | 30 | 0 | 7 | 0 | |
| Dominica | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 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 | 6386 | 6633 | 6672 | 6598 | 6185 | 6953 | 5547 | 5140 | 4079 | 3996 | 4595 | 3968 | 3957 | 4586 | 5376 | 5521 | 5448 | 5564 | 4366 | 4949 | 4147 | 4889 | 5622 | 4084 | 3750 |
| EU.France | 75 | 75 | 75 | 95 | 46 | 84 | 97 | 164 | 110 | 104 | 122 | 0 | 74 | 169 | 102 | 178 | 92 | 46 | 14 | 15 | 35 | 16 | 94 | 44 | 28 |
| EU.Ireland | 0 | 0 | 0 | 7 | 0 | 15 | 15 | 132 | 81 | 35 | 17 | 5 | 12 | 1 | 1 | 3 | 2 | 2 | 1 | 1 | 2 | 5 | 2 | 3 | |
| 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.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 | 475 | 773 | 542 | 1961 | 1599 | 1617 | 1703 | 903 | 773 | 777 | 732 | 735 | 766 | 1032 | 1320 | 900 | 949 | 778 | 747 | 898 | 1054 | 1203 | 882 | 1438 | 1241 |
| EU.United Kingdom | 0 | 0 | 0 | 2 | 3 | 1 | 5 | 11 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | |
| FR.St Pierre et Miquelon | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 3 | 36 | 48 | 0 | 82 | 48 | 17 | 90 | 1 | 0 | 18 | 3 |
| Faroe Islands | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Grenada | 1 | 2 | 3 | 13 | 0 | 1 | 4 | 15 | 15 | 42 | 84 | 0 | 54 | 88 | 73 | 56 | 30 | 26 | 43 | 0 | 0 | 0 | 0 | 0 | |
| Iceland | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Japan | 1051 | 992 | 1064 | 1126 | 933 | 1043 | 1494 | 1218 | 1391 | 1089 | 161 | 0 | 0 | 0 | 575 | 705 | 656 | 889 | 935 | 778 | 1062 | 523 | 639 | 300 | 551 |
| Korea Rep. | 51 | 3 | 3 | 19 | 16 | 16 | 19 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 51 | 65 | 175 | 157 | 3 | 0 | 0 | 0 | 64 | 35 |
| Liberia | 3 | 0 | 7 | 14 | 26 | 28 | 28 | 28 | 28 | 28 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Libya | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Maroc | 91 | 110 | 69 | 39 | 36 | 79 | 462 | 267 | 191 | 119 | 114 | 523 | 223 | 329 | 335 | 334 | 341 | 237 | 430 | 724 | 963 | 782 | 770 | 1062 | 1062 |
| Mexico | 0 | 0 | 0 | 6 | 14 | 0 | 22 | 14 | 28 | 24 | 37 | 27 | 34 | 32 | 44 | 41 | 31 | 35 | 34 | 32 | 35 | 38 | 40 | 33 | 32 |
| NEI (ETRO) | 714 | 43 | 35 | 111 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Norway | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Panama | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 17 | 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 | 1 | 4 | 44 | 5 | 0 | 8 | 0 | 22 | 28 | 0 | 17 | 36 | 9 | 14 | |
| Rumania | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Russian Federation | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Senegal | 0 | 6 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 108 | 108 | 0 | 38 | 0 | 28 | 11 | 1 | 44 | 43 | |
| Seychelles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Sierra Leone | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| St. Vincent and Grenadines | 3 | 0 | 3 | 23 | 0 | 4 | 3 | 1 | 0 | 1 | 0 | 22 | 22 | 7 | 7 | 7 | 0 | 51 | 7 | 34 | 13 | 11 | 8 | 4 | |
| St. Lucia | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 3 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Trinidad and Tobago | 66 | 71 | 562 | 11 | 180 | 150 | 158 | 110 | 130 | 138 | 41 | 75 | 92 | 78 | 83 | 91 | 19 | 29 | 48 | 30 | 21 | 16 | 14 | 16 | |
| U.S.A. | 5519 | 4310 | 3852 | 3783 | 3366 | 4026 | 3559 | 2987 | 3058 | 2908 | 2863 | 2217 | 2384 | 2513 | 2380 | 2160 | 1873 | 2463 | 2387 | 2730 | 2274 | 2551 | 3393 | 2824 | |
| 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 | 1 | 1 | 5 | 5 | 3 | 3 | 2 | 0 | 0 | 1 | 1 | 0 | 3 | 4 | 3 | 3 | 3 | 1 | 1 | |
| UK.British Virgin Islands | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 4 | 7 | 0 | 3 | 0 | 0 | 4 | 0 | 0 | |
| UK.Turks and | | | | | | | | | | | | | | | | | | | | | | | | | |

SWO-ATL-Table 2. Estimated probabilities (%) that both the fishing mortality is below F_{MSY} and spawning stock biomass is above SSB_{MSY} for North Atlantic swordfish from ASPIC base model.

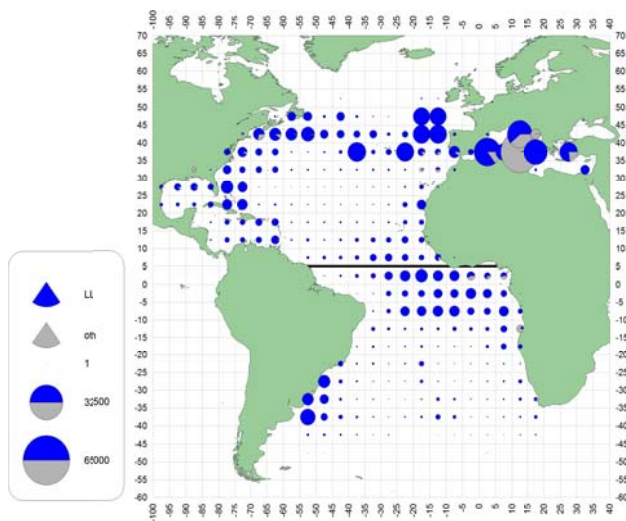
| TAC | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|--------------|------|------|------|------|------|------|------|------|
| 13000 | 88 | 91 | 92 | 92 | 92 | 92 | 93 | 93 |
| 13200 | 88 | 91 | 91 | 92 | 92 | 91 | 91 | 91 |
| 13400 | 88 | 90 | 90 | 89 | 89 | 89 | 89 | 89 |
| 13600 | 88 | 88 | 88 | 88 | 87 | 87 | 86 | 85 |
| 13700 | 88 | 88 | 88 | 87 | 85 | 84 | 84 | 83 |
| 13800 | 88 | 87 | 86 | 85 | 83 | 82 | 82 | 81 |
| 13900 | 88 | 86 | 84 | 83 | 82 | 80 | 79 | 77 |
| 14000 | 88 | 84 | 82 | 80 | 79 | 77 | 75 | 74 |
| 14100 | 88 | 82 | 80 | 78 | 76 | 74 | 72 | 69 |
| 14200 | 88 | 81 | 79 | 76 | 73 | 71 | 67 | 63 |
| 14300 | 88 | 80 | 76 | 73 | 70 | 65 | 61 | 56 |
| 14400 | 88 | 78 | 74 | 71 | 65 | 60 | 54 | 47 |
| 14600 | 88 | 74 | 69 | 63 | 56 | 47 | 40 | 33 |
| 14800 | 88 | 70 | 62 | 51 | 43 | 34 | 29 | 22 |
| 15000 | 88 | 64 | 55 | 42 | 32 | 25 | 17 | 13 |



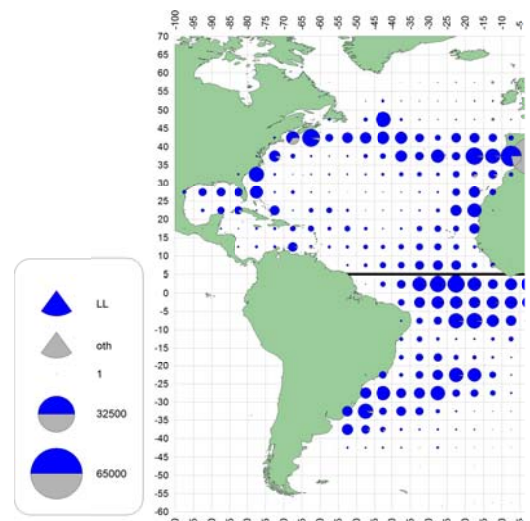
a. SWO(1960-69)



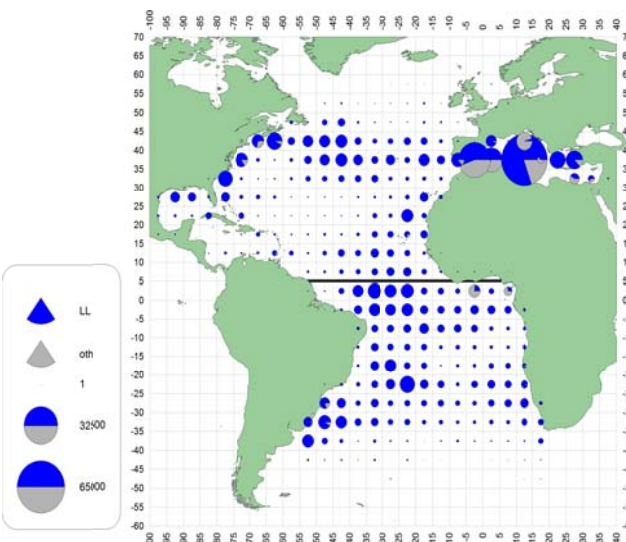
b. SWO(1970-79)



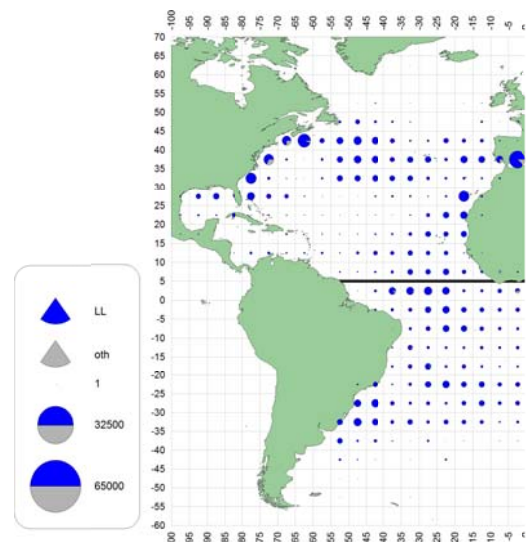
c. SWO(1980-89)



d. SWO(1990-99)

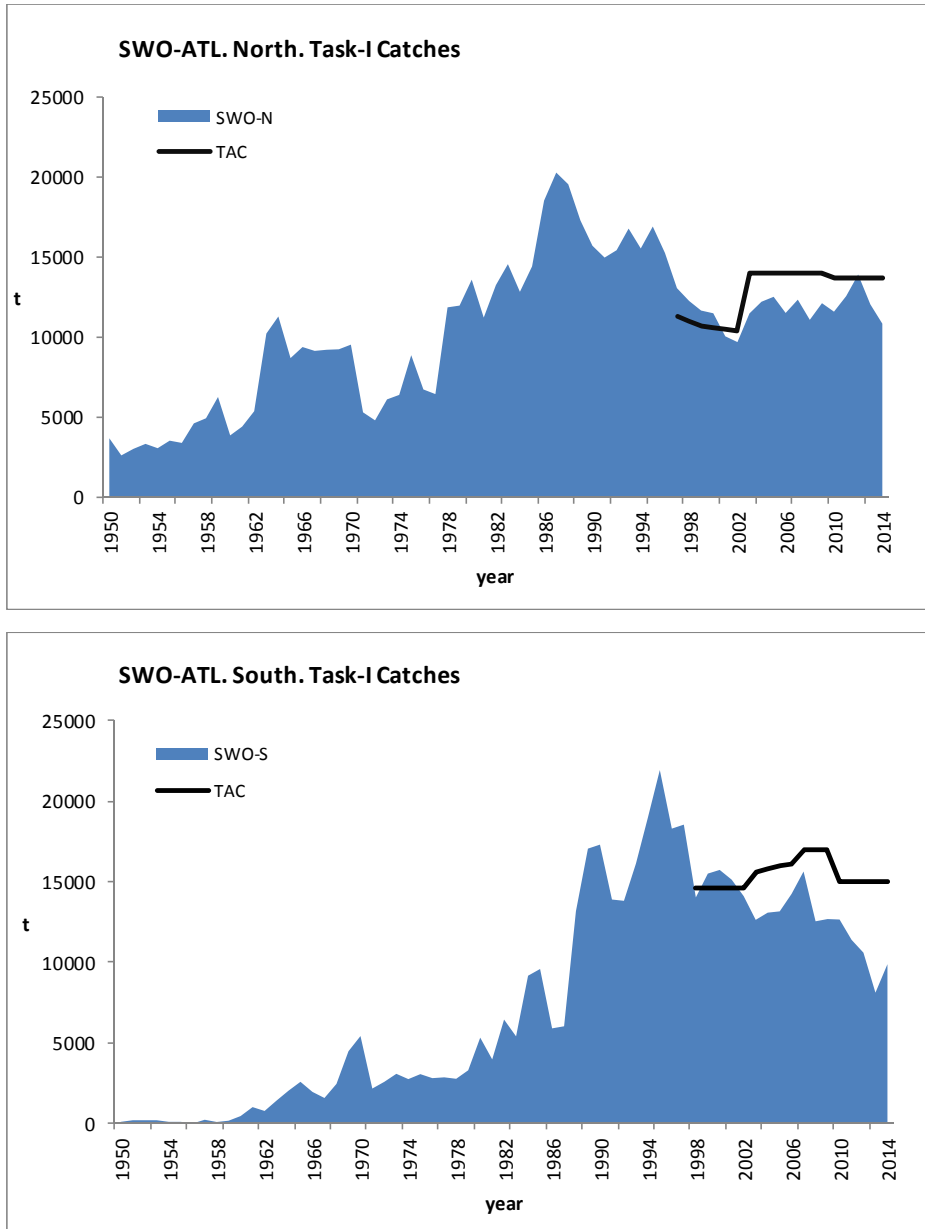


e. SWO (2000-09)

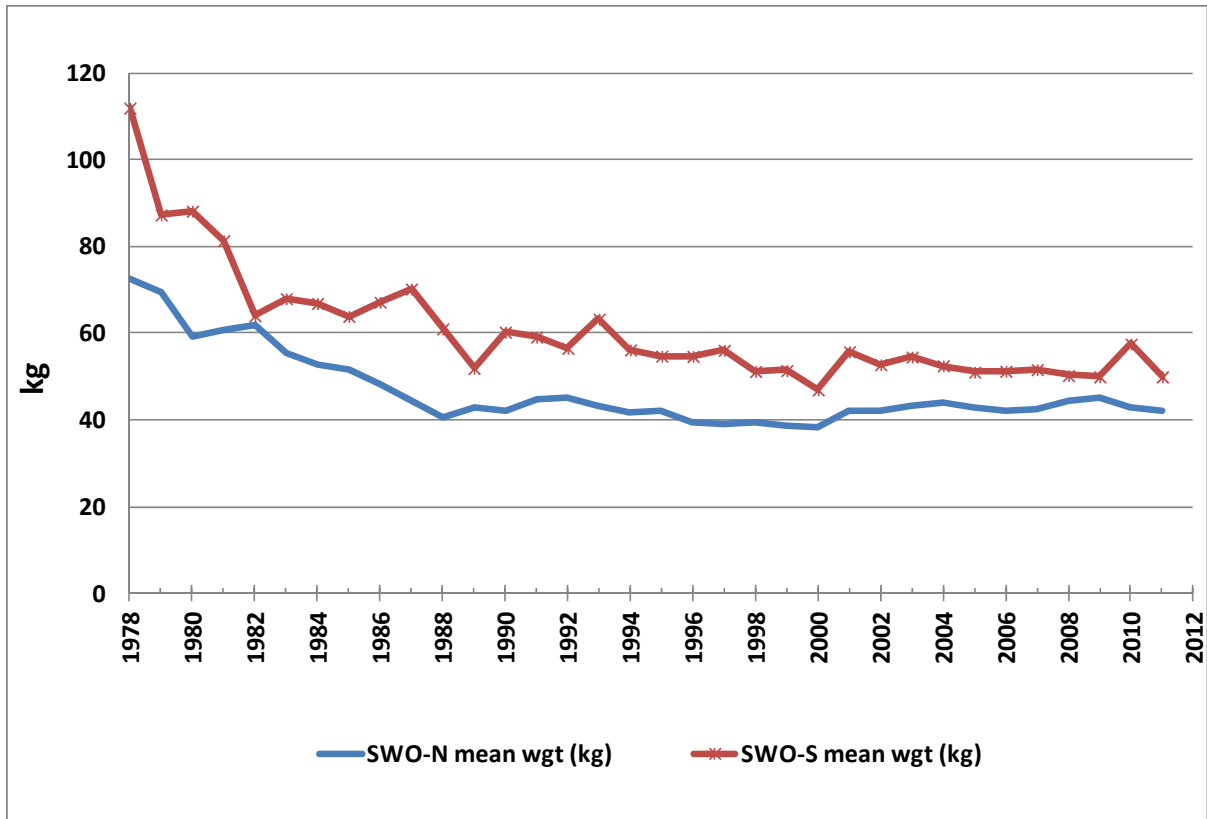


f. SWO(2010-13)

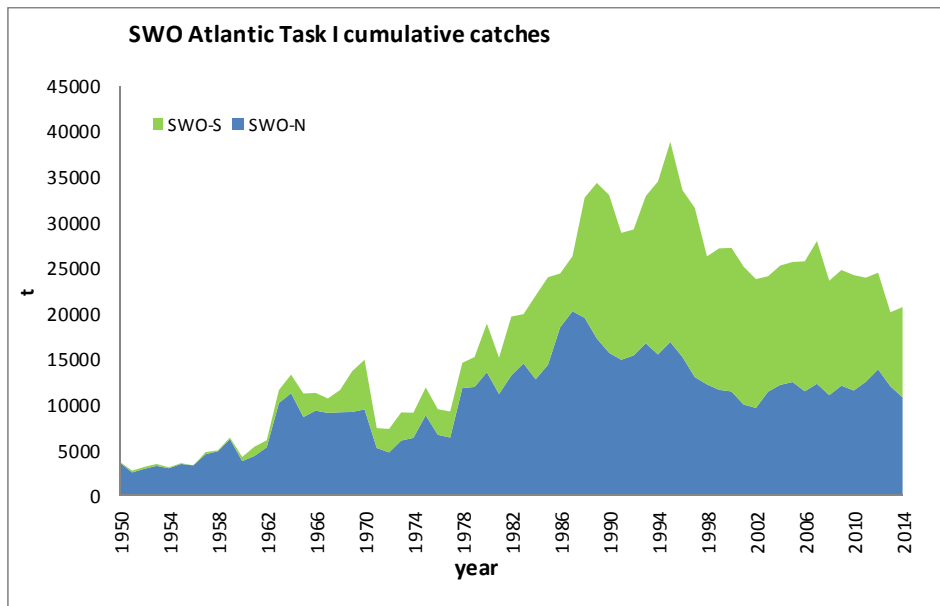
SWO-ATL-Figure 1. Geographic distribution of swordfish cumulative catch (t) by gear, in the Convention area, shown on a decadal scale. The maps are scaled to the maximum catch observed during 1960-2013.



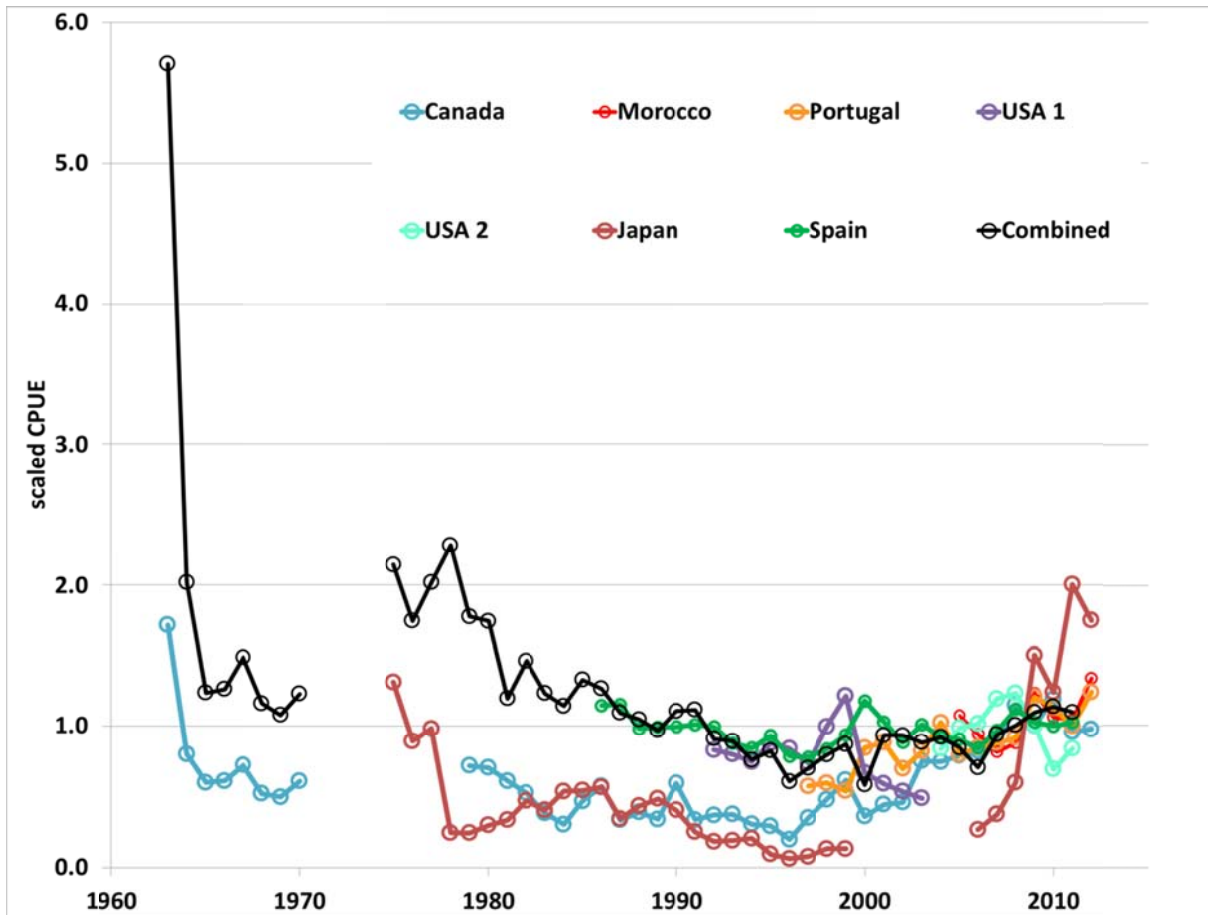
SWO-ATL-Figure 2. North and South Atlantic swordfish catches and TAC (t).



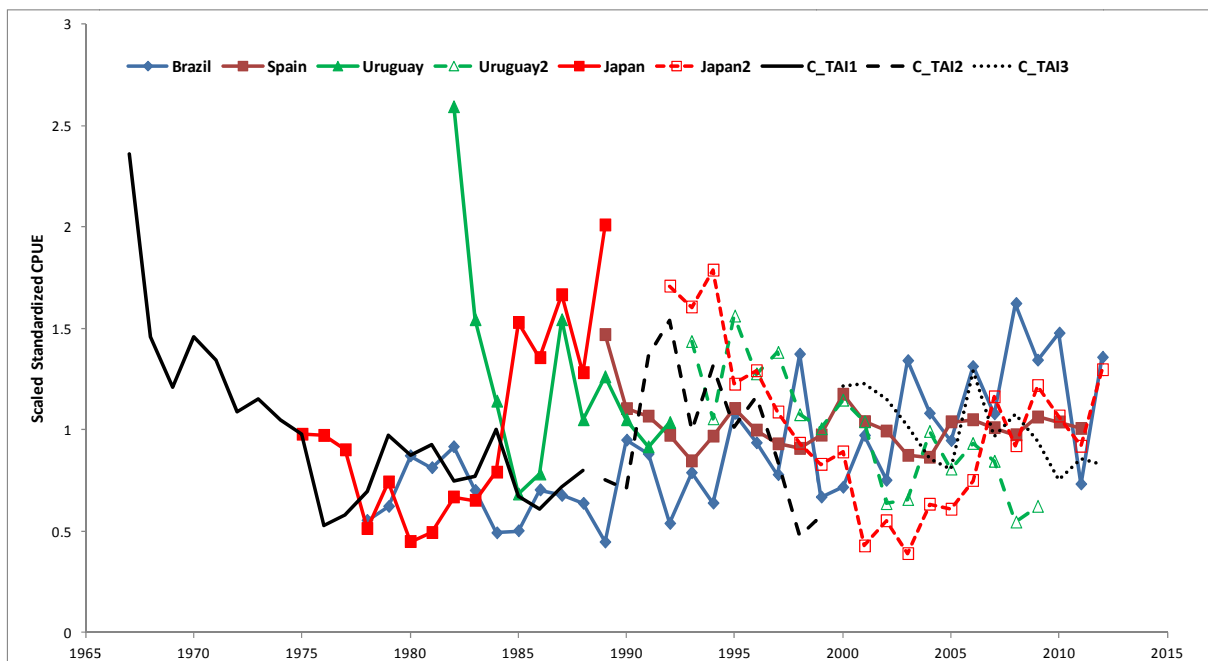
SWO-ATL-Figure 3. Trends in mean weight (kg) for the entire North and South Atlantic swordfish stocks. The information for 2010 is being reviewed and should be considered preliminary.



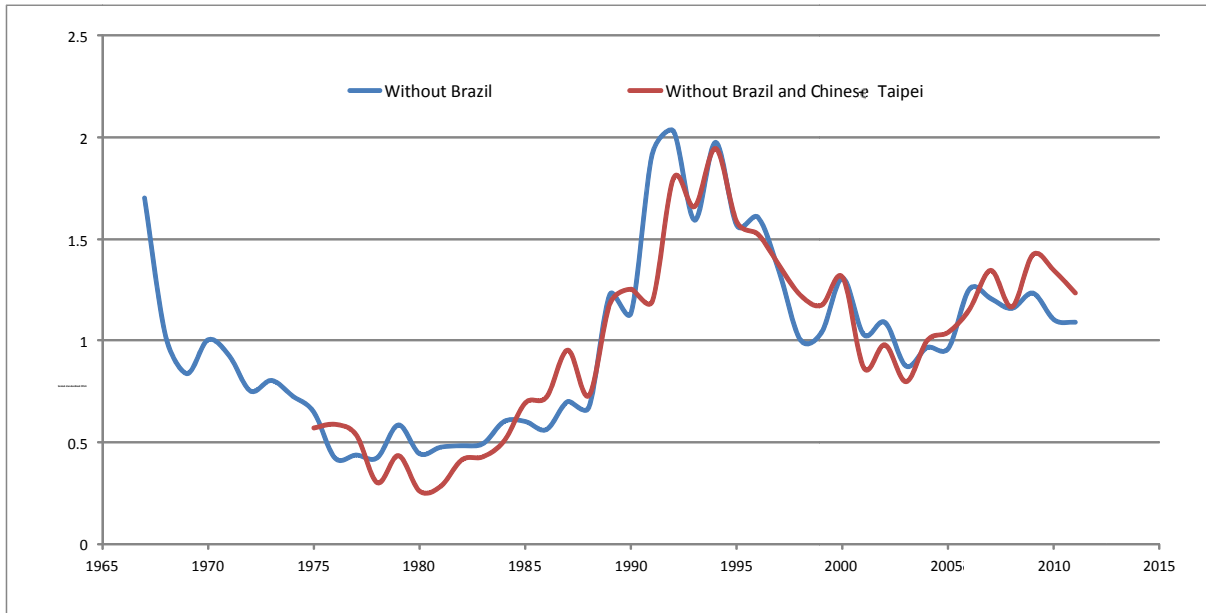
SWO-ATL-Figure 4. Swordfish reported catches (t) for North and South Atlantic, for the period 1950-2014.



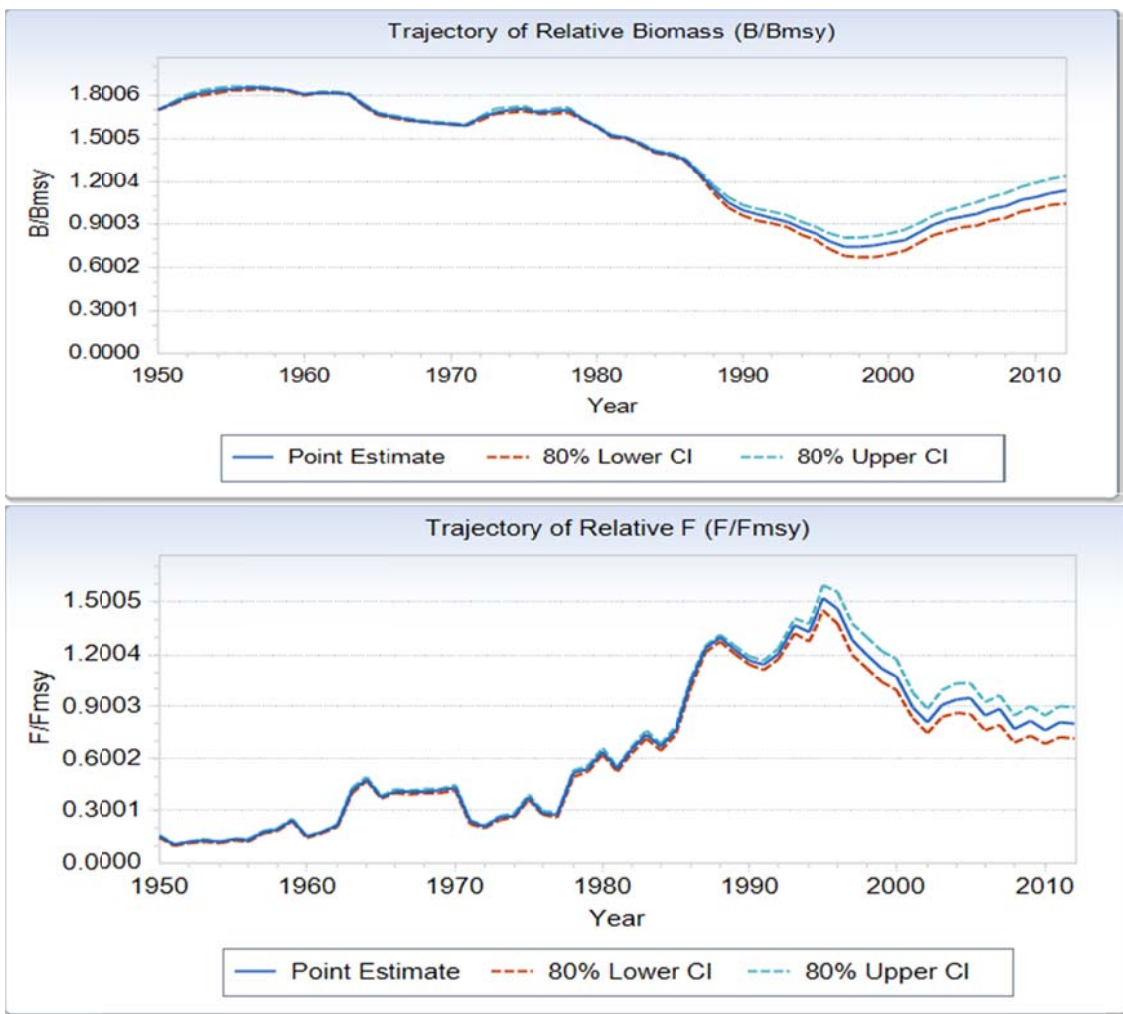
SWO-ATL-Figure 5. Standardized CPUEs series provided by CPCs for the North Atlantic swordfish and the combined index of the base production model. The CPUE series were scaled to their mean for the overlapping years.



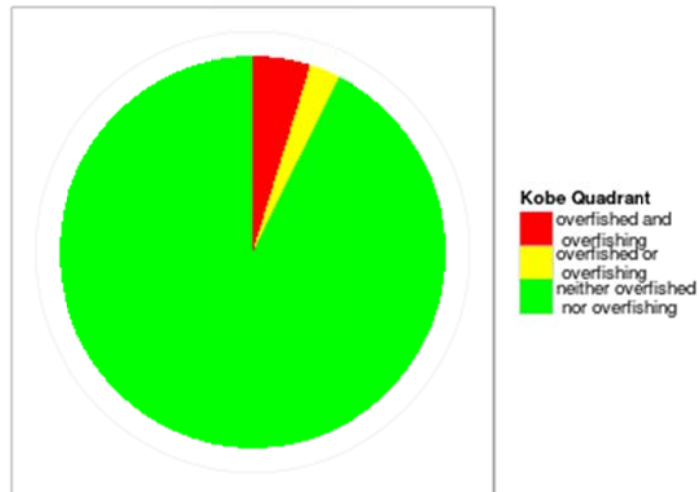
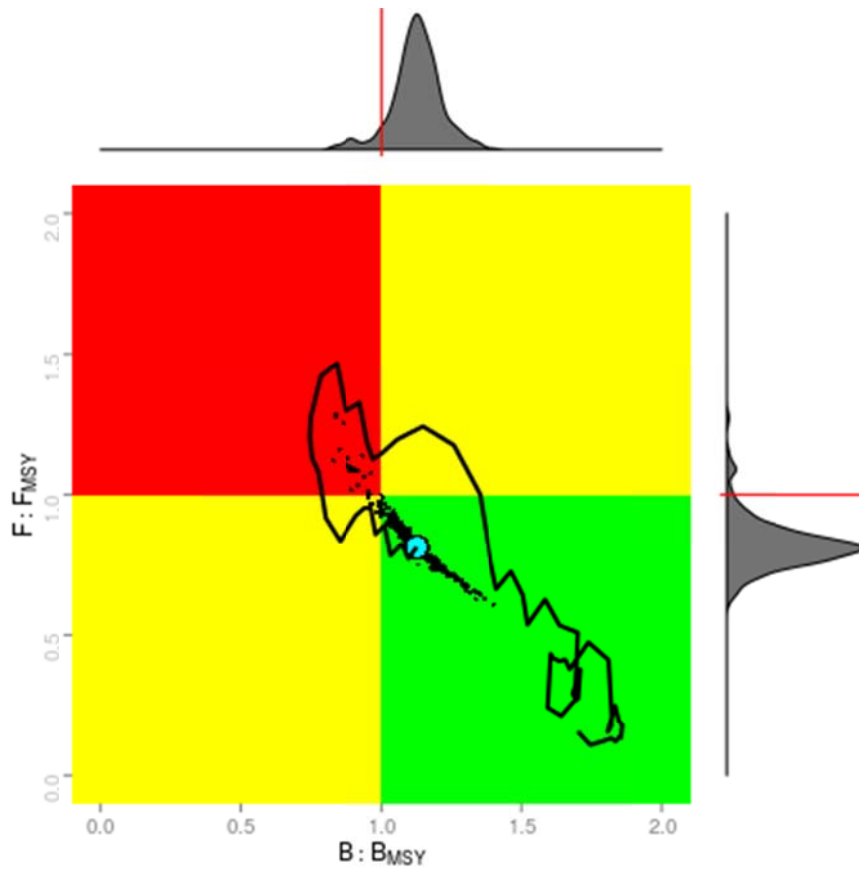
SWO-ATL-Figure 6. Standardized CPUEs series provided by CPCs for South Atlantic swordfish. The CPUE series were scaled to their mean for the overlapping years.



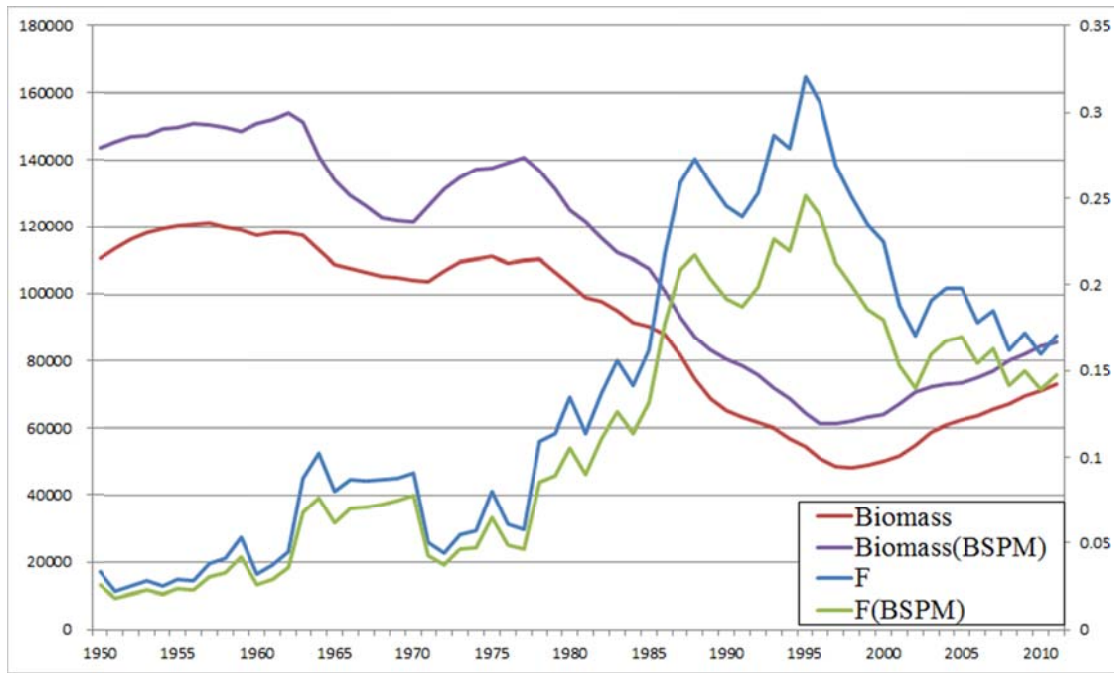
SWO-ATL-Figure 7. South Atlantic swordfish combined standardized CPUE indices.



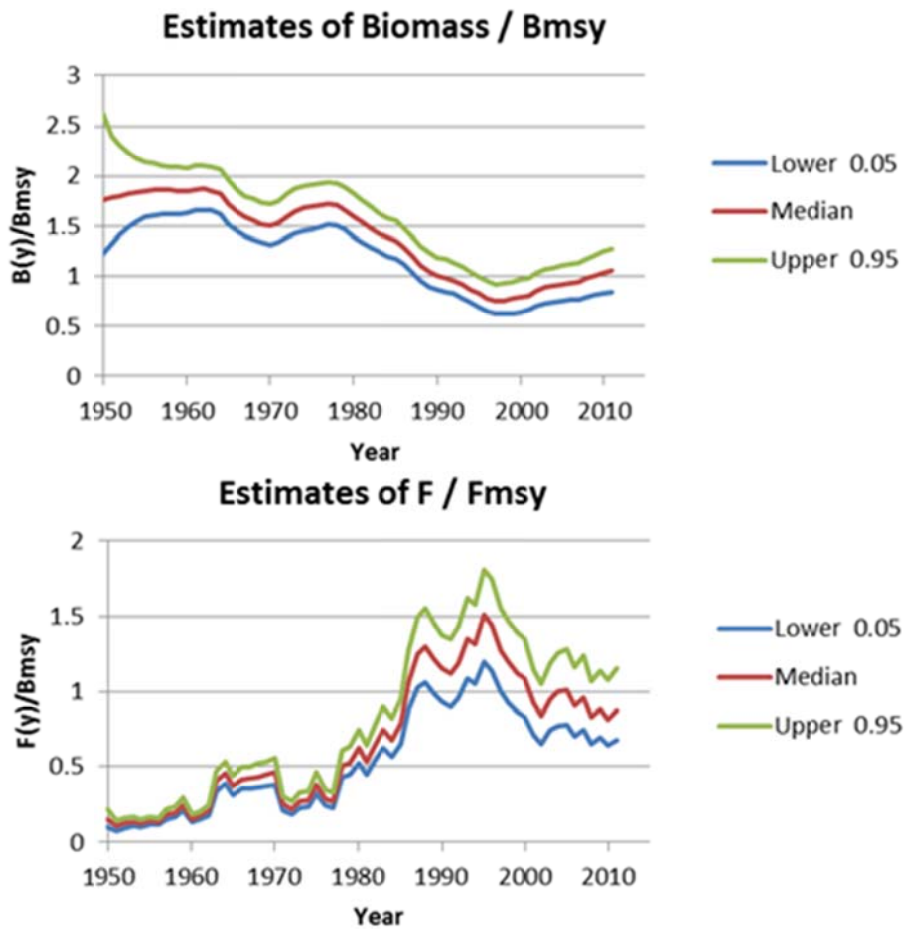
SWO-ATL-Figure 8. Results from the North Atlantic base case ASPIC model: trends in swordfish relative biomass (top) and fishing mortality (bottom) point estimates.



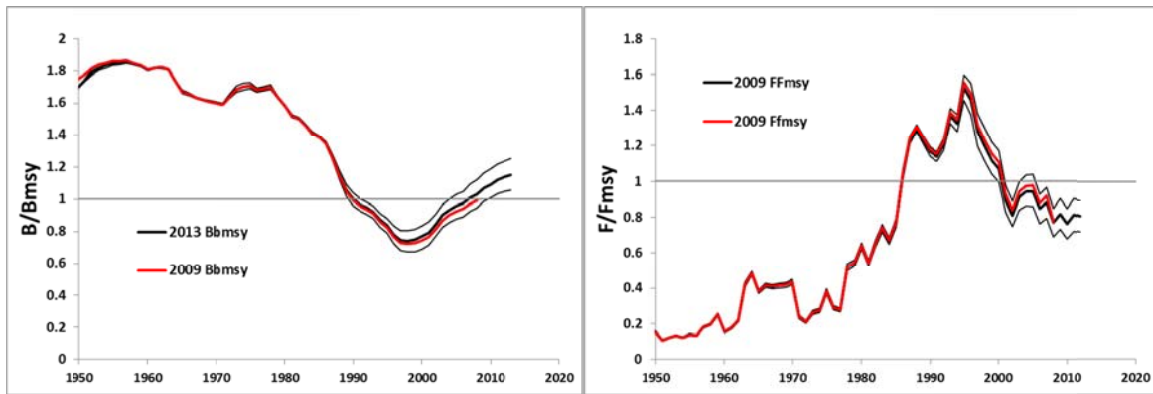
SWO-ATL-Figure 9. North Atlantic swordfish stock status trajectory (solid line) for the period 1950-2011, from the base ASPIC model (solid circle is the estimated median point). The pie chart represents the probabilities of stock being in the different color quadrants (red 3%, yellow 2%, green 95%).



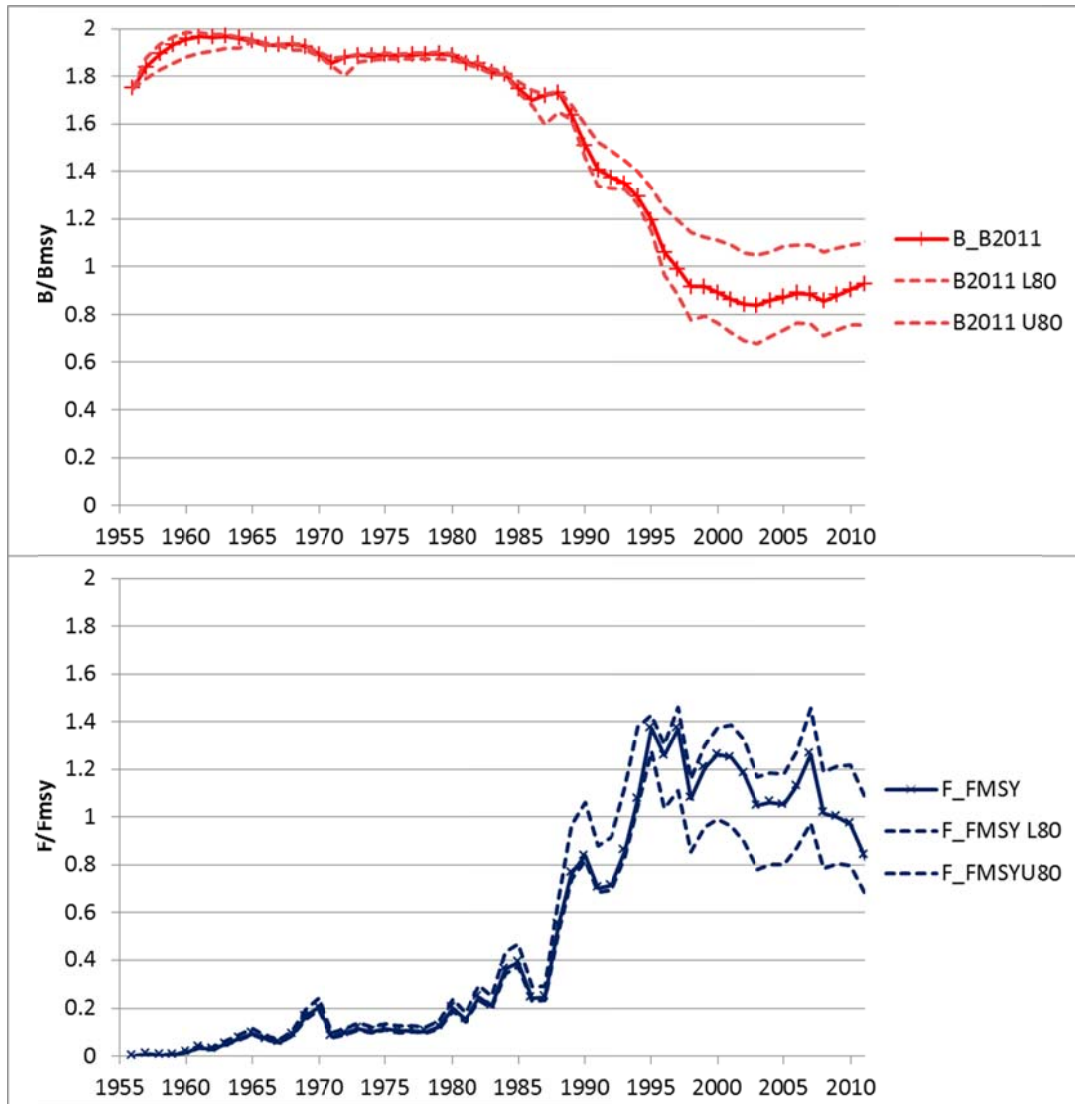
SWO-ATL-Figure 10. Trends in North Atlantic swordfish absolute biomass and fishing mortality estimates from the ASPIC and BSP2 base case models.



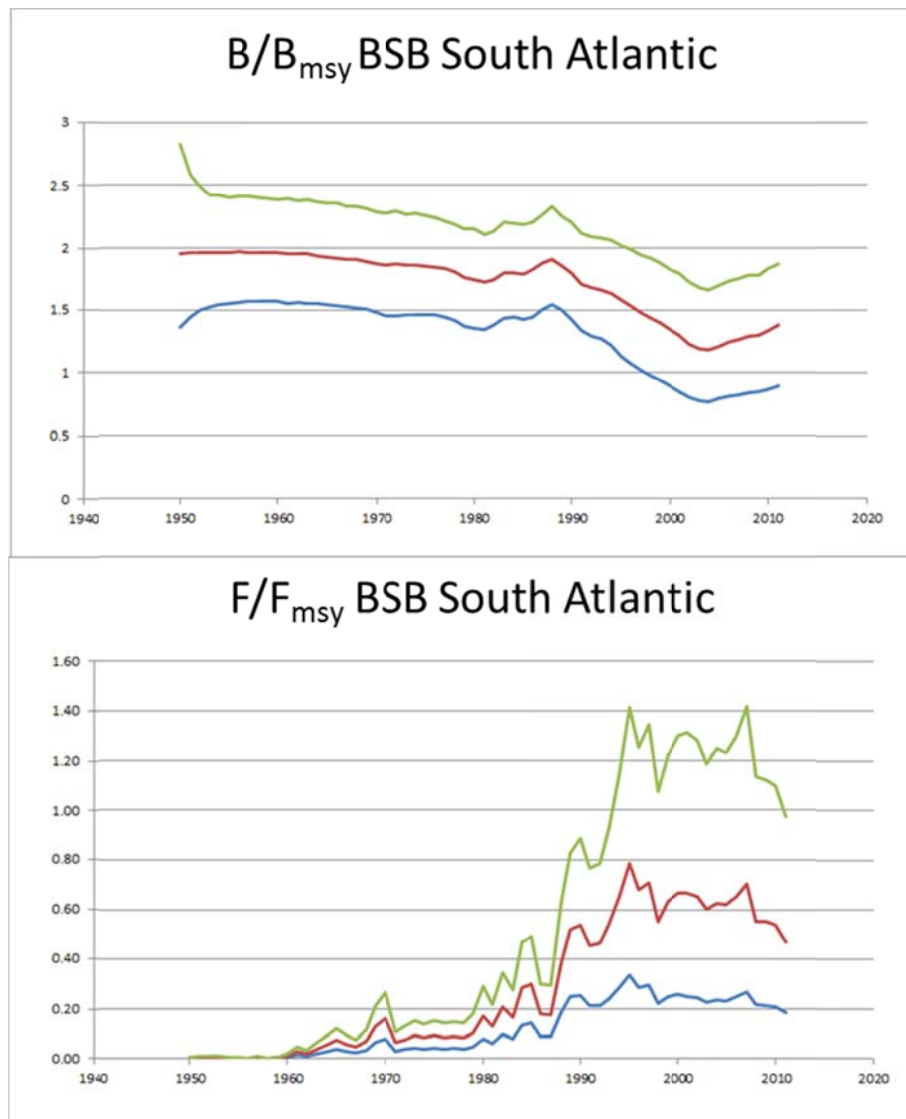
SWO-ATL-Figure 11. Plots of the ratios of i) stock biomass to B_{MSY} and ii) fishing mortality rate to F_{MSY} from the base case BSP2 for North Atlantic swordfish.



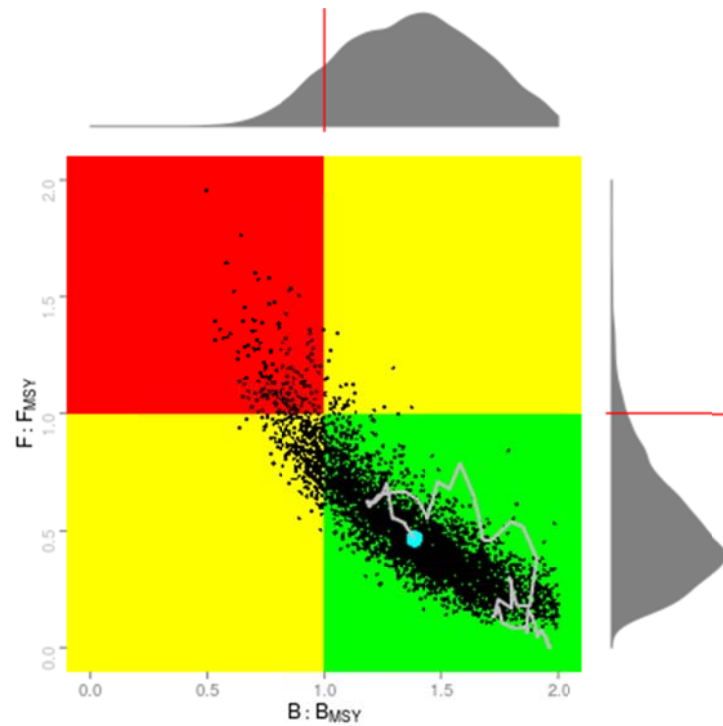
SWO-ATL-Figure 12. Comparison of the relative biomass (left) and fishing mortality (right) estimated by the North Atlantic ASPIC base case models in 2009 and 2013 assessments. Thin lines indicate the 80% confidence bounds for the 2013 estimates.



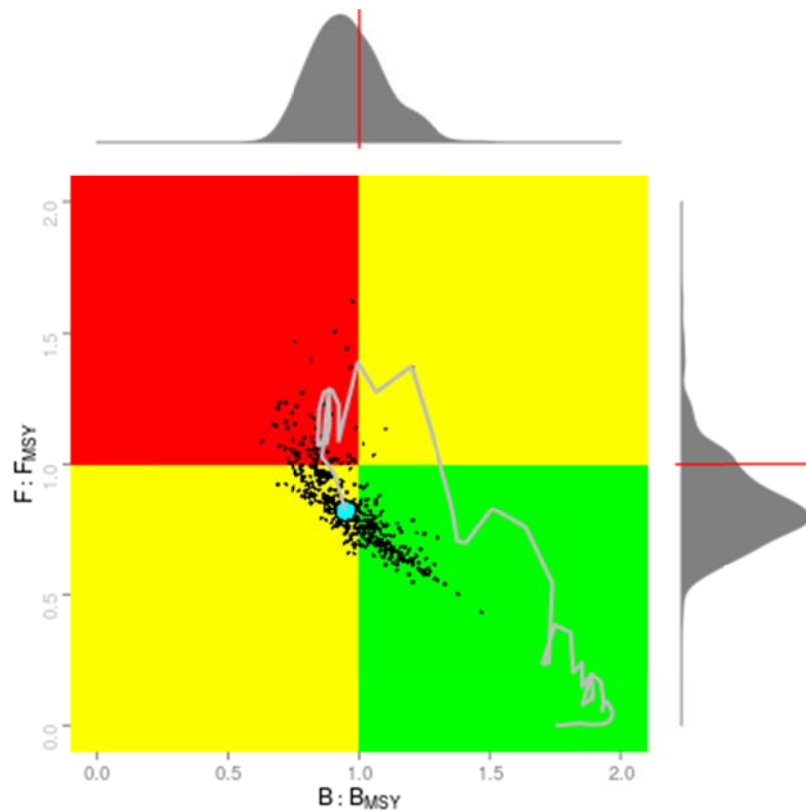
SWO-ATL-Figure 13. South Atlantic swordfish B/B_{MSY} and F/F_{MSY} estimated by ASPIC, dashed lines are the lower and upper 80 percentiles of the bootstrap runs.



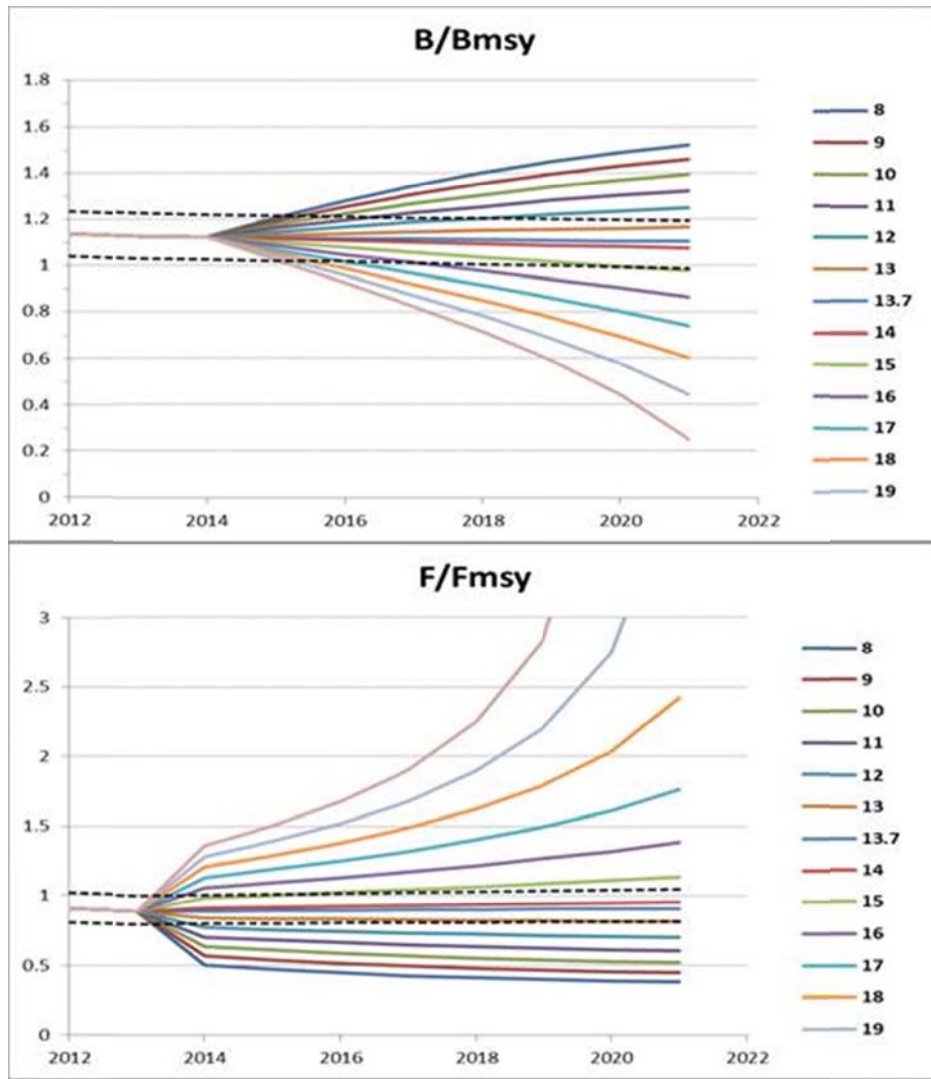
SWO-ATL-Figure 14. South Atlantic swordfish B/B_{MSY} and F/F_{MSY} estimated by BSP2. Posterior median and 90% intervals are plotted.



SWO-ATL-Figure 15. Kobe plots for the BSP reference model for southern Atlantic swordfish. The diamonds show the level of uncertainty and the line represents the trajectories of the status of the stocks of B/B_{MSY} and F/F_{MSY} , 1950-2011.



SWO-ATL-Figure 16. Kobe plots for the ASPIC reference model for southern Atlantic swordfish. The diamonds show the level of uncertainty and the line represents the trajectories of the status of the stocks of B/B_{MSY} and F/F_{MSY} , 1950-2011.



SWO-ATL-Figure 17. Median trends of the relative biomass (B/B_{MSY}) and fishing mortality (F/F_{MSY}) for the projected North Atlantic swordfish stock based on the ASPIC SP model base under different constant catch scenarios (thousand tons). The lines show the median value of bootstrap runs and the dashed lines are 80% confidence intervals around projection at 13,700 t in the projection time period and the observed catch in the historical time period. The TAC in 2012 was 13,700 t.

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 2014, making use of the available catch and effort information through 2013. 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. Although mixing between stocks is believed to be low and generally limited to the region around the Strait of Gibraltar, preliminary results of a study on the reproduction biology of swordfish in the area of Gibraltar that was presented in the Committee, suggested the possible occurrence of a high mixing rate between the Mediterranean and North Atlantic stocks west of the 05°W boundary separating the two stocks.

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. A study that was presented during the latest assessment session suggested that the growth pattern of swordfish in the Strait of Gibraltar was very similar to that obtained from past studies in various Mediterranean areas. Given the existing growth differences among Atlantic and Mediterranean swordfish, this suggests that the majority of fish caught in this area are most likely belonging to the Mediterranean stock. However, further studies are needed to identify the degree of mixing among stocks. Size at age estimates from a recently published growth study performed in the Aegean Sea, were in general agreement with those predicted by the model adopted in ICCAT.

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 the SCRS, 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

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; thus earlier catches may be higher than those appearing in Task I tables. Since 1988, the reported landings of swordfish in the Mediterranean Sea have declined fluctuating mostly between 12,000 to 16,000 t. 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 reported Task I catch for 2014 was 9,737 t, which is the lowest annual catch since 1983. It should be noted that the total 2013 catch estimate that was used during the assessment was considerably higher (11,254 t) due to the unavailability of Italian catch data at that time and the assumptions made (average of the 2010-2012 period) regarding the missing Italian production in 2013. The biggest producers of swordfish in the Mediterranean Sea in recent years (2003-2014) are EU-Italy (45%), Morocco (14%), EU-Spain (13%), EU-Greece (10%) and Tunisia (8%). Also, Algeria, EU-Cyprus, EU-Malta 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 the FAO.

In recent years (2003-2014), the main fishing gears used are surface longlines (on average, representing 84% of the annual catch) and gillnets. Since 2012, gillnets have been eliminated following ICCAT recommendations for a general ban of driftnets in the Mediterranean. Minor catches are also reported from harpoon, trap and fisheries targeting other large pelagic species (e.g. albacore). From 2009-2010 a mesopelagic longline gear has been gradually introduced and nowadays has replaced the surface longline gear in almost all Italian swordfish fleets. This is particularly noteworthy, as these fisheries are among the largest within the stock area, and the changes have implications for the use of catch rates as indices of abundance in the stock assessments.

A study presented during the latest assessment session examined the effects of the introduction of this new mesopelagic longline in the Ligurian Sea fishery. The results showed a significant increase of swordfish mean size and nominal CPUE, with a decrease of the by-catch for the first two years (2010 and 2011). A substantial decline, both of mean size and CPUE values, was recorded in the 2012, and followed by a small recovery in 2013. The introduction of this new gear revealed that a fraction of the swordfish population, made up of large spawners, may be not fully available to the traditional surface longlines. This fishery, however, is confined to a rather small area and its catches represent a small part (<10%) of the total Italian catch. Therefore, it is unknown if the above findings are representative of the fleets using mesopelagic longlines.

Standardised CPUE series from various longline and gillnet fisheries targeting swordfish, which were presented during the 2014 stock assessment session, did not reveal any trend over time (**SWO-MED-Figure 2**). CPUE series, however, did not cover the earlier years of the reported landings. Similarly to CPUE, no trend over the past 25 years was identified regarding the mean fish weight in the catches (**SWO-MED-Figure 3**).

SWO-MED-3. State of the stocks

It should be noted that the assessment results and projections presented here are based on the results of the 2014 assessment, including the landings data that were available at the time of the assessment (August 2014), which have been updated since.

Two forms of assessment (production modelling – ASPIC, BSP and age-structured analysis – XSA) indicated that current SSB levels are much lower than those in the 80s, although no trend appears since then. However, the XSA, ASPIC and BSP models gave different estimates of the absolute abundance, which caused them to produce very different estimates of stock status. Given the lack of trend in the relative abundance indices that introduces uncertainty in production modeling estimates and the limitations of the examined approaches, it was considered that the XSA provides a more reliable assessment of stock status than the production models. This is also in line with the previous assessments that provided advice based on XSA results.

XSA results indicate that recruitment shows a slightly declining trend in the last decade, while stock biomass remains stable at levels that are about 1/3 of that in the mid 1980s (**SWO-MED-Figure 4**). Trends in F-at-age are shown in **SWO-MED-Figure 5**; there appears to have been a recent decline in F, particularly for ages 1 and 2.

Results of equilibrium yield analyses based on the XSA assessment in which we have more confidence indicated that the stock is overfished and subject to overfishing. Current (2013) SSB is less than 30% of B_{MSY} and F is almost twice the estimated F_{MSY} (**SWO-MED-Figure 6**). Results indicate that the stock is overfished throughout the whole period considered in the XSA assessment (1985-2013). Note, however, that there is considerable uncertainty about the stock status relative to the Convention objectives, mainly due to the lack of clear signal in the data, the lack of abundance indices before 1987 and the discrepancy between the assumed 2013 catch and the official Task I data.

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 7**). A reduction of the volume of juvenile catches would improve yield per recruit and spawning biomass per recruit levels.

Noting that the Italian catch has been updated from 4,512 to 2,862 t in 2013, the Committee explored the implications of the change in total removals on stock status and management advice. Even with the inclusion of the revised landings, that reduced the total catch in 2013 by 1,650 t, the stock remains in an overexploited state.

SWO-MED-4. Outlook

The assessment of Mediterranean swordfish indicates that biomass levels appear to be rather stable over the past 20 years. However, the stock is below the level which can support MSY and current fishing mortality 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. Based on the stock status estimates, a reduction of current F to the $F_{0.1}$ level would result in a substantial (about four times) longterm increase in SSB as the estimated equilibrium curves are very sensitive to F changes (**SWO-MED-Figure 8**). The above findings, however, should be faced with caution as they are based on reference point estimates resulted from an equilibrium analysis assuming recruitment independent of stock size. Unfortunately, the lack of a clear signal in the data did not allow the calculation of a reasonable stock-recruitment relationship. It is worth mentioning that the estimated SSB_{MSY} levels are considerably higher (~30%) than the SSB values estimated before the full expansion of the fishery. Correspondingly, the estimated F_{MSY} is lower than all historical F values. It should be also noted that current F (2013) may be overestimated as the official 2013 catch is lower (~15%) than that assumed during the stock assessment. 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 before the expansion of the fisheries may be also considered as a B_{MSY} proxy for the stock. These levels are around 30,000 t, about 30% lower than the currently estimated B_{MSY} value (~47,000 t).

Projections of 20% fishing mortality reductions based on highly-aggregated data derived from the age-structured assessment assuming either the current exploitation pattern or partial movement towards that of the mesopelagic longline (i.e. shift towards bigger individuals) are forecast to be beneficial in moving the stock condition closer to the Convention objective, resulting in substantial SSB increases in the medium term. However, SSB will still not reach the highest level in the time series, i.e. the late 80s' levels. Slight SSB increases under either exploitation pattern are expected even under the current F . It should be noted that due to the earlier mentioned discrepancy (section 2) between the 2013 estimated catch used in the assessment and the officially reported catch, SSB projections may be biased. Therefore, future SSB levels are expected to be higher than those estimated. Further projections including various combinations of F reductions and gear selection changes can be accomplished online by means of a tool developed by the ICCAT Secretariat. Results of the projections are summarized in **SWO-MED-Figures 9 and 10**.

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. Through Recommendations 11-03 and 13-04 the Commission has adopted additional management measures intended to bring the stock back to levels that are consistent with the ICCAT Convention objective. Those measures include 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. 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.

After the adoption of the aforementioned recommendations, reported catches have decreased significantly from the 2000s' level, being the catches in 2012 and 2013 the minimum values of the last three decades. In addition, reported catches of juvenile swordfish of less than 90 cm has also decreased on average 54% in the last two years compared with the levels of the decade of 2000s. Apart from the seasonal closures, the introduction of the mesopelagic LL by some fleets in place of surface longline effort, may have contributed to the observed decrease of catches of juveniles.

SWO-MED-6. Management recommendations

Assessment provided signals of decreasing fishing mortality trends since 2010 and it is likely that this is mainly due to the management measures adopted by the Commission. Given the concerns about the stock status, already mentioned in section 4, and the shortness of the time series with which to fully evaluate the effectiveness of the most recent management measures, the Committee recommends to maintain the current management measures of Mediterranean swordfish as adopted in Rec. 13-04 until additional data permits a conclusion as to whether or not they are sufficient to allow the stock to rebuild to a level in line with the Convention objectives.

However, it has been noted that the recently adopted management measures may have increased discard levels of undersized swordfish; therefore it is recommended to closely monitor the fishery and that every component of the Mediterranean swordfish mortality be adequately reported to ICCAT by the CPCs. It is noteworthy that information on the volume of discards is hardly reported so far. Moreover, as it has been noted that the number of vessels in the ICCAT records of vessels authorized to catch Mediterranean swordfish is generally higher than the vessels that are active in each CPC, the Committee recommends that the implications of this potential excess capacity should be considered by the Commission.

MEDITERRANEAN SWORDFISH SUMMARY

| | |
|---|---|
| Maximum Sustainable Yield | ~15,000 t ¹ |
| Current (2014) Yield | 9,793 t ² |
| Current (2013) Replacement Yield | 9,540 t ¹ |
| B _{MSY} | 47,600 t ¹ |
| F _{MSY} | 0.24 ¹ |
| Relative Biomass (B ₂₀₁₃ /B _{MSY}) | 0.27 ¹ |
| Relative Fishing Mortality | |
| F ₂₀₁₃ /F _{MSY} | 1.82 ¹ |
| F ₂₀₁₃ /F _{0.1} | 2.97 ¹ |
| Stock Status 2013 | Overfished: Yes ¹ Overfishing: Yes 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 [Rec. 13-04]. ³ |

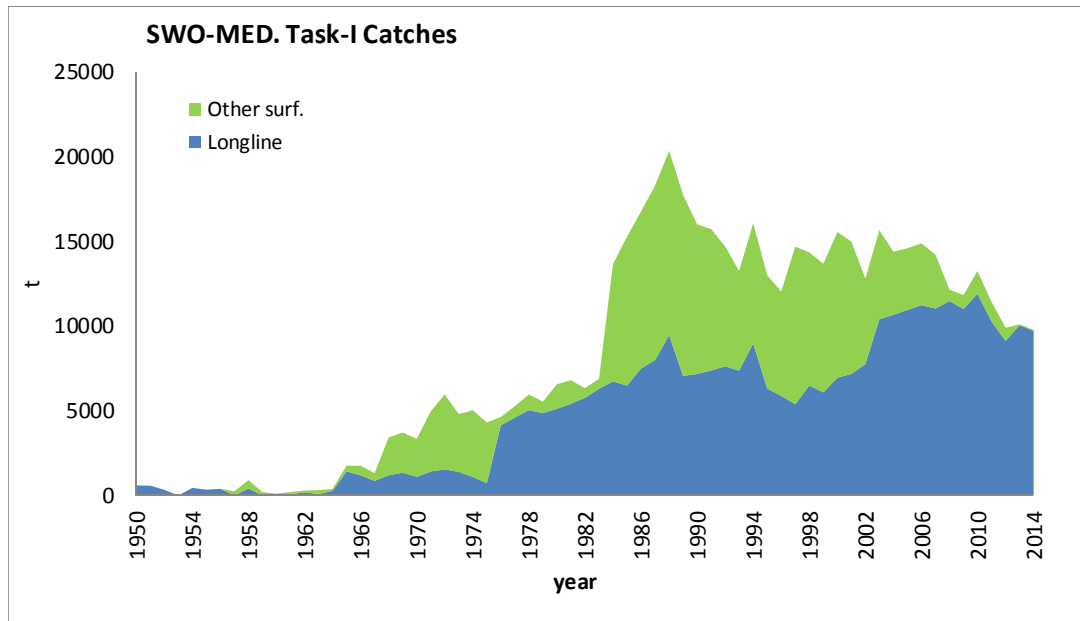
¹ Estimates based on the XSA and equilibrium analyses (see text for details).

² As of September 2015.

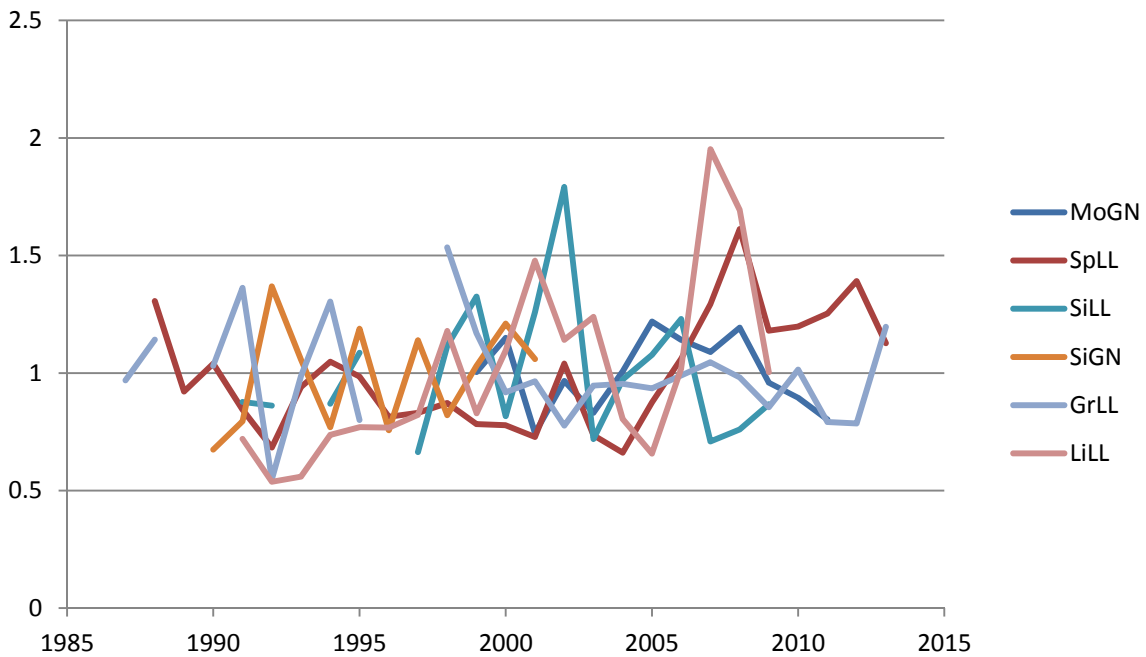
³ Certain additional fishery restrictions are implemented at the national level.

SWO-MED-Table 1. Estimated catches (t) of swordfish (*Xiphias gladius*) in the Mediterranean by gear and flag. (v1, 2015-09-25)

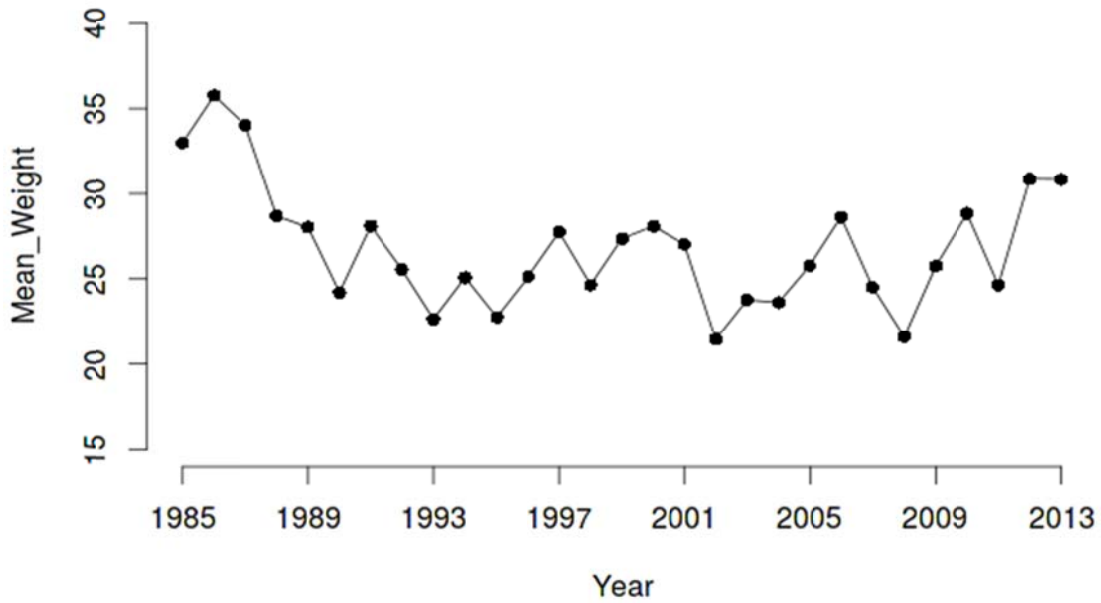
| | | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|----------|----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|------|
| TOTAL | MED | 16018 | 15746 | 14709 | 13265 | 16082 | 13015 | 12053 | 14693 | 14369 | 13699 | 15569 | 15006 | 12814 | 15674 | 14405 | 14600 | 14893 | 14227 | 12164 | 11840 | 13265 | 11450 | 9913 | 10110 | 9793 |
| Landings | Longline | 7184 | 7393 | 7631 | 7377 | 8985 | 6319 | 5884 | 5389 | 6496 | 6097 | 6963 | 7180 | 7767 | 10415 | 10667 | 10848 | 11228 | 11028 | 11465 | 11020 | 11918 | 10288 | 9131 | 10061 | 9710 |
| | Other surf. | 8834 | 8353 | 7078 | 5888 | 7097 | 6696 | 6169 | 9304 | 7873 | 7602 | 8606 | 7826 | 5047 | 5259 | 3729 | 3639 | 3649 | 3179 | 672 | 819 | 1347 | 1162 | 782 | 49 | 83 |
| Discards | Longline | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 113 | 16 | 19 | 27 | 0 | 0 | 0 | 0 | 0 | 0 |
| Landings | Albania | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 13 | 13 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Algerie | 712 | 562 | 395 | 562 | 600 | 807 | 807 | 807 | 825 | 709 | 816 | 1081 | 814 | 665 | 564 | 635 | 702 | 601 | 802 | 468 | 459 | 216 | 387 | 403 | 557 |
| | Chinese Taipei | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | EU.Croatia | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 3 | 6 | 6 | 4 | 10 | 16 |
| | EU.Cyprus | 173 | 162 | 56 | 116 | 159 | 89 | 40 | 51 | 61 | 92 | 82 | 135 | 104 | 47 | 49 | 53 | 43 | 67 | 67 | 38 | 31 | 35 | 35 | 51 | 51 |
| | EU.España | 1523 | 1171 | 822 | 1358 | 1503 | 1379 | 1186 | 1264 | 1443 | 906 | 1436 | 1484 | 1498 | 1226 | 951 | 910 | 1462 | 1697 | 2095 | 2000 | 1792 | 1744 | 1591 | 1607 | 2073 |
| | EU.France | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 27 | 0 | 19 | 0 | 0 | 14 | 14 | 16 | 78 | 81 | 12 | 66 | 127 | |
| | EU.Greece | 1344 | 1904 | 1456 | 1568 | 2520 | 974 | 1237 | 750 | 1650 | 1520 | 1960 | 1730 | 1680 | 1230 | 1120 | 1311 | 1358 | 1887 | 962 | 1132 | 1494 | 1306 | 877 | 1731 | 1344 |
| | EU.Italy | 9101 | 8538 | 7595 | 6330 | 7765 | 7310 | 5286 | 6104 | 6104 | 6312 | 7515 | 6388 | 3539 | 8395 | 6942 | 7460 | 7626 | 6518 | 4549 | 5016 | 6022 | 5274 | 4574 | 2862 | 3393 |
| | EU.Malta | 135 | 129 | 85 | 91 | 47 | 72 | 72 | 100 | 153 | 187 | 175 | 102 | 257 | 163 | 195 | 362 | 239 | 213 | 260 | 266 | 423 | 532 | 503 | 460 | 376 |
| | EU.Portugal | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 115 | 8 | 1 | 120 | 14 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Japan | 2 | 1 | 2 | 4 | 2 | 4 | 5 | 5 | 7 | 4 | 2 | 1 | 1 | 0 | 2 | 4 | 0 | 3 | 1 | 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 | 1 | 0 | 0 | 0 | 0 | 0 |
| | Libya | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 0 | 8 | 6 | 0 | 10 | 2 | 0 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Maroc | 1249 | 1706 | 2692 | 2589 | 2654 | 1696 | 2734 | 4900 | 3228 | 3238 | 2708 | 3026 | 3379 | 3300 | 3253 | 2523 | 2058 | 1722 | 1957 | 1587 | 1610 | 1027 | 802 | 770 | 770 |
| | NEI (MED) | 1360 | 1292 | 1292 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Syria | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 37 | 28 | 0 | 0 | 0 | 9 | 4 | |
| | Tunisie | 176 | 181 | 178 | 354 | 298 | 378 | 352 | 346 | 414 | 468 | 483 | 567 | 1138 | 288 | 791 | 791 | 949 | 1024 | 1011 | 1012 | 1016 | 1040 | 1038 | 2050 | 1030 |
| | Turkey | 243 | 100 | 136 | 292 | 533 | 306 | 320 | 350 | 450 | 230 | 370 | 360 | 370 | 350 | 386 | 425 | 410 | 423 | 386 | 301 | 334 | 190 | 80 | 97 | 56 |
| Discards | EU.Greece | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 113 | 16 | 19 | 27 | 0 | 0 | 0 | 0 | 0 | 0 |



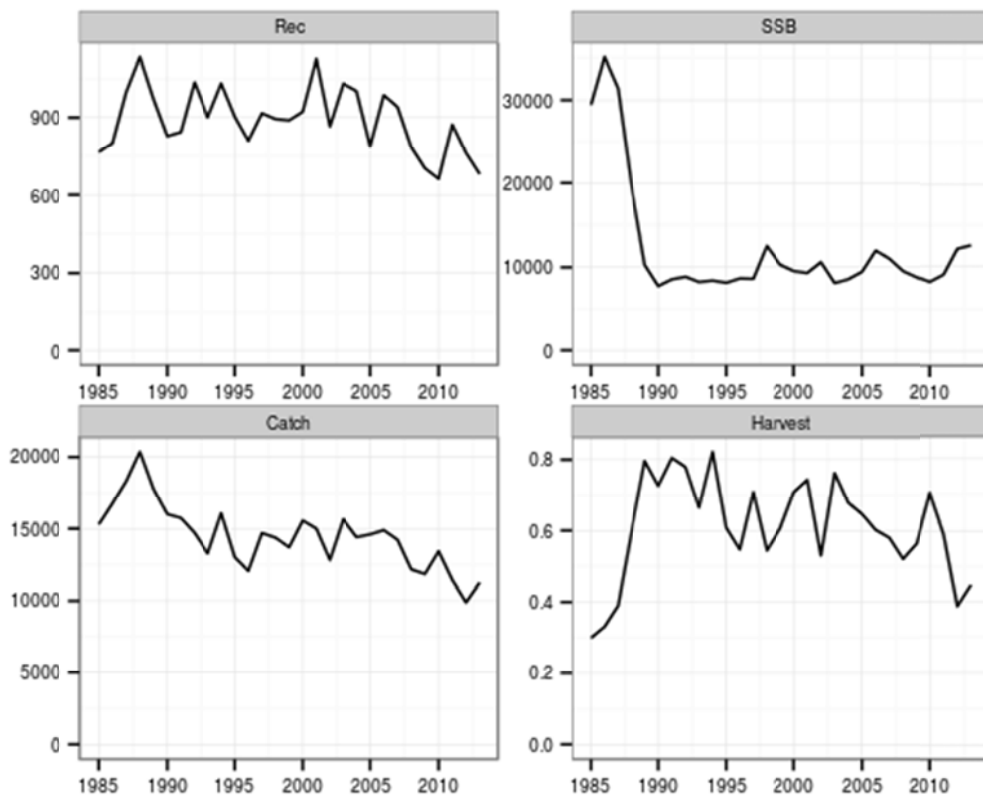
SWO-MED-Figure 1. Cumulative estimates of Task I swordfish catches (t) in the Mediterranean by major gear types, for the period 1950-2014.



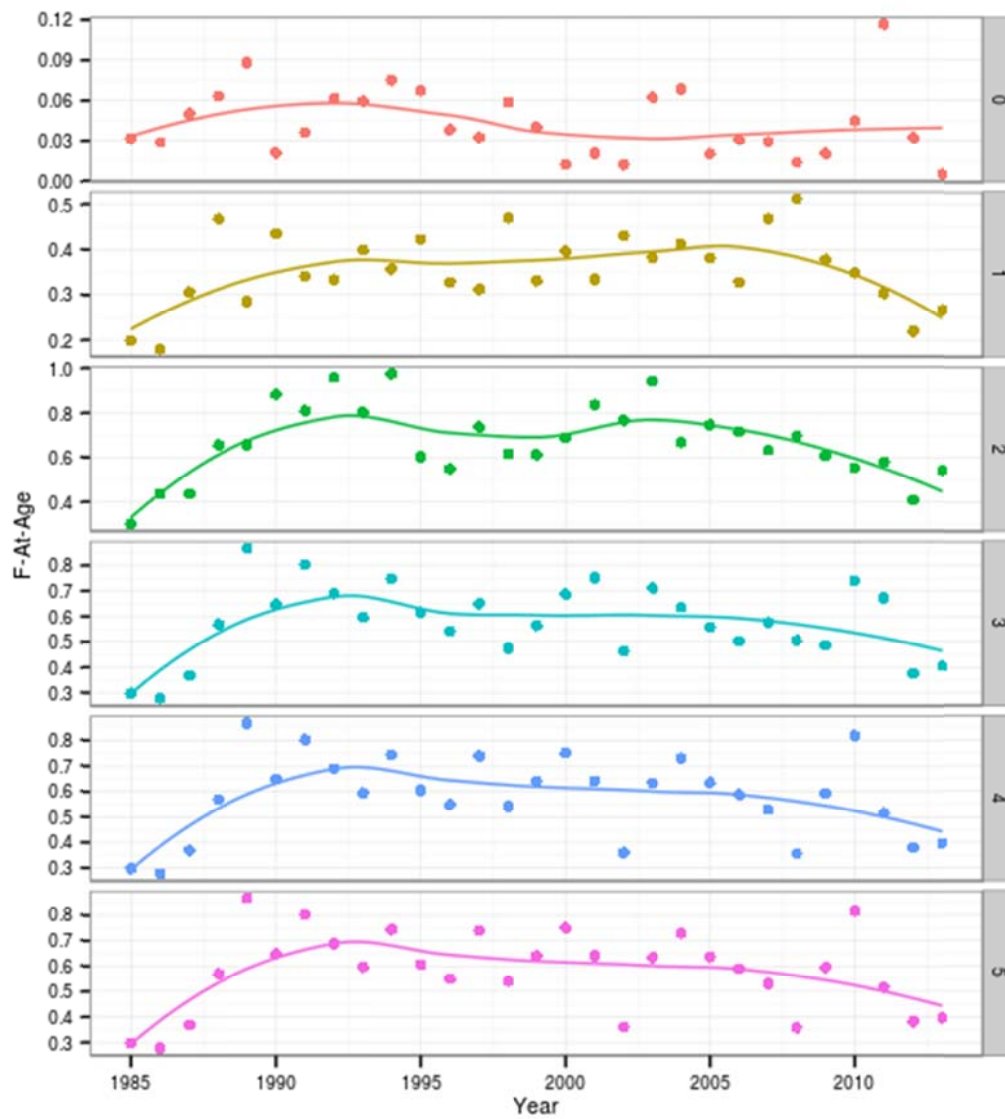
SWO-MED-Figure 2. Time series of standardized CPUE rates scaled to the corresponding mean value for the Spanish longliners (SpLL), Sicilian longliners (SiLL), Greek longliners (GrLL), Moroccan gillnetters (MoGN), Sicilian gillnetters (SiGN) and Ligurian longliners (LiLL).



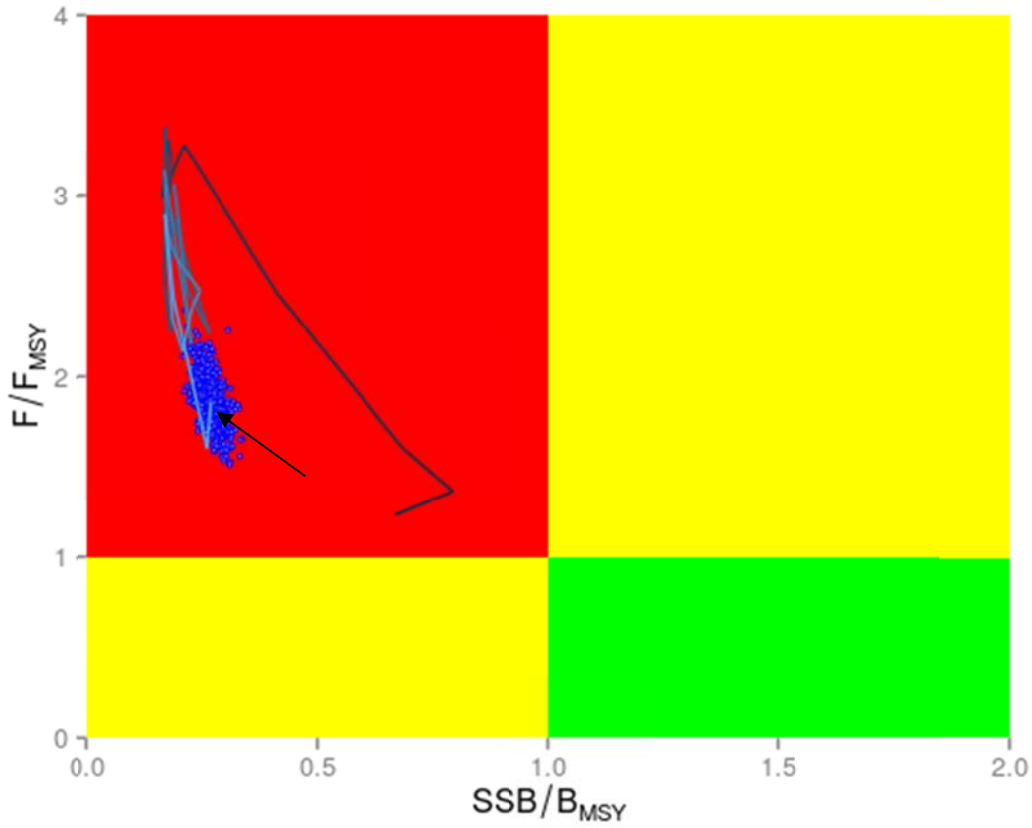
SWO-MED-Figure 3. Time series of mean fish weight (kg) in the catches.



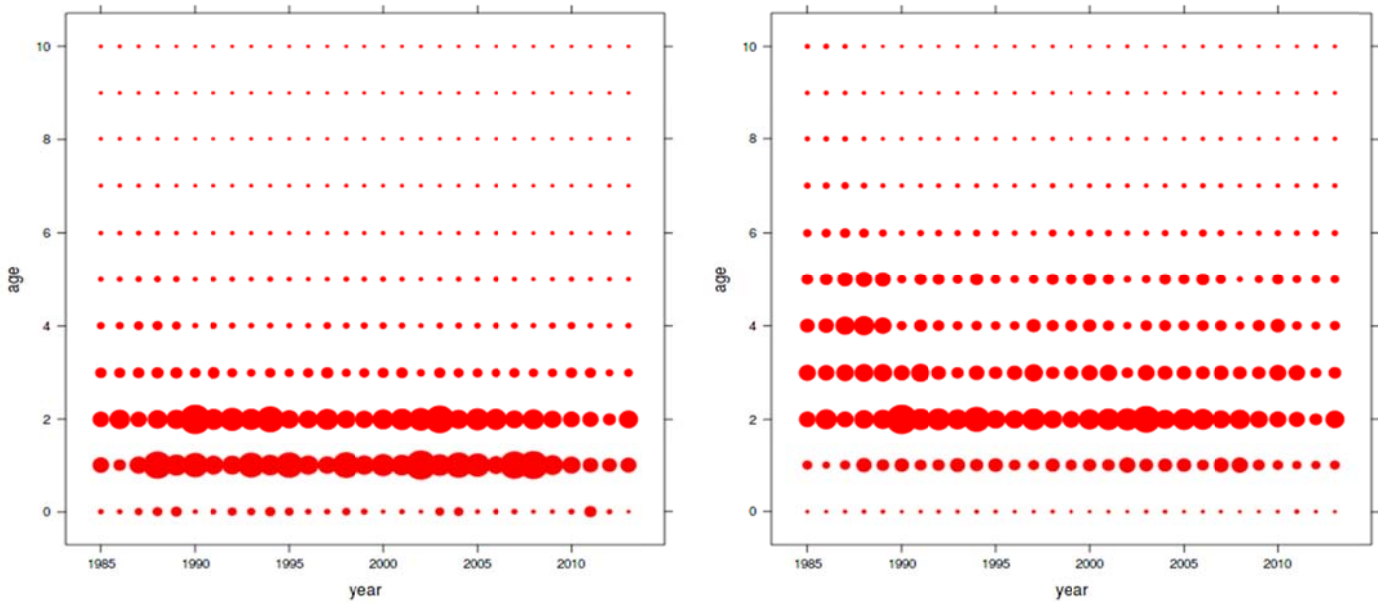
SWO-MED-Figure 4. XSA estimates of historic time series of recruitment (thousands of fish), SSB (t), catch (t) and average fishing mortality (harvest) of ages 2-4.



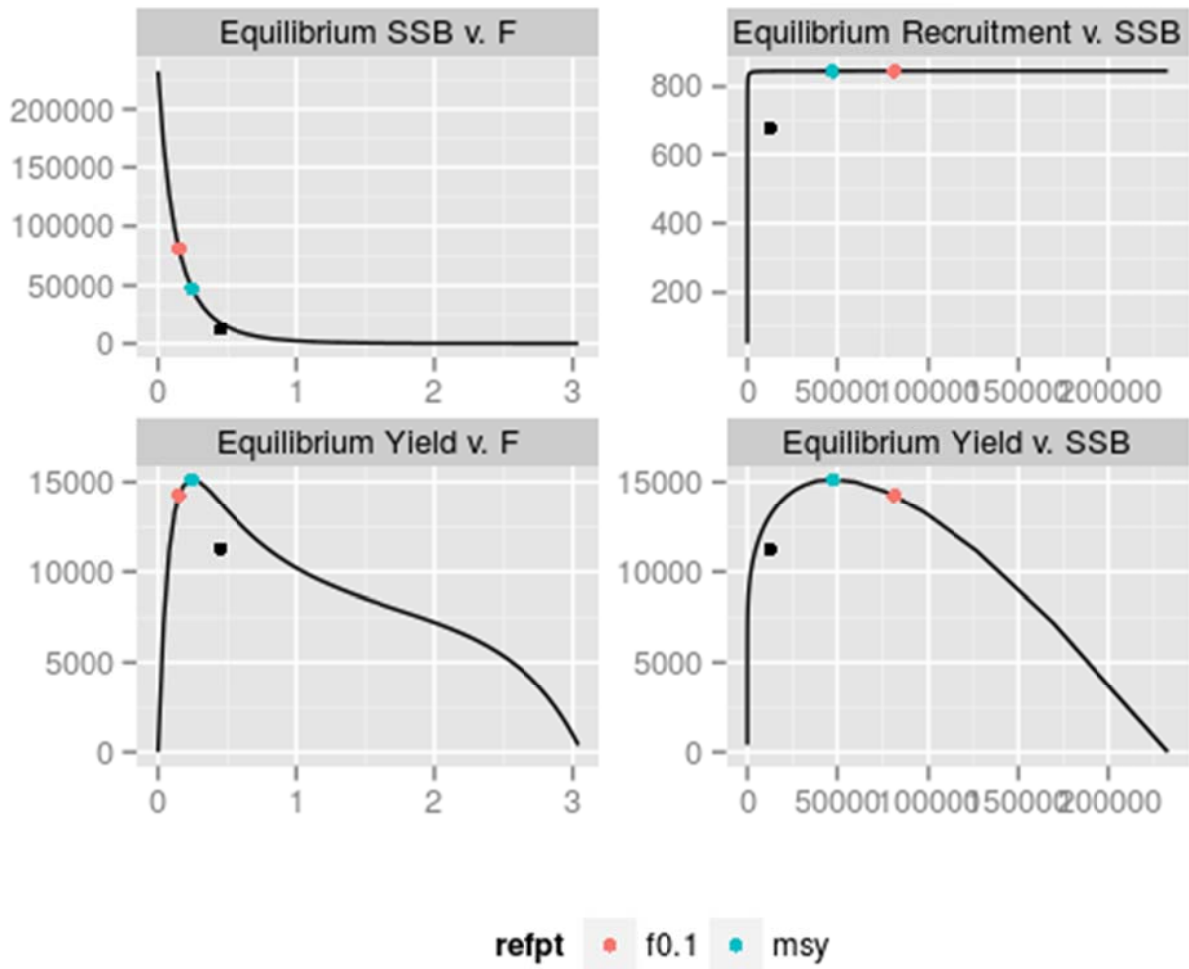
SWO-MED-Figure 5. XSA estimates of F-at-age; lines represent lowest smoothers.



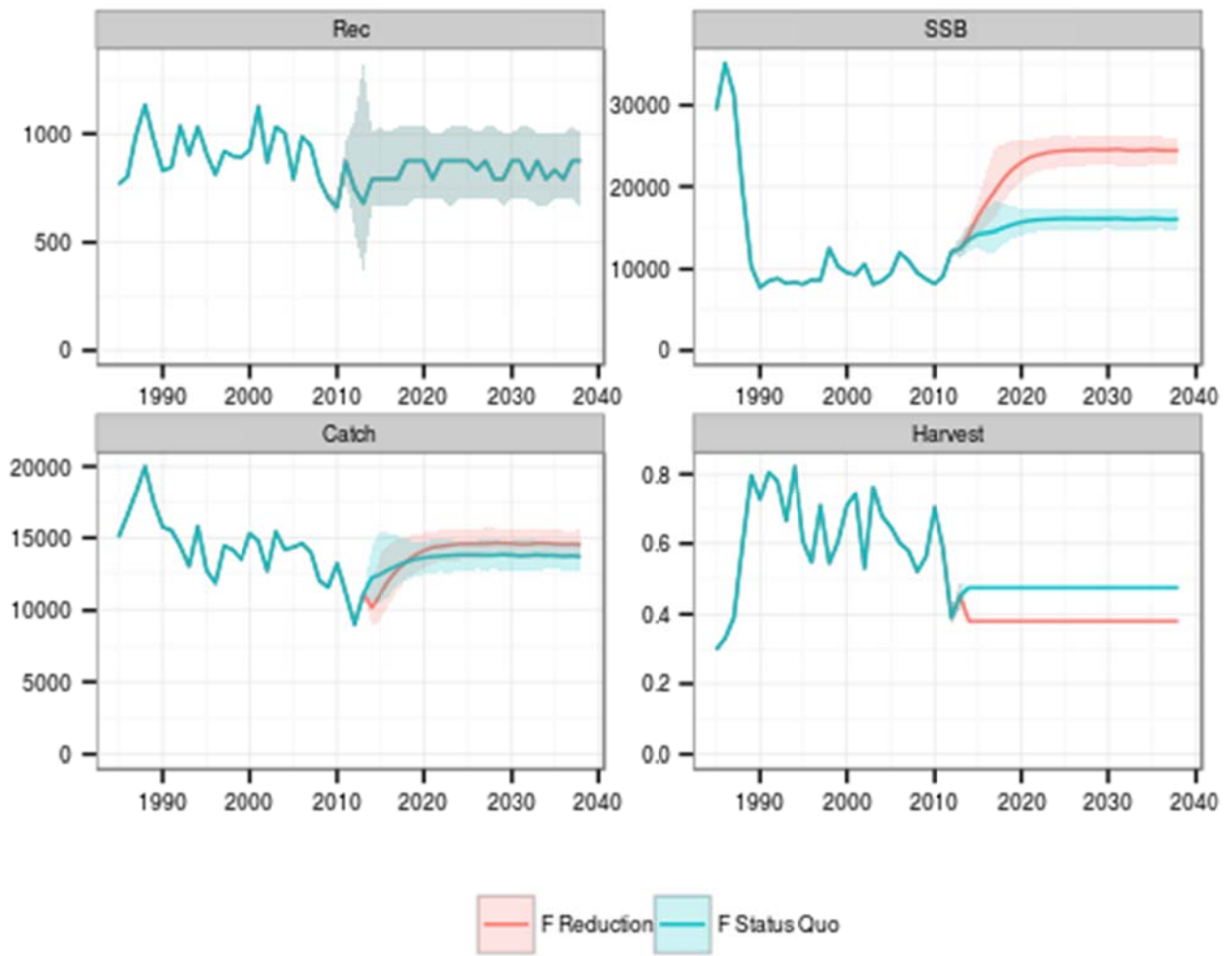
SWO-MED-Figure 6. Time trends for stock status (B/B_{MSY} and F/F_{MSY}) derived from the XSA. The arrow indicates the ratio estimates for the last assessment year (2013).



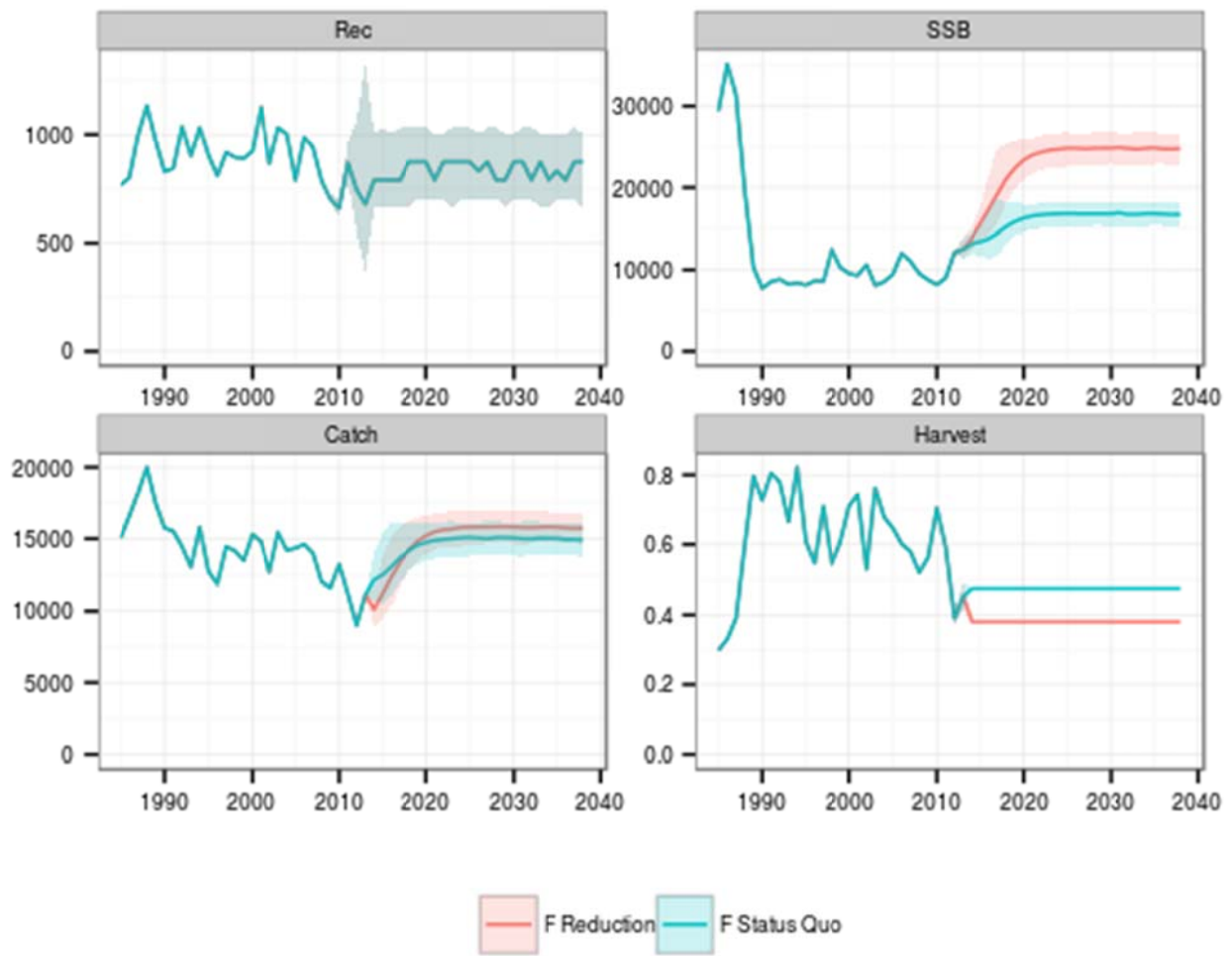
SWO-MED-Figure 7. Proportion of catch numbers (left) and catch weight (right) at age by year.



SWO-MED-Figure 8. Equilibrium curves based on expected weight, maturity, M, selection pattern and SRR estimates. Black dots indicate the corresponding estimates for the last assessment year (2013) obtained from the XSA assessment.



SWO-MED-Figure 9. Projections based on the current selection pattern and two different F (harvest) levels: status quo (blue) and 80% of current (red). Estimates are based on the XSA assessment.



SWO-MED-Figure 10. Projections based on a mixed selection pattern (50:50 current and mesopelagic) and two different F (harvest) levels: status quo (blue) and 80% of current (red). Estimates are based on the XSA assessment.

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 report in order to know the research on southern bluefin tuna and the stock assessments carried out. The reports are available from the CCSBT.

8.12 SMT – SMALL TUNAS

SMT-1. Generalities

The species under the Small Tunas Species Group include the following tuna and tuna-like species:

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

Knowledge on the biology and fishery of small tunas is very fragmented. Furthermore, the quality of the knowledge varies according to the species concerned. This is due in large part to the fact that these species often being perceived to have little economic importance compared to other tunas 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. The amount caught is rarely reported in logbooks; however observer programs from purse seine fleets have recently provided estimates of catches of small tunas.

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

Scientific collaboration between 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

Small tuna 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 into 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.). Small tunas are the prey of large tunas, marlins, sharks and marine mammals which at the same time are predators of small pelagics. A recent document on the feeding habit of dolphin fish off the Brazilian coast showed that these species also feed on crustaceans, mollusks and cephalopods. 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. A recent study conducted on the eastern coast of Tunisia has shown that the spawning area of the bullet tuna (*Auxis rochei*) is offshore at the limit of the continental shelf and related to the high abundance of the Zooplankton. A recent study based on the histological analysis and the gonado-somatic index of female gonads found that the spawning season of the West African Spanish mackerel extends from April to July in the Gulf of Guinea.

The growth rate currently estimated for these species is very rapid for the first two or three years, and then slows as they reach size-at-first maturity. Information on the migration patterns of small tuna species is very limited, due to low tagging levels of these species.

The bullet tuna caught in the Spanish Mediterranean coast showed a positive allometric growth with no effect of sex on growth. Another new study showed that the bullet tuna (age class 3+) caught in the same area had a better physical condition during years with positive NAO phase. These results could be explained by the environmental conditions during positive NAO phase that would enhance the migration process

Finally a new study conducted along the Gulf of Gabes (Ionian Sea-Mediterranean) indicated that the Larvae of *Auxis rochei* were mainly concentrated between the isobaths 50 and 200 m, and the spawning grounds of this species were mainly offshore

In general, biological information remain still incomplete for the majority of species in the main fishing area (**SMT-Table 2**).

SMT-3. Fisheries indicators

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 the scarce monitoring of various fishing activities in some areas, all the small tuna fisheries have high social and 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.

Recent information on small tuna catches and effort were presented from two observer programs activities in Venezuela: the National Observer Program in 2013 on industrial fleets, and the artisanal off-shore longline fleets that target tuna and tuna-like species. Important small tuna catches (in numbers and weight) observed consisted of blackfin tuna (BLF) and dolphinfish (DOL), and to a lesser degree, wahoo (WAH).

The standardized CPUE from the Moroccan artisanal gillnet fishery fishing for Atlantic bonito in the Atlantic did not show any trend from 2004 to 2010.

In the framework of the ICCAT SMTYP, new data from the Moroccan artisanal and coastal fleets fishing for small tunas caught in south of the Moroccan Atlantic coasts were made available. The results from this study showed that these species are caught by different gears, mainly gillnet. The catches and the fishing effort directed at small tunas have substantially fluctuated during the last decade, depending on the availability of these resources and the changes in the oceanographic conditions.

New documents updating the small tunas fisheries indicators using different gears in Algeria, Côte d'Ivoire, Mexico, Portugal, Senegal and Tunisia were presented.

SMT-Table 1 shows historical landings of small tunas for the 1989 to 2014 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. Seven (7) of 13 species represent more than 90% of small tuna Task I catches between 1950 and 2014: BON (*Sarda sarda*): 34%, LTA (*Euthynnus alletteratus*): 14%, FRI (*Auxis thazard*): 12%, KGM (*Scomberomorus cavalla*): 11%, SSM (*Scomberomorus maculatus*): 11%, BRS (*Scomberomorus brasiliensis*): 5% and BLT (*Auxis rochei*): 5%. In 1980, there was a marked increase in reported landings compared to previous years, reaching a peak of about 145,560 t in 1988 (**SMT-Figure 1**). The five species mentioned above are: Atlantic bonito (*Sarda sarda*), frigate tuna (*Auxis thazard*) which may include some catches of bullet tuna (*Auxis rochei*), little tunny (*Euthynnus alletteratus*), king mackerel (*Scomberomorus cavalla*), and Atlantic Spanish mackerel (*Scomberomorus maculatus*) (**SMT-Figure 2**). Reported landings for the 1989-1995 period decreased to approximately 91,764 t, and then an oscillation in the values in the following years, with a minimum of 64,450 t in 2008 and a maximum of 132,275 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 2014 is 72,165 t. The Committee 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 catches in the ICCAT area.

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.

However, after the adoption of the ICCAT Small Tunas Research Program (SMTYP) in 2012, new historical catch, effort and size data from the main artisanal fisheries in the west of Africa (Senegal, Côte d’Ivoire and Morocco) were recovered and made available to the Secretariat.

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. 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.

The mean lengths obtained from length frequencies for the small tuna species in the Task II database, pooled by year and sampling strata, are plotted in **Figure 3**. L_{opt} is the length at which a cohort achieves its maximum biomass based on a yield per recruit analysis, i.e. the maximum catch would be taken at this size. However, L_{opt} is based on a per recruit analysis which ignores recruitment dynamics, for example the age/size structure and the distribution of a population which all determine productivity and hence sustainability and the formulation of robust management advice.

To better understand the appropriateness of indicators like L_{opt} the work proposed in the SMT recommendations is extremely important. It will not only help in the management of small tunas but be important in helping to move towards an EBFM and provide an example for the “data rich” stocks of how to incorporate biology and population dynamics into stock assessment.

In 2015, an Ecological Risk Analysis (ERA) was applied for the tuna longline fishery in the Southwestern Atlantic and Indian Oceans. Considering only the small tuna in the Atlantic Ocean, the study found that *Scomberomorus cavalla*, *Acanthocybium solandri* and *Scomberomorus brasiliensis* are of high risk relatively to other small tuna species and hence are priority for assessment for this region. *Euthynnus alletteratus*, *Auxis thazard*, *Auxis rochei* and *Sarda sarda* were assigned with moderate risk (**SMT-Table 3**).

Given the social and economic importance of *Sarda sarda*, *Auxis rochei*, *Auxis thazard* and *Euthynnus alletteratus*, the Committee also recommends these species as a priority for assessment.

SMT-5. Outlook

In the absence of any assessment, there is no projection made by the Committee.

Additional work is being carried out under the SMTYP to address knowledge gaps as regards size data and biological parameters, which are necessary for their assessment.

The Committee notes that the tropical tunas tagging programme adopted by ICCAT will also tag small tunas and may contribute to the collection of biological data of these species.

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

The provision of management advice by the SCRS relies on accurate reporting of Task I and II data. However, due to the nature of small tuna fisheries (i.e. multi-gear, multi-species, artisanal fisheries, etc.), information on fisheries data is difficult to collect. Therefore, the Committee has not been able to conduct any quantitative stock assessment for any of the small tunas stocks. However, work is currently being conducted on developing indicators that in the future could be used to provide management advice to the Commission.

| | | | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|-----|--------------|----------------------------|-------|-------|------|-------|------|------|-------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| | | St. Vincent and Grenadines | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Sta. Lucia | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 5 | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| FRI | TOTAL | ATL | 16738 | 10356 | 6367 | 12678 | 8407 | 7535 | 13809 | 14954 | 15872 | 13004 | 12918 | 12788 | 11635 | 4527 | 6446 | 4905 | 6606 | 7368 | 6942 | 10465 | 10809 | 11121 | 11879 | 14522 | 11997 |
| | Landings | All gears | 16738 | 10356 | 6367 | 12678 | 8407 | 7535 | 13809 | 14954 | 15872 | 13004 | 12918 | 12788 | 11635 | 4527 | 6446 | 2933 | 5649 | 6431 | 5087 | 7878 | 7350 | 8550 | 9098 | 11937 | 9757 |
| | Landings(FP) | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1972 | 958 | 936 | 1855 | 2587 | 3459 | 2571 | 2780 | 2585 | 2240 |
| | Landings | Angola | 28 | 1 | 0 | 4 | 6 | 21 | 29 | 12 | 31 | 2 | 38 | 38 | 38 | 0 | 0 | 0 | 0 | 95 | 0 | 63 | 19 | 59 | 39 | 48 | 47 |
| | | 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 | 0 |
| | | Belize | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 36 |
| | | 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 | 0 |
| | | Brazil | 592 | 746 | 291 | 608 | 906 | 558 | 527 | 215 | 162 | 166 | 106 | 98 | 1117 | 860 | 414 | 532 | 603 | 202 | 149 | 313 | 204 | 347 | 306 | 444 | 293 |
| | | Cabo Verde | 75 | 135 | 82 | 115 | 86 | 13 | 6 | 22 | 191 | 154 | 81 | 171 | 278 | 264 | 344 | 300 | 318 | 378 | 574 | 1312 | 711 | 853 | 1811 | 2461 | 5418 |
| | | Curacao | 0 | 0 | 0 | 0 | 0 | 0 | 590 | 1157 | 1030 | 1159 | 1122 | 989 | 710 | 505 | 474 | 0 | 150 | 106 | 485 | 364 | 0 | 235 | 238 | 481 | 935 |
| | | Côte D'Ivoire | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 1 | 1 | 0 | 0 | 994 | 4 | 354 | 541 | 14 | 813 | 161 | 297 | 38 | 2837 | 261 |
| | | 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 | 0 |
| | | EU.España | 2240 | 541 | 228 | 362 | 297 | 386 | 947 | 581 | 570 | 23 | 17 | 722 | 438 | 635 | 34 | 166 | 73 | 278 | 631 | 1094 | 950 | 877 | 1708 | 1234 | 1200 |
| | | EU.Estonia | 0 | 198 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | EU.France | 3872 | 0 | 121 | 63 | 105 | 126 | 161 | 147 | 146 | 0 | 91 | 127 | 91 | 0 | 168 | 47 | 6 | 98 | 24 | 24 | 91 | 147 | 246 | 233 | 147 |
| | | EU.Latvia | 0 | 243 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | EU.Lithuania | 0 | 290 | 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 | 9 | 150 | 90 | 0 | 164 | 5 | 85 | 0 |
| | | EU.Portugal | 26 | 3 | 0 | 0 | 0 | 0 | 0 | 1 | 31 | 5 | 9 | 28 | 5 | 4 | 7 | 212 | 3 | 832 | 181 | 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 | 6 | 0 | 26 | 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 | 0 |
| | | Ghana | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2577 | 2134 | 1496 | 2786 | 3604 | 2295 | 2469 | 2382 | 0 |
| | | Grenada | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 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 | 98 | 74 | 81 | 78 | 48 | 63 | 0 | 26 |
| | | Guinea Ecuatorial | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 20 | 0 | 0 | 0 | 0 | 0 |
| | | Guinée Rep. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 96 | 94 | 332 | 503 | 236 |
| | | Japan | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Maroc | 1045 | 1131 | 332 | 274 | 122 | 645 | 543 | 2614 | 2137 | 494 | 582 | 418 | 441 | 184 | 542 | 61 | 48 | 135 | 179 | 9 | 19 | 862 | 554 | 55 | 21 |
| | | Mixed flags (FR+ES) | 1728 | 3633 | 4017 | 9674 | 3107 | 1919 | 7177 | 6063 | 6342 | 8012 | 9864 | 9104 | 7748 | 1623 | 1722 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | NEI (ETRO) | 237 | 1 | 4 | 32 | 68 | 70 | 180 | 120 | 309 | 491 | 291 | 420 | 186 | 71 | 180 | 166 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Panama | 0 | 243 | 57 | 118 | 341 | 328 | 240 | 91 | 0 | 0 | 0 | 0 | 0 | 0 | 394 | 975 | 970 | 1349 | 411 | 439 | 425 | 339 | 463 | 504 | 905 |
| | | 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 | 0 |
| | | Russian Federation | 0 | 1078 | 627 | 150 | 405 | 456 | 46 | 500 | 2433 | 477 | 12 | 25 | 308 | 56 | 56 | 63 | 6 | 6 | 12 | 113 | 270 | 912 | 113 | 217 | 139 |
| | | S. Tomé e Príncipe | 35 | 41 | 39 | 33 | 37 | 48 | 79 | 223 | 197 | 209 | 200 | 200 | 200 | 200 | 234 | 215 | 290 | 0 | 275 | 282 | 290 | 286 | 288 | 287 | 0 |
| | | Senegal | 1084 | 311 | 201 | 342 | 319 | 309 | 0 | 0 | 7 | 0 | 4 | 0 | 13 | 288 | 151 | 83 | 119 | 383 | 15 | 217 | 201 | 341 | 16 | 22 | 0 |
| | | Sta. Lucia | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Trinidad and Tobago | 0 | 0 | 0 | 17 | 0 | 56 | 199 | 368 | 127 | 138 | 245 | 0 | 0 | 414 | 0 | 0 | 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 | 0 |
| | | U.S.S.R. | 2739 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Ukraine | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 36 | 48 | 0 | 43 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Venezuela | 3037 | 1762 | 368 | 886 | 2609 | 2601 | 3083 | 2839 | 2164 | 1631 | 210 | 444 | 32 | 113 | 182 | 42 | 165 | 52 | 48 | 54 | 215 | 508 | 85 | 150 | 71 |
| | Landings(FP) | Belize | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 154 | 71 | 86 | 78 | 107 | |
| | | Cabo Verde | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 144 | 84 | 200 | 189 | 188 | 428 | 130 | 271 | 256 | 268 | |
| | | Curacao | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 29 | 55 | 29 | 36 | 225 | 233 | 139 | 214 | 149 | 224 | |
| | | Côte D'Ivoire | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 177 | 81 | 236 | |
| | | EU.España | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 265 | 191 | 108 | 663 | 866 | 889 | 708 | 576 | 555 | 586 | |
| | | EU.France | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 444 | 217 | 94 | 151 | 264 | 555 | 500 | 605 | 520 | 221 | |
| | | Guatemala | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 142 | 75 | 69 | 99 | 53 | 105 | 25 | 150 | 42 | 65 | |
| | | Guinée Rep. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 168 | 0 | 24 | 37 | 0 | 174 | 518 | 542 | 672 | 441 | |
| | | Mixed flags (EU tropical) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 507 | 105 | 161 | 383 | 631 | 764 | 247 | 0 | 0 | 0 | |
| | | Panama | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 274 | 230 | 251 | 297 | 261 | 157 | 230 | 158 | 234 | 92 | |
| DOL | TOTAL | A+M | 260 | 291 | 188 | 174 | 334 | 334 | 307 | 295 | 363 | 349 | 234 | 303 | 347 | 564 | 2632 | 2772 | 1295 | 4753 | 1042 | 5381 | 9889 | 7187 | 3647 | 4471 | 5255 |
| | Landings | All gears | 260 | 291 | 188 | 174 | 334 | 334 | 307 | 295 | 363 | 349 | 234 | 303 | 347 | 564 | 2632 | 2772 | 1295 | 4753 | 1042 | 5381 | 9889 | 7187 | 3394 | 4245 | 5074 |
| | Discards | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 253 | 226 | 181 | |
| | Landings | Brazil | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2159 | 2311 | 761 | 4270 | 472 | 4400 | 7990 | 4379 | 641 | 241 | 762 |
| | | Chinese Taipei | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 343 | 307 | 245 |
| | | 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 | 199 |
| | | EU.España | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 54 | 73 | 73 | 0 | 85 | 166 | 113 | 102 | |
| | | EU.France | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 372 | 819 | 1737 | 1360 | 1474 | 1473 | |
| | | 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 | 700 | 525 |
| | | EU.Malta | 260 | 291 | 188 | 174 | 334 | 334 | 307 | 295 | 363 | 349 | 234 | 303 | 347 | 507 | 473 | 447 | 517 | 274 | 399 | 39 | | | | | |

| | | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|--------------|----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|------|------|-------|------|------|------|------|------|------|------|------|------|
| | Mauritania | 50 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Mixed flags (FR+ES) | 1152 | 2422 | 2678 | 4975 | 2071 | 1279 | 3359 | 2836 | 2936 | 3846 | 4745 | 4238 | 3334 | 1082 | 1148 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | NEI (ETRO) | 0 | 0 | 0 | 8 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 33 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Panama | 0 | 0 | 0 | 64 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 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 | 0 |
| | Russian Federation | 0 | 617 | 306 | 265 | 189 | 96 | 49 | 0 | 88 | 0 | 0 | 0 | 74 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 268 | 11 | 208 | 399 | 255 |
| | S. Tomé e Príncipe | 52 | 46 | 48 | 41 | 40 | 43 | 40 | 50 | 39 | 37 | 33 | 33 | 33 | 178 | 182 | 179 | 0 | 183 | 188 | 193 | 191 | 384 | 287 | 287 | |
| | Senegal | 4363 | 3484 | 4011 | 4724 | 4536 | 3613 | 1972 | 4174 | 4715 | 1607 | 3546 | 5176 | 2866 | 4394 | 3508 | 2699 | 3826 | 3885 | 5108 | 5683 | 6371 | 4910 | 2769 | 5912 | 3774 |
| | South Africa | 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 |
| | St. Vincent and Grenadines | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Sta. Lucia | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 2 | 0 | 1 | 10 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 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 | 0 |
| | U.S.A. | 173 | 228 | 597 | 1286 | 1142 | 1312 | 2230 | 2015 | 1546 | 1623 | 1209 | 1451 | 1366 | 1492 | 1382 | 765 | 1351 | 1401 | 963 | 1244 | 1120 | 1201 | 1507 | 1191 | 1408 |
| | U.S.S.R. | 667 | 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 | 8 | 10 | 11 | 5 | 6 | 6 | 7 | 6 | 5 | 4 | 2 | 1 | 5 | 4 | 5 | 7 | 5 | 5 | 4 | 3 | 4 | 5 | 6 | 3 | 3 |
| | Venezuela | 1294 | 1963 | 1409 | 1889 | 2115 | 2115 | 1840 | 1840 | 2815 | 2247 | 2247 | 2247 | 2254 | 50 | 0 | 0 | 0 | 0 | 30 | 0 | 2 | 8 | 4 | 1 | 4 |
| MED | Algerie | 0 | 522 | 585 | 495 | 459 | 552 | 554 | 448 | 384 | 562 | 494 | 407 | 148 | 0 | 158 | 116 | 187 | 96 | 142 | 119 | 131 | 98 | 6 | 157 | 341 |
| | EU.Croatia | 0 | 2 | 3 | 2 | 15 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 28 | 25 | 44 | 37 |
| | EU.Cyprus | 23 | 25 | 21 | 11 | 23 | 10 | 19 | 19 | 19 | 16 | 19 | 19 | 19 | 0 | 0 | 0 | 0 | 6 | 5 | 4 | 0 | 0 | 0 | 0 | 0 |
| | EU.España | 0 | 0 | 0 | 0 | 0 | 15 | 18 | 9 | 15 | 0 | 8 | 82 | 32 | 0 | 41 | 262 | 116 | 202 | 212 | 86 | 299 | 488 | 441 | 235 | 300 |
| | EU.France | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 42 | 0 | 0 | 0 |
| | EU.Greece | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 132 | 0 | 0 | 112 | 69 | 72 | 183 | 148 | 165 | 301 | 276 | 363 | 127 |
| | EU.Italy | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 24 | 38 | 34 | 0 | 0 | 486 | 243 | 365 | 304 | 669 | 557 | 442 |
| | EU.Malta | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 3 | 2 | 5 | 3 | 7 | 5 | 21 | 9 | 4 |
| | Israel | 129 | 108 | 126 | 119 | 119 | 215 | 119 | 119 | 119 | 119 | 119 | 119 | 119 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Libya | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 45 | 52 | 0 | 5 | 4 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Maroc | 16 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 14 | 8 | 0 | 0 | 3 | 1 | 0 | 9 | 0 | 331 | 19 | 24 | 1 | 0 | 0 | 0 | 0 |
| | NEI (MED) | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Palestine | 0 | 0 | 0 | 0 | 0 | 0 | 90 | 59 | 61 | 60 | 60 | 60 | 129 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Serbia & Montenegro | 0 | 5 | 0 | 28 | 21 | 35 | 22 | 18 | 20 | 18 | 16 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Syria | 127 | 110 | 156 | 161 | 156 | 155 | 270 | 350 | 417 | 390 | 370 | 370 | 330 | 0 | 0 | 0 | 0 | 193 | 133 | 163 | 148 | 155 | 304 | 229 | |
| | Tunisie | 2113 | 1343 | 664 | 242 | 204 | 696 | 824 | 333 | 1113 | 752 | 1453 | 1036 | 960 | 657 | 633 | 0 | 0 | 0 | 0 | 0 | 810 | 800 | 803 | 798 | 798 |
| | Turkey | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 500 | 750 | 750 | 750 | 750 | 0 | 568 | 507 | 1230 | 785 | 1074 | 1309 | 1046 | 1437 | 1645 | 1386 | 682 |
| | Yugoslavia Fed. | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Landings(FP) | ATL | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Belize | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 223 | 51 | 238 | 144 | 133 |
| | Cabo Verde | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 45 | 76 | 265 | 214 | 189 | 262 | 266 | 179 | 438 | 178 | |
| | Curaçao | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 39 | 42 | 50 | 160 | 185 | 167 | 209 | 284 | 284 | |
| | Côte D'Ivoire | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 162 | 56 | 12 | |
| | EU.España | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 41 | 126 | 208 | 844 | 970 | 1030 | 1096 | 577 | 583 | 873 | |
| | EU.France | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 102 | 145 | 141 | 103 | 207 | 695 | 994 | 1354 | 720 | 365 | |
| | Guatemala | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 35 | 178 | 92 | 118 | 17 | 121 | 43 | 126 | 145 | 64 | |
| | Guinée Rep. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 0 | 21 | 2 | 0 | 358 | 260 | 666 | 1186 | 202 | |
| | Mixed flags (EU tropical) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 139 | 306 | 364 | 262 | 516 | 530 | 0 | 0 | 0 | |
| | Panama | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 35 | 191 | 577 | 368 | 228 | 106 | 250 | 259 | 72 | 30 | |
| MAW | TOTAL | 6629 | 3652 | 2423 | 1723 | 1138 | 1808 | 2831 | 1415 | 1482 | 909 | 1219 | 828 | 1345 | 550 | 285 | 443 | 276 | 435 | 422 | 460 | 2079 | 1103 | 1021 | 2905 | 905 |
| | Landings | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Angola | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 86 | 1650 | 249 | 221 | 1247 | |
| | Benin | 211 | 214 | 202 | 214 | 194 | 188 | 188 | 362 | 511 | 205 | 205 | 205 | 205 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Côte D'Ivoire | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 66 | 0 | 1 | 0 | 0 | 0 | 90 | 35 | |
| | EU.Estonia | 0 | 49 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | EU.Ireland | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |
| | EU.Latvia | 208 | 34 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | EU.Lithuania | 0 | 52 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 298 | 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 | 1 | 1 | 0 | 10 | 0 | 0 | 0 |
| | Gabon | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 85 | 0 | 0 | 0 | 0 | 0 | 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 | 0 |
| | Ghana | 1500 | 2778 | 899 | 466 | 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 | 19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | S. Tomé e Príncipe | 6 | 5 | 3 | 5 | 6 | 6 | 8 | 7 | 8 | 5 | 6 | 6 | 6 | 21 | 12 | 13 | 0 | 91 | 94 | 96 | 95 | 191 | 143 | 143 | |
| | Senegal | 2432 | 520 | 1225 | 1019 | 938 | 1614 | 2635 | 1046 | 878 | 700 | 987 | 617 | 794 | 532 | 262 | 431 | 196 | 435 | 329 | 278 | 331 | 749 | 610 | 1426 | 870 |
| | U.S.S.R. | 2272 | 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 | 90 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 21 | 0 | 42 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SSM | TOTAL | 12782 | 15318 | 16285 | 16317 | 14490 | 13697 | 16571 | 15403 | 8641 | 9837 | 8220 | 8383 | 9414 | 9793 | 8119 | 10470 | 6282 | 6102 | 5900 | 6197 | 5974 | 5931 | 5185 | 5459 | 3857 |
| | Landings | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Colombia | 76 | 37 | 95 | 58 | 69 | 69 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cuba | 665 | 538 | 611 | 310 | 409 | 548 | 613 | 613 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Dominica | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | |

| | | | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|---------------------|--------------|----------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 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 | 0 |
| U.S.A. | | | 2554 | 5655 | 5663 | 5143 | 4380 | 3363 | 2866 | 3509 | 2968 | 3282 | 3893 | 4524 | 4613 | 4552 | 4477 | 4747 | 2425 | 2147 | 1746 | 1946 | 1846 | 1896 | 1864 | 1877 | 0 |
| WAH | TOTAL | A+M | 1498 | 1721 | 1835 | 2671 | 2143 | 2408 | 2515 | 3085 | 2488 | 2957 | 2020 | 2296 | 2202 | 2049 | 2596 | 2456 | 1809 | 2568 | 2158 | 2354 | 2032 | 2228 | 3893 | 3499 | 2418 |
| | Landings | All gears | 1498 | 1721 | 1835 | 2671 | 2143 | 2408 | 2515 | 3085 | 2488 | 2957 | 2020 | 2296 | 2202 | 2049 | 2596 | 2099 | 1630 | 2283 | 1586 | 1883 | 1763 | 1750 | 3704 | 3392 | 2331 |
| | Landings(FP) | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 357 | 179 | 285 | 572 | 471 | 269 | 477 | 85 | 0 | 0 |
| | Discards | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 104 | 108 | 86 |
| | Landings | Antigua and Barbuda | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Aruba | 70 | 60 | 50 | 50 | 125 | 40 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Barbados | 51 | 60 | 51 | 91 | 82 | 42 | 35 | 52 | 52 | 41 | 41 | 0 | 0 | 34 | 45 | 26 | 41 | 36 | 27 | 17 | 30 | 29 | 22 | 21 | 17 |
| | | 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 | 0 |
| | | Brazil | 52 | 64 | 71 | 33 | 26 | 1 | 16 | 58 | 41 | 0 | 0 | 0 | 0 | 405 | 519 | 449 | 111 | 75 | 76 | 70 | 19 | 357 | 213 | 73 | 153 |
| | | Cabo Verde | 458 | 351 | 350 | 326 | 361 | 408 | 503 | 603 | 429 | 587 | 487 | 578 | 500 | 343 | 458 | 449 | 555 | 524 | 351 | 472 | 470 | 470 | 445 | 445 | 445 |
| | | Chinese Taipei | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1132 | 1012 | 810 |
| | | Curacao | 280 | 250 | 260 | 270 | 250 | 230 | 230 | 230 | 230 | 230 | 230 | 230 | 230 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Côte D'Ivoire | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 3 | 1 | 11 | 0 | 5 | 5 | 12 | 9 | 95 | 1 |
| | | Dominica | 38 | 43 | 59 | 59 | 59 | 58 | 58 | 58 | 58 | 50 | 46 | 11 | 37 | 10 | 6 | 8 | 15 | 14 | 16 | 10 | 13 | 13 | 0 | 0 | 0 |
| | | Dominican Republic | 6 | 9 | 13 | 7 | 0 | 0 | 0 | 325 | 112 | 31 | 35 | 35 | 35 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | EU.España | 23 | 28 | 32 | 22 | 20 | 15 | 25 | 25 | 29 | 28 | 32 | 38 | 46 | 48 | 305 | 237 | 110 | 66 | 38 | 73 | 53 | 87 | 35 | 50 | 41 |
| | | EU.France | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 4 | 0 | 0 | 0 | 46 |
| | | EU.Portugal | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 3 | 0 | 4 | 3 | 9 | 8 | 10 | 2 | 0 | 0 |
| | | Grenada | 54 | 77 | 104 | 96 | 46 | 49 | 56 | 56 | 59 | 82 | 51 | 71 | 59 | 44 | 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 | 1 | 0 | 0 | 0 | 0 | 14 |
| | | Maroc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 76 | 0 | 0 | 0 | 0 |
| | | Mexico | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 35 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 |
| | | Panama | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 91 | 240 | 120 | 86 | 111 | 99 | 210 | 373 | 0 |
| | | S. Tomé e Príncipe | 28 | 34 | 27 | 36 | 39 | 46 | 80 | 52 | 56 | 62 | 52 | 52 | 52 | 52 | 94 | 88 | 76 | 0 | 131 | 235 | 241 | 238 | 479 | 359 | 0 |
| | | Saint Kitts and Nevis | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 6 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Senegal | 0 | 0 | 0 | 64 | 0 | 0 | 1 | 0 | 0 | 5 | 0 | 0 | 0 | 5 | 0 | 1 | 1 | 0 | 0 | 2 | 6 | 0 | 11 | 24 | 0 |
| | | South Africa | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | St. Vincent and Grenadines | 28 | 33 | 33 | 41 | 28 | 16 | 23 | 10 | 65 | 52 | 46 | 311 | 17 | 40 | 60 | 0 | 241 | 29 | 24 | 31 | 40 | 31 | 5 | 32 | 24 |
| | | Sta. Lucia | 77 | 79 | 150 | 141 | 98 | 80 | 221 | 223 | 223 | 310 | 243 | 213 | 217 | 169 | 238 | 169 | 187 | 0 | 171 | 195 | 199 | 0 | 148 | 155 | 0 |
| | | Suriname | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 588 | 415 | 0 |
| | | Trinidad and Tobago | 0 | 118 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 2 | 1 | 9 | 7 | 6 | 6 | 7 | 6 | 6 | 5 | 5 | 7 | 9 | 9 | 9 |
| | | U.S.A. | 82 | 134 | 203 | 827 | 391 | 764 | 608 | 750 | 614 | 858 | 640 | 633 | 846 | 789 | 712 | 558 | 89 | 1123 | 495 | 522 | 358 | 240 | 399 | 207 | 480 |
| | | UK.Bermuda | 74 | 67 | 80 | 58 | 50 | 93 | 99 | 105 | 108 | 104 | 61 | 56 | 91 | 87 | 88 | 83 | 86 | 124 | 117 | 101 | 81 | 100 | 88 | 75 | 76 |
| | | UK.British Virgin Islands | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 1 | 0 | 4 | 1 |
| | | UK.Sta Helena | 18 | 12 | 17 | 35 | 26 | 25 | 23 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 29 | 19 | 31 | 12 | 16 | 16 |
| | | 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 | 159 | 302 | 333 | 514 | 542 | 540 | 487 | 488 | 360 | 467 | 4 | 17 | 13 | 9 | 7 | 16 | 13 | 33 | 9 | 25 | 28 | 23 | 38 | 32 | 27 |
| | Landings(FP) | Belize | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 40 | 0 | 0 | 0 |
| | | Cabo Verde | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 92 | 9 | 55 | 60 | 22 | 29 | 25 | 4 | 0 | 0 |
| | | Curacao | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 7 | 31 | 57 | 23 | 78 | 9 | 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 | 3 | 0 | 0 | 0 | 0 |
| | | EU.España | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 92 | 63 | 44 | 224 | 262 | 136 | 240 | 56 | 0 | 0 |
| | | EU.France | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 28 | 10 | 3 | 16 | 26 | 26 | 17 | 0 | 0 | 0 |
| | | Guatemala | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 68 | 11 | 21 | 28 | 7 | 0 | 8 | 0 | 0 | |
| | | Guinée Rep. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 8 | 15 | 7 | 0 | 0 | 0 | 0 | |
| | | Mixed flags (EU tropical) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 28 | 30 | 44 | 97 | 26 | 39 | 0 | 0 | 0 | 0 |
| | | Panama | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 39 | 44 | 104 | 102 | 65 | 13 | 66 | 15 | 0 | 0 |
| | Discards | Chinese Taipei | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 104 | 108 | 86 | 0 |

1. Brazilian Task I catches from 2012 to 2014 are preliminary and under revision

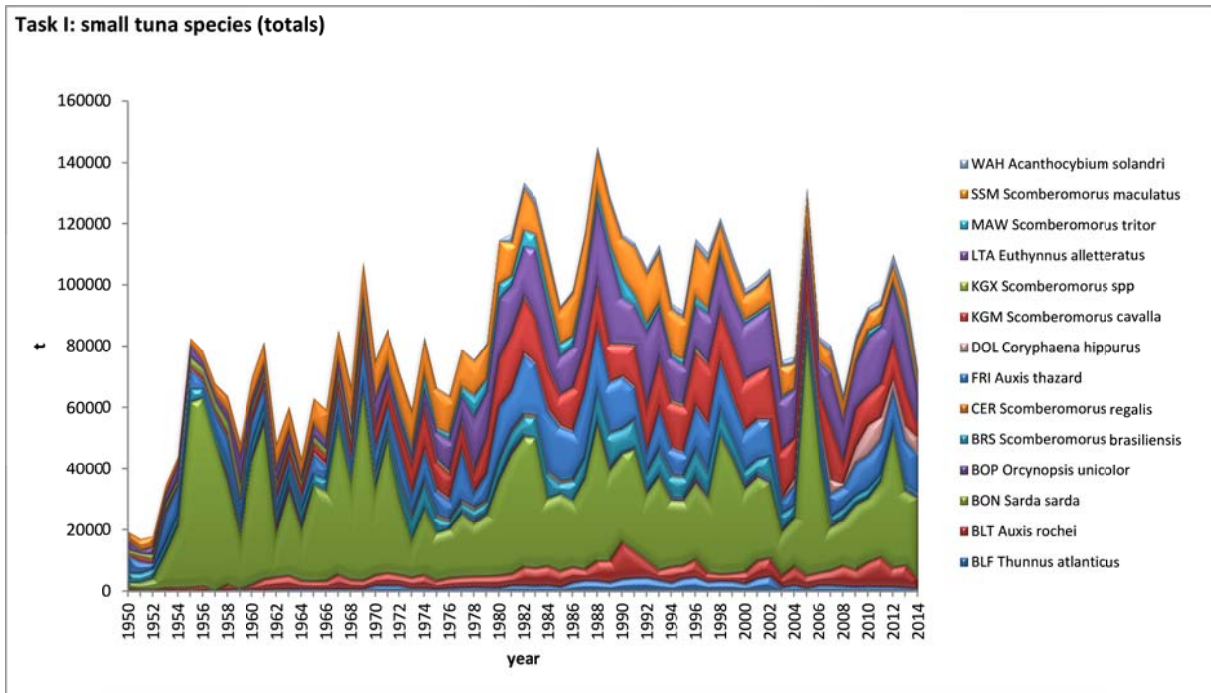
SMT-Table 2. Risk of the small tunas species caught by tuna longline fisheries in the Atlantic Ocean.

| Species | Risk |
|-----------------------------------|-------------|
| <i>Scomberomorus cavalla</i> | High |
| <i>Acanthocybium solandri</i> | High |
| <i>Scomberomorus brasiliensis</i> | High |
| <i>Euthynnus alletteratus</i> | Moderate |
| <i>Auxis thazard</i> | Moderate |
| <i>Auxis rochei</i> | Moderate |
| <i>Sarda sarda</i> | Moderate |
| <i>Thunnus atlanticus</i> | Low |
| <i>Scomberomorus regalis</i> | Low |

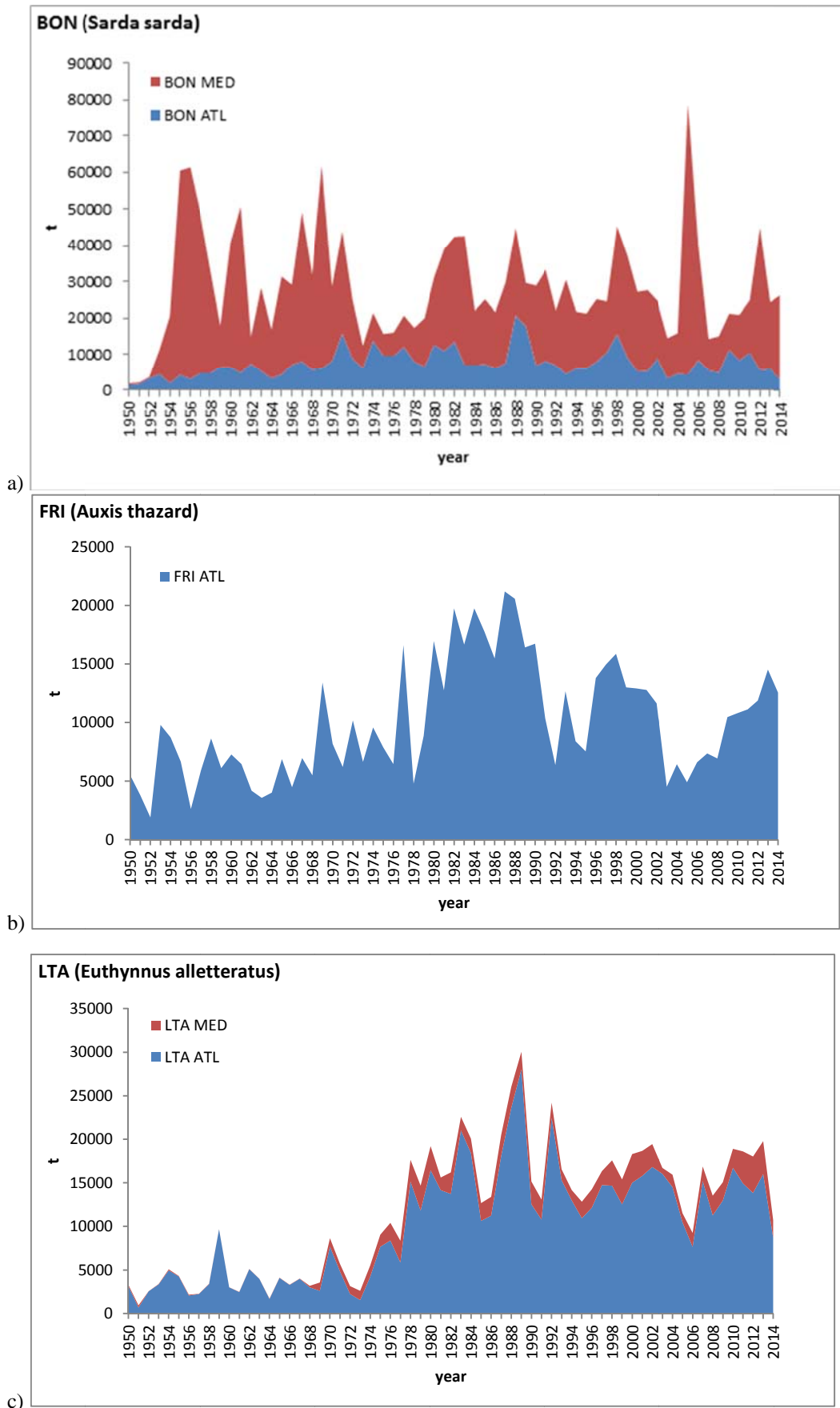
SMT-Table 3. Summary of life-history parameters currently available for the small tunas for the 5 major areas: North and South Atlantic Ocean (both Eastern and Western) and the Mediterranean Sea.

| ZONES | NORTHEAST ATLANTIC | | SOUTHEAST ATLANTIC | | NORTHWEST ATLANTIC | | SOUTHWEST ATLANTIC | | MEDITERRANEAN | |
|-------------------|--------------------|------------------------|--------------------|------------------------|--------------------|------------------------|--------------------|------------------------|-------------------|------------------------|
| Species/Parameter | Growth Parameters | Reproduction parameter | Growth Parameters | Reproduction parameter | Growth Parameters | Reproduction parameter | Growth Parameters | Reproduction parameter | Growth Parameters | Reproduction parameter |
| LTA | | | | | | | | | | |
| FRI | | | | | | | | | | |
| BLT | | | | | | | | | | |
| SSM | | | | | | | | | | |
| MAW | | | | | | | | | | |
| BON | | | | | | | | | | |
| WAH | | | | | | | | | | |
| BRS | | | | | | | | | | |
| BLF | | | | | | | | | | |
| KGM | | | | | | | | | | |

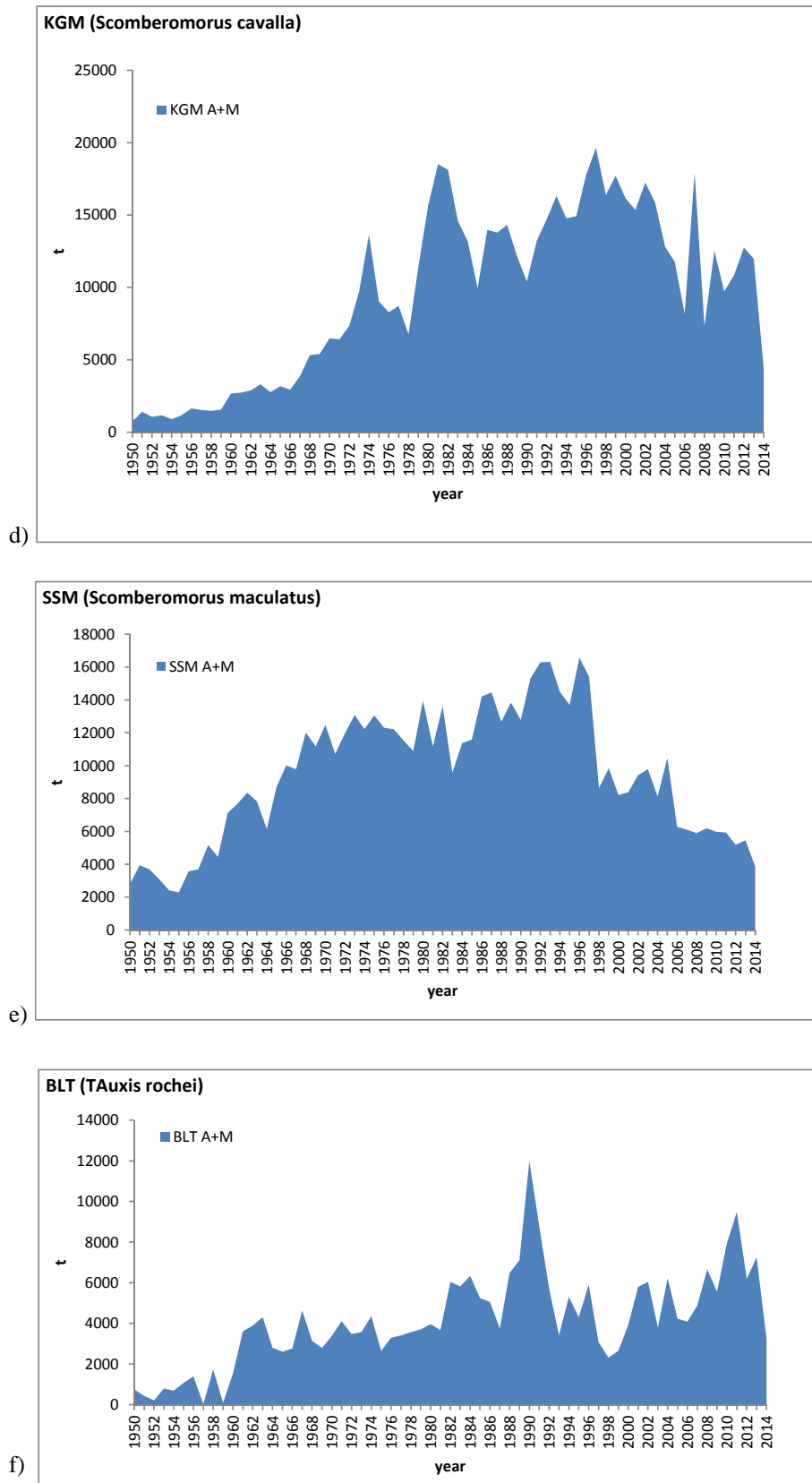
Data available but needed to be update
 No existing data



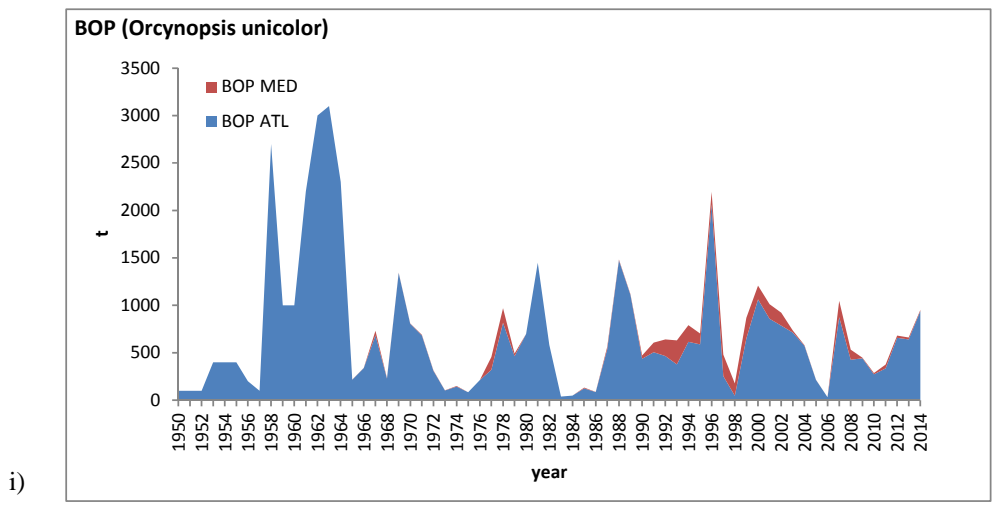
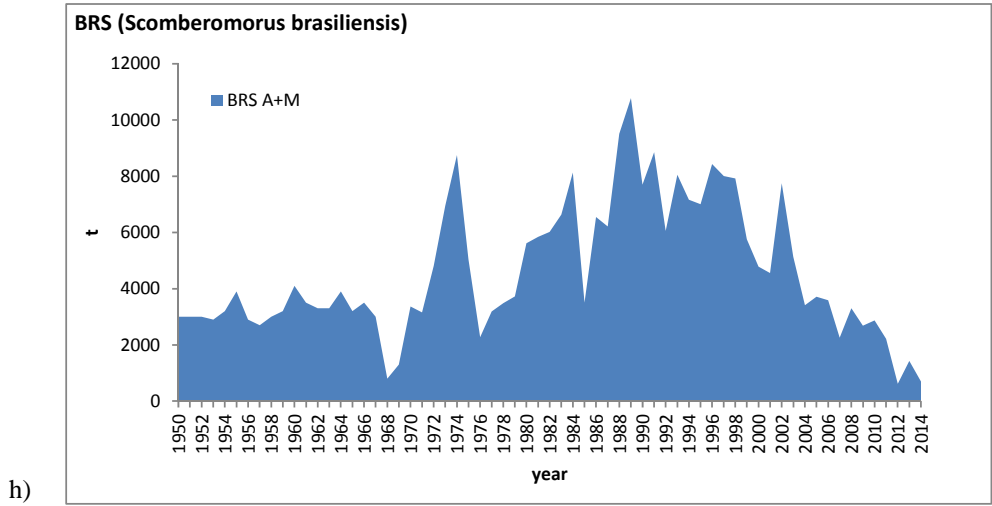
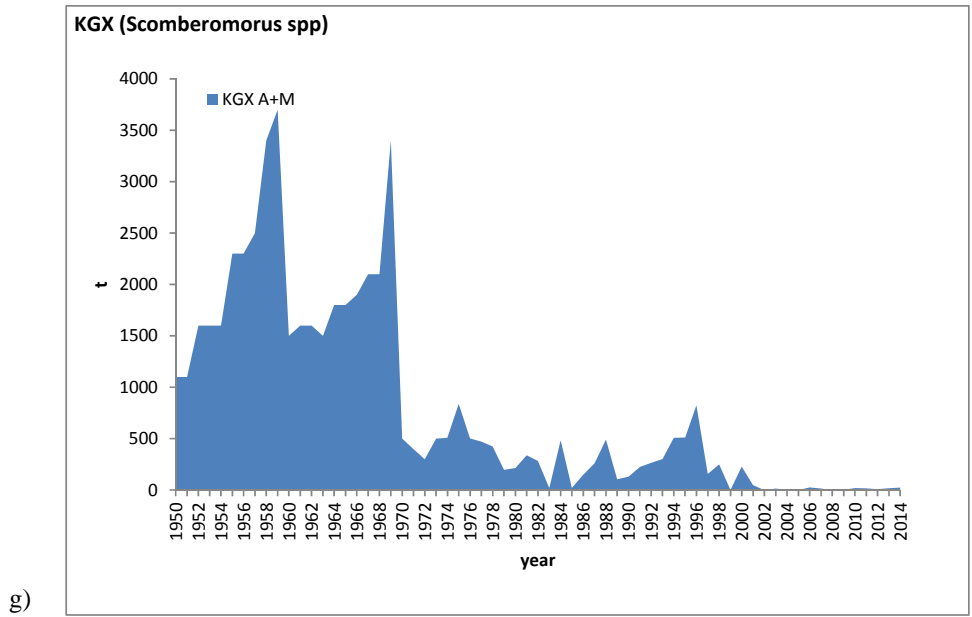
SMT-Figure 1. Estimated landings (t) of small tunas (combined) in the Atlantic and Mediterranean, 1950-2014. The data for the last three years are incomplete.



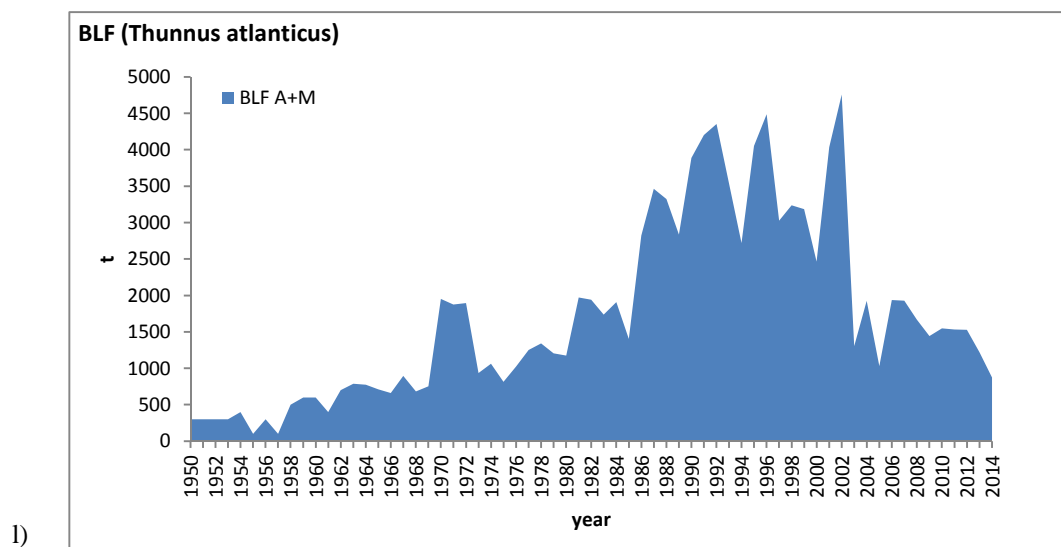
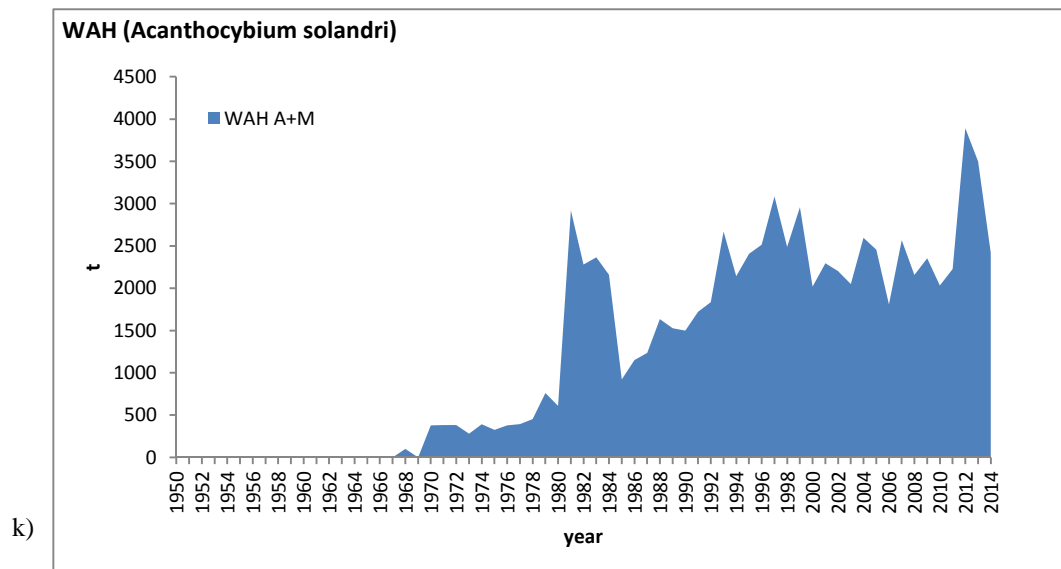
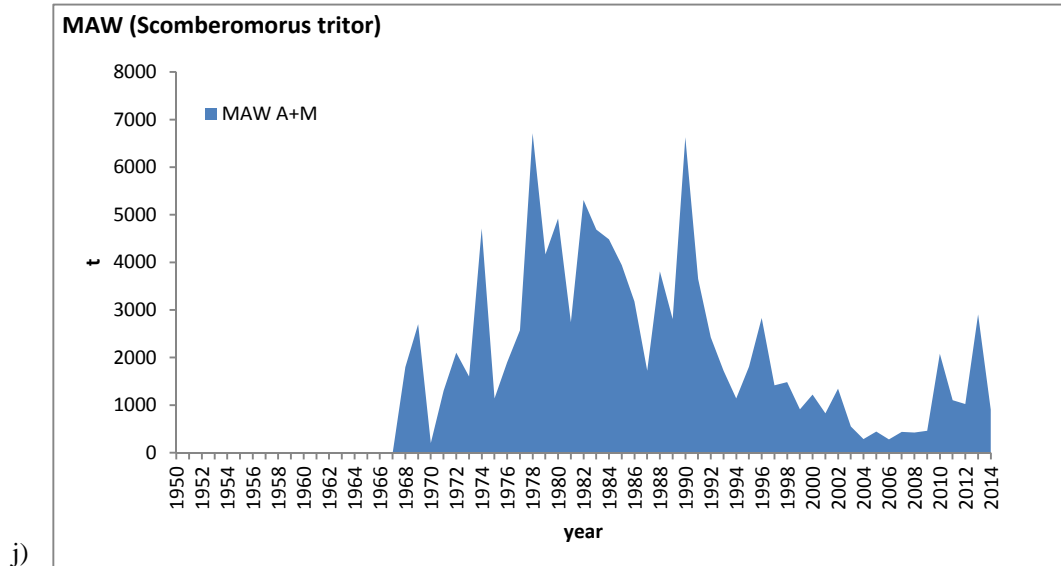
SMT-Figure 2. Estimated landings (t) of the major species of small tunas in the Atlantic and Mediterranean, 1950-2014. The data for the last years are incomplete.



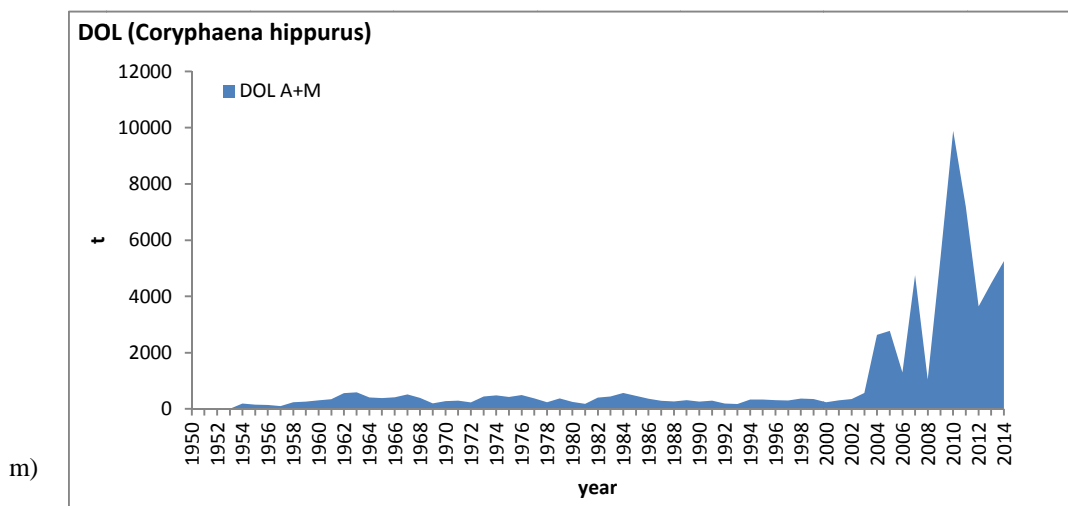
SMT-Figure 2. Estimated landings (t) of the major species of small tunas in the Atlantic and Mediterranean, 1950-2014. The data for the last years are incomplete.



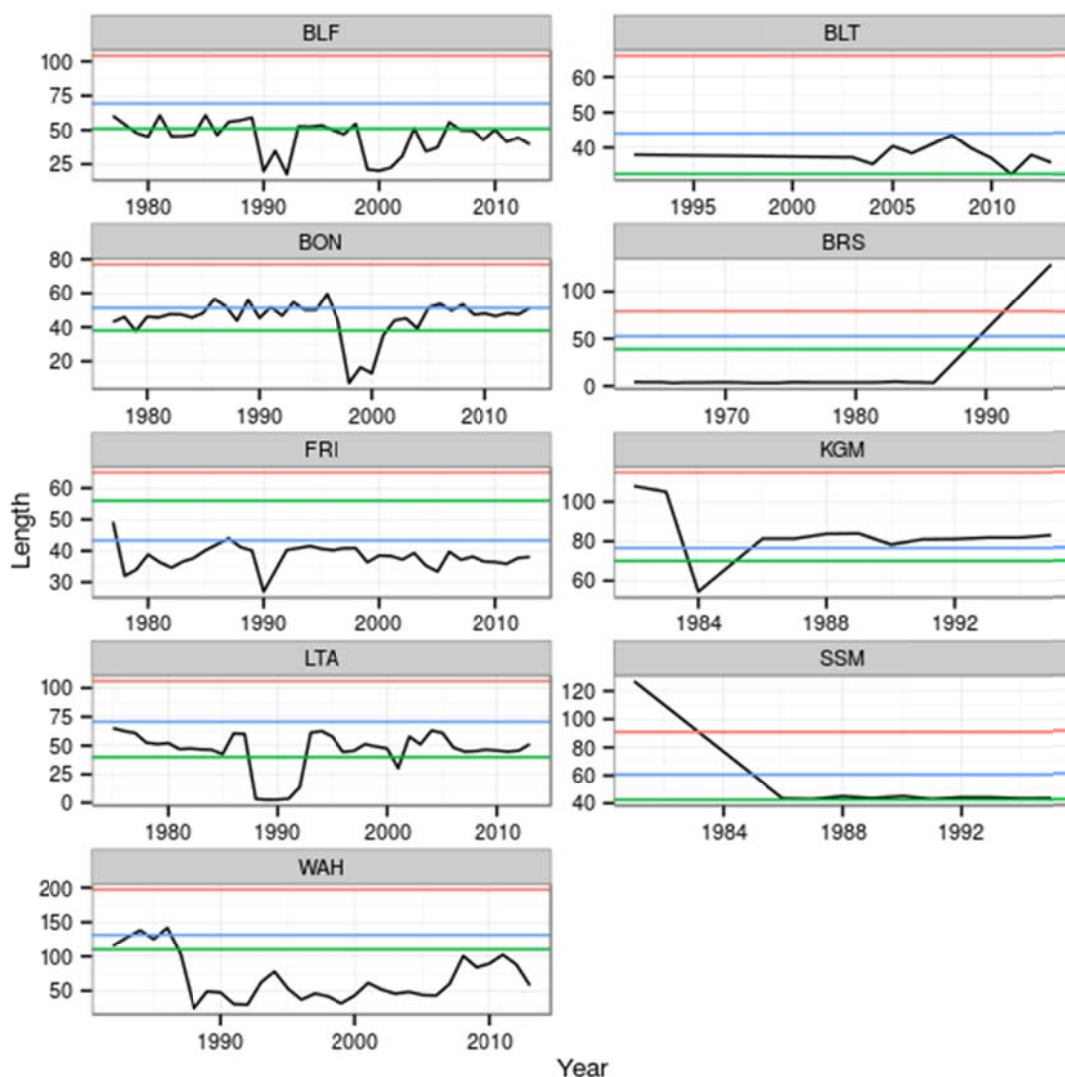
SMT-Figure 2. Estimated landings (t) of the major species of small tunas in the Atlantic and Mediterranean, 1950-2014. The data for the last years are incomplete.



SMT-Figure 2. Estimated landings (t) of the major species of small tunas in the Atlantic and Mediterranean, 1950-2014. The data for the last years are incomplete.



SMT-Figure 2. Estimated landings (t) of the major species of small tunas in the Atlantic and Mediterranean, 1950-2014. The data for the last years are incomplete.



SMT-Figure 3. Time series of mean size, estimated from Task 2 data in the ICCAT database. The horizontal lines are L_{max} (red), L_{opt} (blue) and L_{50} (green). L_{opt} is the body length when an unfished age group reaches its maximum biomass and was estimated, in this case, as representing two thirds of L_{max} .

8.13 SHK – SHARKS

Two intersessional meetings were conducted in 2015 with the main goal of assessing the status of North and South Atlantic blue sharks. The first meeting was a Data Preparatory Session held in Tenerife, Spain, 23-27 March followed by a stock assessment session held in Lisbon, Portugal, 27-31 July. Information about the status of the shortfin mako (*Isurus oxyrinchus*) is available in the 2012 report of the assessment (Anon. 2013b), while information about the status of the porbeagle (*Lamna nasus*) stock is available in the SCRS 2009 report of the assessment of that species (Anon. 2010b). An Ecological Risk Assessment had also been conducted for 16 shark species (20 stocks), which is detailed in the 2013 report of the Sharks Working Group (Anon. 2014a).

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 to 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 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 aplacental viviparity with an oophagy reproductive system, which decreases their fecundity but increases the probability of survival of their young. The blue shark is placental viviparous and has an average litter size of 35 individuals, while the shortfin mako has an average litter size of around 12 and the porbeagle a litter size of usually just four 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 behavioral 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 for most stocks with sufficient precision to guide fishery management toward optimal harvest levels. While reported and estimated catches for blue shark, shortfin mako and porbeagle are still generally subject to higher levels of uncertainty than the major tuna stocks, they have been considered sufficiently complete for the purpose of quantitative stock assessment, and are provided in **SHK-Table 1** and **SHK-Figures 1 and 2**.

Multiple standardized CPUE data series for blue shark were used in 2015 for both the North and South Atlantic stocks. For the North Atlantic stock, the eight indices of abundance used were: US longline observer, Japanese longline (early and late), U.S. observer cruise, Portuguese longline, Venezuelan longline, Spanish longline, and Chinese Taipei longline; for the South Atlantic stock, the six indices used were: Uruguayan longline, Brazilian longline, Japanese longline (early and late), Chinese Taipei longline, and Spanish longline. For both stocks, the series were generally flat or showed increasing trends, which conflicted with the also increasing catch tendencies, especially for the South Atlantic stock (**SHK-Figure 3**).

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. 2010b), 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. Nevertheless, it should be noted that two Mediterranean-specific measures relevant to shark 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. Second, the General Fisheries Commission for the Mediterranean (GFCM) adopted Recommendation GFCM/36/2012/3, under which shark species listed under Annex II of the Barcelona Convention cannot be retained on board, transhipped, landed, transferred, stored, sold, displayed, or offered for sale. Additionally, in 2014, porbeagle was added to Appendix II of CITES, which regulates global trade.

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. 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

Considerable progress was made on the integration of new data sources, in particular size data, and modelling approaches, particularly model structure, in the 2015 assessment of the status of the stock of North Atlantic blue shark. For both the North and South Atlantic stocks, uncertainty in data inputs and model configuration was explored through sensitivity analysis. Although sensitivity analyses did not cover the full range of possible uncertainty, they revealed that results were sensitive to structural assumptions of the models. All the production model formulations had difficulty fitting the flat or increasing trends in the CPUE series combined with increasing catch trends. Overall, assessment results were uncertain (e.g. the level of absolute abundance varied by an order of magnitude between models with different structures) and should be interpreted with caution.

For the North Atlantic stock, all scenarios considered with the Bayesian surplus production model and the integrated model (SS3) indicated that the stock was not overfished and that overfishing was not occurring, as was also concluded in the 2008 stock assessment (**SHK Figure 7**). However, the Committee acknowledged that there still remained a high level of uncertainty in data inputs and model structural assumptions, by virtue of which the possibility of the stock being overfished and overfishing occurring could not be ruled out. The Committee identified a better definition of fleets for SS3 and a more in depth historical catch reconstruction, especially discard estimates, as some of the main sources of uncertainty that may help to improve model fit and provide a more certain stock status in the future.

For the South Atlantic stock, all scenarios with the Bayesian surplus production model estimated that the stock was not overfished and that overfishing was not occurring, as concluded in the 2008 stock assessment. Estimates obtained with the state-space surplus production model formulation were generally less optimistic, predicting that the stock could be overfished and overfishing could be occurring in some cases (**SHK Figure 8**).

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 final 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 level of catches at that time 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 9**). For the South Atlantic stock, all model runs indicated that the stock was not overfished and overfishing was not occurring (**SHK-Figure 10**). 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 11**). 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. In 2013 Uruguay prohibited retention of porbeagle sharks. 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 status relative to virgin biomass. Exploratory assessments indicate that biomass is below B_{MSY} and that recent fishing mortality is near or above F_{MSY} (**SHK-Figure 12**). Recovery of this stock to B_{MSY} under no fishing mortality is estimated to take ca. 15-34 years. The 2009 EU TAC of 436 t in effect for the Northeast Atlantic may have allowed the stock to remain stable, at its depleted biomass level, under most credible model scenarios. Since 2010 the EU TAC has been set at zero.

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 fishing mortality rates also below F_{MSY} (**SHK-Figure 13**). 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. Canadian directed fisheries for porbeagle have been closed since 2013.

During the 2009 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 was from directed porbeagle fisheries which are not under the Commission's direct mandate. The main porbeagle directed fisheries in the North Atlantic have subsequently ceased operations (Canada and EU).

SHK-4. Outlook

SHK-4.1 Blue shark

Due to the difficulty of determining current status for both the North and South Atlantic stocks, in particular absolute population abundance, the Committee considered that it was not appropriate to conduct quantitative projections of future stock condition based on the range of scenarios considered at the stock assessment meeting.

SHK-5. Management recommendations

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

Considering the need to improve stock assessments of pelagic shark species impacted by ICCAT fisheries and bearing in mind Rec. 12-05 adopted in 2012 as well as the various previous recommendations which made the submission of shark data mandatory, the Committee strongly urges the CPCs to provide the corresponding statistics, including discards (dead or alive), of all ICCAT fisheries, including recreational and artisanal fisheries, and to the extent possible non-ICCAT fisheries capturing these species. 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.

The Committee reiterates that the CPCs provide estimates of shark catches in purse seines, gillnets, and artisanal fisheries. Estimates of shark entanglements in FADs are also important. 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.

Given the uncertainty in stock status results for the South Atlantic stock of blue sharks, the Committee recommends that recent catch levels (e.g. in the past five years, 2009-2013) not be increased. For the North Atlantic stock, while all model formulations explored predicted that the stock was not overfished and that overfishing was not occurring, the level of uncertainty in the data inputs and model structural assumptions was high enough to prevent the Committee from reaching a consensus on a specific management recommendation.

The Committee recommends that the Commission work with countries catching porbeagle and relevant RFMOs to ensure recovery of North Atlantic porbeagle stocks (e.g. NAFO) and cooperate with the current Areas Beyond National Jurisdiction (ABNJ) coordinated South Atlantic stock assessment. In particular, porbeagle fishing mortality should be kept to levels in line with scientific advice and with catches not exceeding the 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.

Taking into consideration the continued high vulnerability ranking in the ERA, results from the modelling approaches used in the assessment, the associated uncertainty, and the relatively low productivity of shortfin mako sharks, the Committee reiterates, as a precautionary approach, that catches of shortfin mako sharks should not be increased with respect to the 2006-2010 levels until more reliable stock assessment results are available for both the Northern and Southern stocks.

NORTH ATLANTIC BLUE SHARK SUMMARY

| | | |
|----------------------------|--------------------|-------------------------|
| Provisional Yield (2014) | | 36,516 t ¹ |
| 2013 Yield | | 36,748 t ² |
| Relative Biomass | B_{2013}/B_{MSY} | 1.35-3.45 ³ |
| | B_{2013}/B_0 | 0.75-0.98 ⁴ |
| Relative Fishing Mortality | F_{MSY} | 0.19-0.20 ⁴ |
| | F_{2013}/F_{MSY} | 0.04-0.75 ⁵ |
| Stock Status 2013 | Overfished | Not likely ⁶ |
| | Overfishing | Not likely ⁶ |

¹ Task I catch.

² Estimated catch used in the 2015 assessments.

³ Range obtained with the Bayesian Surplus Production (BSP) and SS3 models. Value from SS3 is SSF/SSF_{MSY} .

⁴ Range obtained with the BSP model.

⁵ Range obtained with the BSP and SS3 models.

⁶ Although the models explored indicate the stock is not overfished and overfishing is not occurring, the Committee acknowledges that there still remains a high level of uncertainty.

SOUTH ATLANTIC BLUE SHARK SUMMARY

| | | |
|----------------------------|--------------------|---------------------------|
| Provisional Yield (2014) | | 25,939 t ¹ |
| 2013 Yield | | 20,799 t ² |
| Relative Biomass | B_{2013}/B_{MSY} | 0.78-2.03 ³ |
| | B_{2013}/B_0 | 0.39-1.00 ³ |
| Relative Fishing Mortality | F_{MSY} | 0.10-0.20 ³ |
| | F_{2013}/F_{MSY} | 0.01-1.19 ³ |
| Stock Status 2013 | Overfished | Undetermined ⁴ |
| | Overfishing | Undetermined ⁴ |

¹ Task I catch.

² Estimated catch used in the 2015 assessments.

³ Range obtained with the Bayesian Surplus Production (BSP) and State-Space Bayesian Surplus Production (SS-BSP) models.

⁴ Given the uncertainty in stock status, the Committee cannot make a determination but cautions that the stock may have been overfished and overfishing may have occurred in recent years.

NORTH ATLANTIC SHORFIN MAKO SUMMARY

| | | |
|-------------------------------|--------------------|--|
| Provisional Yield (2014) | | 2,899 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 |
| Stock Status 2010 | Overfished | No ³ |
| | Overfishing | 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 (2014) | | 3,160 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 |
| Stock Status 2010 | Overfished | No ³ |
| | Overfishing | 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 |
| Stock Status | Overfished | Yes |
| | Overfishing | 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 was 185 t (in 2008) (MSY catch is 250 t); the TAC for the USA is 11.3 t (dressed weight).

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 |
| Stock Status | Overfished | Yes |
| | Overfishing | No |
| Domestic Management Measures in Effect: | | TAC of 0 t ⁵ |

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).

⁵ Retention of porbeagle sharks has been prohibited in Uruguay since 2013.

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 |
| Stock Status | Overfished | Yes |
| | Overfishing | No |
| Domestic Management Measures in Effect | | TAC of 0 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 not 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 the TAC has been set at zero t since 2010.

BSH-Table 1. Estimated catches (t) of blue shark (*Prionace glauca*) by area, gear and flag. (v2, 2015-09-25)

| | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|--------------------------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| TOTAL | 3039 | 4318 | 3668 | 9600 | 11300 | 11584 | 11650 | 39578 | 35623 | 37023 | 40664 | 35800 | 32765 | 37928 | 36305 | 43072 | 43888 | 50464 | 53901 | 58842 | 65193 | 73050 | 63093 | 56673 | 62689 |
| ATN | 3037 | 4306 | 3560 | 9589 | 8590 | 8468 | 7395 | 29283 | 26763 | 26172 | 28174 | 21709 | 20066 | 22951 | 21742 | 22359 | 23217 | 26927 | 30723 | 35198 | 37178 | 38084 | 36778 | 37066 | 36516 |
| ATS | 0 | 8 | 107 | 10 | 2704 | 3108 | 4252 | 10145 | 8797 | 10829 | 12444 | 14043 | 12682 | 14967 | 14438 | 20642 | 20493 | 23487 | 23097 | 23459 | 27799 | 34926 | 26274 | 19507 | 25939 |
| MED | 1 | 3 | 1 | 0 | 6 | 8 | 2 | 150 | 63 | 22 | 45 | 47 | 17 | 11 | 125 | 72 | 178 | 50 | 81 | 185 | 216 | 40 | 42 | 100 | 235 |
| Landings | | | | | | | | | | | | | | | | | | | | | | | | | |
| ATN Longline | 2076 | 3037 | 2884 | 7458 | 7645 | 7547 | 6130 | 28678 | 26152 | 25382 | 27305 | 20699 | 19290 | 22880 | 21297 | 22167 | 23067 | 26810 | 30514 | 35031 | 36952 | 37777 | 36549 | 36882 | 36239 |
| Other surf. | 220 | 497 | 492 | 994 | 373 | 300 | 559 | 426 | 419 | 681 | 732 | 905 | 708 | 70 | 380 | 126 | 104 | 63 | 80 | 63 | 59 | 100 | 109 | 74 | 205 |
| ATS Longline | 0 | 8 | 107 | 10 | 2704 | 3108 | 4246 | 10135 | 8790 | 10801 | 12444 | 14042 | 12678 | 14961 | 14339 | 20638 | 20434 | 23417 | 22708 | 23453 | 27785 | 34531 | 25878 | 19375 | 24147 |
| Other surf. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 4 | 27 | 0 | 1 | 4 | 6 | 99 | 3 | 59 | 10 | 375 | 6 | 14 | 391 | 264 | 0 | 1678 |
| MED Longline | 0 | 0 | 0 | 0 | 5 | 7 | 1 | 147 | 61 | 20 | 44 | 47 | 17 | 10 | 43 | 71 | 83 | 48 | 81 | 18 | 50 | 40 | 41 | 68 | 190 |
| Other surf. | 1 | 3 | 1 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | 1 | 1 | 0 | 81 | 0 | 95 | 2 | 1 | 167 | 165 | 0 | 0 | 32 | 45 |
| Discards | | | | | | | | | | | | | | | | | | | | | | | | | |
| ATN Longline | 741 | 772 | 184 | 1136 | 572 | 621 | 602 | 180 | 170 | 104 | 137 | 105 | 68 | 0 | 63 | 66 | 45 | 53 | 129 | 102 | 167 | 205 | 119 | 109 | 72 |
| Other surf. | 0 | 0 | 0 | 0 | 0 | 0 | 103 | 0 | 22 | 4 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 2 | 1 | 0 | 0 |
| ATS Longline | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 5 | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 60 | 14 | 0 | 0 | 4 | 132 | 132 |
| 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 |
| Landings | | | | | | | | | | | | | | | | | | | | | | | | | |
| ATN Belize | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 114 | 461 | 1039 | 903 | 1216 | 392 |
| Brazil | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Canada | 680 | 774 | 1277 | 1702 | 1260 | 1494 | 528 | 831 | 612 | 547 | 624 | 1162 | 836 | 346 | 965 | 1134 | 977 | 843 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Cabo 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 | 0 |
| China PR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 185 | 104 | 148 | 0 | 0 | 0 | 367 | 109 | 88 | 53 | 109 | 98 | 327 | |
| Chinese Taipei | 0 | 0 | 0 | 0 | 487 | 167 | 132 | 203 | 246 | 384 | 165 | 59 | 0 | 171 | 206 | 240 | 588 | 292 | 110 | 73 | 99 | 148 | 94 | 121 | 146 |
| EU.Denmark | 2 | 1 | 1 | 0 | 1 | 2 | 3 | 1 | 1 | 0 | 2 | 1 | 13 | 5 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| EU.España | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 24497 | 22504 | 21811 | 24112 | 17362 | 15666 | 15975 | 17314 | 15006 | 15464 | 17038 | 20788 | 24465 | 26094 | 27988 | 28666 | 28562 | 29041 |
| EU.France | 130 | 187 | 276 | 322 | 350 | 266 | 278 | 213 | 163 | 399 | 395 | 207 | 221 | 57 | 106 | 120 | 99 | 167 | 119 | 84 | 122 | 115 | 31 | 216 | 132 |
| EU.Ireland | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 66 | 31 | 66 | 11 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 2 | 1 |
| EU.Netherlands | 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 |
| EU.Portugal | 1387 | 2257 | 1583 | 5726 | 4669 | 4722 | 4843 | 2630 | 2440 | 2227 | 2081 | 2110 | 2265 | 5643 | 2025 | 4027 | 4338 | 5283 | 6167 | 6252 | 8261 | 6509 | 3768 | 3694 | 3060 |
| EU.United Kingdom | 1 | 0 | 0 | 0 | 12 | 0 | 0 | 1 | 0 | 12 | 9 | 6 | 4 | 6 | 5 | 3 | 6 | 6 | 96 | 8 | 10 | 8 | 10 | 10 | 10 |
| FR.St Pierre et Miquelon | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 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 | 0 | 0 | 0 | 0 | 1203 | 1145 | 618 | 489 | 340 | 357 | 273 | 350 | 386 | 558 | 1035 | 1729 | 1434 | 1921 | 2531 | 2007 | 1763 | 1227 | 2437 | 1808 | 3369 |
| Korea Rep. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 537 | 299 | 327 | 113 |
| Mexico | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Panama | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 254 | 892 | 613 | 1575 | 0 | 0 | 0 | 289 | |
| Senegal | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 456 | 0 | 0 | 0 | 0 | 43 | 134 | 255 | 56 | 0 | 5 | 12 | 17 |
| Suriname | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 181 | 281 | |
| Trinidad and Tobago | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 3 | 2 | 1 | 1 | 0 | 2 | 8 | 9 | 11 | 11 | 8 | 10 |
| U.S.A. | 87 | 308 | 215 | 680 | 29 | 23 | 283 | 211 | 255 | 217 | 291 | 39 | 0 | 0 | 7 | 2 | 2 | 1 | 8 | 4 | 9 | 65 | 56 | 32 | 39 |
| UK.Bermuda | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Venezuela | 9 | 7 | 24 | 23 | 18 | 16 | 6 | 27 | 7 | 47 | 43 | 47 | 29 | 40 | 10 | 28 | 12 | 19 | 8 | 73 | 75 | 118 | 98 | 52 | 113 |
| ATS | | | | | | | | | | | | | | | | | | | | | | | | | |
| Belize | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 37 | 259 | 0 | 236 | 109 | 0 | 273 | 243 | 483 | 234 | 171 |
| Benin | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 4 | 27 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Brazil | 0 | 0 | 0 | 0 | 0 | 0 | 743 | 1103 | 0 | 179 | 1683 | 2173 | 1971 | 2166 | 1667 | 2523 | 2591 | 2258 | 1986 | 1274 | 1500 | 1980 | 1607 | 1008 | 2551 |
| China PR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 565 | 316 | 452 | 0 | 0 | 0 | 585 | 40 | 109 | 41 | 131 | 84 | 64 | 48 |
| Chinese Taipei | 0 | 0 | 0 | 0 | 1232 | 1767 | 1952 | 1737 | 1559 | 1496 | 1353 | 665 | 0 | 521 | 800 | 866 | 1805 | 2177 | 1843 | 1356 | 1625 | 2138 | 1941 | 2117 | 2059 |
| 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 | 92 |
| EU.España | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5272 | 5574 | 7173 | 6951 | 7743 | 5368 | 6626 | 7366 | 6410 | 8724 | 8942 | 9615 | 13099 | 13953 | 16978 | 14348 | 10473 | 11447 |
| EU.Netherlands | 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 |
| EU.Portugal | 0 | 0 | 0 | 0 | 0 | 847 | 867 | 1336 | 876 | 1110 | 2134 | 2562 | 2324 | 1841 | 1863 | 3184 | 2751 | 4493 | 4866 | 5358 | 6338 | 7642 | 2424 | 1646 | 1622 |
| EU.United Kingdom | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 239 | 0 | 0 | 14 | 0 | 0 | 0 | 0 | 0 | |
| Ghana | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1583 |
| Japan | 0 | 0 | 0 | 0 | 1388 | 437 | 425 | 506 | 510 | 536 | 221 | 182 | 343 | 331 | 209 | 236 | 525 | 896 | 1789 | 981 | 1161 | 1483 | 3060 | 2255 | 3248 |
| Korea Rep. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 222 | 125 | 112 | 61 | 10 |
| Namibia | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | |

| | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|---------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| U.S.A. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Uruguay | 0 | 8 | 107 | 10 | 84 | 57 | 259 | 180 | 248 | 118 | 81 | 66 | 85 | 480 | 462 | 376 | 232 | 337 | 359 | 942 | 208 | 725 | 433 | 130 | 0 |
| MED EU.Cyprus | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 3 | 6 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| EU.España | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 146 | 59 | 20 | 31 | 6 | 3 | 3 | 4 | 8 | 61 | 3 | 2 | 7 | 48 | 38 | 39 | 37 | 53 |
| EU.France | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 4 | 5 |
| EU.Italy | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 113 | 1 | 95 | 46 | 75 | 175 | 165 | 0 | 0 | 57 | 173 |
| EU.Malta | 1 | 3 | 1 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 4 |
| EU.Portugal | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 5 | 41 | 14 | 3 | 0 | 56 | 22 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |
| Japan | 0 | 0 | 0 | 0 | 5 | 7 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Discards ATN 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 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 10 | 6 |
| 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. | 741 | 772 | 184 | 1136 | 572 | 618 | 704 | 180 | 192 | 100 | 137 | 106 | 68 | 0 | 65 | 66 | 45 | 54 | 130 | 103 | 167 | 206 | 106 | 99 | 66 |
| UK.Bermuda | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ATS Brazil | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 60 | 14 | 0 | 0 | 0 | 0 | 0 | 0 |
| Chinese Taipei | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 132 | 132 | 112 |
| 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 |
| 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 | 1 |
| U.S.A. | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 5 | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

1. Brazilian Task I catches from 2012 to 2014 are preliminary and under revision

SMA-Table 1. Estimated catches (t) of Shortfin mako (*Isurus oxyrinchus*) by area, gear and flag. (v2, 2015-09-25)

| | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|----------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| TOTAL | 1349 | 1326 | 1446 | 2966 | 3148 | 5057 | 2977 | 5759 | 5654 | 4285 | 5142 | 4724 | 5361 | 7698 | 7598 | 6618 | 6330 | 6911 | 5440 | 6143 | 6661 | 7024 | 7360 | 5560 | 6058 |
| ATN | 785 | 797 | 953 | 2193 | 1587 | 3130 | 2035 | 3571 | 3847 | 2785 | 2588 | 2658 | 3395 | 3895 | 5174 | 3472 | 3370 | 4075 | 3559 | 4109 | 4183 | 3771 | 4478 | 3646 | 2899 |
| ATS | 564 | 529 | 493 | 773 | 1562 | 1927 | 942 | 2182 | 1798 | 1495 | 2549 | 2059 | 1964 | 3801 | 2423 | 3130 | 2951 | 2834 | 1880 | 2034 | 2477 | 3251 | 2880 | 1914 | 3160 |
| MED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 8 | 5 | 4 | 7 | 2 | 2 | 2 | 17 | 10 | 2 | 1 | 1 | 2 | 2 | 2 | 0 | 0 |
| Landings | | | | | | | | | | | | | | | | | | | | | | | | | |
| ATN Longline | 497 | 573 | 660 | 1499 | 1234 | 1654 | 1787 | 3394 | 3679 | 2693 | 2275 | 2431 | 3129 | 3884 | 4755 | 3172 | 3105 | 3901 | 3387 | 3919 | 4007 | 3549 | 4191 | 3362 | 2623 |
| Other surf. | 278 | 213 | 254 | 670 | 331 | 1447 | 248 | 177 | 168 | 91 | 313 | 227 | 266 | 11 | 418 | 300 | 264 | 168 | 163 | 171 | 173 | 213 | 268 | 278 | 266 |
| ATS Longline | 564 | 519 | 480 | 763 | 1542 | 1914 | 927 | 2160 | 1788 | 1485 | 2540 | 2041 | 1949 | 3770 | 2347 | 3116 | 2907 | 2792 | 1798 | 2027 | 2476 | 3189 | 2817 | 1880 | 3127 |
| Other surf. | 0 | 9 | 13 | 10 | 20 | 13 | 15 | 23 | 10 | 10 | 9 | 18 | 15 | 31 | 76 | 14 | 43 | 30 | 82 | 7 | 1 | 62 | 55 | 34 | 31 |
| MED Longline | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 8 | 5 | 4 | 7 | 2 | 2 | 2 | 17 | 10 | 2 | 1 | 1 | 2 | 2 | 2 | 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 | | | | | | | | | | | | | | | | | | | | | | | | | |
| ATN Longline | 10 | 11 | 38 | 24 | 21 | 29 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 9 | 20 | 2 | 9 | 19 | 5 | 10 |
| Other surf. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| ATS Longline | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 0 | 0 | 0 | 0 | 8 | 0 | 2 |
| Landings | | | | | | | | | | | | | | | | | | | | | | | | | |
| ATN Belize | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 28 | 69 | 114 | 99 | 1 |
| Brazil | 0 | 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 | 111 | 67 | 110 | 69 | 70 | 78 | 69 | 78 | 73 | 80 | 91 | 71 | 72 | 43 | 53 | 41 | 37 | 29 | 35 | 55 |
| China PR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 81 | 16 | 19 | 29 | 18 | 24 | 11 | 5 |
| Chinese Taipei | 0 | 0 | 0 | 0 | 61 | 21 | 16 | 25 | 31 | 48 | 21 | 7 | 0 | 84 | 57 | 19 | 30 | 25 | 23 | 11 | 14 | 13 | 14 | 8 | 8 |
| EU.España | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2416 | 2199 | 2051 | 1566 | 1684 | 2047 | 2068 | 3404 | 1751 | 1918 | 1816 | 1895 | 2216 | 2091 | 1667 | 2308 | 1509 | 1481 |
| EU.France | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 2 | 0 | 0 | 0 | 0 | 1 |
| EU.Portugal | 193 | 314 | 220 | 796 | 649 | 657 | 691 | 354 | 307 | 327 | 318 | 378 | 415 | 1249 | 473 | 1109 | 951 | 1540 | 1033 | 1169 | 1432 | 1045 | 1023 | 820 | 219 |
| EU.United Kingdom | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 3 | 2 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 15 | 0 | 0 | 0 | 0 | 0 | 0 |
| FR.St Pierre et Miquelon | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 4 | 0 | 0 | 4 | 0 |
| Japan | 221 | 157 | 318 | 425 | 214 | 592 | 790 | 258 | 892 | 120 | 138 | 105 | 438 | 267 | 572 | 0 | 0 | 82 | 131 | 98 | 116 | 53 | 56 | 33 | 70 |
| Korea Rep. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 27 | 27 | 15 | 8 |
| Maroc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 420 | 406 | 667 | 624 |
| Mexico | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 10 | 16 | 0 | 10 | 6 | 9 | 5 | 8 | 6 | 7 | 8 | 8 | 8 | 4 | 4 |
| Panama | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 49 | 33 | 39 | 0 | 0 | 0 | 19 | 0 |
| Philippines | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Senegal | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 17 | 21 | 0 | 0 | 2 | 0 | 2 |
| St. Vincent and Grenadines | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sta. Lucia | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| Trinidad and Tobago | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 2 | 3 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 0 | 2 | 1 | 1 |
| U.S.A. | 360 | 315 | 376 | 948 | 642 | 1710 | 469 | 407 | 347 | 159 | 454 | 395 | 415 | 142 | 521 | 469 | 386 | 375 | 344 | 365 | 392 | 383 | 412 | 406 | 396 |
| UK.Bermuda | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 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 | 58 | 20 | 6 | 11 | 2 | 35 | 22 | 20 | 33 | 9 | 13 |
| ATS Belize | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 38 | 0 | 17 | 2 | 0 | 32 | 59 | 78 | 88 | 1 |
| Brazil | 0 | 0 | 0 | 0 | 0 | 0 | 83 | 190 | 0 | 27 | 219 | 409 | 226 | 283 | 238 | 426 | 210 | 145 | 203 | 99 | 128 | 192 | 196 | 80 | 268 |
| China PR | 0 | 0 | 0 | 34 | 45 | 23 | 27 | 19 | 74 | 126 | 305 | 22 | 208 | 260 | 0 | 0 | 0 | 77 | 6 | 24 | 32 | 29 | 8 | 9 | 9 |
| Chinese Taipei | 0 | 0 | 0 | 0 | 116 | 166 | 183 | 163 | 146 | 141 | 127 | 63 | 0 | 626 | 121 | 128 | 138 | 211 | 124 | 117 | 144 | 203 | 150 | 157 | 154 |
| Côte D'Ivoire | 0 | 9 | 13 | 10 | 20 | 13 | 15 | 23 | 10 | 10 | 9 | 15 | 15 | 30 | 15 | 14 | 16 | 25 | 0 | 5 | 7 | 0 | 20 | 34 | 19 |
| EU.España | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1356 | 1141 | 861 | 1200 | 1235 | 811 | 1158 | 703 | 584 | 664 | 654 | 628 | 939 | 1192 | 1535 | 1197 | 1083 | 1077 |
| EU.Portugal | 0 | 0 | 0 | 0 | 0 | 92 | 94 | 165 | 116 | 119 | 388 | 140 | 56 | 625 | 13 | 242 | 493 | 375 | 321 | 502 | 336 | 409 | 176 | 132 | 127 |
| EU.United Kingdom | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 11 | 0 | 0 | 0 | 0 | 0 | 0 |
| Japan | 538 | 506 | 460 | 701 | 1369 | 1617 | 514 | 244 | 267 | 151 | 264 | 56 | 133 | 118 | 398 | 0 | 0 | 72 | 115 | 108 | 103 | 132 | 291 | 114 | 183 |
| Korea Rep. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 29 | 13 | 7 | 7 | 4 |
| Namibia | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 459 | 375 | 509 | 1415 | 1243 | 1002 | 295 | 23 | 307 | 377 | 586 | 9 | 950 |
| Panama | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 24 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Philippines | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Russian Federation | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 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 | 0 |
| South Africa | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19 | 13 | 0 | 79 | 19 | 138 | 126 | 125 | 99 | 208 | 136 | 100 | 144 | 211 | 92 | 177 | 365 |
| U.S.A. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| UK.Sta Helena | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Uruguay | 26 | 13 | 20 | 28 | 12 | 17 | 26 | 20 | 23 | 21 | 35 | 40 | 38 | 188 | 249 | 146 | 68 | 36 | 41 | 106 | 23 | 76 | 36 | 1 | 0 |
| Vanuatu | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | |

| | | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | |
|----------|--------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|---|
| MED | EU.Cyprus | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | | |
| | EU.España | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 7 | 5 | 3 | 2 | 2 | 2 | 2 | 2 | 4 | 1 | 0 | 0 | 1 | 2 | 2 | 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 | 0 | |
| | EU.Portugal | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 5 | 0 | 0 | 0 | 15 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | Japan | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Maroc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Discards | ATN Chinese Taipei | 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 | |
| | Mexico | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | U.S.A. | 10 | 11 | 38 | 24 | 21 | 28 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 10 | 20 | 2 | 9 | 18 | 5 | 10 | |
| | UK.Bermuda | 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 | |
| ATS | Brazil | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | Chinese Taipei | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 2 | |

1. Brazilian Task I catches from 2012 to 2014 are preliminary and under revision.

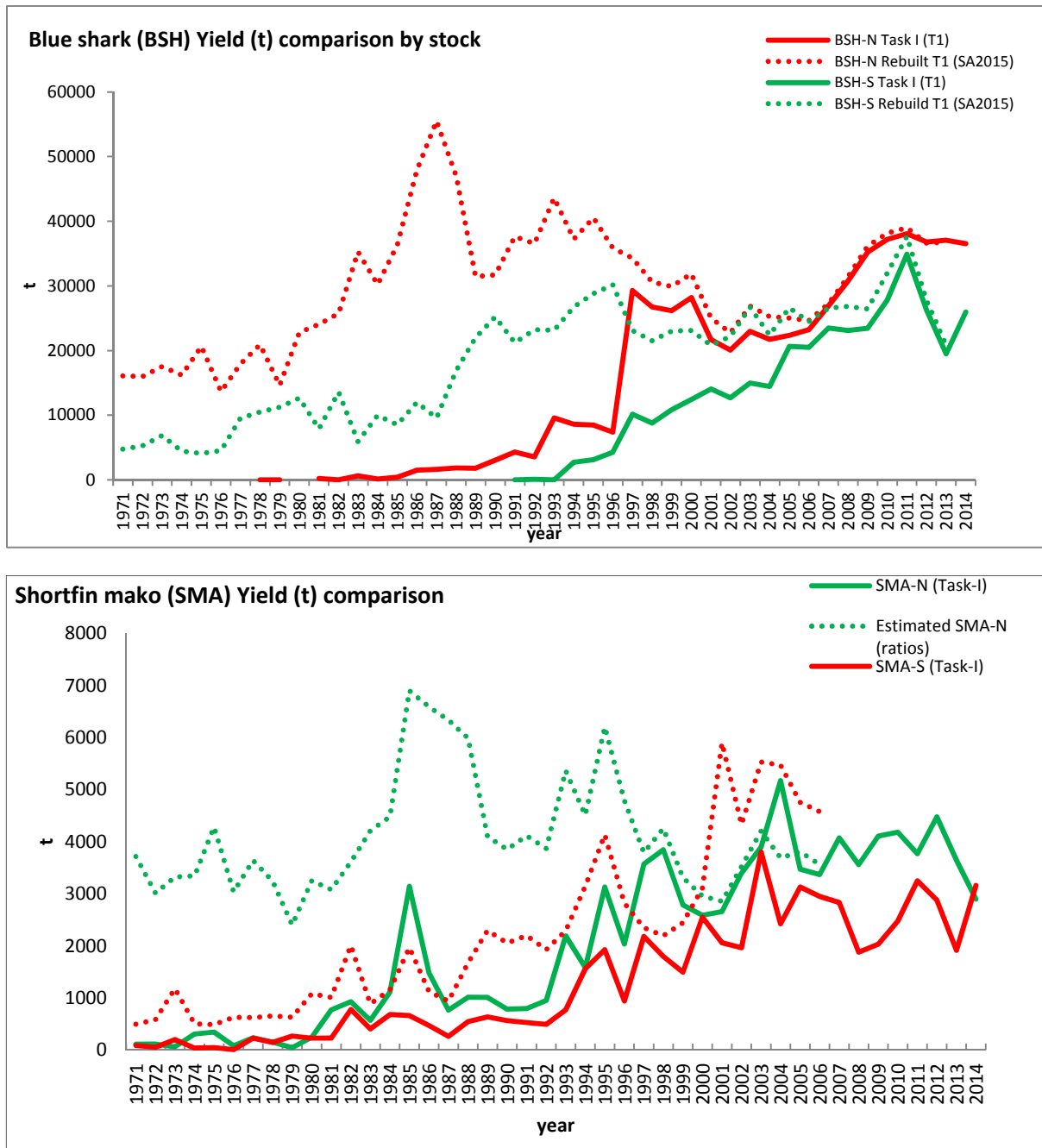
POR-Table 1. Estimated catches (t) of porbeagle (*Lamna nasus*) by area, gear and flag. (v2, 2015-09-25)

| | | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|----------|--------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| TOTAL | | 1309 | 1991 | 2603 | 1910 | 2729 | 2140 | 1560 | 1859 | 1469 | 1403 | 1469 | 509 | 848 | 648 | 745 | 571 | 507 | 525 | 611 | 484 | 136 | 90 | 149 | 185 | 64 |
| | ATN | 1309 | 1990 | 2603 | 1909 | 2726 | 2136 | 1556 | 1833 | 1451 | 1393 | 1457 | 507 | 838 | 604 | 725 | 539 | 470 | 512 | 524 | 421 | 119 | 68 | 111 | 156 | 26 |
| | ATS | 0 | 0 | 0 | 1 | 2 | 3 | 3 | 26 | 17 | 10 | 11 | 1 | 11 | 43 | 17 | 31 | 37 | 13 | 85 | 62 | 16 | 21 | 37 | 29 | 38 |
| | MED | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 3 | 2 | 1 | 0 | 2 | 1 | 1 | 0 | 1 | 0 | 0 |
| Landings | ATN All gears | 1309 | 1990 | 2601 | 1909 | 2725 | 2136 | 1556 | 1833 | 1451 | 1393 | 1457 | 507 | 838 | 604 | 725 | 539 | 470 | 512 | 524 | 421 | 117 | 67 | 111 | 153 | 21 |
| | ATS | 0 | 0 | 0 | 1 | 2 | 3 | 3 | 26 | 16 | 9 | 11 | 1 | 11 | 43 | 17 | 31 | 37 | 13 | 85 | 62 | 16 | 21 | 37 | 29 | 38 |
| | MED | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 3 | 2 | 1 | 0 | 2 | 1 | 1 | 0 | 1 | 0 | 0 |
| Discards | ATN | 0 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 0 | 2 | 5 |
| | ATS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Landings | ATN Canada | 78 | 329 | 813 | 919 | 1575 | 1353 | 1051 | 1334 | 1070 | 965 | 902 | 8 | 237 | 142 | 232 | 202 | 192 | 93 | 124 | 62 | 83 | 30 | 33 | 19 | 9 |
| | EU.Denmark | 46 | 85 | 80 | 91 | 93 | 86 | 72 | 69 | 85 | 107 | 73 | 76 | 42 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 |
| | EU.España | 26 | 47 | 15 | 21 | 52 | 19 | 41 | 25 | 25 | 18 | 13 | 24 | 54 | 27 | 11 | 14 | 34 | 8 | 41 | 77 | 0 | 0 | 0 | 0 | 0 |
| | EU.France | 551 | 300 | 496 | 633 | 820 | 565 | 267 | 315 | 219 | 240 | 410 | 361 | 461 | 303 | 413 | 276 | 194 | 354 | 311 | 228 | 0 | 2 | 4 | 0 | 0 |
| | EU.Germany | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 17 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | EU.Ireland | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 2 | 6 | 3 | 11 | 18 | 0 | 4 | 8 | 7 | 3 | 0 | 0 | 0 | 0 | 0 |
| | EU.Netherlands | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | EU.Portugal | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 4 | 10 | 101 | 50 | 14 | 6 | 0 | 3 | 17 | 7 | 0 | 0 | 0 | 0 | 0 |
| | EU.Sweden | 2 | 2 | 4 | 3 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | EU.United Kingdom | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 6 | 8 | 12 | 10 | 0 | 0 | 24 | 11 | 26 | 15 | 11 | 0 | 0 | 0 | 0 | 0 |
| | Faroe Islands | 550 | 1189 | 1149 | 165 | 48 | 44 | 8 | 9 | 7 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Iceland | 0 | 0 | 1 | 3 | 4 | 6 | 5 | 3 | 4 | 2 | 2 | 3 | 2 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |
| | Japan | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 10 | 13 | 13 | 14 | 49 | 98 | 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 |
| | Maroc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | Norway | 43 | 32 | 41 | 24 | 24 | 26 | 28 | 17 | 27 | 32 | 22 | 11 | 14 | 19 | 0 | 8 | 27 | 10 | 12 | 10 | 12 | 11 | 17 | 9 | 5 |
| | U.S.A. | 2 | 5 | 1 | 50 | 106 | 35 | 78 | 56 | 13 | 3 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 11 | 4 | 27 | 7 |
| | ATS Benin | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Brazil | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 |
| | Chile | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Chinese Taipei | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 0 |
| | 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 | 0 |
| | EU.España | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 7 | 1 | 2 | 9 | 4 | 0 | 3 | 5 | 4 | 13 | 0 | 0 | 0 | 0 | 0 | 0 |
| | EU.Netherlands | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | EU.Poland | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | EU.Portugal | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Falklands | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Ghana | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 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 | 0 |
| | Japan | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 14 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 41 | 34 | 8 | 7 | 25 | 15 | 13 | 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 | 14 | 0 |
| | 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 | 0 |
| | Uruguay | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 5 | 13 | 2 | 4 | 0 | 8 | 34 | 8 | 28 | 34 | 3 | 40 | 14 | 6 | 12 | 12 | 0 | 0 |
| | MED EU.Italy | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | EU.Malta | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| Discards | ATN 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 | 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 | 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 |
| | U.S.A. | 0 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 0 | 2 | 4 |
| | ATS 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 | 0 |
| | Uruguay | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

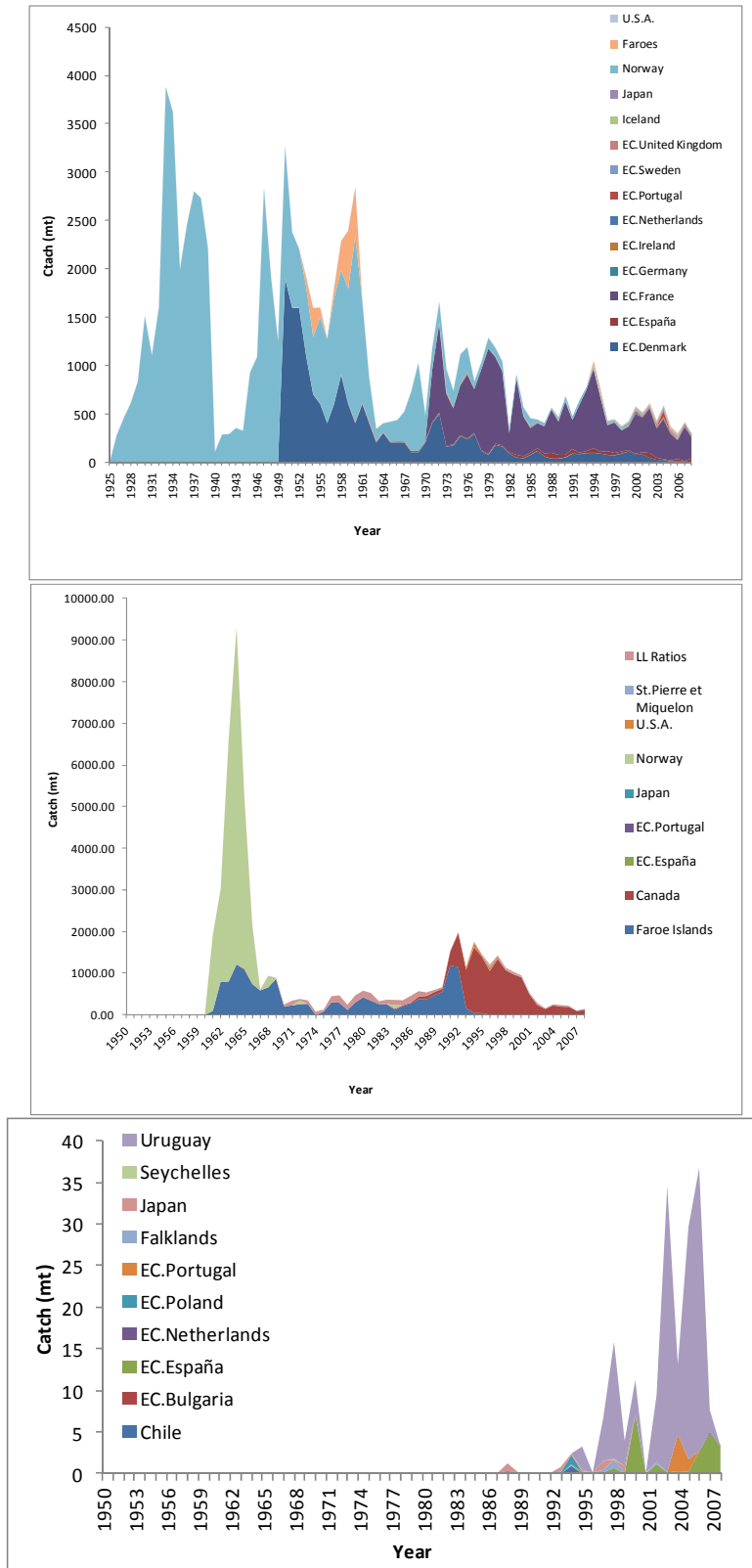
1. Brazilian Task I catches from 2012 to 2014 are preliminary and under revision.

SHK-Table 2. Vulnerability ranks for 20 stocks of pelagic sharks calculated with three methods: Euclidean distance (v_1), multiplicative (v_2), and arithmetic mean (v_3). 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.

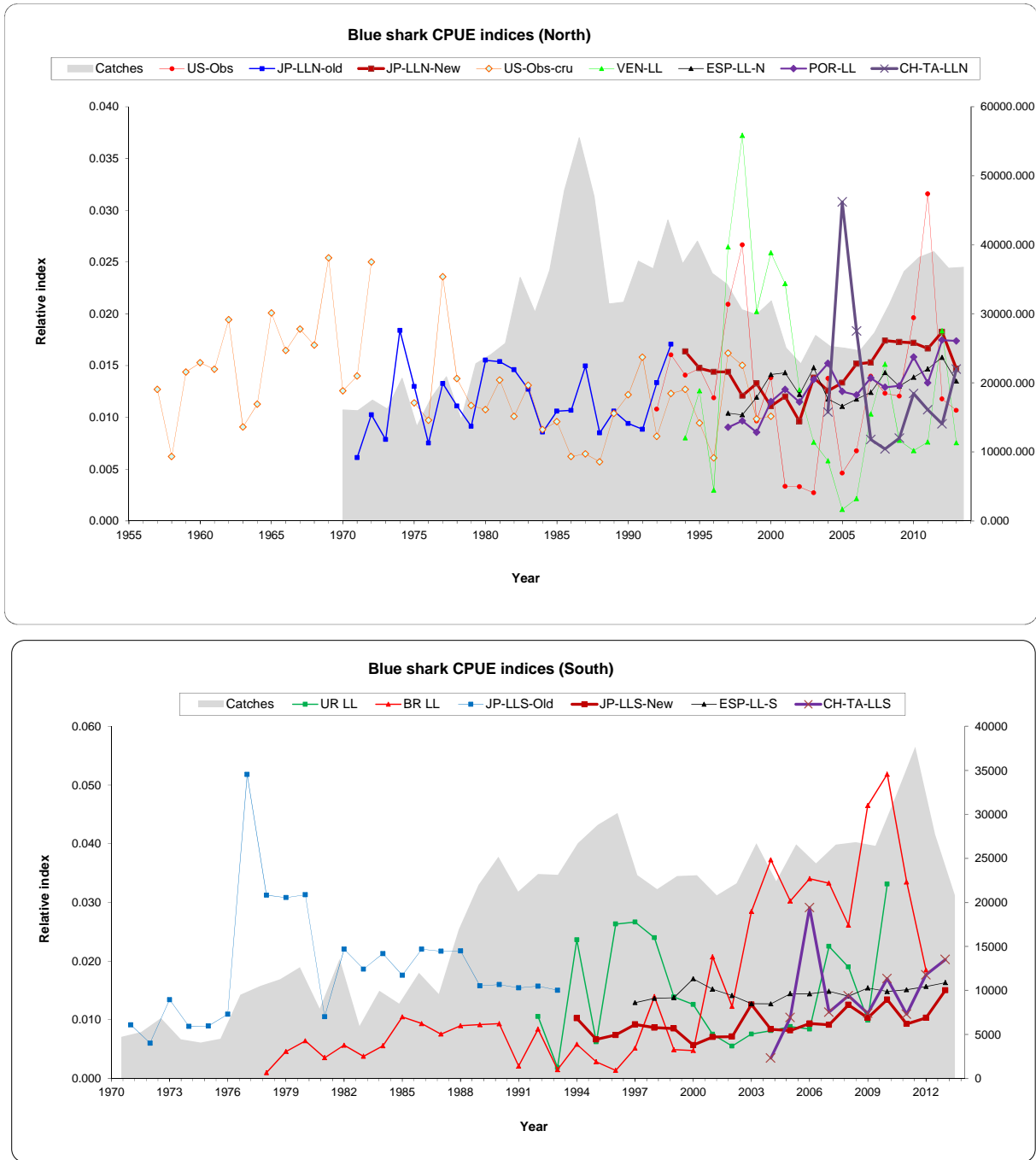
| Stock | v_1 | v_2 | v_3 |
|--------|-------|-------|-------|
| BTH | 3 | 1 | 1 |
| LMA | 5 | 3 | 2 |
| SMA | 1 | 8 | 2 |
| POR | 2 | 7 | 4 |
| CCS | 11 | 4 | 5 |
| FAL SA | 12 | 5 | 6 |
| CCP | 15 | 2 | 6 |
| OCS | 4 | 13 | 8 |
| FAL NA | 8 | 11 | 8 |
| ALV | 9 | 14 | 11 |
| BSH NA | 6 | 19 | 10 |
| 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 |



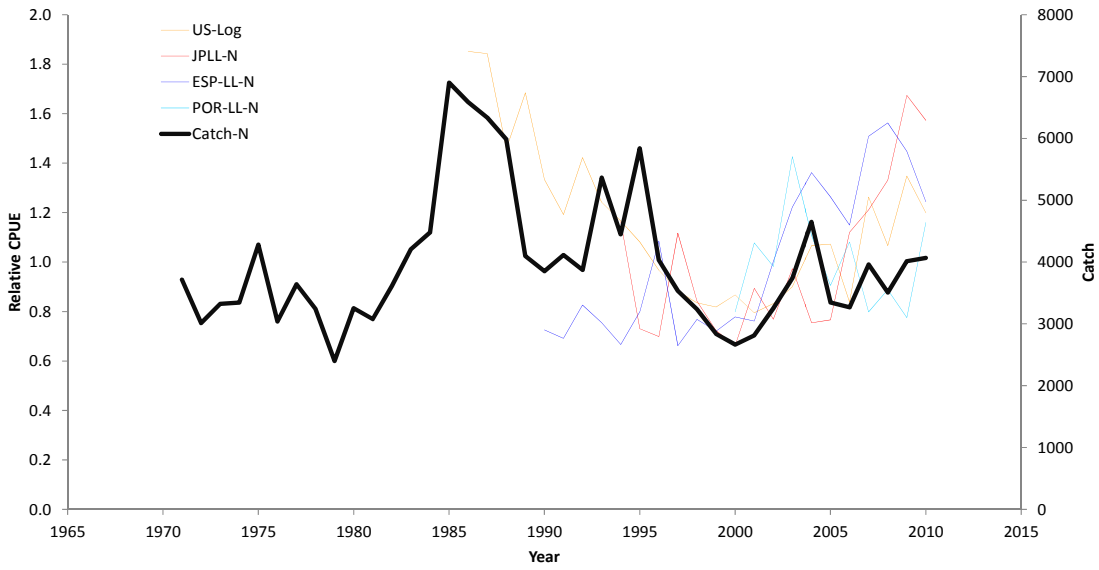
SHK-Figure 1. Blue shark (BSH) and shortfin mako (SMA) catches reported to ICCAT (Task I) and estimated by the Committee (2014 landings are considered provisional).



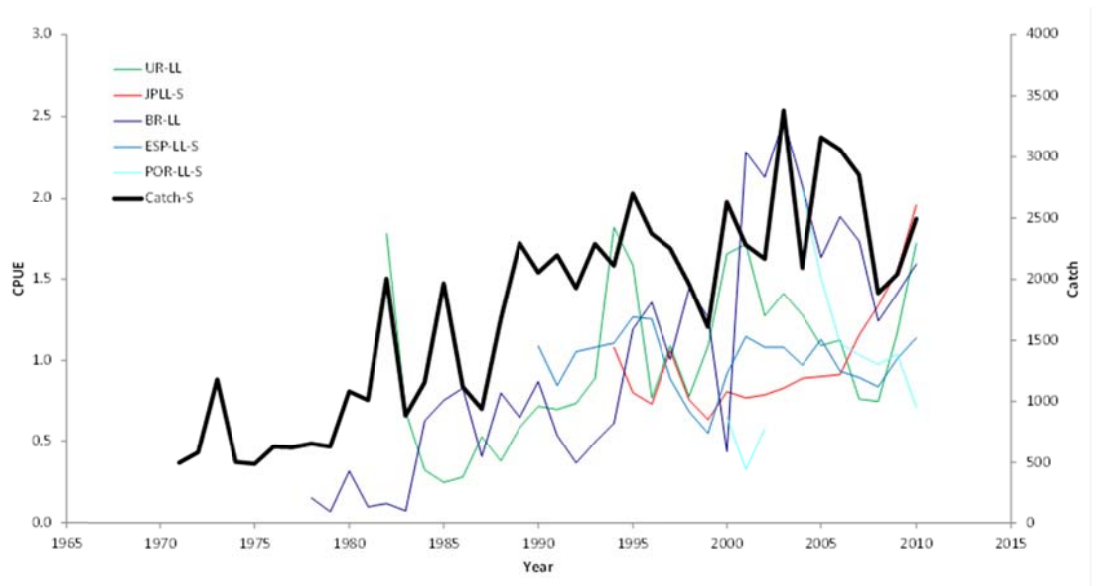
SHK Figure 2. Catch by flag of porbeagle sharks from the northeast Atlantic (top), northwest Atlantic (middle), and southwest Atlantic (bottom) used in the assessment. While these catches are considered the best available, NE catches are believed to underestimate the pelagic longline catches for this species, those from the NW include non-reporting fleets, which in this case represent a small proportion of the total, and those from the SW are Task I data also believed to significantly underestimate actual catches by all fleets.



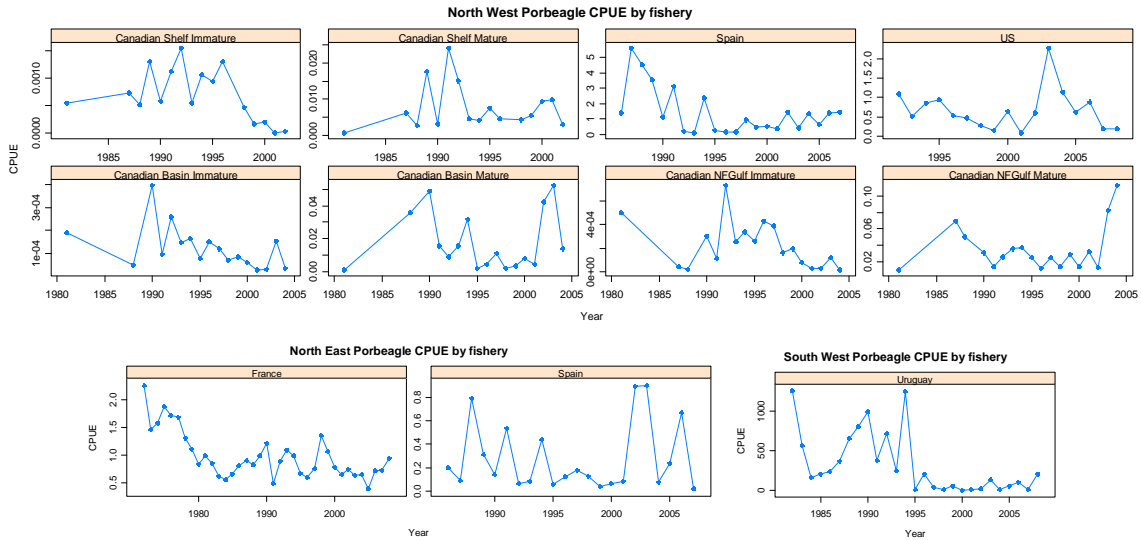
SHK-Figure 3. CPUE series used in the assessments of North and South Atlantic blue shark (BSH) stocks. Total catches used in the assessments are also shown.



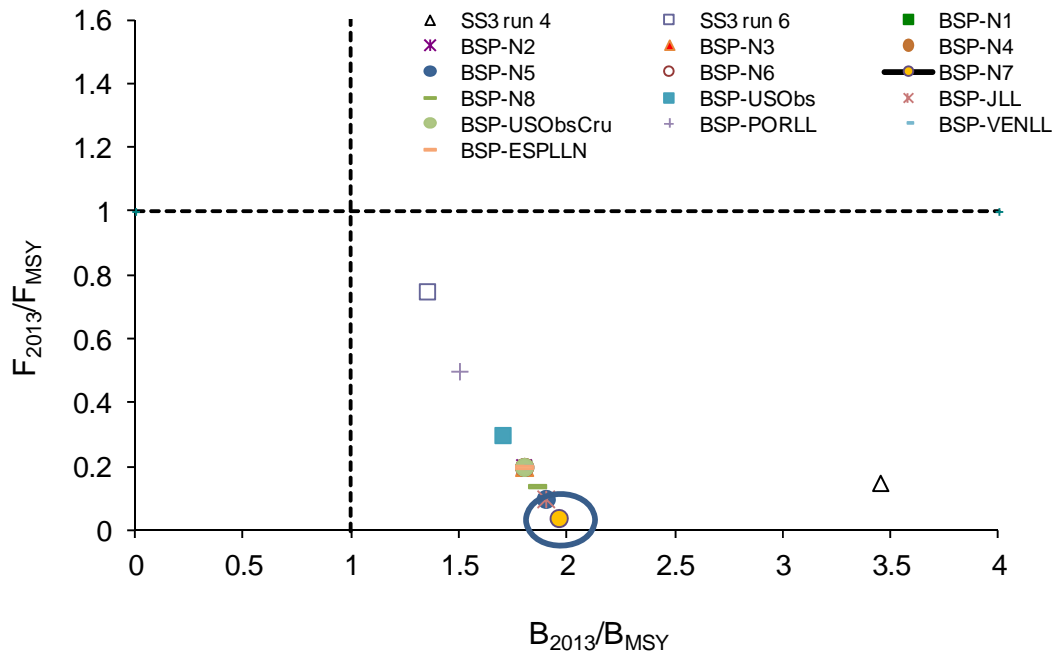
SHK-Figure 4. Indices of abundance for North Atlantic shortfin mako shark, along with total catches input into the BSP model.



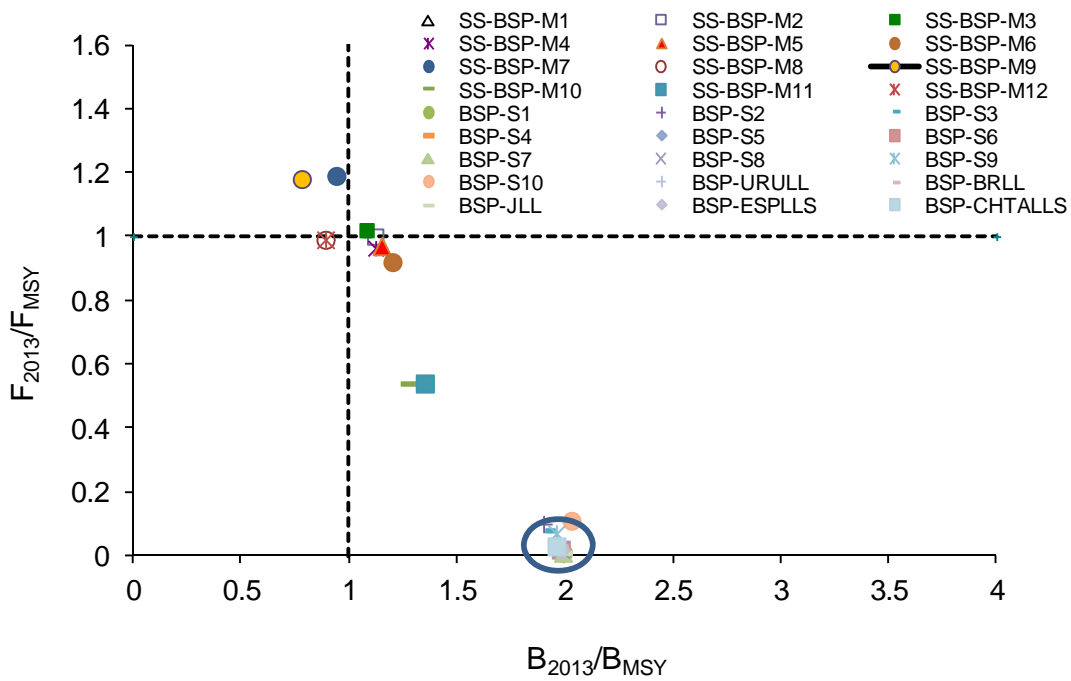
SHK-Figure 5. South Atlantic shortfin mako catches and indices of abundance input to the BSP model.



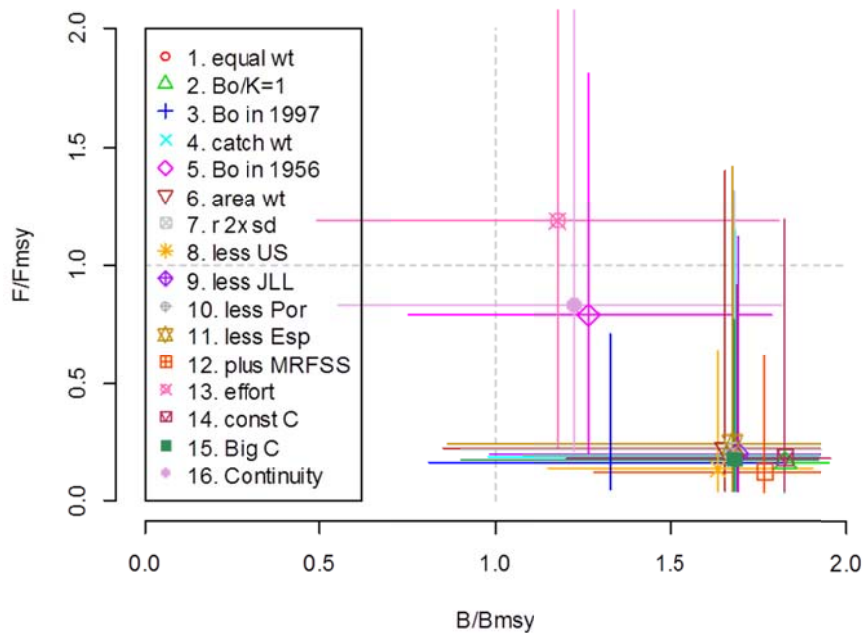
SHK-Figure 6. CPUE series for the porbeagle used in the last assessment NW stock (upper figures), NE stock (lower left figures) and SW stock (lower right figure).



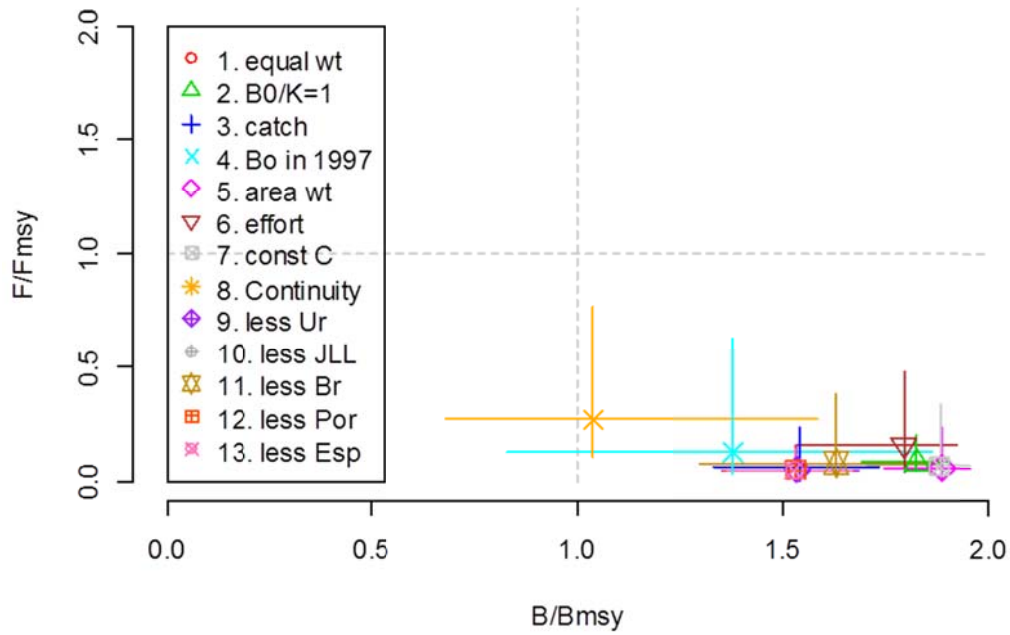
SHK-Figure 7. Phase plots summarizing scenario outputs for the current (for 2013) stock status of North Atlantic blue shark (BSH). BSP=Bayesian surplus production model; SS3=Stock synthesis model. The circle denotes common status for several BSP runs. Note that the x-axis values for SS3 are SSF_{2013}/SSF_{MSY} .



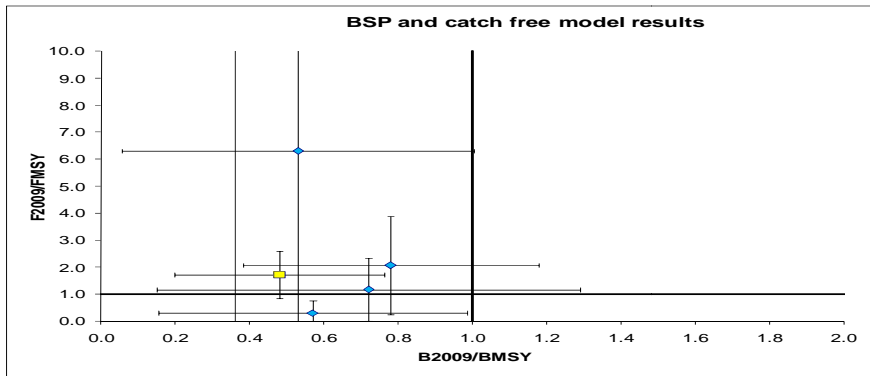
SHK-Figure 8. Phase plots summarizing scenario outputs for the current (for 2013) stock status of South Atlantic blue shark (BSH). BSP=Bayesian surplus production model; SS-BSP=State-space Bayesian surplus production model. The circle denotes common status for several BSP runs.



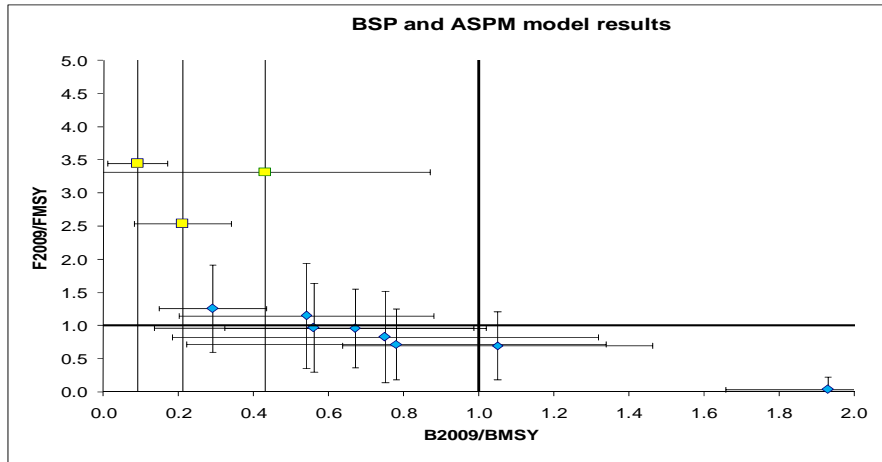
SHK-Figure 9. For North Atlantic shortfin mako sharks, median biomass relative to B_{MSY} and median fishing mortality rate relative to F_{MSY} , with 80% credibility intervals, from BSP model.



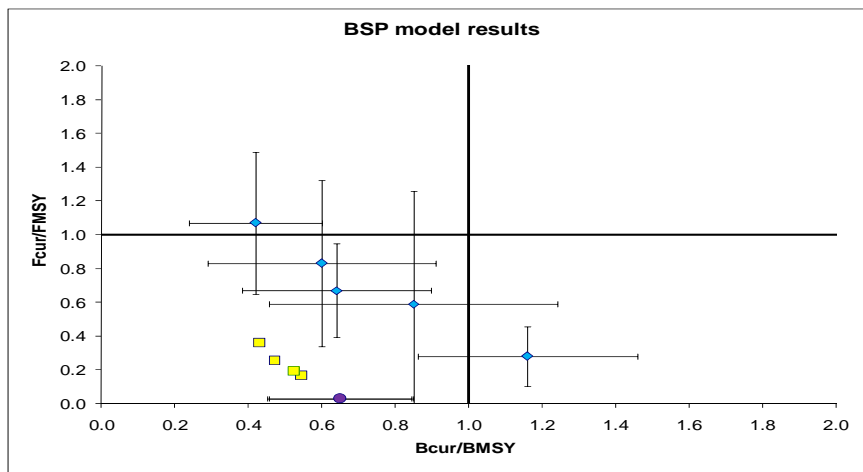
SHK-Figure 10. For South Atlantic shortfin mako sharks, median biomass relative to B_{MSY} and fishing mortality rate relative to F_{MSY} , with 80% credibility intervals.



SHK-Figure 11. 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 12. 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 13. 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 N_{2009}/N_{1961} times 2. Error bars are plus and minus one standard deviation.

9. Report of intersessional SCRS meetings

The reports of the intersessional meetings held in 2015 were presented.

9.1 Meeting of the ICCAT Working Group on Stock Assessment Methods (WGSAM)

The meeting was held in Miami, USA, 16-20 February 2015 with the objective: of making progress on the use of Management Strategy Evaluation (MSE) to evaluate Harvest Control Rules and Reference Points and to design a simulation study to show how to include spatially changing oceanographic and environmental conditions into the assessment process.

The Detailed Report of the meeting is presented as document SCRS/2015/010.

The Working Group on Stock Assessment Methods Work Plan for 2016 is attached as **Appendix 11**.

9.2 Bluefin data preparatory meeting

The meeting was held in Madrid, Spain, 2-6 March 2015. It aimed at reviewing all the available data and preparing the data required to carry out the full assessment of the West Atlantic and the East Atlantic and Mediterranean stocks, foreseen for 2016. Likewise, the activities were defined by the Core Modelling Group to continue the development of new modelling frameworks using Management Strategy Evaluation (MSE) that can better take into account various sources of uncertainties.

The Detailed Report of the meeting is presented as document SCRS/2015/013

The Bluefin Tuna Preparatory Work Plan for 2016 is attached as **Appendix 11**.

9.3 Blue shark data preparatory and assessment meetings

The data preparatory meeting was held in Tenerife, Spain, 23-27 March 2015. The major meeting objective was to revise all available data (catch, effort, size and tagging) aiming for the Atlantic stock assessment session in July. The results of several cooperative efforts led by National Scientists to gather and analyse data were presented, including analysis of size data by sex and region for the main fleets operating in the Atlantic and a detailed review of all available life history information.

The Detailed Report is presented as document SCRS/2015/012.

The assessment meeting was held at the *Oceanário de Lisboa*, Portugal, 27-31 July 2015. The objective of this meeting was to assess the stocks (North and South) status of Atlantic blue shark. The last assessment was conducted in 2008 and targeting longline fisheries has developed in recent years.

The Detailed Report is presented as document SCRS/2015/018.

The Sharks Work Plan for 2016 is attached as **Appendix 11**.

The Collaboration with CITES, as presented by the Secretariat, was highlighted.

9.4 Bigeye data preparatory and assessment meetings

The data preparatory meeting was held in Madrid, Spain, 4-8 May 2015. The major objectives of the meeting were to revise all available statistical data (catch, effort, size and tagging), fisheries indicators and indices of relative abundances, aiming for the stock assessment session in July.

The Detailed Report is presented as document SCRS/2015/011.

The assessment meeting was held in Madrid, Spain, 13-17 July. The objective of this meeting was to evaluate the Atlantic bigeye tuna stock status, since the last assessment was conducted in 2010 and there have been significant changes to the historical data, mainly related to an influx of purse seiners from the Indian Ocean. The Feasibility Study for the Atlantic Ocean Tropical Tuna Tagging Programme (AOTTP) was also reviewed.

The Detailed Report is presented as document SCRS/2015/015.

The Tropical Tunas Work Plan for 2016 is attached as **Appendix 11**.

9.5 Small tunas species group intersessional meeting

The meeting was held in Madrid, Spain, 10-13 June 2015. The main objectives of the meeting were to make an inventory of the overall available information, since the recent efforts to improve the Task I and Task II data; and to conduct some preliminary analyses of these data sets. Moreover, the Group identified a hierarchy of species and stocks that are priority for assessment.

The Detailed Report of the meeting is presented as document SCRS/2015/019.

The Small Tunas Work Plan for 2015 is attached as **Appendix 11**.

10. Report of Special Research Programmes

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

Dr Antonio Di Natale, Programme Coordinator, presented the report on the Atlantic-wide Bluefin Tuna Research Programme (GBYP) activities carried out in 2015. The SCRS Chairman recognized the good work conducted by the GBYP team and the ICCAT Secretariat as well as the coordinated work of the CPC research institutions and scientists.

The activities of the Atlantic-wide research programme on bluefin tuna (GBYP) officially started in March 2010. The fourth phase of GBYP activities began in March 2013 and was extended up to 21 February 2015, including (a) continuation of data mining, recovery and elaboration, (b) biological studies, (c) tagging, including awareness and rewarding campaign, (d) aerial survey on bluefin spawning aggregations and (e) further steps of the modelling approaches. The extension period was used for improving few activities, due to the budget restrictions. The fifth Phase of GBYP started on 22 February 2015 and it will be active until 21 February 2016; it includes the same activities listed in Phase 4, with some different details. A very impressive amount of data was recovered in the first phases, covering a period from 1952 to 2009, all available for the normal ICCAT procedures and officially presented to ICCAT meeting on bluefin tuna data in 2013 and 2015, and to the SCRS in 2013 and 2014; additional recovered data will be presented to the SCRS in 2015. The conventional tag seeding in these first years was quite successful and the reporting is improving, even if the recovery rate is still low. The miniPATs implanted since 2011 provided very interesting results, which opened new perspectives in our understanding of bluefin tuna behaviour, and the first results in 2015 strongly contributed to our knowledge, changing several previous hypotheses. The aerial survey, carried out in an extended area (about 60% of the Mediterranean) in 2015, provided updated estimates, but the final analyses will be available at the end of Phase 5, because of the many details that were included for the first time. The large participation of scientific institutions from many countries to the biological studies is also providing some interesting preliminary results, but more effort is needed for having all the analyses pursued; the western and eastern stocks seem to have micro-chemical and genetic differentiations, but mixing among all areas is evident, and it can be very important and variable among years. So far, mixing among the two stocks seems not evident in the two main spawning areas. The modelling efforts are continuing, with a new modelling Coordinator in Phase 5 and all efforts are directed to the development of a MSE.

The Committee thanked the Coordinator of the project and recognized the amount of work that has gone into this programme. It was queried however, how the data collected under this project has contributed to the assessment and resource management process. The Committee was made aware of several instances in which the data have already been used and how it has generally resulted in an increase in collaboration and data collection for the species, although it was acknowledged that perhaps more could be done. As such it was agreed that an evaluation of the project should take place soon. This evaluation should be an external review of the state of the project, the data collected and its use, and should provide clear guidance as to how the programme should proceed. It was acknowledged that this project has experienced logistical and funding problems. As such it needs to be thoroughly evaluated including a power analysis on the different approaches considered. The feasibility of the continuation of the programme needs to be decided and advice provided on how best the programme should continue in the future.

The report was adopted and is attached as **Appendix 4**.

10.2 Enhanced Research Programme for Billfish (EPBR)

The ICCAT Enhanced Programme for Billfish Research continued its activities in 2015. The Secretariat coordinates the transfer of funds and distribution of tags, information, and data. The overall programme Coordinator during 2014 was Dr David Die (USA); Dr Eric D. Prince (U.S.A.) was coordinator for the western Atlantic Ocean, and Mr. Paul Bannerman (Ghana) coordinated activities for the eastern Atlantic Ocean. In 2015, Dr John P. Hoolihan (USA) assumed the role of overall coordinator and western Atlantic coordinator, while Dr Fambaye Ngom Sow (Senegal) assumed the role of coordinator for the eastern Atlantic.

The original plan (1986) for EPBR included the following objectives: (1) to provide more detailed catch and effort statistics, particularly for size frequency data; (2) to initiate the ICCAT tagging programme 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 objectives of EPBR expand to evaluate adult billfish habitat use, study billfish spawning patterns and billfish population genetics. The Billfish Species Group believes that these studies are essential to improve billfish assessments.

The programme depends on financial contributions, including in-kind support, to reach its objectives. This support is especially critical because the largest portion of billfish catches in recent years comes from countries that depend on the support of the programme to collect fishery data and biological samples. ICCAT has provided financial support in recent years, while annual contributions have been made from Chinese Taipei since 2009.

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

10.3 Small Tunas Research Programme

To implement the main activities scheduled in 2015, in particular continuing the recovery of historical Task I and Task II data series and conducting the biological sampling for the main small tuna's species, a draft call for tenders was sent to the Secretariat in February 2015. After discussing the proposal with the SCRS Chair, the Secretariat decided to postpone the call for tenders, until the Group would define the priority stocks to be covered by the biological sampling during its data preparatory meeting that took place in June 2015. Furthermore, during the small tuna data preparatory meeting the Secretariat asked the members of the Group that desire participating in the biological sampling activities to be organized within a consortium to better achieve the objectives of the programme and facilitate the administrative procedures related to the contract to be granted to the consortium. As there was not enough time during that meeting to discuss about the details of this possible consortium, this matter has been delayed to next year. Work was conducted with assistance from the ICCAT/JCAP, following a request from the Group in 2014. In May 2015 a training course on the identification of species and the biological sampling of small tunas was held.

The Group identified the priorities that should be taken into account both in terms of the species to be sampled and the biological data to be collected under the SMTYP. These priorities are presented in the Small Tunas Work Plan for 2016 (**Appendix 11**).

It was noted that the project did not spend any of the allocated funds in 2015. As such, the request for additional funding in 2016 for the SMTYP could be problematic especially as the Working Capital Fund has already been required to co-fund the AOTTP in order to meet the requirements to liberate funds for this new programme. The Chair of the Small Tunas Working Group clarified that the reasons for this lack of use of these funds are clearly explained in the report of the SMTYP project and that it was a decision by the Group in conjunction with the Secretariat, to postpone the call for tenders to utilise these funds until 2016.

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

10.4 Shark Research and Data Collection Programme (SRDCP)

The Group noted that during the 2015 Blue Shark Stock Assessment meeting and shortly thereafter, four project proposals covering different aspects of the life history, stock structure, and fisheries of the shortfin mako were presented: a pan-Atlantic age and growth study; a population genetics study to estimate the stock structure and phylogeography of Atlantic shortfin mako; a post-release mortality study focusing on pelagic longline fisheries; and a satellite tagging study for determining movements and habitat use. A fifth project, to study the trophic relationships of Atlantic mako sharks through stable isotope analysis and possibly fatty acid analysis, was also expected. The Group explained that this project is envisioned to continue in 2016 and 2017 and presented the proposed tasks to be conducted during those years.

The report was adopted and is attached as **Appendix 7**.

10.5 Atlantic Ocean Tunas Tagging Programme (AOTTP)

The Secretariat provided the Committee with a brief summary of the status of the programme. It was noted that the contract has been signed with the EU and the contracting of key positions is underway. Since the voluntary contributions for this programme have been very low, the Secretariat raised the possibility of providing the requested amount from the ICCAT Working Capital Fund. The details will be discussed during the forthcoming meeting of STACFAD.

It was noted that the funding required for this programme is an important and problematic issue and the poor level of contributions to complement the allocation from the EU has placed an increased burden on the ICCAT Working Capital Fund. It was strongly recommended that other countries contribute to fund this project. The EU are constrained by the percentage they can contribute and the additional 10% is critical to ensure the funding for this programme. The securing of the 10% funding required is fundamental and all CPCs were urged to engage and commit to this funding.

11. Report of the Sub-committee on Statistics

Dr Guillermo Diaz, Convener of the Sub-committee on Statistics, presented the Sub-committee's Report, which held its session in Madrid, 21 and 22 September 2015. The Sub-committee presented to the SCRS the major decisions and recommendations made that will affect the submission of Task I and II data and that will require a response from specific species groups. In particular, the Sub-committee emphasized the proposed protocol for the reporting of zero catches which will solve some of the difficulties that CPCs had in the past while reporting zero catches. The Sub-committee reviewed the progress of last year's recommendations and provided its support to the recommendations with financial implications related to specific tasks to be performed by the Secretariat.

The Sub-committee reinforced the necessity for CPCs to view and update their list of statistical correspondents maintained by the Secretariat. This full list is provided in **Appendix 10**. These updated details will be included in the filter 1 criteria in statistical data submission forms in 2016. In addition, the Committee queried whether the terms *real* and *global zeros* will be maintained in the future or whether there is flexibility to refine these terms to reduce confusion in data reporting.

The report was adopted and is attached as **Appendix 8**.

12. Report of the Sub-committee on Ecosystems

An Intersessional Meeting of the Sub-committee on Ecosystems was held in Madrid (Spain) 8-12 June 2015. With regards to by-catch, the objective of the meeting was to review the methodology to be used to update the longline EFFDIS data and, based on this estimation, to update the ecological risk assessment of the impact of ICCAT fisheries on sea turtles and to provide advice based on its results. The Group also attempted to review the efficiency of seabird by-catch mitigation measures as described in Rec. 11-09. The primary objectives of the Ecosystems components of the meeting were to review progress made in implementing the EBFM and to develop a list of key indicators and objectives for its implementation. In addition the Group continued assessing the importance of the Sargasso Sea ecosystem to ICCAT.

The Detailed Report of the meeting of the Sub-committee on Ecosystems is presented as document SCRS/2015/017.

A summary of the intersessional meeting is attached as **Appendix 9**.

The Chair of the SCRS thanked the Sub-committee for providing information and assistance in the preparations for the Standing Working Group to Enhance Dialogue between Scientists and Managers (SWGSM). It was noted that the Joint tuna RFMO meeting mentioned during the presentation, which will be funded by the GEF-Common Oceans ABNJ Tuna Project is awaiting approval by the Commission in November.

It was noted that many CPCs have problems with the identification of seabird species and thus identification guides were requested. It was clarified that the Sub-committee is reviewing seabird identification guides provided by ACAP and once finalised, these will be uploaded to the ICCAT website and further distribution will be considered.

13. Report of the Ad hoc Working Group on FADs

The meeting was held in Madrid, Spain, 11-12 May 2015. The ad hoc Working Group is composed by scientists, fisheries managers, industry representatives and other interested stakeholders and shall report on its work with a view to recommend the adoption of appropriate measures at the 2016 ICCAT Commission meeting at the latest. The discussions related to a wide range of issues, such as: assessing the use of FADs in tropical tuna fisheries; identifying data gaps, developments in FAD-related technology, stakeholder initiatives to manage FADs and review of FAD management in other t-RFMOs.

The Detailed Report of the meeting is presented as document SCRS/2015/014.

The Committee recognised the importance of this work and encouraged that it should continue. It was noted that a meeting is required to present the results of ongoing initiatives and provide draft management options as specified in the Terms of Reference for this Group. It was also acknowledged that the issues relevant for this Group are also relevant to other tuna RFMOs and thus the possibility of conducting a cross-cutting exercise was encouraged (e.g. IOTC). It was agreed that in order to conduct all of these exercises, a longer meeting might be required than that conducted in 2015. As such the SCRS Chair opened the possibility of extending the time period available for this Group.

14. Report of the Third meeting of the Working Group of Fisheries Managers and Scientists in Support of the Western Bluefin Tuna Stock Assessment

The meeting was held in Bilbao, Spain, 25-26 June 2015. The Working Group reviewed the developments related to the three recommendations agreed by the CPCs at the previous meeting and discussed on the progress of combining raw catch/effort data for individual fleets into a new index of western bluefin tuna abundance.

It was noted that the meeting of the Working Group of Fisheries Managers and Scientists in Support of the Western Bluefin Tuna Stock Assessment will not be held on an annual basis and issues will be addressed in the Standing Working Group to Enhance Dialogue between Fisheries Scientists and Managers (SWGSM) meeting in the future. In the bluefin tuna Working Group it was recommended to form a small working group with managers to discuss issues related to MSE.

15. Report of the Second meeting of the Standing Working Group to Enhance Dialogue between Fisheries Scientists and Managers (SWGSM)

The meeting was held in Bilbao, Spain, 22-24 June 2015. The overall objective of the Working Group is to enhance communication and foster mutual understanding between fisheries managers and scientists. These efforts will support the further development and implementation of science-based management strategies. During this meeting the Working Group revised and discussed: basic components of the precautionary management, how harvest control rules might be designed for ICCAT fisheries, basic elements of management strategy evaluation and examples in managed fisheries.

The need to identify management objectives and develop a dialogue with managers to allow them to choose appropriate elements of HCRs was highlighted. It was also thought that this dialogue should be further improved. It was agreed to discuss these issues further before the Commission.

A main task for scientists in MSE is to develop operating models that represent the main forms of uncertainty and to evaluate their impact on management objectives. Given the questions identified in recent stock assessments in relation to developing and weighting model hypotheses this is an important issue that needs to be addressed, e.g. by the tRFMO-MSE Working Group.

The Committee recommended that better dialogue between scientists, stakeholders and Commissioners is needed to develop appropriate management objectives for the management strategy evaluations. This dialogue would be facilitated by alternatives such as the creation of a working group with membership from the Commission and SCRS that focuses on management strategy evaluations.

16. Report of the implementation of the Science Strategic Plan for 2015-2020 in 2015 and work plan for 2016, including the definition of an ICCAT training plan as well as the update of the stock assessment software catalogue

The SCRS has, with the support of the Secretariat, started the implementation of the plan **Table 16.1** represents two possible options which could be used to report this progress to the Commission. The schedule of meetings for 2015 followed the calendar proposed by the plan, however, changes in the meetings proposed for 2016 would need an adjustment of the 2015-2020 calendar (**Table 16.2**).

ICCAT produces budgets in a 2 year cycle with a new cycle starting in 2016-2017 and budgets for that period being prepared in the middle of 2015. As the SCRS increases its request of funds to support its activities it is imperative that these requests are made to fit such 2-year budget cycle. This would also increase the possibility that the SCRS would find a more stable and predictable mechanism for funding its research, as proposed by the SWGSM in 2015.

The SCRS therefore recommends the Commission to support the development of this new mechanism by establishing a competitive research fund administered by the ICCAT Secretariat. The fund would be used to support the research activities identified in the Science Strategic Plan for research developed by the SCRS. The competitive nature of the fund would ensure the relevance, quality and efficient use of research funds to support management of tuna resources. Every two years, and pending approval of the research fund budget by the Commission, the Secretariat would release a call for proposals prior to the Commission meeting. A Committee comprised of SCRS officers would review proposals and make recommendations for funding, taking into account the level of funding provided by the Commission, and so as to have funds available in January of the following year. Research teams would be led by a principal investigator that will have the responsibility of reporting the activities of the project to the SCRS during its plenary meeting. Research teams should start planning proposals as soon as the SCRS establishes its priorities in early October and in anticipation of the call for proposals to ensure that proposals can be evaluated and decisions can be made within the month of December. Funding decisions would be based on criteria including relevance of the research to the work of the SCRS, alignment with the strategic plan, level of collaboration between CPCs, level of engagement of G77 economies and contributions of the project to capacity building.

The SCRS has been increasing its training and capacity building activities in recent years, thanks to the support of various programs. There is a need to develop a coordinated approach to these activities to ensure the limited funds available are used in the most productive manner possible and according to the goals and objectives for participation and capacity building contained in the Science Strategic Plan of the SCRS. The SCRS should therefore develop a 5 year calendar of training and capacity building activities similar to the one developed for assessment meetings and also a mechanism for prioritizing these activities.

Table 16.1. Options for reporting progress in the implementation of the 2015-2020 Strategic Plan.

Option 1

| | Progress toward target | | | | | |
|--|--|------|-----------|------|------|------|
| | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
| PARTICIPATION AND CAPACITY BUILDING | | | | | | |
| 1.1 Avoid conflict of interes | Code of conduct | | | | | |
| 2.1 Increase capacity of CPC | 20% reduction in data elements lacking | | | | | |
| 2.2 Increase ability of SCRS in application of methods | 5 courses conducted | | | | | |
| | | | | | | |
| | In progress | | Completed | | | |
| | | | | | | |

Option 2

| Goal | Objective | 2015 | 2016 | 2017 | 2018 | 2019 |
|-------|--|---------------|------|------|------|------|
| 1 | IMPROVE FISHERY DATA COLLECTION AND REPORTING | | | | | |
| 1.1 | Strengthen the collection of High Quality Task I and II data | | | | | |
| 1.1.1 | <i>Effectiveness of existent Recommendations and Resolutions for improving data bases</i> | | | | | |
| 1.1.2 | <i>Collaborating with other tuna RFMOs and research institutes</i> | (a), (b) | | | | |
| 1.1.3 | <i>Refining protocols for data collection and species identification for target species and bycatch</i> | | | | | |
| 1.1.4 | <i>Designing and conduct data evaluation meetings on a regular basis,</i> | | | | | |
| 1.1.5 | <i>Investing in capacity building and cooperation</i> | (c), (d), (e) | | | | |
| 1.2 | Improve resolution and precision of total catch composition | | | | | |
| 1.2.1 | <i>Demonstrating through simulation modelling, improvement in precision of estimates of exploitation</i> | | | | | |
| 1.2.2 | <i>Pursuing broad-based application of electronic monitoring systems</i> | | | | | |
| 1.2.3 | <i>Utilising VMS data for all tuna fisheries for which VMS is required</i> | | | | | |
| 1.2.4 | <i>Compiling comprehensive data on FADs and on fishing operations</i> | (f) | | | | |
| | | | | | | |
| | (a) | | | | | |
| | (b) | | | | | |
| | JCAP workshop, | | | | | |
| | (d) CECOFAD project... | | | | | |
| | € | | | | | |

Table 16.2. Revised calendar of SCRS meetings.

| 2015-2020 TENTATIVE SCHEDULE OF MEETINGS | | | | | | |
|---|---------------------------------|---|---|-------------------------|--|---|
| | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
| ALB | | ALB (N,S,M) Data Prep ALB (N,S,M) SA session | | | | ALB (N,S,M) Data Prep ALB (N,S,M) SA session |
| BFT | BFT (E,W) Data Prep | BFT (E,W) Data Prep | BFT SA session | | BFT Data Prep | BFT SA session |
| YFT-SKJ-BET | BET Data Prep BET SA session | YFT Data Prep YFT SA session | Management of FAD fishing in the EAF context | | SKJ SA session | BET Data Prep BET SA session |
| SWO | | | SWO (N,S,M) Data Prep SWO (N,S,M) SA session | | | |
| BIL | | SAI SA | | BUM & WHM SA | | |
| SHK | BSH SA session | SHK Data Prep | SMA SA | Other SHK SA session | POR SA | |
| SMT | SMT Data Prep | SMT Data Prep | SMT Data Prep | SMT SA session | | SMT Data Prep |
| | | Workshop on Ecosystem Based Fishery Management | | | | |
| | | Ad hoc WG FADs | Management of FAD fishing in the EAF context | | Workshop on fishery independent abundance indicators | |
| Methods | WGSAM | | | | | |
| Ecosystems | SC-ECO | | | | | |
| Courses | COURSES | | | | | |
| SCRS-COM | WG DIALOGUE SCRS - COMM | | | | | |

This schedule has been prepared for planning purposes and will be adapted according to the different requirements and the progress of the SCRS SSP, especially with the incorporation of MSE approaches in the work of the SCRS.

The Committee noted that the presentation by the SCRS Chair was interesting and provided important options as to how to proceed. Regarding the issue as to how assessments/processes can be carried out, it was noted that as has been discussed previously on many occasions, a position document may be required from the SCRS. It was noted that this may take time, and thus in the short term the Working Group on Stock Assessment Methods (WGSAM) should continue assisting quality control on methods and inputs into the assessment processes.

The Committee welcomed this presentation and its attempts to provide information on the state of where the plan currently is and how it could proceed in the future. It was suggested that a competitive research fund could be a good initiative to ensure the best use of funds for scientific purposes. The competitive nature of the fund would ensure proper prioritization of funding as well as ensuring that funds are properly utilized. The ICCAT Executive Secretary pointed out that any new proposals regarding funding will have to be clearly defined and justified at the Commission.

The SCRS Chair also clarified that he has initiated work on the proposed Code of Conduct. The Chair has started to compile various codes and asked the Committee to provide further examples to collate and start development of a first draft. This would then be reviewed by the SCRS.

17. Consideration of plans for future activities

17.1 Annual Work Plans

The Rapporteurs summarized the Work Plans for 2016 for the various Species Groups, the Working Group on Stock Assessment Methods, the Sub-committee on Statistics and the Sub-committee on Ecosystems. These Plans were adopted and are attached as **Appendix 11**.

17.2 Inter-sessional meetings proposed for 2016

Taking into account the assessments mandated by the Commission and the Committee's recommendations for research coordination, the proposed intersessional meetings for 2016 are shown in **Table 17.2**. The Committee noted that the schedule needs to maintain some flexibility in order to account for any changes that may result from the deliberations held by the Commission in November 2015 and the meetings scheduled by other RFMOs.

The European Union put forward an invitation to host three meetings. The albacore and sharks meetings were proposed to be held in Madeira (Portugal) and the yellowfin tuna assessment in Pasaia (Basque Country, Spain).

17.3 Date and place of the next meeting of the SCRS

The next meeting of the Standing Committee on Research and Statistics (SCRS) will be held in Madrid, Spain, from 3 to 7 October 2016; the Species Groups will meet from 26-30 September 2016 at the ICCAT Secretariat.

Table 17.2 Proposed calendar of ICCAT scientific meetings in 2016.

| | 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 | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|----|----|----|--|
| Jan | | | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | |
| Feb | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mar | | | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Apr | | | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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 | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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 | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aug | | | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sep | | | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Oct | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

SCRS meetings

18. General Recommendations to the Commission

18.1 General recommendations to the Commission that have financial implications

Eastern and western Atlantic bluefin tuna

- The Commission should reconsider the means to secure funding to ensure the future of longterm research activities such as fisheries independent surveys (aerial, larval and acoustic surveys) and scientific tagging programmes (via GBYP or otherwise). Many CPCs do not regularly contribute the expected funds and the Committees proposal for a research allocation of 300 t has not gained traction at the Commission.
- The next full assessment for bluefin tuna, which will employ new methods and new information, is scheduled for 2017. However, the Secretariat and National Scientists have not had the resources to fully acquire and process the new data. To this end the Committee recommends intersessional meetings in 2016 for the following activities:
 - Data preparatory meeting to update the latest available information. There will be a need for several external experts to assist with the interpretation of those data, particularly the principal investigators of several key studies.
 - Modelling Group meeting to specify remaining characteristics of the operating model; define the scope of possible management procedures; and agree on a detailed time schedule for the next three years.
 - Joint Canada/Japan/Mexico/U.S. meeting to evaluate the feasibility of combining catch/effort data and develop joint indices of abundance.
 - Annual workshop to train people to run relevant assessment models.

Albacore

- In 2016, stock assessments of three albacore stocks (North Atlantic, South Atlantic and Mediterranean) are planned. During the last years, the Albacore Working Group experienced poor attendance from some CPCs directly involved in the fishery. This also affected the expertise of the Group to conduct different analyses. The stock assessments that are planned to be conducted in 2016 will require expertise mostly on surplus production models (ASPIC and BSP). Thus, the assistance of an external stock assessment expert, with expertise in surplus production models, is required to conduct the analyses.
- Several countries with important albacore fisheries were not represented in the 2013 data preparatory meeting. This limited the ability of the Group to properly revise the basic fishery data and some standardized CPUEs that were submitted electronically. This resulted in unquantified uncertainties and negatively affected the objective of the meeting. To overcome this, the Group recommends that CPCs make additional efforts and be made aware of capacity building funds available for participation in and contributing to working group meetings.

Tropicals

- The Working Group agreed that the cooperation between Ghanaian and IRD scientists be continued in 2016 in order to complete the development of the T3+ software necessary for the overall treatment of Ghanaian statistics. An amount of €38,500.00 is envisaged for the programme.
- In order to ensure the quality of the yellowfin tuna assessment in 2016 it is recommended that an external peer reviewer be invited to review the work of the Group.

Billfishes

- In the recent blue marlin and white marlin stock assessments, it was indicated that one of the major uncertainties was in the reported catch estimates to ICCAT. It is possible that a portion of the unreported catches of these species may be in the data from some artisanal fisheries across the region, like the one presented in Arocha *et al.*, 2015. The Group recommends that the Enhanced Program for Billfish Research continues and increases its support to enhance species-specific data collection and reconstruction from all artisanal fisheries in the area of the Convention.

- In order to fulfill the sailfish stock assessment, assistance for developing standardized CPUEs for the artisanal fleets (Côte d’Ivoire, Ghana, Senegal) needs to be determined in late 2015 and early 2016. The designation of participants to review data and do analyses is required. A support workshop needs to be organized and funded from ICCAT Data Improvement funds.
- In order to ensure the quality of the sailfish assessment in 2016 it is recommended that an external peer reviewer be invited to review the work of the Group.

Sharks

2016

- Shark Research and Data Collection Programme (SRDCP) Year 2 budget (€65,000). The proposed budget for Year 2 of the SRDCP (2016) includes funds for the following activities: €15,000 for the age and growth study, €10,000 for the post-release mortality study, €20,000 for the genetics, movements, stock boundaries, and habitat use study, and €20,000 for the isotopes study.

2017

Funds requested for 2017 include the following activities (€150,000):

- Historical catch recovery project (€15,000). The purpose of this project is to estimate/recover past shark catches by CPCs that misreport catches and thus contribute to the improvement of shark stock assessments. This work could be undertaken by considering catches of tunas and billfishes of fleets whose catch is known to be correlated with shark catches; comparing species composition of fleets with shark misreporting with those that have reliable shark catch estimates; estimating shark catches of fleets with shark misreporting using shark catch data of fleets with similar species composition; and, when feasible, repeating the above steps by area and/or season that reflect spatiotemporal changes of shark CPUE and/or size.
- Shortfin mako age and growth workshop (€45,000). There are still uncertainties in the age and growth parameters for shortfin makos. Previous studies assumed that vertebral band deposition could be either one or two bands per year, both in the Atlantic and Pacific Oceans. Some recent studies in the Atlantic have validated a one band per year periodicity based on bomb radiocarbon, while in the Pacific a two band per year pattern was validated for juvenile specimens based on oxytetracycline tagging. As such, the question of age validation for the shortfin mako shark still remains uncertain, but it seems possible that this species shifts from depositing two bands per year to one band per year after reaching maturity. The proposed workshop would bring together experts on shortfin mako ageing from the Pacific and Atlantic Oceans to share expertise and views.
- Observer and dockside training workshops (€90,000). Implementation of observer programmes is essential for ICCAT fisheries, in which pelagic sharks are often caught as by-catch and discarded. Observer programmes are in fact the most reliable source of information for pelagic sharks to characterize fisheries mortality. Furthermore, observer programmes are the only available method to compile data on at-vessel mortality and fate of discarded animals for less common species. Several ICCAT recommendations address observer programmes: e.g., Rec. 10-10 and Rec. 11-10. In the case of tuna fisheries catching sharks, an observer programme should collect data with the aim of: i) improving catch data for stock assessments; ii) estimating by-catch and discard levels; iii) compiling basic biological data; and iv) collecting information on gear and fishing strategies. Unfortunately many ICCAT member nations have not been able to generate observer programmes. We therefore propose to conduct regional workshops aimed at training onboard observers and dockside samplers that allow these nations to be fully trained on data collection with particular emphasis on sharks and by-catch species. Workshops would take place in Central America and the Caribbean, northern Africa and Central Africa.

Small Tunas

- Continue with the ICCAT annual SMTYP research programme activities in 2016 to further improve the biological data collection for the main species identified by the Group (the details of this programme contained in the Small Tunas Work Plan for 2016 in **Appendix 11**).

Swordfish

Atlantic

- Model expertise. During the 2013 Atlantic swordfish stock assessment alternatives model approaches provided added confidence to the Group determination of stock status. Consequently, the Group expressed continued interest in exploring multiple models approaches, that fully exploit the currently collected data, and recommends that the Secretariat continue to support external expertise to assist the Group with its modeling work using other modeling platforms.
- Stock Structure. Given new information on genetics, satellite archival tagging and early life history studies that has become available, the Group recommends that prior to the next data preparatory meeting, that the Group synthesizes the new information and updates the results of the 2006 Stock Structure Workshop as necessary. In addition to synthesizing existing information, the Group proposes to collect additional critical new data, in areas identified as mixing zones. The costs of the work described would be USD80,000 for a population genetics study and USD20*5,000 (=USD100,000) for deployment of 20 pop-up satellite archival tags. Such costs could be spread over a two year period as follows: 100,000USD in 2015/16 and USD80,000 in 2016/2017. This recommendation applies to both the North and South Atlantic and Mediterranean Stocks.

Sub-committee on Statistics

- In view of the necessity for code migration (due to the lack of backward compatibility in the most recent version of Microsoft Office) for the numerous applications that interact with various databases of the ICCAT-DB system, the SCRS requested in 2014, €150,000 for the completion of this work. The Commission approved €75,000 for one year. The work conducted in 2015 using this budget included the migration of the most important database applications. This migration did not include any of the planned improvements and previewed additions to the applications which will still require additional work. Also, the structure for the observer database to store the data from forms ST09-NatObPrg has been created, but as of yet, no application has been developed. This will require extensive coding due to the complex nature of the data being submitted and will need to be completed in 2016. Due to these applications all being migrated to the Java programming language, the Secretariat is also striving to undertake continued training in this capacity to maintain and continue development on the applications as well as other resources for the maintenance of the ICCAT databases. As such, an additional €75,000 will be required in 2016 to continue these activities.
- The ICCAT VMS system is badly outdated and in need of upgrading. The VMS infrastructure in the Secretariat has been running mostly uninterrupted 24 hours a day for seven days a week since it was installed in 2008. There is a real danger of a critical systems failure that will result in loss of data. This includes the inability to receive messages and data loss due to the obsolete system. In addition, the age of the system has made it extremely difficult to create backups, further endangering the data. As such, the Secretariat is looking to update both the hardware and software related to the system in 2016. This update does not change or modify the existing functionality of the system. The Secretariat is awaiting a final proposal to conduct this update, but it is envisioned that roughly €50,000 will be required for this task (based on the preliminary quote received from CLS (the service provider)).

Sub-committee on Ecosystems

- The Sub-committee on Ecosystems requires financial support to invite experts to the intersessional meetings in 2016 and 2017.

The estimated cost to implement the recommendations above is detailed in the Table below.

| <i>Proponent Working Group / Sub-committee</i> | <i>Description of project</i> | <i>Budget¹</i> | | <i>Priority²</i> | | <i>Source of funds³</i> |
|--|--|---------------------------|-------------------|-----------------------------|-------------|------------------------------------|
| | | <i>2016</i> | <i>2017</i> | <i>2016</i> | <i>2017</i> | |
| <i>Statistics and Secretariat</i> | | | | | | |
| SC- STATS | Update the ICCAT VMS system | 39,507.14 | | Low | | Commission |
| | Complete the code migration, for the numerous applications that interact with various databases of the ICCAT-DB system. Improve the existing applications and create additional databases. | 75,000.00 | | High | | Commission |
| <i>Subtotal Statistics and Secretariat</i> | | 114,507.14 | | | | |
| <i>Stock assessment and data preparatory meetings</i> | | | | | | |
| BILL | External peer reviewer | 10,000.00 | | High | | Commission |
| TROP | External peer reviewer | 10,000.00 | | High | | Commission |
| ALB | External expert | 10,000.00 | | High | | Commission |
| BFT | External expert | 16,000.00 | | High | | GBYP |
| SWO | External expert | | 10,000.00 | | High | Commission |
| <i>Subtotal assessments</i> | | 46,000.00 | 10,000.00 | | | |
| <i>Research in support of assessments</i> | | | | | | |
| SC-ECO | External expert | 10,000.00 | 10,000.00 | Medium | Medium | Commission |
| BILL | CPUE standardization workshop SAI | 40,000.00 | | High | | Commission |
| SWO | Stock structure work 2016/2017: genetics and pup satellite archival tags | 89,600.00 | 71,700.00 | Medium | Medium | Commission |
| BFT | Facilitation of workshops for building modelling capacity | 16,000.00 | | Medium | Medium | GBYP |
| | Facilitation of workshops for developing collaborative multinational indices of abundance | 8,000.00 | | High | High | GBYP |
| TROP | Complete the development of the T3+ software | 38,500.00 | | Medium | Medium | EU |
| SMT | SMTYP years 2 and 3: Recovery Task I and Task II data and to support biological sampling in the Atlantic: size and biological data | 82,500.00 | 142,500.00 | High | Medium | Commission |
| SHK | Shark Research and Data Collection Programme (SRDCP) Year 2 | 65,000.00 | | High | | Commission |
| | SRDCP continuation 2017: Historical catch recovery project, SMA age and growth workshop, observer and dockside training workshop. | | 150,000.00 | | Medium | Commission |
| <i>Subtotal research</i> | | 349,600.00 | 374,200.00 | | | |
| Totals | | 510,107.14 | 384,200.00 | | | |

¹ Two year budgets set to coincide with Commission budget cycle.

² Priorities reflect SCRS needs, not the Commission's. Activities that are deemed to be mostly important for other management components (e.g. compliance) are given low priority by the SCRS.

³ Source of funds other than Commission are only tentative and have not been confirmed.

18.2 Other recommendations

General

The SCRS recommends that all tag release data for all tags deployed on species under the ICCAT management within the ICCAT Convention area shall be mandatory reported to the ICCAT Secretariat for the inclusion in the ICCAT tag database.

Albacore

- The Committee recommends that further elaboration of the MSE framework be developed for albacore. Among other things, work should be promoted towards including a more complete range of uncertainties, including observation, process, model, and implementation errors. This would permit better characterization of uncertainty in current and future stock condition. Moreover, such a framework would help establish priorities between the main components of the Albacore Research Programme (biological parameters, fishery data, models). The MSE framework would also help the Albacore Species Group simplify the process of updating management advice (e.g., through the use of simpler models).
- The biological parameters used in the assessment should be reviewed. Accurate biological parameters are very important for stock assessment purposes and for the process of estimating limit reference points for albacore stocks. Albacore biological parameters are in many cases based on old studies and it is important to assess whether these parameters have changed over time or if current observations are consistent with estimates from old studies.
- The Committee recommended further studies on the effect of environmental variables on albacore distribution as well as on CPUE trends of surface and other fisheries. The joint analysis of different CPUE datasets from different fisheries is also recommended in order to reveal patterns over a larger spatial scale and thus more representative of the population (compared to local trends that might show conflict between areas).

Eastern and western Atlantic 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 Commission should also consider adding to the current recommendation, upon request from the SCRS, that harvesters should allow biological samples (at least otoliths and spines) to be taken at the time of harvesting. Effort should be increased to improve the temporal and spatial coverage for detailed size and catch-effort statistics of the different fisheries, especially in the Mediterranean.

North and South Atlantic swordfish

- Model validation. The Committee recommended that methods be developed to evaluate indices of stock abundance based on fisheries dependent data, e.g. by using simulation and cross validation based on detailed data such as logbooks and sales records.
- Impact of management on CPUE series. As fishery-dependent time series of CPUE are absolutely critical to all ICCAT assessments, it is essential to maintain their continuity and ensure they properly capture distribution changes of swordfish stocks. To this end, and to the extent possible, any management action that may affect catchability should either: a) be phased in over a series of years so that there is overlap, allowing the effect of the action to be estimated; or b) have the effect of the action assessed experimentally, e.g. experiments testing the effects of a new hook type. This will achieve two valuable purposes: a) maintaining the integrity of CPUE time series; and b) allow for the direct estimation of the efficacy of the management action.

Mediterranean swordfish

- Stock mixing and management boundaries. The Committee noted the need to intensify collaborative and multidisciplinary research taking into account fine-scale (e.g. 1° squares) and quarterly sampling strata, aiming at improving the current knowledge about stock boundaries between the Mediterranean and North Atlantic swordfish stocks.
- Gear selectivity. 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. The Committee recommended further studies to be conducted on the recently developed mesopelagic longlines fisheries, due to the impact these new fisheries may have in terms of catch composition, CPUE series, size distribution of the catches and consequently on the assessment of the stock status and provision of management advice.

Tropicals

- In view of the demonstrated potential use of cannery data as a valuable tool to cross-check ICCAT databases, the Committee recommends to continue the work initiated in 2015 of compilation and comparison of ISSF participating companies tropical tuna unloadings data against ICCAT databases.
- The Working Group recommends the SCRS to adopt minimum standards for the use of Electronic Monitoring Systems (EMS) (i.e. cameras, etc.) in reporting and analyzing more timely and reliable data from fishing activities onboard tuna surface fleets most especially purse seiners.

Billfishes

- Marlins and sailfish have been assessed to be overfished and possibly to continue to suffer overfishing. Unfortunately these assessments have substantial uncertainty that can only be reduced if scientists from all countries that have a stake in these stocks contribute to the research and assessment process. Of the CPCs that capture billfishes in the Atlantic, relatively few sent participants to the billfish scientific meetings. As a consequence, the Committee did not have the full advantage of the experience and insight of the experts that could have attended. The Commission needs to reaffirm its obligation and commitment (*Resolution by ICCAT on Best Available Science* [Res. 11-17]) to support the SCRS in this regard, to ensure the best possible scientific products.
- Although it is preferable to have scientists present at the Billfish Working Group meeting contributions can be made in the form of SCRS documents that other members of the Group can present at the meeting. Such papers are often critical to the productivity of the Group during the meeting. Therefore, the Committee again stresses the need that scientists prepare SCRS documents for the meeting.
- In order to maximize the number of CPC participants in the sailfish assessment, the Committee recommends that the assessment be paired with another intersessional meeting.

Sharks

- National scientists should start preparing all information relevant to the assessment of shortfin mako, including catch, CPUE, length composition, and biology, and trade data if available.
- The WGSAM should develop guidelines and criteria for evaluating the plausibility of model scenarios, including model diagnostics that could lead to accepting or rejecting model results.

Small Tunas

- CPCs should report frigate tuna catches (FRI) in the Mediterranean as bullet tunas (BLT) because the most recent published genetic studies indicate that only *Auxis rochei* exists in the Mediterranean.

- Assess the following high priority species: Atlantic bonito (*Sarda sarda*), bullet tuna (*Auxis rochei*), little tuna (*Euthynnus alleteratus*), the frigate tuna (*Auxis thazard*), the Wahoo (*Acanthocybium solandri*), king mackerel (*Scomberomorus cavalla*) and Serra Spanish mackerel (*Scomberomorus brasiliensis*). All these species have high social and economic importance for many CPCs, while three others were identified as the most vulnerable among small tunas and with higher risk of being impacted by fishing.
- Extend the species description chapter (*ICCAT Manual*) for wahoo (*Acanthocybium solandri*), serra Spanish mackerel (*Scomberomorus brasiliensis*), West African Spanish mackerel (*Scomberomorus tritor*) and dolphinfish (*Coryphaena hippurus*) and update of all other species which were last updated in 2006, except for *Thunnus atlanticus*, which was updated in 2013.

Working Group on Stock Assessment Methods (WGSAM)

- The Committee recommended that, to facilitate the adoption of LRP, HCR, and various management strategies by ICCAT, examples of the utility and benefits of these management approaches be presented to the Standing Working Group to Enhance Dialogue between Fisheries Scientists and Managers (SWGSM). This should facilitate the conversation with managers and help in the discussions on defining management objectives and other necessary elements required to advance this work by the SCRS.
- The WGSAM will analyze ways to facilitate the dialogue with the Commission about the concepts referred to in paragraph above (MSE, HCR, RP) to be considered for the SWGSM.
- The WGSAM plans to continue its work on the simulation study on how best to bring spatially changing oceanographic, environmental conditions and climate change into the assessment process. The study was designed during the 2015 meeting with some progress made to date and work to continue in 2016.

Sub-committee on Ecosystems

With regard to Ecosystems:

- The SCRS should lead a joint meeting of tRFMOs on the implementation of EBFM in 2016 with support from the Common Oceans ABNJ tuna Project.
- The Committee on Ecosystems has noted that over the last few years the number of ecosystem-related research activities have increased in several ICCAT Working Groups. The Committee recommends finding mechanisms to improve the communication among groups in order to share and transfer new knowledge and tools emerging in all the working groups.
- Given that the WGSAM is testing approaches for combining CPUE indices and how to best incorporate environmental drivers into the stock assessment process the Sub-committee recommends that they should test state space modelling method (SCRS/2015/122).

With regard to by-catch:

- CPCs, upon the request by Secretariat, will submit current and historic fishing effort south of 25°S to submit seabird by-catch and associated fisheries data using a revised observer form for the years 2010-2014 in time for the 2016 Sub-committee meeting.
- CPCs, upon the request by Secretariat, to fill and verify data gaps in sea turtle by-catch rates for their longline fleets to further advance the sea turtle impact assessment.

Sub-committee on Statistics

- The Committee reiterates the decision made by SCRS that the Chairs of all the SCRS species groups and the Sub-committee on Ecosystems must attend the meeting of the Sub-committee on Statistics.

- The Committee recommends that National Scientist review the results of the newly estimated EFFDIS to ensure accuracy.
- Recommendation for the Secretariat and USA scientists to work together to fully integrate the USA and ICCAT tagging databases.

19. Responses to Commission's requests

19.1 Evaluate the efficacy of the area/time closure referred to in paragraph 24 for the reduction of catches of juvenile bigeye and yellowfin, Rec. 14-01 paragraph 26

Recommendation 14-01 established an area/time closure in relation with the protection of juveniles.

24. Fishing for, or supported activities to fish for bigeye, yellowfin and skipjack tunas in association with objects that could affect fish aggregation, including FADs, shall be prohibited:
- a) From 1 January to 28 February each year, and
 - b) In the area delineated as follows:

| | |
|----------------|-----------------------------|
| Northern limit | African coast |
| Southern limit | Parallel 10° South latitude |
| Western limit | Meridian 5° West longitude |
| Eastern limit | Meridian 5° East longitude |

25. The prohibition referred to in paragraph 24 includes:

- launching any floating objects, with or without buoys;
- fishing around, under, or in association with artificial objects, including vessels;
- fishing around, under, or in association with natural objects;
- towing floating objects from inside to outside the area.

26. The efficacy of the area/time closure referred to in paragraph 24 for the reduction of catches of juvenile bigeye, yellowfin and skipjack tunas shall be evaluated by the SCRS in 2015.

The efficacy of the area-time closure (moratorium) agreed in Rec. 14-01 was evaluated by examining fine-scale (1°x1°) skipjack, yellowfin, and bigeye catch by month distributions from the European and associated purse seine fleet FAD fishery and the Ghanaian purse seine and baitboat fishery (**Figure 19.1.1**).

After reviewing this information, the Committee concluded that the moratorium has not been effective at reducing the mortality of juvenile bigeye tuna, and any reduction in yellowfin tuna mortality was minimal, largely due to the redistribution of effort into areas adjacent to the moratorium area. The details of this review are provided below.

The level of catch during the moratorium time-area is small, compared to the average levels produced by these fleets from 2006-2012 (**Figure 19.1.2**). While the moratorium was respected by the fleets examined, catches of the three tropical tuna species by these fleets increased by ~20% (27% for skipjack, 17% for bigeye and -5% for yellowfin) in the moratorium years compared to the average seven years prior. At the same time, tropical tuna purse seine fishing capacity (carrying capacity) and number of purse seine vessels increased by 40-50% (SKJ-Figure 9). A redistribution of effort feature is noticeable in **Figure 19.1.1**, where catches in 5°x5° areas at the boundaries of the moratorium zone increased in 2013-2014 compared to the years prior to the moratorium. These boundary effects are also commonly seen in the application of other time-area closures, and reduce expected benefits from the closures. It is noteworthy that higher proportions of bigeye in the catch are observed offshore compared to the coastal area and thus a closure that is further offshore, larger, and for a longer period would

likely provide a better potential for limiting catches of juvenile bigeye than the one established in Rec. 14-01. A more detailed evaluation of these potentials would be required if the Commission could establish the target level of reduction it wishes to attain by such a closure. However, as noted, the fleet has considerable flexibility to compensate for temporal/spatial closures.

The deployment of FADs in the fishery is high and increasing and should be monitored by the Ad Hoc Working Group on FADs. It is unclear that solely implementing seasonal closures over selected areas will provide sufficient control to reduce the catch of juvenile bigeye.

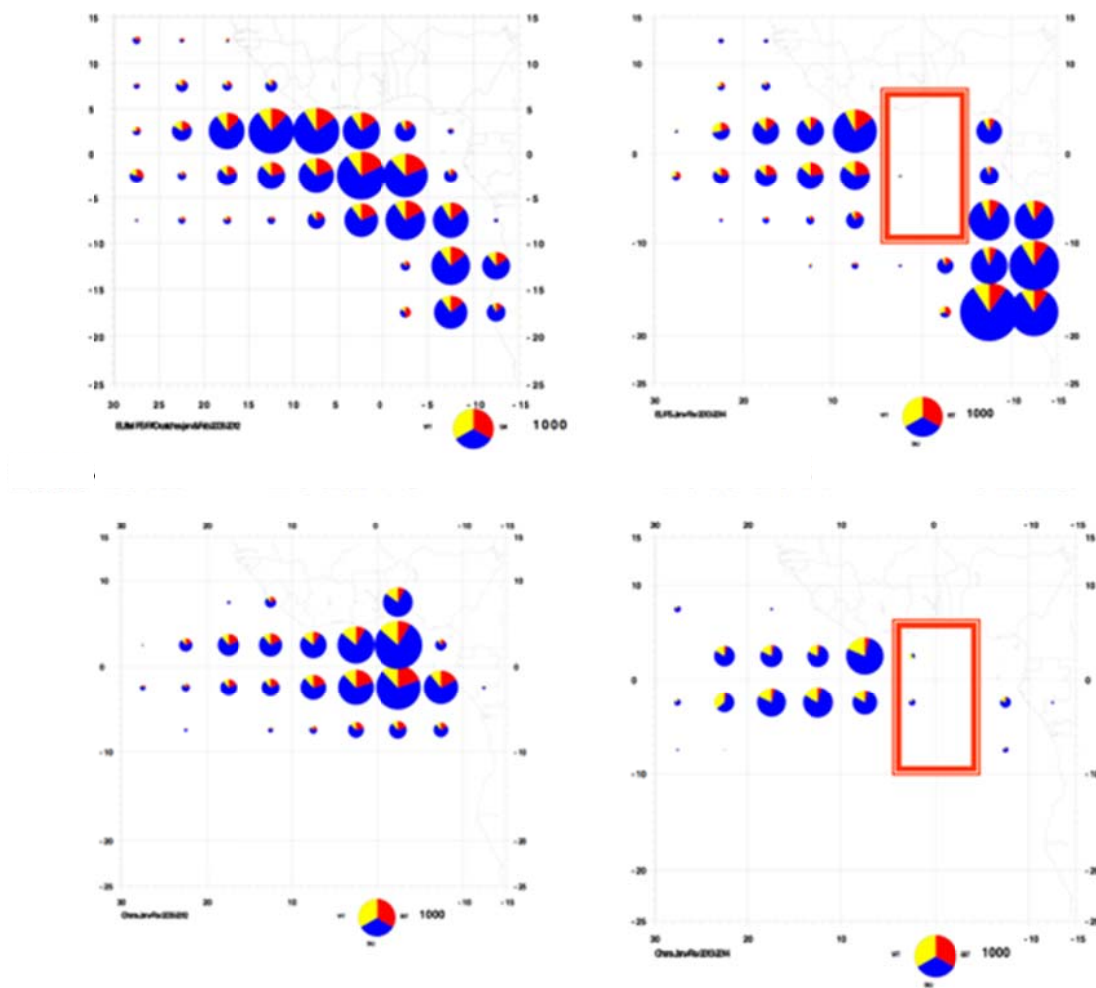


Figure 19.1.1. Spatial distribution of catches by species made by European and associated purse seine fleet fishing on FADs (upper row panels) and Ghanaian purse seine and baitboat fleets (lower row panels) during January and February for the seven years prior to the time-area closure in Rec. 14-01 (left hand column) and for the two years of the time-area closure (right hand column) for which data are available.

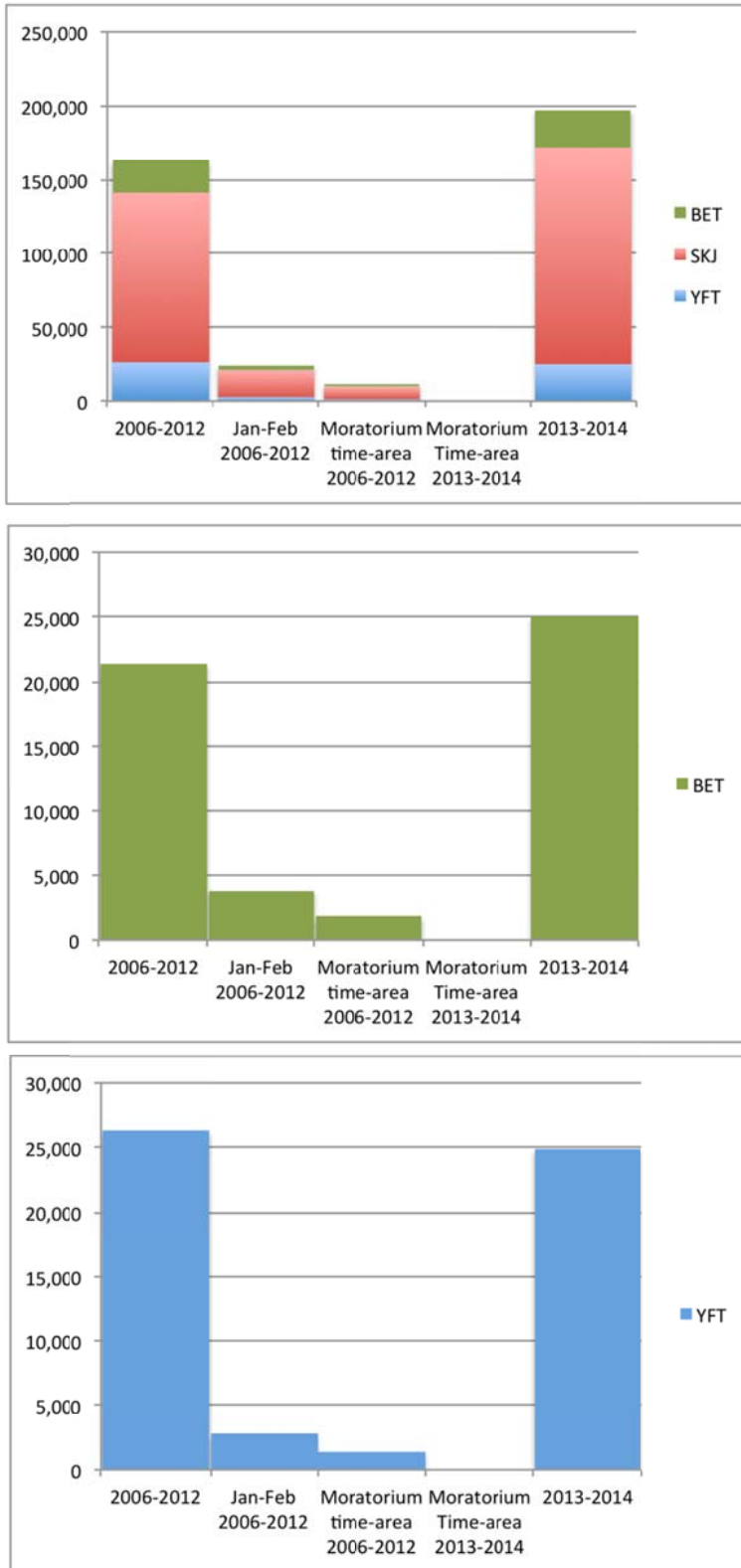


Figure 19.1.2. Average annual catches of yellowfin, bigeye and skipjack made in the times and areas indicated by the EU and associated purse seine FAD and Ghana purse seine and baitboat fisheries.

19.2 Evaluate the potential impact on the level of catches of the detailed capacity management plan submitted by Ghana, Rec. 14-01 paragraph 2

Rec. 14-01, which replaced Rec. 11-01, established a new bigeye capacity allocation plan for CPCs whose vessels (>20m LOA) participate in the yellowfin and bigeye fisheries, as noted below:

Capacity limitation for bigeye tuna

2. A capacity limitation shall be applied for the duration of the Multi-annual Program, in accordance with the following provisions:

- a) The capacity limitation shall apply to vessels 20 meters length overall (LOA) or greater fishing bigeye tuna in the Convention area.
- b) CPCs which have been allocated a catch limit in accordance with paragraph 13 shall each year:
 - i) Adjust their fishing effort so as to be commensurate with their available fishing possibilities;
 - ii) Be restricted to the number of their vessels notified to ICCAT in 2005 as fishing for bigeye tuna. However, the maximum number of longline and purse seine vessels shall each year be subject to the following limits:

| <i>CPC</i> | <i>Longliners</i> | <i>Purse seiners</i> |
|----------------|-------------------|----------------------|
| China | 45 | - |
| EU | 269 | 34 |
| Ghana | - | 13 |
| Japan | 245 | - |
| Panama | - | 3 |
| Philippines | 11 | - |
| Korea | 14 | - |
| Chinese Taipei | 75 | - |

- c) Ghana shall be allowed to change the number of its vessels by gear type within its capacity limits communicated to ICCAT in 2005, on the basis of two baitboats for one purse seine vessel. Such change must be approved by the Commission. To that end, Ghana shall notify a comprehensive and detailed capacity management plan to the Commission at least 90 days before the annual meeting. The approval is notably subject to assessment by the SCRS of the potential impact of such a plan on the level of catches.
- d) The capacity limitation shall not apply to CPCs whose annual catch of bigeye tuna in the Convention area in 1999, as provided to the SCRS in 2000, is less than 2,100 t.

The capacity allocation table in Rec. 14-01 reduced the number of purse seiners for Ghana from the currently authorized 17 to 13, a 24% reduction, when fully realized. As indicated above, Rec. 14-01 requests an assessment by the SCRS of the potential impact of the Ghanaian allocation on the level of bigeye catches. An assessment of this *potential* follows.

Assuming the fishing power and efficiency of the 4 purse seiners (or baitboat equivalents) removed from the Ghanaian fleet is equivalent to the vessels remaining, then the expected reduction in Ghanaian flag catch of bigeye would be the same as the capacity reduction (24%).

In practice, however, it seems more likely that the four purse seiners (or eight baitboats) would be less productive than the balance of the authorized vessels remaining, thus reducing the potential below the expectation. How far below is not readily estimable since this form of analysis would require specific vessel productivity information and specific knowledge of the vessels to be removed from the Ghanaian fleet; information not available to the Committee. This is common practice amongst other capacity (vessel) reduction schemes applied globally.

It is also noteworthy that reduction in the Ghanaian fleet capacity would not necessarily result in an expectation of reduction in overall catch of bigeye since the capacity limitations in Rec. 14-01 do not restrict capacity for all CPCs and the allocation does not account for increasing efficiency or fishing power in the fleets with capacity limits.

19.3 The SCRS shall update the Commission annually and prior to the Commission meeting, on any changes of the estimated bluefin catch rates per vessel and gear, Rec. 14-04 paragraph 43

Background: Rec. 14-04 paragraph 43 requests SCRS to update the Commission annually and prior to the Commission meeting, on any changes of the estimated bluefin catch rates per vessel and gear.

Due to time constraints the Committee was unable to address this question, although it noted that these catch rates have not been updated since 2010. Moreover, there were indications that this request was carried over inadvertently from a previous recommendation. Therefore, the Committee requests confirmation from the Commission that this work is still needed, in which case it could be addressed at the next data preparatory meeting and SCRS species group.

19.4 Continue to explore operationally viable technologies and methodologies for determining the size and biomass at the points of capture and caging and report to the Commission, Rec. 14-04 paragraph 82

Background: Rec. 14-04 paragraph 82 requests CPCs to take the necessary measures and actions to better estimate both the number and weight of bluefin tuna at the point of capture and caging and report the results to the SCRS.

The Commission requests the SCRS to continue to explore operationally viable technologies and methodologies for determining the size and biomass at the points of capture and caging and report to the Commission at the annual meetings.

Since 2014, CPCs with bluefin tuna farms have been submitting size and weight measures of bluefin tuna at caging operation using stereo camera video systems. In 2015, as of 15 September, 78 caging reports were received, from 10 farms and 6 CPC flags, with over 21,000 thousand size/weight measurements provided. In addition, all involved CPCs provided reports of technical details of the camera systems used in the farms.

A number of studies related to the use of the stereoscopic camera were presented. Document SCRS/2015/166 provides a detailed account of the procedures applied in Malta for the deployment of the stereoscopic camera systems during caging operations. This document gave a detailed description of the steps taken during and after the footage is taken and the methodology applied to count the number of fish caged. The paper also described the procedure for the random selection of the 20% sample of fish to be measured in order to determine size distribution and the total biomass of fish caged, in line with ICCAT Recommendation 14-04. Document SCRS/2015/195 reported on growth of bluefin tuna in size at farms by measuring changes in straight fork length of fish caged for 4 to 5 months. A stereo camera system was deployed in 3 cages just before harvesting was started and the footage was used to measure the straight fork lengths of fish from the two size groups of fish normally found in cages in Malta. The overall increase in straight fork length in the period from caging to pre-harvest in small fish was found to be 19.6% on average and that of bigger fish was found to be 6.7% on average. This represents an average RWT increase of 85.5% and 36.4% for the small and big fish respectively over the 4 to 5 month farming period.

Paper SCRS/2015/200 reported on research carried out in eight cages of four Croatian farms studying the reliability of the stereoscopic camera measurements obtained from footage of bluefin tuna just prior to harvesting of fish caged between 18 and 32 months before. Comparing stereoscopic camera straight fork length measurements with actual caliper measurements made during the harvest of the fish showed that the average difference between measurements was less than 1%. When converted to RWT, the difference between stereoscopic camera predicted RWT and actual harvest RWT was also small, less than 4%.

In summary, stereoscopic cameras have been demonstrated as viable technologies. As stated in Rec. 14-04, CPCs should use the same L/W relationship to convert size estimates into weights, i.e. the adopted SCRS relationships (on the ICCAT website).

19.5 Evaluate the results of the 100% coverage programme using stereoscopic cameras systems or alternative techniques that provide the equivalent precision to refine the number and weight of the fish during all caging operations. Rec. 14-04 paragraph 83

Background: Rec. 14-04 paragraph 83 requests all farming CPCs to submit annually to the SCRS, by 15 September, the results of this programme which uses stereoscopic cameras systems or alternative techniques.

The SCRS should evaluate such procedures and results and report to the Commission by the annual meeting in accordance with Annex 9 of the Rec. 14-04.

Two documents were presented to the SCRS demonstrating the reliability and accuracy of the stereoscopic camera systems to determine the size (straight fork length SFL) of bluefin tuna at caging and prior to harvest in farms. The results indicated accuracy on size measures close to 99% when compared to actual fish measurements. The estimates of weight were close to 96% compared with actual weights. In 2014 and 2015, over 38,000 stereoscopic camera size (FL) measurements were provided from caging operations providing new size frequency data for use in stock assessments.

The SCRS continues to analyse the SFL data from stereoscopic camera footage obtained during caging operations and the SFL and RWT data coming from harvesting operations in order to study the average growth by size category of the fish during the farming period. Information from two documents presented to the SCRS confirm that growth can be significant during the farming period but showed that there are significant differences in growth rates between and within farms likely depending on various factors, including environmental factors (such as temperature), farm management and company strategy.

The Committee continues to see considerable value in the use of stereocamera technology to estimate fish size. It was noted that CPCs are using different methodologies and a standardized universal protocol remains to be determined.

19.6 Evaluate the bluefin tuna national observer programmes conducted by CPCs to report to the Commission and to provide advice on future improvements, Rec. 14-04 paragraph 88

Background: Rec. 14-04 paragraph 88 states each CPC shall ensure coverage by observers, issued with an official identification document, on vessels and traps active in the bluefin tuna fisheries. Data and information collected under each CPCs observer programme shall be provided to the SCRS and the Commission, as appropriate, in accordance with requirements and procedures to be developed by the Commission by 2009 taking into account CPC confidentiality requirements.

For the scientific aspects of the programme, the SCRS shall report on the coverage level achieved by each CPC and provide a summary of the data collected and any relevant findings associated with that data. The SCRS shall also provide any recommendations to improve the effectiveness of CPC observer programmes.

In accordance with Recs. 12-03 and 13-07, data collected under the national bluefin tuna observer programmes has been submitted to the Secretariat. A form presented to the Sub-committee on Ecosystems in 2014 has been adopted for observer data submission. This form could be used for CPCs with observer programmes for bluefin tuna, possibly with modifications to deal with confidentiality issues.

19.7 Evaluation of data deficiencies pursuant to Rec. 05-09

The Commission expressed in Rec. 05-09 for the SCRS to evaluate:

“the effect of the data deficiency(ies) on the Commission’s ability to determine the status of the stock(s) and on the effectiveness of the ICCAT conservation and management measures”.

Data deficiencies are present for many of the basic information used to support ICCAT assessments, however, there are clear differences between stocks on how these deficiencies affect the ability of the SCRS to conduct assessments of stock status and to provide management advice. In general, data deficiencies are more common for by-catch species than for target stocks. For example, one of the major uncertainties for billfish and shark assessments are related to the incomplete reporting of catch. In the past, many CPCs provided data to ICCAT that did not separate by species the catches of sharks and billfish. Although this practice is now relatively rare, it has undermined the usefulness for stock assessments of historical reported catches of many by-catch species.

Data deficiencies are also common for small tunas and species of sharks that are now clearly targeted by some fishing fleets.

More specifically, a recent review of Task I billfish data, suggests the potential existence of catches from Caribbean countries that are not reported. Many of such catches are the result of the development of moored FAD fisheries in several Caribbean countries over the last two decades. In addition, several CPCs that previously reported billfish catches have not reported catches in the last three years and the SCRS does not have information to determine if such lack of reporting is related to declines in effort or to lack of reporting.

For assessments of sea birds and sea turtles, the SCRS relies almost exclusively on data obtained by on-board scientific observers, because few fleets record these species in their logbooks. Unfortunately few CPCs submit such observer data with details regarding the time, area and gear used in the fishing operation in a way that can be used to calculate catch per unit of effort for these species. Given that most fleets of artisanal gillnet and longline fleets do not have on board observers, there are very few reports of sea turtle catches for these fleets. These data deficiencies strongly hamper the work of the Sub-committee on Ecosystems in evaluating the impact of fishing upon sea turtles and sea birds.

The SCRS is now working on evaluating data poor assessment methods using management strategy evaluation (MSE). This will allow the performance of stock assessment models that uses alternative data sources to be evaluated. These tools can be used to answer the question of how much a particular data set contributes to the assessment of stock status and to achieving management objectives, thus providing a quantitative evaluation of the impacts of data deficiencies.

19.8 Continue assessing the ecological importance of the Sargasso Sea to tuna and tuna-like species and ecologically associated species, Rec. 12-12 paragraph 1

An assessment of the ecological importance of the Sargasso Sea to tuna and tuna-like species and ecologically associated species has resulted in a significant increase in information and understanding of this ecosystem and includes the following:

1. Of the many fish species known to occur in the Sargasso Sea, information on the biology and ecology of 18 pelagic ICCAT species has been presented to date. This includes the principal ICCAT target species, billfishes, smaller tuna species and pelagic sharks. This analysis focused on their habitat use and migration patterns.
2. Six of these ICCAT species are known to reproduce in the Sargasso Sea and a further eight species are presumed to reproduce there based on suitable oceanographic conditions.
3. All of the above species use the area for feeding and a preliminary food web has been proposed incorporating most of the species above.
4. All of the above species use the Sargasso Sea for one or more of their life history phases.
5. A multi-species spawning area of three ICCAT-managed species has been identified in the southern Sargasso Sea and spawning seasonality has been defined.
6. The catches of targeted ICCAT species in the Sargasso Sea were analyzed from 1992-2011. The analysis indicated that the Sargasso Sea was not a significant fishing area for any of the six principal target species as the 20 year average annual catch levels were under 3% of the respective species stock totals.
7. The Sargasso Sea is an important and unique ecosystem for ICCAT species. At the same time, it was acknowledged that there are other ecosystems in the Atlantic Ocean that are also important and unique for ICCAT species.
8. Significant advances were made in the past few years to increase the understanding of the importance of the Sargasso Sea for ICCAT species and it was recommended continuing collecting and reviewing information from the Sargasso Sea.

The full analysis and assessment is presented in document SCRS/2015/201 (an assessment of the ecological importance of the Sargasso Sea to tuna and tuna-like species and ecologically associated species).

20. Other matters

20.1 Collaboration with other International Organizations (ICES, CITES, GEF, etc.)

CITES

In 2015 ICCAT and CITES have agreed to collaborate in order to conduct two training courses for government staff (CITES Scientific Authorities and fisheries agencies) and other relevant stakeholders in the West Africa region (one in English and one in French). There are several countries in this region that were identified as priority countries for assistance under the EU-CITES project with regard to implementing the new CITES listings for sharks and rays. These workshops were originally planned to be conducted in 2015, but due to delays in the approval of the budget at CITES, they have been delayed until early 2016. Training will include issues such as species identification, including the provision of ID cards, biological and fisheries sampling techniques, data reporting requirements and implementation of CITES shark listings in Appendix II. In addition, a budget has been made available by CITES for the collection of catch and biological data. The data will significantly increase the member states capacity to make NDFs as this is not currently possible with the information available. It will also improve the data available to ICCAT for the assessment and management of shark stocks in the region through analysis of the data by the ICCAT shark species group.

ICES

Considering the fruitful experience ICCAT and ICES have had in recent years with regard to scientific collaboration, there is the willingness of both organisations to strengthen this cooperation and explore new initiatives and discussions have commenced between the Secretariats. It has been agreed therefore that it is appropriate and desirable to improve collaboration between ICCAT SCRS-ICES particularly in the areas of by-catch and sharks issues, through our sub-committee on ecosystems and by-catch and the shark species group. Specifically it would be convenient to keep the participation of ICES scientific experts in ICCAT shark stock assessments and vice versa. In addition, discussions have taken place with ICES in 2015 regarding the continuation of the development of stock assessment methods, following on from the highly successful Strategic Initiative on Stock Assessment Methods (SISAM), by potentially holding joint intra-regional stock assessment methods Working Groups from 2016 onwards. Lastly, it was proposed that following the joint ICCAT/ICES training courses that have been held in the past, ICCAT could continue to work with ICES on areas of capacity building.

GEF – Common Oceans ABNJ Tuna Project

In 2015, requested funding for the extension, technical support and dissemination activities relating to the electronic Bluefin Catch Document scheme did not receive ABNJ Tuna Project support. Despite this, ICCAT is willing to cooperate through the sharing of the final system for adaptation and extension to other oceans/species once completed. Continued participation in the GEF programme will need to be determined by the Commission. The Secretariat has identified with the ABNJ project coordinator certain areas for possible future cooperation.

The main activities with ICCAT involvement foreseen are:

- The organisation of the tRFMO-MSE Working Group and follow up activities
- Implementation of the Ecosystem Approach to Fisheries

A report on the status of the Common Oceans/ABNJ Tuna Project was presented by the representative of FAO that is the Coordinating Agency for the Project. The Project is financed by the Global Environmental Facility, and represents a partnership of 19 entities, including all tuna RFMOs and IGOs, NGOs, and private sector organisations. The Project is conducting a large number of activities strengthening management, addressing the issue of IUU fishing and aimed at reducing ecosystem impacts of fishing activities. Several SCRS global initiatives will be conducted by ICCAT within the Project context, and, it was noted that additional activities listed under the SCRS workplan might be eligible for support by the Project.

The SCRS also acknowledges the opportunities presented by the Project and encouraged the Chair of the SCRS and the Secretariat to work closely to maximise the benefits for ICCAT Contracting Parties.

OSPAR

The Secretariats of OSPAR and ICCAT have discussed and developed guidelines for potential cooperation and collaboration, in line with the guidelines already agreed between ICCAT and CITES.

20.2 Consideration of implications of the Third Meeting of the Working Group on Convention Amendment and the ICCAT Performance Review Virtual Working Group

Convention Amendment

Given that the Working Group on Convention Amendment will meet in November to finalise the modifications to the Convention text, the full implications for SCRS work are not yet evident. However, the Working Group agreed that Article IV should include a general description of the species under the mandate of the Convention, rather than a specific taxonomic reference or list of species that may change over time. At the same time, the Working Group agreed that a list of specific species understood to fall under the terms “tuna and tuna-like species” and “elasmobranchs that are oceanic, pelagic, and highly migratory” should be elaborated in an instrument separate from the Convention. This would allow the list to be adjusted in light of any future taxonomic changes. The Working Group requested that the SCRS review the draft Recommendation containing the list of species (**Annex 1**), before its presentation to the Commission.

The draft texts with the most implications for the SCRS which are currently under consideration would read as follows: [NOTE: these draft texts are still under consideration by the Commission, and those options in square brackets are open for discussion].

Article IV

In order to carry out the objectives of this Convention the Commission shall be responsible for the study of the populations of tuna and tuna-like fishes, elasmobranchs that are oceanic, pelagic and highly migratory (hereinafter ICCAT species)]; and such other species caught in fishing for ICCAT species in the Convention area, taking into account the work of other relevant international fishery-related organizations and arrangements. Such study shall include research on those species; the oceanography of their environment; and the effects of natural and human factors upon their abundance. The Commission may also study species belonging to the same ecosystem or dependent on or associated with the ICCAT species. The Commission, in carrying out these responsibilities shall, insofar as feasible, utilise the technical and scientific services of, and information from, official agencies of the Contracting Parties and their political sub-divisions and may, when desirable, utilise the available services and information of any [public or private] institution, organization or individual, and may undertake within the limits of its budget with the cooperation of concerned Contracting Parties, independent research to supplement the research work being done by governments, national institutions or other international organizations. [The Commission shall ensure that any information received from such institution, organisation or individual is consistent with established scientific standards regarding quality and objectivity.]

Article VIII

1. (a) *The Commission may, on the basis of scientific evidence, make recommendations designed to:*

- (i) *ensure in the Convention area the long-term conservation and sustainable use of ICCAT species by [maintaining or restoring the abundance of stocks of those species at or above levels capable of producing] maximum sustainable yield; and*
- (ii) *promote, where necessary, the conservation of other species that are dependent on or associated with ICCAT species, with a view to maintaining or restoring populations of such species above levels at which their reproduction may become seriously threatened.*

The full report of the Third meeting of the Working Group on Convention Amendment is available on: https://www.iccat.int/intermeetings/Convention/2015/ENG/2015_CONV_final_report_ENG.pdf

The new text in the annex has a small change in the general description of the term “tuna and tuna-like species” as compared to the text proposed by the SCRS to the Commission last year.

The term “tuna and tuna-like species” shall be understood to include the species of the family Scombridae, with the exception of the genus *Scomber*, and the sub-order Xiphioidei as follows:”

The SCRS reviewed and accepted this description and the subsequent list of species, and will provide, prior to the Commission meeting in 2015, the requested common names in the three official ICCAT languages.

Performance review

At its 19th Special Meeting in 2014, the Commission agreed that a second Performance Review of ICCAT should be carried out. During 2015, a virtual Working Group has drafted Terms of Reference for this work, which includes assessing the functioning of the Commission and of its subsidiary bodies, in particular the Compliance Committee and the SCRS. These ToRs will be subject to review by the Commission in November. It is envisaged that at least one of the reviewers should be a fisheries scientist, and that work will start in early 2016. The Reviewers will be selected from a list of nominees, and the SCRS Chair will be on the selection committee. During this process, the review panel may request some information from the SCRS Working Group rapporteurs and from the SCRS Chair in order to be able to carry out the review.

The report of the virtual Working Group on Performance Review is available as: https://www.iccat.int/intermeetings/Performance_Rev/ENG/PER_013_ENG.pdf

The SCRS reviewed these terms of reference and suggests the following change:

| <i>Area</i> | <i>General Criteria</i> | <i>Detailed Criteria</i> | <i>Changes compared to 2007 criteria</i> |
|-------------|--|--|--|
| 5 | Quality and provision of scientific advice | Extent to which SCRS produces the best scientific advice relevant to the fish stocks under its purview, as well as to the effects of fishing on the marine environment | Copied from previous "conservation and management" with specific reference to the SCRS |

Also, in anticipation of the possibility that as part of this review the SCRS will be asked if it has implemented a "total quality management process" to ensure "best available science", the SCRS will develop a draft set of modifications of its strategic research plan for consideration at the SCRS annual meeting of 2016.

Annex 1 to Item 20.2

1. Upon the entry into force of the amendments to the Convention as developed by the Working Group on Convention Amendment, the term “tuna and tuna-like species” shall be understood to include the species of the family Scombridae, with the exception of the genus *Scomber*, and the sub-order Xiphiodei as follows:

Scombridae

Acanthocybium solandri (Cuvier 1832) – Wahoo
Auxis rochei rochei (Risso 1810) – Bullet tuna
Auxis thazard thazard (Lacepède 1800) – Frigate tuna
Euthynnus alletteratus (Rafinesque 1810) – Little tunny
Katsuwonus pelamis (Linnaeus 1858) – Skipjack tuna
Orcynopsis unicolor (Geoffrey St. Hilaire 1817) – Plain bonito
Sarda sarda (Bloch 1793) – Atlantic bonito
Scomberomorus maculatus (Mitchill 1815) – Spanish mackerel
Scomberomorus regalis (Bloch 1793) – Cero
Scomberomorus tritor (Cuvier in Cuvier & Valenciennes 1832) – West African Spanish Mackerel
Gasterochisma melampus (Richardson 1845) – Butterfly kingfish
Allothunnus fallai (Serventy 1948) – Slender tuna
Thunnus alalunga (Bonnaterre 1788) – Albacore
Thunnus albacares (Bonnaterre 1788) – Yellowfin tuna
Thunnus atlanticus (Lesson 1831) – Blackfin tuna
Thunnus obesus (Lowe 1839) – Bigeye tuna
Thunnus thynnus (Linnaeus 1758) – Atlantic bluefin tuna
Thunnus maccoyii (Castelnau 1872) – Southern bluefin tuna

Istiophoridae

Istiompax indica (Cuvier 1832) – Black marlin
Istiophorus platypterus (Shaw 1792) – Sailfish
Kajikia albida (Poey 1860) – White marlin (currently known as *Tetrapturus albidus* in FAO and other CPCs species list that use FAO species names as reference)
Makaira nigricans (Lacepède 1802) – Blue marlin
Tetrapturus belone (Rafinesque 1810) – Mediterranean spearfish
Tetrapturus georgii (Lowe 1841) – Roundscale spearfish
Tetrapturus pfluegeri (Robins & de Sylva 1963) – Longbill spearfish

Xiphiidae

Xiphias gladius (Linnaeus 1758) – Swordfish

2. Upon the entry into force of the amendments to the Convention as developed by the Working Group on Convention Amendment, the term “elasmobranchs that are oceanic, pelagic, and highly migratory” shall be understood to include the species as follows:

| <i>Order</i> | <i>Family</i> | <i>Genus</i> | <i>Species</i> | <i>Species authorship</i> |
|----------------------------|-----------------------------|------------------------------|-------------------------------|---------------------------|
| [...] Orectolobiformes | [...] Rhincodontidae | <i>Rhincodon</i> | <i>typus</i> | Smith 1828 |
| [...] Lamniformes | [...] Pseudocarchariidae | <i>Pseudocarcharias</i> | <i>kamoharai</i> | Matsubara 1936 |
| [...] Lamniformes | [...] Lamnidae | <i>Carcharodon</i> | <i>carcharias</i> | Linnaeus 1758 |
| [...] Lamniformes | [...] Lamnidae | [...] <i>Isurus</i> | [...] <i>oxyrinchus</i> | Rafinesque 1810 |
| [...] Lamniformes | [...] Lamnidae | <i>Isurus</i> | <i>paucus</i> | Guitart Manday 1966 |
| [...] Lamniformes | [...] Lamnidae | <i>Lamna</i> | <i>nasus</i> | Bonnaterre 1788 |
| [...] Lamniformes | [...] Cetorhinidae | <i>Cetorhinus</i> | <i>maximus</i> | Gunnerus 1765 |
| [...] Lamniformes | [...] Alopiidae | [...] <i>Alopias</i> | [...] <i>superciliosus</i> | Lowe 1841 |
| [...] Lamniformes | [...] Alopiidae | [...] <i>Alopias</i> | [...] <i>vulpinus</i> | Bonnaterre 1788 |
| [...] Carcharhiniformes | [...] Carcharhinidae | [...] <i>Carcharhinus</i> | [...] <i>falciformis</i> | Müller & Henle 1839 |
| [...] Carcharhiniformes | [...] Carcharhinidae | [...] <i>Carcharhinus</i> | [...] <i>galapagensis</i> | Snodgrass & Heller 1905 |
| [...] Carcharhiniformes | [...] Carcharhinidae | [...] <i>Carcharhinus</i> | [...] <i>longimanus</i> | Poey 1861 |
| [...] Carcharhiniformes | [...] Carcharhinidae | [...] <i>Prionace</i> | [...] <i>glauca</i> | Linnaeus 1758 |
| [...] Carcharhiniformes | [...] Sphyrnidae | [...] <i>Sphyrna</i> | [...] <i>lewini</i> | Griffith & Smith 1834 |
| [...] Carcharhiniformes | [...] Sphyrnidae | [...] <i>Sphyrna</i> | [...] <i>mokarran</i> | Rüppell 1837 |
| [...] Carcharhiniformes | [...] Sphyrnidae | [...] <i>Sphyrna</i> | [...] <i>zygaena</i> | Linnaeus 1758 |
| [...] Myliobatiformes | [...] Dasyatidae | <i>Pteroplatytrygon</i> | <i>violacea</i> | Bonaparte 1832 |
| [...] Myliobatiformes | [...] Mobulidae | [...] <i>Manta</i> | [...] <i>alfredi</i> | Kreff 1868 |
| [...] Myliobatiformes | [...] Mobulidae | [...] <i>Manta</i> | [...] <i>birostris</i> | Walbaum 1792 |
| [...] Myliobatiformes | [...] Mobulidae | [...] <i>Mobula</i> | [...] <i>hypostoma</i> | Bancroft 1831 |
| [...] Myliobatiformes | [...] Mobulidae | [...] <i>Mobula</i> | [...] <i>japanica</i> | Müller & Henle 1841 |
| [...] Myliobatiformes | [...] Mobulidae | [...] <i>Mobula</i> | [...] <i>mobular</i> | Bonnaterre 1788 |
| [...] Myliobatiformes | [...] Mobulidae | [...] <i>Mobula</i> | [...] <i>rochebrunei</i> | Vaillant 1879 |
| [...] Myliobatiformes | [...] Mobulidae | [...] <i>Mobula</i> | [...] <i>tarapacana</i> | Philippi 1892 |
| [...] Myliobatiformes | [...] Mobulidae | [...] <i>Mobula</i> | [...] <i>thurstoni</i> | Lloyd 1908 |

21. Adoption of Report and closure

The Chair thanked the SCRS for its hard work this year.

Dr Die thanked the Secretariat staff for all their excellent work and appreciated its professional attitude and then expressed his appreciation for the interpreters.

The Executive Secretary closed the meeting showing his appreciation to Dr Die for the work done during his first plenary meeting as SCRS Chair. Mr. Meski also thanked Dr Die for the trust he placed in the Secretariat and thanked the Secretariat staff for their efforts in supporting the SCRS work before and during the meeting. Mr. Meski thanked the interpreters for their hard work this week and wished everyone a safe journey home.

The Report of the 2015 SCRS meeting was adopted and the 2015 Meeting of the SCRS was adjourned.

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, BUM-Blue marlin, WHM-White marlin, SAI-Sailfish, SWO-Atl. Swordfish, SWO-Med. Swordfish, SMT-Small Tunas, SHK-Sharks
9. Report of inter-sessional SCRS meetings
 - 9.1 Meeting of the ICCAT Working Group on Stock Assessment Methods
 - 9.2 Bluefin data preparatory meeting
 - 9.3 Blue shark data preparatory and assessment meetings
 - 9.4 Bigeye data preparatory and assessment meetings
 - 9.5 Small tunas species group intersessional meeting
10. Report of Special Research Programs
 - 10.1 Atlantic Wide Research Programme for Bluefin Tuna (GBYP)
 - 10.2 Enhanced Billfish Research Program (EBRP)
 - 10.3 Small Tunas Year Programme (SMTYP)
 - 10.4 Shark Research and Data Collection Programme (SRDCP)
 - 10.5 Atlantic Ocean Tropical Tuna Tagging Programme (AOTTP)
11. Report of the Sub-Committee on Statistics
12. Report of the Sub-Committee on Ecosystems
13. Report of the Ad Hoc Working Group on FADs
14. Report of the Standing Working Group of Fisheries Managers and Scientists in Support of the W-BFT Stock Assessment
15. Report of the Standing Working Group to Enhance Dialogue between Fisheries Scientists and Managers
16. Report on the implementation of the Science Strategic Plan for 2015-2020 in 2015 and work plan for 2016 which includes the definition of an ICCAT training plan as well as the update of the stock assessment software catalogue
17. Consideration of plans for future activities
 - 17.1 Annual Work Plans
 - 17.2 Intersessional meetings proposed for 2016
 - 17.3 Date and place of the next meeting of the SCRS
18. General recommendations to the Commission
 - 18.1 General recommendations to the Commission that have financial implications
 - 18.2 Other recommendations

19. Responses to Commission's requests

- 19.1 Evaluate the efficacy of the area/time closure referred to in paragraph 24 for the reduction of catches of juvenile bigeye and yellowfin, Rec. 14-01 paragraph 26
- 19.2 Evaluate the potential impact on the level of catches of the detailed capacity management plan submitted by Ghana, Rec. 14-01 paragraph 2
- 19.3 The SCRS shall update the Commission annually and prior to the Commission meeting, on any changes of the estimated bluefin catch rates per vessel and gear, Rec. 14-04 paragraph 43
- 19.4 Continue to explore operationally viable technologies and methodologies for determining the size and biomass at the points of capture and caging and report to the Commission, Rec. 14-04 paragraph 82
- 19.5 Evaluate the results of the 100% coverage programme using stereoscopic cameras systems or alternative techniques that provide the equivalent precision to refine the number and weight of the fish during all caging operations, Rec. 14-04 paragraph 83
- 19.6 Evaluate the BFT national observer programmes conducted by CPCs to report the Commission and to provide advice on future improvements, Rec. 14-04 paragraph 88
- 19.7 Evaluation of data deficiencies pursuant to Rec. 05-09
- 19.8 Continue assessing the ecological importance of the Sargasso Sea to tuna and tuna-like species and ecologically associated species, Rec. 12-12 paragraph 1

20. Other matters

- 20.1 Collaboration with other International Organizations (ICES, CITES, GEF, etc.)
- 20.2 Consideration of implications of the Third Meeting of the Working Group on Convention Amendment and the ICCAT Performance Review Virtual Working Group

21. Adoption of report and closure

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LIST OF 2015 SCRS DOCUMENTS

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| SCRS/2015/167 | An illustrative example of a management procedure for eastern North Atlantic bluefin tuna | Rademeyer R.A. and Butterworth D.S. |
| SCRS/2015/168 | Projections, Kobe Plots and Maximum Sustainable Yields for Atlantic bigeye tuna in 2015 | Schirripa M.J. |
| SCRS/2015/169 | Updated standardised bluefin tuna CPUE index of the Bay of Biscay baitboat fishery (1952-2014) | Santiago J., Arrizabalaga H., Ortiz. M. and Goñi N. |
| SCRS/2015/170 | Atlantic bluefin tuna electronic tagging data summary | Lauretta M., Hanke A. and Di Natale A. |
| SCRS/2015/171 | An index of abundance of bluefin tuna in the northwest Atlantic Ocean from combined Canada-U.S. pelagic longline data | Lauretta M. and Hanke A. |
| SCRS/2015/172 | Discussion on the area stratification in the North Atlantic for bluefin tuna mixing model | Kimoto A., Takeuchi Y. and Itoh T. |
| SCRS/2015/173 | Comparison of age estimates from paired calcified structures from Atlantic bluefin tuna | Rodriguez-Marin E., Quelle P., Ruiz M., Busawon D. and Golet W. |

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| SCRS/2015/174 | Preliminary reproductive pattern of swordfish (<i>Xiphias gladius</i>) caught by the Moroccan artisanal longline fishery in Strait of Gibraltar | Abid N., Laglaoui A., Arakrak A. and Bakkali M. |
| SCRS/2015/175 | Comparison between the size frequency data of bluefin tuna (<i>Thunnus thynnus</i>) estimated from the stereoscopic camera and that obtained from the biological scraps sampling for 2014 | Abid N., Benchoucha S., El Arraf S. and El Fanichi C. |
| SCRS/2015/176 | Etude de l'exploitation et de la biologie de l'espadon de l'Atlantique Marocain | Ahmed Baibbat A., Abid N. and Malouli M. |
| SCRS/2015/177 | Atlantic bluefin tuna data base for age and stock identification | Rodriguez-Marin E.R. and Hanke, A. |
| SCRS/2015/178 | A preliminary western bluefin tuna index of abundance based on Canadian and USA rod and reel fisheries data | Hanke A., Lauretta M. and Andrushchenko I. |
| SCRS/2015/179 | Structure and estimation framework for Atlantic bluefin tuna operating models | Carruthers T., Kimoto A., Powers J., Kell L., Butterworth D., Lauretta M. and Kitakado T. |
| SCRS/2015/180 | A summary of data to inform operating models in management strategy evaluation of Atlantic bluefin tuna | Carruthers T., Powers J., Lauretta M., Di Natale A. and Kell L. |
| SCRS/2015/181 | Electronic tagging of adult bluefin tunas (<i>Thunnus thynnus</i>) in the eastern Mediterranean and Sardinian Sea: improving accuracy of tuna size estimates. | Mariani A., Dell'Aquila M., Valastro M., and Scardi M. |
| SCRS/2015/182 | Length/weight relationship for bluefin tuna caught by longliners in central Mediterranean Sea | Lombardo F., Baiata P. and Pignalosa P. |
| SCRS/2015/183 | Indicateurs sur la pêche thonière en Algérie | Kouadri Krim A. and Ferhani K. |
| SCRS/2015/184 | Estimated sailfish catch-per-unit-effort for the U.S. recreational billfish tournaments (1973-2014) | Hoolihan J.P. and Brown C. |
| SCRS/2015/185 | Sailfish (<i>Istiophorus platypterus</i>) catch rates from observer data from the U.S. pelagic longline fishery in the northwest Atlantic and Gulf of Mexico 1986-2014 | Hoolihan J.P. and Walter J.F. |
| SCRS/2015/186 | Age-length relationship of larval skipjack tuna (<i>Katsuwonus Pelamis</i>) in the Gulf of Mexico | Zygas A., Malca E., Gerard T. and Lamkin J. |

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| SCRS/2015/187 | The influence of hydrodynamics on the vertical distribution of tuna larvae in the Gulf of Mexico | Rasmuson L.K., Lamkin J.T., Gerard T., Malca E., Provoznik S. and Richards W.J. |
| SCRS/2015/188 | Update of standardized catch rates of large bluefin tuna (<i>Thunnus thynnus</i>) from the U.S. pelagic longline fishery in the Gulf of Mexico 1987-2014 | Walter J.F. |
| SCRS/2015/189 | Update of standardized catch rates of bluefin tuna (<i>Thunnus thynnus</i>) from the rod and reel/handline fishery off the northeast United States during 1993-2014 | Lauretta M.V. and Brown C.A. |
| SCRS/2015/190 | On making statistical inferences regarding the relationship between spawners and recruits and the irresolute case of western Atlantic bluefin tuna | Porch C.E. and Lauretta M.V. |
| SCRS/2015/191 | Catch rates and catch structures of the Balfegó purse seine fleet in Balearic waters from 2000 to 2015; three years of size frequency distribution based on video techniques | Gordoa A. and Bahamón N. |
| SCRS/2015/192 | Ejecución del programa nacional de observadores a bordo de la flota industrial atunera venezolana del mar Caribe y Océano Atlántico año 2014 | Laurent C. and Marcano J.H. |
| SCRS/2015/193 | Electronic tagging of bluefin tuna in the trap fishery of Sardinia (West Mediterranean) | Addis O., Secci M., Sabatini A., Palmas F., Cau A., Mariani A., Dell'Aquila M. and Valastro M |
| SCRS/2015/194 | Variability in size and species composition of tropical tuna schools caught by purse seiners in the Atlantic Ocean | Bessigneul G., Floch L., Dewals P., Damiano A., Cauquil P., Delgado A. and Chassot E. |
| SCRS/2015/195 | Preliminary investigation using stereocamera technology on the changes occurring in the fork lengths of farmed Atlantic bluefin tuna (<i>Thunnus thynnus</i>) between caging and harvesting | Deguara S. |
| SCRS/2015/196 | Statistics of the French purse seine fishing fleet targeting tropical tunas in the Atlantic Ocean (1991-2014) | Floch L., Dewals P., Irié D., Cauquil P., Chavance P. and Chassot E. |

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| SCRS/2015/197 | Endocarditis in bluefin tuna (<i>Thunnus thynnus</i>) from the Ligurian Sea (western Mediterranean) | Garibaldi F., Eleonora Scaglione GF., Bollo E., Mignone W. and Guarda F. |
| SCRS/2015/200 | Reliability of bluefin tuna size estimates by stereoscopic camera system | Katavić I., Šegvić-Bubić T., Grubišić L. and Talić I. |
| SCRS/2015/201 | An assessment of the ecological importance of the Sargasso Sea to tuna and tuna-like species and ecologically associated species | Anon. |
| SCRS/2015/202 | Progress of the ICCAT Enhanced Programme for Billfish Research in the western Atlantic Ocean During 2015 | Hoolihan J. P. and Prince E.D. |
| SCRS/2015/203 | Herring Acoustic Surveys: A new perspective for Atlantic bluefin tuna in the Gulf of St Lawrence | Melvin G.D. and Finley M. |
| SCRS/2015/204 | First acoustic survey for a fishery-independent abundance index of juvenile bluefin tunas in the Bay of Biscay | Goñi N., Onandia I., Uranga J., Boyra G., Arrizabalaga H. and Arregui I |
| SCRS/2015/205 | Distribution des captures et des tailles du voilier de l'Atlantique (<i>Istiophorus albicans</i>) capturé par la pêche artisanale au Sénégal | Ngom Sow F. |
| SCRS/2015/206 | A modeling approach to Estimate Overall Atlantic Fishing Effort by time-area Strata (EFFDIS) | Beare D. |
| SCRS/2015/207 | Scientific peer review procedures of tuna regional fisheries management organizations | Sundaram R and Die D. |
| SCRS/2015/208 | Development of Management Strategy Evaluations for Atlantic bluefin tuna | Anon. |
| SCRS/2015/209 | Assessing of Atlantic sailfish catch rates based on Brazilian sport fishing tournaments (1996-2014) | Mourato B.L., Hazin H., Hazin F., Carvalho F., Travassos P. and Amorim A.F. |
| SCRS/2015/210 | Review of purse seine logbooks used in the ICCAT area and recommendations for a harmonised form | Monteagudo, J.P., Restrepo V. and Justel Rubio A. |

Appendix 4

**ICCAT ATLANTIC-WIDE RESEARCH PROGRAMME FOR
BLUEFIN TUNA (ICCAT GBYP) ACTIVITY REPORT FOR THE LAST PART OF PHASE 4 & THE
FIRST PART OF PHASE 5 (2014-2015), INCLUDING A GENERAL
OVERVIEW OF THE ACTIVITIES UP TO 2015**

1. Introduction

The Atlantic-wide Research Programme for bluefin tuna was officially adopted by the 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 for six years, and the European Union and some other Contracting Parties undertook to contribute to this programme in 2009 and in the following years; the budget officially approved by the ICCAT Commission in 2008 was 19,075,000 Euros for six years. The costs of the initial year were 653,874 Euros (against the original approved figure of 890,000 Euros), the costs of the second phase were 2,318,849 Euros (against the original figure of 3,390,000 Euros), while the costs of the third phase were 1,769,262 Euros (against the original approved figure of 5,845,000 Euros). The fourth phase had a total budget of 2,875,000 Euros (against the original approved figure of 5,195,000 Euros) and final costs were 2,819,557 Euros. The fifth phase has a total budget of 2,115,000 Euros (against the original approved figure of 3,345,000 Euros). The overall ICCAT GBYP operating budget for the first five phases, covering six years (a total of 9,676,548 Euros) is about 50.73% of what it was supposed to be (the 19,075,000 Euros approved by the Commission). Several private or public entities provided some additional funds or in kind support. These budget reductions have had an impact on all activities carried out so far.

The ICCAT GBYP funding is provided by voluntary contributions from the ICCAT Contracting Parties. The European Union has funded 80% of the budget for each Phase since the beginning of the programme. The remaining 20% has been provided by the CPCs having a bluefin tuna quota for the eastern stock and by other CPCs.

Taking into account that the funding of this programme is a serious constraint on its activities, the Steering Committee submitted a proposal for funding the ICCAT GBYP through an annual scientific quota. This proposal has been rejected by the Commission several times.

The Steering Committee has repeatedly stated that this programme is of great importance. For this reason, in 2014, the Steering Committee proposed to the Commission to extend the programme up to 2021, however funding is still an issue which needs to be solved.

The detailed ICCAT GBYP report is presented as document SCRS/2015/144.

2. Coordination activities

2.1 ICCAT GBYP coordination

The fourth phase of the ICCAT GBYP officially began on 6 March 2013, following the signature of the Grant agreement for the co-financing of ICCAT GBYP Phase 4 (SI2.643831) by the European Commission. It was then extended for a total of about 23 months, ending on 23 February 2015. The partial results were presented to the SCRS and the Commission in 2013 and 2014 (Di Natale *et al.*, 2014a and Di Natale, 2015a) and they have been approved.

The fifth phase of the ICCAT GBYP officially started on 24 February 2015 following the signature of the Grant agreement for the co-financing of the ICCAT GBYP Phase 5 (SI2.702514) by the European Commission and will end on 23 February 2016.

In the second part of Phase 4 the staff was reduced, leaving only the Coordinator; the previous staffing level (an assistant and a data base specialist) was resumed from May 2015. The ICCAT Secretariat has always provided the support necessary for ICCAT GBYP activities.

A total of nine calls for tenders were issued in Phase 4 and a total of 25 contracts were awarded to various entities in Phase 4. Six additional calls for tenders have been announced to date in the first part of Phase 5 and a total of 15 contracts have been awarded to date to various entities in Phase 5.

A total of 88 contracts have been awarded under the ICCAT GBYP up to the first part of Phase 5 to 83 entities, located in 23 different countries; many hundreds of researchers and technicians have been involved to date in the various ICCAT GBYP activities. This extensive and open participation in ICCAT GBYP activities is considered to be one of the best results of this research programme.

A total of 45 reports were produced in the framework of Phase 4 of the ICCAT GBYP. Several additional documents and reports have also been issued by the ICCAT GBYP for the needs of Steering Committee meetings. A total of 58 scientific papers were produced in Phase 4, while others will be published later on. A total of 22 reports have been produced in the first part of Phase 5, along with 25 scientific papers.

2.2 Mid-term Review

The mid-term review of ICCAT GBYP was carried out in Phase 4 and the report, which was distributed to the Commission and the SCRS, is available at http://www.iccat.int/GBYP/Documents/RESEARCH/GBYP_Mid-Term_Review2013.pdf.

The reviewers provided an extensive analysis of the work carried out from 2010 to 2014 and an extensive range of proposals for improving the research in the following years.

The reviewers recognized the important improvements in scientific knowledge obtained by the ICCAT GBYP in the first parts of the programme. Specifically, the reviewers pointed out that “on the whole, the ICCAT GBYP did yield an impressive increase in scientific investigations into Atlantic bluefin tuna, delivering much of the background scientific evidence crucial to conducting and improving stock assessments and ultimately management advice” and that “the investment in coordination of the programme through ICCAT is another shining example of good practice”.

3. Steering Committee

The ICCAT GBYP Steering Committee is currently composed by the SCRS Chair, the West bluefin tuna Rapporteur, the East bluefin tuna Rapporteur, the ICCAT Executive Secretary and one contracted external expert.

The activity of the Steering Committee included regular correspondence by e-mail with the ICCAT GBYP coordination, which provided the necessary information, as well as a monthly report. In Phase 4, the Steering Committee held three meetings (28-29 September 2013, 22-26 September 2014 and 10-12 February 2015), discussing various aspects of the programme, and providing guidance and opinions. All finalised reports of the Steering Committee are available at <http://www.iccat.int/GBYP/en/scommittee.htm>.

4. Data mining and data recovery

The total budget for data mining and data recovery activities over three years was 600,000 Euros; so far, the total expenditure for six years of activities has been 395,462.06 Euros (65.91% of the original budget), and much more data have been recovered than initially planned. Several SCRS meetings and workshops have been held on bluefin tuna data, including the Symposium on Bluefin Tuna Traps. To date, the ICCAT GBYP objectives set for data recovery and data mining in these first Phases have been largely accomplished.

The data mining and data recovery activity continued according to the objectives recommended by the Steering Committee. A complete and detailed overview of the data recovered in this last period is available (see Di Natale *et al.*, 2014b, Justel *et al.*, 2014, Mielgo, 2015, Di Natale, 2015b and SCRS/2015/148). Most of the market and auction data provided to the ICCAT GBYP as a donation in kind were initially validated (Mielgo, 2015) and were finally endorsed by the SCRS. Task II data collected by the ICCAT GBYP are currently incorporated in the ICCAT bluefin tuna database. All the historical trap data received as a donation in kind in Phase 4 were checked against the ICCAT GBYP trap database and the results are provided in document SCRS/2015/148.

Furthermore, a specific activity for recovering genetic data from ancient bluefin tuna samples was carried out in the last part of Phase 4 and in the first part of Phase 5. An initial report (Melvin, 2015) was presented to the SCRS, while a second comprehensive report (with genetic data from the 2nd century B.C. to the early 1900s) will be available at the end of Phase 5.

5. Aerial survey

The ICCAT GBYP Aerial Survey on bluefin spawning aggregations was initially identified by the Commission as one of the three main research objectives of this programme, in order to provide fishery-independent trends and estimates on the minimum SSB. The original programme included a total of three surveys over a maximum of three areas, but this was later modified by the Steering Committee, and a first power analysis revealed that under the best possible conditions a minimum of six/seven surveys will be necessary for detecting a trend. The total original budget set for three surveys in three areas was 1,200,000 Euros; the cost of carrying out four surveys in many more areas (four main “internal” areas and seven “external” areas) is approximately 1,619,624.24 Euros (134.97% of the original budget, but with more than twice the activities). So far, the ICCAT GBYP objectives initially set for the aerial survey on spawning aggregations in these first Phases have been largely accomplished.

The aerial survey design was revised again in 2015, according to the specific request of the Steering Committee. It included four “internal” areas and seven “external” areas, covering more than 60% of the Mediterranean Sea. Furthermore, the ICCAT GBYP set an improved protocol for the aerial survey. A SWOT analysis for assessing the possibility of a calibration exercise was carried out by the ICCAT GBYP coordination and presented to the Steering Committee; it is now available in document SCRS/2015/143. ICCAT GBYP issued a Call for Tenders and four contracts were awarded in 2015. A training course for pilots, professional spotters and scientific observers was held at the Secretariat on 26 May 2015. The survey was conducted in most of the Mediterranean areas thanks to the cooperation of various ICCAT CPCs, but permits were not available for some southern and eastern air spaces. In spite of many operational and logistical difficulties or constraints and thanks to the strong cooperation of some CPCs as well as the four companies in charge of the survey, it was possible to carry out the survey and to obtain all the final reports.

The Steering Committee requested a complex and comprehensive analysis, providing an external contract and an extremely preliminary report (SCRS/2015/147). For the first time, it was also possible to use the data obtained from a selection of miniPATs for studying the additional variance associated with the bluefin tuna behaviour during the spawning season in the survey area (SCRS/2015/146). The data collected in Phases 4 and 5 confirmed the validity of the approach adopted in Phases 1 and 2, but at the same time confirmed the need for conducting several surveys before detecting any trend for a minimum SSB, due to the high variability of the oceanography in the Mediterranean Sea and adaptive behaviour of bluefin tuna.

6. Tagging

The initial, short-term ICCAT GBYP objective approved by the Commission in 2008 was to implant 30,000 conventional tags and 300 electronic tags in three years in the eastern Atlantic and Mediterranean, with a total budget of 9,765,000 Euros; the mandatory tag awareness and reward campaigns, as well as the tagging design study and protocol, were not included. So far, with only 37.65% of the funding (a total of 3,767,593 Euros, including the budget amount set for Phase 5, equal to 431,758 Euros), the ICCAT GBYP has deployed 81.05% of the conventional tags (24,314) and 79.33% of the electronic tags (238; 180 mini PATs, 50 internal archival tags and 8 acoustic tags). Furthermore, the tagging design and protocols, the awareness and reward campaigns have been included in the activity carried out to date. It is very clear that the general objectives set for the tagging activities in these first Phases have been largely accomplished so far in terms of the total number of tags to be deployed, taking into account the proportion of the available budget.

6.1 Conventional and electronic tagging activity

The tagging activities carried out in Phase 4 were reported to the SCRS (Di Natale and Idrissi, 2015 and Quílez-Badía *et al.*, 2015).

In September 2014, the Steering Committee adopted a different tagging strategy for Phase 5, maintaining the conventional baitboat tagging only in the Bay of Biscay and in the Strait of Gibraltar, while electronic tagging activities were planned in traps for adults (both in Morocco and Sardinia); experimental tagging with miniPATs was planned in the eastern Mediterranean and by purse seine for adults in the Turkish area. In February 2015, the Steering Committee considered that it was impossible to deploy the tags in all the areas as planned at the beginning due to various logistical and security issues, that it was not possible to carry out any PIT tagging, that the scientific tag recovery activity was not possible for some changes in the fisheries and that this would be anyway limited to one or two areas, that the tag reporting rate for conventional tags was too low and recommended revising the plan for Phase 5, by cancelling the conventional tagging, and directing all activity only at electronic tagging in the three areas previously identified.

ICCAT GBYP issued a Call for Tenders and three contracts were awarded in 2015. 20 miniPATs were deployed in a Moroccan trap (Larache), 30 (of a total of 40) miniPATs were implanted in tunas caught by a purse seiner in the Turkish area and 28 (of a total of 30, because the tags that were not used in Turkey were moved there) miniPATs were deployed in a Sardinian trap (Isola Piana). Furthermore, a complimentary tagging activity was carried out on tunas kept in an Italian cage (Marina di Camerota) that were released at sea and five miniPATs were implanted. Most of these tags had a premature release, suspected to be mostly due to fishing operations, however some tags provided extremely important results. The detailed report is provided in SCRS/2015/149.

As a matter of fact, five of the tags deployed in Turkey went to other Mediterranean areas (one off Libya, two in the Ionian Sea). One fish was off the Galician coast and another one as far as the North East Atlantic, off the Faroe Islands. The results from these tags, together with the recapture in 2015 in Turkey of two tunas tagged in the Strait of Gibraltar and in the Adriatic Sea, can finally support the results of the ICCAT GBYP genetic studies, which showed full mixing in all bluefin tunas sampled in the Mediterranean Sea. At the same time, any different hypothesis made up to 2014 about a possible isolation of the bluefin tunas in the Levantine Sea seems unsustainable.

The results from the tags deployed in Morocco in 2015 show that most of the tunas entered into the Mediterranean Sea, possibly for spawning. Even here, a re-analysis of the full data sets from the tags deployed in Morocco since the beginning of the ICCAT GBYP, along with the data concerning the fish natal origin obtained by the ICCAT GBYP micro-chemistry analyses, might have detected a possible solution for explaining why several tunas did not enter in the Mediterranean for spawning during those years. It seems that the highly variable percentage of western Atlantic-origin fish in the Moroccan traps could be a major motivation, although not the only one. The bluefin tuna tagged with both miniPAT and conventional tags in Morocco in cooperation with the University of Stanford in 2014, which went close to Greenland in the same year, was recently fished in the Strait of Gibraltar, providing another important piece of our knowledge.

Furthermore, as reported in item 5, the data sets obtained from miniPATs implanted in tunas that entered the Mediterranean Sea during the spawning season and coincided with the aerial survey, were used for the first time for preliminary assessment of an additional variance for the ICCAT GBYP aerial survey (SCRS/2015/146).

Additional complimentary tagging activities with conventional tags are being or have already been carried out in Phase 5 in Italy, Morocco, Spain and Portugal. The full data will be available at the end of Phase 5.

In total, up to 1 September 2015, the total number of bluefin tunas tagged in all Phases of ICCAT GBYP is 16,883, and a total of 24,560 tags of various types have been implanted, mostly in juvenile bluefin tunas. Among these, 7,878 bluefin tunas were double tagged, amounting to 46.6% of the fish, a percentage which is well over the target (set at 40%).

These last activities show how important tagging activity is and how essential it is to continuously refine objectives and comprehensive analyses, taking into account the many ICCAT GBYP (and other) research projects and the extremely complex and adaptive behaviour of bluefin tuna. These results clearly show the great interest of ICCAT GBYP tagging activities in the future Phases of the ICCAT GBYP, providing inputs for more realistic management of the bluefin tuna stocks and populations.

6.2 Tag awareness and tag reporting campaign

According to the recommendations provided by the Steering Committee in all meetings, the ICCAT GBYP continued the tag awareness campaign, for the purpose of improving the tag recovery and reporting rates. Further, thousands of awareness material in 12 languages (posters and stickers) were produced and distributed in all Phases. Details are available at: <http://www.iccat.int/GBYP/en/AwCamp.asp>. The tagging awareness campaign is coupled with a tag reward campaign which is strongly recommended by the Steering Committee, and includes substantial rewards, special T-shirts and increased annual lottery prizes. The ICCAT GBYP also provides immediate feedback to the tagging teams and the tag recovery persons, informing them about the history of each tag. A field tag awareness programme was developed in 2014 in which several countries have been visited, and contact made directly with local authorities, fisher organizations, tuna factories, tuna traps, observers and sport fishers:

http://www.iccat.int/GBYP/Documents/TAGGING/PHASE%204/_Tag_Awareness_Report_2014.pdf

Specific training was provided yearly to ICCAT ROPs, requesting that they pay maximum attention to tags (including natural marks) when observing harvesting in cages or any fishing activity at sea.

To improve information and tagging programme awareness, the ICCAT GBYP is developing contacts with various stakeholder organizations and journalists. Information on the ICCAT GBYP is now present on various websites, while some articles have been published in local newspapers.

A total of 341 tags (311 conventional tags, 19 mini-PATs, seven archival tags and four commercial tags) from bluefin tunas have been reported to ICCAT GBYP up to 4 September 2015, showing a very substantial improvement in the total number of reported tags (see details in Di Natale and Idrissi, 2015, Di Natale, 2015a, SCRS/2015/144 and SCRS/2015/149). Even if the tag reporting rate is still very low (0.91% of the deployed tags), comparing the mean annual bluefin tuna tag reporting rate to ICCAT for the eight years (2002-2009) prior to the ICCAT GBYP (0.77 tags/year) and the current reporting rate for the full period of the ICCAT GBYP up to 1 September 2015 (60.14 tags/year), the increase is about 7810%.

Furthermore, the double tagging activity planned for studying the shedding rate of the different types of spaghetti tags and the specific recoveries reported so far (from 90 fish, with a reporting rate of 1.14%) showed that the results between single-barb spaghetti and double-barb spaghetti are quite comparable, because the double-barb ones were still on the fish in 92.2% of the cases, compared to 90% of the single-barb ones.

7. Biological studies

The initial, short-term ICCAT GBYP objective approved by the Commission in 2008 was to collect samples from 12,000 fish (including western Atlantic and the Japanese catches and markets) and carry out ageing and genetic studies, and micro-constituent analyses in three years in the eastern Atlantic and Mediterranean, with a total budget of 4,350,000 Euros. So far, with only 34.04% of funding (a total of 1,480,787 Euros, including the budget amount set for Phase 5, equal to 342,496 Euros), the ICCAT GBYP collected samples from 9217 fish (76.8% of the target) and carried out ageing, genetic and micro-constituent analyses; furthermore, the sampling design and protocols, and the otolith shape analyses were included in the activity carried out so far. It is very clear that the general objectives sets for the biological studies in these first Phases were largely accomplished so far, taking into account the proportion of the available budget.

An SCRS meeting was organized in May 2013 in Tenerife for reviewing the bluefin tuna biological parameters and the report is available on http://www.iccat.int/Documents/Meetings/Docs/2013-BFT_BIO_ENG.pdf. The results are also in Di Natale *et al.*, 2014c, Rodriguez-Marin *et al.*, 2014, Rooker *et al.*, 2014, USA Scientists, 2014, all presented at the Tenerife meeting. The latest data are in SCRS/2014/051 and SCRS/2015/144. The details of the areas were revised jointly by the ICCAT GBYP coordination and the Steering Committee prior to the field activities in 2015 and now there are 12 areas, 38 strata and 79 substrata, allowing for detailed analyses.

Following two Calls for Tenders in Phase 5, two contracts were awarded. One of the contracts was awarded to a large Consortium of 14 entities and 7 sub-contracted entities, belonging to 11 countries, and is in charge of both sampling and analyses. Unfortunately, it was not possible to contract out the ageing calibration in 2015, due to the unacceptable quality of bids received in Phase 5.

In total, 9,217 bluefin tunas have been sampled up to September 1, 2015 and about 40% have already been analysed. At the moment, there are 6,795 muscle/fins, 4,447 otoliths, 3,493 spines and 688 gonads already stocked in the ICCAT GBYP tissue bank, currently maintained by AZTI; an additional 735 fish were sampled in 2015, but sampling is going on in many areas.

The first results, which can still be considered preliminary, are extremely interesting and very promising:

- Genetic analyses show that there is a genetic difference between western Atlantic bluefin tuna and eastern Atlantic bluefin tuna, and a certain mixing is present in almost all areas; at the same time, for the eastern Atlantic stock, it is difficult at the moment to discriminate among the many Mediterranean areas because there is significant mixing. Results need to be confirmed by a larger number of samples, further extending the sampling to areas which have not yet been sampled.
- Microchemistry analyses showed that current stock components are well identified; mixing in the Mediterranean Sea is minimal, but the presence of important percentages of bluefin tuna from different areas in central-North Atlantic and in Atlantic Iberian-Moroccan area needs to be much more investigated and checked before having more solid results, but it seems that the two stocks can be present there, with a very high interannual variability; it is possible that intra-Mediterranean components can be further discriminated.
- Otolith shape has provided the first, very preliminary results and even here it seems that bluefin fin tuna population components show some differences, but many other analyses are needed to better study the differences.
- A first ageing calibration was carried out in 2014, with broad participation from scientific institutions and scientists belonging to several CPCs; the initial results show good improvements and similar exercises for smoothing the biases, which are essential for more accurate ageing of bluefin tuna, must be continued.

8. Modelling approaches

The initial, short-term ICCAT GBYP objective which was approved by the Commission in 2008 was to carry out operating modelling studies from year 4, with a total budget of 600,000 Euros. So far, with only 62.98% of the funds (a total of 377,895 Euros, including the budget amount set for Phase 5, equal to 194,670 Euros), the ICCAT GBYP carried out many modelling activities from Phase 2, following the recommendations of the Steering Committee and the SCRS. It is very clear that the general objectives set for the modelling studies in these first Phases were largely accomplished so far, taking into account the proportion of the available budget. Furthermore, the modelling plan was fully revised and now it has been extended up to 2021, as it was endorsed by the Commission.

In Phase 4, two meetings were held on modeling: a first one in May 2013 in Tenerife (EU-ESP) for preparing a first discussion draft document (see:

http://www.iccat.int/GBYP/Documents/MODELLING/PHASE%204/tenerife_Modelling.pdf, and http://www.iccat.int/GBYP/Documents/MODELLING/PHASE%204/Tenerife_gbyp-modelling_draft_proposal.pdf) and a second was held in July in Gloucester (USA), where a detailed planning of bluefin tuna modeling activities have been agreed for submission to the SCRS (http://iccat.int/Documents/Meetings/Docs/2013_BFT_METHODS_REP_ENG.pdf). Another meeting was held in Phase 5, during the SCRS bluefin tuna data preparatory meeting in March 2015 (http://iccat.int/Documents/Meetings/Docs/BFT_DATA_PREP_2015_eng.pdf).

A modeling coordinator and a modeling technical assistant were contracted in Phase 4, following two Calls for Tenders, according to the decision taken by the bluefin tuna species group, the ICCAT GBYP Steering Committee and the SCRS. An ICCAT GBYP Modelling Steering Group was also established. The modelling coordinator was replaced in Phase 5, based on a recommendation of the Steering Committee. There were changes in the membership of the ICCAT GBYP Modelling-MSE Steering Group in Phase 5, taking into account the new BFT rapporteurs and SCRS Chairman. The data obtained from the electronic tagging activities have been included in the trials. The work necessary for developing new modeling approaches will take several years.

9. Legal framework

ICCAT adopted Rec. 11-06 in its meeting in Istanbul in November 2011, which allows for a “research mortality allowance” of 20 t of bluefin tuna per year for the ICCAT GBYP and for the use of any fishing gear in any month of the year in the ICCAT Convention area for ICCAT GBYP research purposes. To implement the recommendation, the ICCAT Secretariat issues a circular in each year of ICCAT GBYP activity.

A total of 171 ICCAT GBYP RMA certificates have been issued up to September 14, 2015 in respect of a total of 10,539.892 kg of bluefin tuna; 6 RMA certificates, concerning 33 tunas for a total of 219.862 kg have been issued so far in Phase 5, but the sampling activity is ongoing. The details are reported in SCRS/2015/145.

10. Cooperation with ROP

The ICCAT GBYP coordination, together with the ICCAT Secretariat, is maintaining and improving the contacts with the ROP observers, for strengthening the cooperation and providing opportunities. The ROPs observers are engaged in checking directly bluefin tuna at harvest for improving tag recovery and reporting. The observers are also requested to report any natural mark and a specific form was provided by the ICCAT GBYP to ROPs. The ICCAT GBYP Coordinator provided yearly a specific training to the ROPs.

11. ICCAT 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 the ICCAT 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 or in kind) are regularly listed, to ensure full transparency. The ICCAT GBYP web pages have recently been fully revised and improved.

12. Following activities

The ICCAT GBYP Steering Committee, the mid-term review and the various ICCAT GBYP meetings provided a list of recommendations on various issues; several of them are essential for fulfilling the duties. A summary of the point of view of the Steering Committee after its last meeting is provided in **Addendum 1 to Appendix 4**. A document on ICCAT GBYP activities presented by the Steering Committee is also provided in **Addendum 2 to Appendix 4**. Further recommendations will be provided this year by the SCRS and will then be forward to the Commission.

In addition, the ICCAT 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, it has been fully demonstrated that it is impossible to reach the level of funding approved by the ICCAT Commission for the first six years of the ICCAT GBYP and, as a consequence, to carry out the various activities as originally planned. The extension of the programme up to 2021 was discussed and considered by the Commission in 2014. However, the ICCAT GBYP funding system should be revised and better defined, stabilised and improved, in order to ensure the regular development of the activities. Regardless of the type of system envisaged, the budget by Phase or year, subject to the Commission’s approval, must be ensured. A second external review should provide an independent overview of the work carried out so far and possible proposals for the following extension.
- b) *Data recovery and data mining*: Task II data have finally been included in the ICCAT bluefin tuna database; several data conflicts were resolved, but some others must be revised as soon as possible by the CPCs and national scientists concerned. The many sets of market and auction data which were validated will be included in a specific ICCAT database and made available to scientists as soon as possible. If additional reliable data about LL BFT fisheries in the Mediterranean in the last decade or other additional data sets, not already included in official Task II data, are detected, then these data should be recovered and used for improving our understanding of these fisheries.

- c) *Aerial survey*: It is considered essential to continue the survey on spawning aggregations in selected areas, for providing a trend to be used in advanced models; a minimum of 6/7 years of survey is needed; the prediction model using the SST data should be further developed and improved; the additional variance estimated thanks to the electronic tags will possibly improve the assessment. An enhanced power analysis will provide the necessary data for informing any further decision about this activity.
- d) *Tagging*: Electronic tagging should be strongly improved, while conventional tagging should be carried out capitalising on the experiences in the first part of the ICCAT GBYP. In particular, electronic tagging should be carried out in the eastern Mediterranean, improving the logistical component. Tag awareness activity will be consistently continued, strongly improving media communication.
- e) *Biological and genetic sampling and analyses*: Sampling should be continued, covering the less sampled areas or areas where mixing problems have recently been detected; the analyses of the available samples should be improved; age analyses should be cross checked for validation (repeating the calibration). The recovery of old ICCAT BYP samples should be defined.
- f) *Modelling*: New additional efforts should be devoted for finding the best approaches for using fishery independent data and innovative approaches for better quantifying uncertainties. The dialogue with stakeholders should be activated and possibly improved. The revised plan should be enforced as soon as possible.

The total budget necessary for Phase 6 is provisionally set once again at €2,125,000.

The ICCAT GBYP will continue encouraging and supporting additional research activities carried out by the various CPCs.

Addendum 1 to Appendix 4**ICCAT GBYP Steering Committee
Summary of meeting held in Madrid (27 September 2015)**

During this meeting the Steering Committee (SC) of the ICCAT GBYP reviewed all documents provided by the ICCAT GBYP Coordinator including SCRS/2015/143, SCRS/2015/144, SCRS/2015/145 SCRS/2015/146, SCRS/2015/149, SCRS/2015/147, SCRS/2015/208 and the report contained in **Appendix 4** and adopted the proposed Agenda.

The SC commends the ICCAT GBYP team on the progress achieved during Phase 5, and recognizes the positive effects that the hiring of the two new staff has had on the productivity of the programme. The ICCAT GBYP Coordinator attempted to implement all the recommendations that the SC made for Phase 5, including changes in the research programme aimed at enhancing the ability of the programme to reach its original objectives.

Great difficulties continued to be found in the implementation of the aerial survey caused by logistical issues related to the political situation in the Mediterranean and the complicated legal environment within which the project needs to implement aerial flights. The information gathered during the 2015 survey adds to that collected in earlier surveys, however, it is unclear to the SC whether the data collected so far indicates whether aerial surveys of adult fish are a viable alternative for a fishery independent index of abundance. The ICCAT GBYP has completed a preliminary analysis of the data collected in the “core areas” of the survey to start answering this question. The SC, however, believes a definite answer will not be reached until a more thorough power analysis of the current aerial surveys (as constrained by logistics) is completed. The SC recommends setting aside resources to implement such a power analysis as soon as possible.

Biological data collection is progressing and has started producing the kind of data that will be usable in the next stock assessment of bluefin tuna. The ICCAT GBYP has put in place modifications to this component that will speed up the processing of biological data that has been accumulating, so that it will be available for the next assessment. The SC places high priority in this processing of biological data (especially the one related to age-length keys) in a format that can be used by the SCRS.

The SC appreciates the efforts made by the ICCAT GBYP team in implementing a more ambitious set of satellite tagging experiments which, in spite of some difficulties, have already yielded very valuable information regarding the structure of the stock within the Mediterranean and its relation to the rest of the Atlantic. This information will also be very valuable in interpreting the probability of detection of tuna by aircrafts, because it contains information on the distribution of fish at depth during the time that aerial surveys are being conducted. Although the release of tuna marked with conventional tags has more or less halted, the SC urges the ICCAT GBYP to continue to invest heavily on tag awareness campaigns in the expectation that tuna released with conventional tags in the past will have grown to sizes that are more likely to be caught by the current fishery. The SC supports the idea of seeking new media and strategies to make this campaign more effective.

The SC will help the ICCAT GBYP in identifying new candidates to implement the feasibility study of close kin and genetic tagging as soon as possible, because this technology has the potential to be an alternative to others attempted so far to develop fishery independent abundance indices.

The data recovery projects have been providing useful information and the SC supports its continuation, at the same level of funding as before, as long as these projects continue to produce data that are clearly useful to the assessment of bluefin tuna.

Progress on the modelling intending to advance the development of an MSE framework for bluefin tuna have been delayed by the change in composition of the modeling group but the SC has confidence that the new team will progress better and faster towards its objectives. The SC stresses the longterm support for this activity because it feels it is an essential tool to evaluate not only management strategies but also the value of data for the assessment including the ICCAT GBYP data. The SC therefore commits to continue to fund this activity as long as the ICCAT GBYP continues. The SC supports the proposal to hold the next meeting of this Group in Monterey in January 2016.

The SC supports the continuation of MSE modelling, biological sampling, electronic tagging and data recovery for Phase 6 of the programme. The SC, however, is not convinced that the aerial surveys should be conducted in Phase 6. The SC will not support such implementation unless the proposed power analysis is completed prior to February 2016 and provides clear evidence that an aerial survey based on the core areas can produce indices of abundance that are useful in the assessment. If this evidence is not forthcoming the ICCAT GBYP should not implement such a survey in 2016.

The SC acknowledges that the ICCAT GBYP has only achieved some of the original objectives of the programme. Many of the delays and difficulties that have caused such objectives not being achieved are clearly outside the control of the ICCAT GBYP staff, including the logistic difficulties to implement the programme in the Mediterranean in the present time and the shortcoming in funds produced by adjustments made by the funding agency. The SC and the ICCAT GBYP staff have tried to remediate some of such shortcomings by adjusting work plans and experimental designs, however, some of such adjustments are yet to produce the desired effect.

The SC sees the ICCAT GBYP as a unique opportunity to advance science in support of the management of bluefin tuna and is committed to its continuation beyond Phase 6. The SC and the ICCAT GBYP therefore support the implementation of an external review of the programme that can help the ICCAT GBYP improve its work and, more importantly, to develop the proposal for next phases of the ICCAT GBYP that are planned for the period following the completion of Phase 6. This review should be completed and presented at the 2016 SCRS meeting with the view of providing information to evaluate the performance of the ICCAT GBYP and to adjust its plans for the future.

Addendum 2 to Appendix 4

Document on ICCAT GBYP provided by the Steering Committee

The objectives of the ICCAT GBYP are to improve basic data collection, understanding of key biological and ecological processes, assessment models and the provision of scientific advice. There are five main areas of work, namely *Data Mining, Biological Sampling, the Aerial Survey, Tagging and Modelling*. A key measure of the success of the ICCAT GBYP is whether the data collected under the ICCAT GBYP is used by the bluefin tuna stock assessment working group to provide advice to the Commission.

The first steps in utilizing the information collected under the ICCAT GBYP were made during the 2014 update of the eastern bluefin assessment, whereas preliminary revision of the catch-at-age data incorporating historical information from the ICCAT GBYP data mining activities was used in a sensitivity analysis. Tagging data, biological information, age-length keys and aerial survey data from the ICCAT GBYP will be evaluated during the 2016 data preparatory workshop with the intention of being used in the next assessment. The main activity under the Modelling component of the ICCAT GBYP is to conduct Management Strategy Evaluation (MSE) in order to evaluate alternative management procedures and to the benefits and costs of different data collection schemes, assessment methods and management options. The operating model developed for the MSE may also be used as the basis for a new stock assessment method that can more effectively utilize the new information obtained through ICCAT GBYP and other programmes. To this end, the ICCAT GBYP contracted an MSE Coordinator and a Technical Assistant in 2014 and 2015 to lead this work.

In 2013 (under Phase 4) a mid-term review was held of the ICCAT GBYP, the review concluded:

The review team considers too that (i) a future ICCAT GBYP type project should be developed by ICCAT with a view to it commencing as the current ICCAT GBYP ends in 2015, and (ii) the SCRS and the ICCAT Commission be tasked now with investigating and promoting such an ambitious project as part of its long-term investigations into improved management of Atlantic bluefin tuna. The review team also recommends that any next generation of an ICCAT GBYP be fully justified and described by means of a full-scale research plan showing in detail the proposed content of the programme: research actions planned and their priorities, cost and time-scales, etc. Ideally, a small task force should be created to take cognizance of all ICCAT GBYP results to date in making their recommendations.

When evaluating programmes such as the ICCAT GBYP, key criteria are relevance, efficiency, effectiveness, impact and sustainability. For example the reviewers asked "*what is the most cost effective way to produce a useful long-term index from aerial surveys and how soon will the outputs feed, with some value, into the stock assessment process*". The review also urged an immediate quantitative analysis of tag recovery rates.

MSE can be used to develop a management procedure (MP) like that used by the CCSBT, which sets management measures (e.g. a Total Allowable Catch) without direct input from the Commission. However, MSE can also be used to evaluate the costs and benefits of different data collection schemes and scientific studies. For example will the data from the tagging activities and aerial survey be able to provide cost effective advice. It could therefore be used to *justify the ICCAT GBYP research plan showing in detail the proposed content of the programme: research actions planned and their priorities, cost and time-scales, etc.* as proposed by the mid-term review.

As the programme, which was established in 2009, is nearing its end, it seems highly appropriate to objectively assess the progress to date and the most effective way to move forward. To this end, the ICCAT GBYP will be issuing calls for tender to fully evaluate the utility of the current aerial survey and tagging activities. It will also issue a call for tender to evaluate the feasibility of genetic tagging (including close-kin analyses such as have been conducted for southern bluefin tuna).

If the programme continues to use the same methods as those employed in the last six years, without evaluating how the data and knowledge gained will improve the scientific advice framework, the programme may fail to meet management objectives. To avoid this risk it is essential to conduct a cost/benefit analysis to help design a programme which will meet programme objectives in a cost effective way. This also requires a clear definition of objectives and milestones to monitor progress.

ICCAT ENHANCED PROGRAMME FOR BILLFISH RESEARCH
(*Expenditures/Contributions 2015 and Programme Plan for 2016*)

Summary and programme objectives

The ICCAT Enhanced Programme for Billfish Research (EPBR) continued its activities in 2015. The Secretariat coordinates the transfer of funds and distribution of tags, information and data. The overall programme coordinator during 2014 was Dr David Die (USA); Dr Eric D. Prince (USA) was coordinator for the western Atlantic Ocean, and Mr. Paul Bannerman (Ghana) coordinated activities for the eastern Atlantic Ocean. In 2015, Dr John P. Hoolihan (USA) assumed the role of overall coordinator and western Atlantic coordinator, while Dr Fambaye Ngom Sow (Senegal) assumed the role of coordinator for the eastern Atlantic.

The original plan (1986) for EPBR included the following objectives: (1) to provide more detailed catch and effort statistics, particularly for size frequency data; (2) to initiate the ICCAT tagging programme 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 objectives of EPBR expand to evaluate adult billfish habitat use, 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 during 2014-2015 are highlighted below.

The programme depends on financial contributions, including in-kind support, to reach its objectives. This support is especially critical because the largest portion of billfish catches in recent years comes from countries that depend on the support of the programme to collect fishery data and biological samples. ICCAT has provided financial support in recent years, while annual contributions have been made from Chinese Taipei since 2009.

2015 activities

Venezuela (INIA/IOV-UDO) continued at-sea sampling activities through 2014 at the port of Cumaná, where industrialized longline vessels targeting yellowfin tuna and swordfish also catch billfish; and, the smaller artisanal drift-gillnet vessels targeting billfish. There were a total of six at-sea observer trips accomplished between August 2013 and December 2014. Most trips were on industrialized small to mid-size longline vessels out of Cumaná port. Shore-based sampling of size frequency data in Venezuela continued in the last part of 2013 through December 2014, with port sampling in Playa Verde and Cumaná. In the port of Playa Verde (off La Guaira, central Venezuela) a total of 3,746 daily trips targeting billfish were recorded in 2014, and 1,341 daily trips from August-December 2013. Biological sampling for sailfish tissue sampling for genetic studies were completed. No catch and effort data from sport fishing tournaments were available for the period 2013-2014, it is presumed that there were very few than three tournaments due to economic circumstances. A major effort to obtain reports of tag recaptured billfish continued during 2014, with the recovery of 12 tags from August 2013-December 2014, which included four blue marlins and one small tuna in 2013 and six blue marlins and two white marlins in 2014.

The EPBR supported characterization of billfish catches on-board small scale vessels in Brazil, tissue sampling for genetic identification in Brazil and Uruguay and biological sampling for reproduction and growth in Venezuela.

Uruguay collaborated in research conducted by Bernard *et al.* (2014) on the comparative population genetics and evolutionary history of two commonly misidentified billfishes (*Tetrapturus georgii* and *Kajikia albida*) of management and conservation concern.

In West Africa the programme continued to support the collection of billfish landing data in Côte d'Ivoire, Ghana, São Tomé and Príncipe and Senegal. Senegal provided 50 sailfish tissue samples to Brazil for genetic analyses. There has been a focus on biological sampling of blue marlin in Côte d'Ivoire, blue marlin being the most common landed billfish species of the artisanal fishery. Improvements of catch and effort records from these countries are reflected in the Task I tables for billfish that were used in the recent marlin assessments 2011 and 2012.

Genetic sampling kits were distributed to a number of fleets to help identify the percentage of white marlin, longbill spearfish and roundscale spearfish in the mixture of landings that represent these three species.

Sampling kits have been distributed to longline fleets in Mexico, Morocco, Portugal, Senegal, Spain and Venezuela and to purse seine fleets in Ghana and Spain. Collected samples are transferred to Nova Southeastern University in Florida (USA) for processing. To date, surface mucous samples for genetic analyses have been provided by Portugal (n = 39) and Spain (n = 1) longline fleets fishing in the eastern central Atlantic. Of these, 36 were identified as white marlin and one sailfish, while three could not be identified due to mold contamination.

More details on the aforementioned activities are available in the documents SCRS/2015/084, SCRS/2015/085 and SCRS/2015/205 that were produced with the benefit of direct or indirect support of the EPBR.

2016 plan and activities

The highest priorities for 2016 are to support the objectives established by the billfish work plan, with specific emphasis on the preparation of information required for the next sailfish assessment and the collection and preparation of data relevant to the identification of white marlin and spearfishes and the collection of biological data on spearfishes:

- support the collecting and processing of samples of billfish for genetic studies;
- support the monitoring of the Brazilian, Uruguayan and Venezuelan longline fleets through onboard observers, reporting of conventional tags and biological sampling;
- support the collection of biological samples in West Africa and;
- support the monitoring of billfish catches from West African artisanal fishing fleets;
- investigate possible unreported important billfish catches in the Caribbean and take steps to develop capacity building where feasible.

All these activities depend on successful coordination, sufficient financial resources and adequate in-kind support. Details of EPBR funded activities for 2016 are provided below. Some of these will complement general improvements in data collection made with the support of the ICCAT data improvement programme and the new Japanese capacity building programme that are especially relevant to the collection of billfish statistics from fleets from West Africa and the Caribbean.

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 off central Venezuela.

Eastern Atlantic

Monitoring and sample collection will be supported for the artisanal fisheries of Ghana, Côte d'Ivoire, São Tomé and Senegal.

At-sea sampling

West Atlantic

Continued support will be provided to the sampling made onboard the Venezuelan, and Brazilian vessels.

Tagging

The programme will need to continue to support the conventional tagging and recapture reporting conducted by programme partners.

Biological studies

The biological and genetic sampling programmes, particularly for white marlin and spearfish, will continue in 2016. This programme aims to determine the ocean-wide ratio of white marlin to roundscale spearfish and longbill spearfish, including how this ratio changed over time.

For determination of sailfish stock structure using genetic analyses, tissue samples from both recognized stocks were collected during 2015. Additional samples from both eastern and western fisheries with important billfish catches are needed for analysis prior to the next stock assessment meeting. Brazilian scientists will conduct the genetic analyses of sailfish samples.

Efforts to collect biological samples for reproduction, age and growth studies requires EPBR support to facilitate cooperation from fleets that are monitored with EPBR funds. In preparation for the next sailfish assessment, emphasis will be placed on biological sampling for age, growth and reproductive studies of sailfish and spearfishes.

Coordination

Training and sample collection

Programme coordinators need to travel to locations not directly accessible to promote EPBR 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. Coordinated activities between EPBR, JCAP and ICCAT data fund will continue to be required.

Programme management

Management of the EPBR budget is assumed by the programme coordinators, with the support of the Secretariat. Reporting to the SCRS is a responsibility of the coordinators. Countries that are allocated budget lines for programme activities need to contact the respective programme coordinators for approval of expenditures before the work is carried out. Invoices and brief reports on activities conducted need to be sent to the programme coordinators and ICCAT to obtain reimbursement. Funding requests need to follow ICCAT protocol for the use of funds (2011 SCRS Report, Appendix 7, Addendum 2).

2015 budget and expenditures

This section presents a summary of the contributions and expenditures for the ICCAT EPBR during 2015. The Billfish Working Group developed a budget of €69,747.44 for the EPBR. The contributions made to the EPBR for the 2015 programme were €31,836.24 from the regular ICCAT budget and €3,000 from Chinese Taipei. Carryover funds remaining from previous year were €34,911.20 thus total funds available for 2015 were €9,747.44 (**Table 1**). Expenditures to date in 2015 have been €3,069.00, with an additional €43,600.00 committed to other activities that have either taken place during January-September 2015 or are anticipated during October-December 2015. One of the main reasons for the smaller expenditures has been the delay in receiving adequate numbers of genetic samples for processing. The estimated balance of EPBR funds at the end of 2015 is €18,078.44 (**Table 1**).

In-kind contributions to the programme continued to be made during 2015. 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 programme, thereby reducing the amount of funds needed for this activity from the ICCAT billfish funds. Some of the travel costs and personnel time of the programme coordinators were absorbed by the U.S. National Marine Fisheries Service, University of Miami, Department of Fisheries of Ghana and by the ICCAT Data fund.

2015 budget and requested contributions

The proposed 2016 budget, totaling €52,578.44 is detailed in **Table 2**. The programme is predicted to have a balance of €18,078.44 by the end of 2015 and therefore requests the Commission to provide a contribution of €1,500.00 for 2016. The requested contribution from ICCAT is necessary to fully implement the EPBR 2016 working plan. To achieve all its objectives in 2016 the programme will continue to require contributions of €3,000.00 from other sources, such as those so generously provided lately by Chinese Taipei.

The consequence of the programme failing to obtain the requested budget will be to stop or reduce programme activities for 2016 including: (1) collection and processing of genetic samples, collection and processing of age and growth samples, (2) at-sea observer trips in Venezuela and Brazil, (3) biological sampling and collection of statistics of catches from 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 an anticipated sailfish assessment in 2016.

Conclusion

The EPBR is an important mechanism towards completing the goal of having the highest quality information to assess billfish stocks. The EPBR has been credited for major improvements in the data supporting the last ICCAT billfish assessments. The EPBR is the only programme that focuses exclusively on billfish. Therefore programme continuation is paramount to facilitate the collection of biological and fishery information on billfish species. The EPBR will continue to require support from ICCAT and other sources to operate and address the needs of the Commission.

Table 1. Detailed 2015 expenditures.

| Income | | Euros (€) |
|--|--|--------------------|
| | Balance transferred from 2014 | 34,911.20 |
| | ICCAT Commission | 31,836.24 |
| | Chinese Taipei | 3,000.00 |
| | Total income | 34,836.24 |
| | | |
| Total Budget | | 69,747.44 |
| | | |
| Expenditures | | |
| | Sampling - Senegal | 3,000.00 |
| | Sampling - Ghana | 3,000.00 |
| | Sampling - São Tomé | 2,000.00 |
| | Travel by coordinator | |
| | Bank charges | 69.00 |
| | Current expenditures Jan-Sep 2015 | 8,069.00 |
| | | |
| Funds obligated until end of the year | Sampling - Venezuela | (6,000.00) |
| | Sampling - Brazil | (5,000.00) |
| | Sampling - Côte d'Ivoire | (3,000.00) |
| | Tagging rewards | (500.00) |
| | Collection of genetic samples* | (2,000.00) |
| | Mailing genetic samples* | (1,000.00) |
| | Processing genetic samples* | (22,000.00) |
| | Coordination travel | (4,000.00) |
| | Bank charges | (100.00) |
| | | |
| | Obligated expenditures Oct-Dec 2015 | (43,600.00) |
| | | |
| | | |
| | | |
| Total Expenditures for full year | | 51,669.00 |
| | | |
| Estimated year-end balance | | 18,078.44 |

* Number of samples collected and processed will depend on the final budget of the programme.

Table 2. Detail of proposed expenditures for 2016.

| Income | | Euros (€) |
|-----------------------------------|--|--------------------|
| | Balance transferred from 2015 (tentative) | 18,078.44 |
| | ICCAT Commission | 31,500.00 |
| | Chinese Taipei | 3,000.00 |
| | Total income | 34,500.00 |
| Total Budget | | 52,578.44 |
| Planned Expenditures | | |
| | West Atlantic shore-based sampling: | |
| | Venezuela | (6,000.00) |
| | West Atlantic at-sea sampling: | |
| | Venezuela | (6,000.00) |
| | Brazil | (5,000.00) |
| | Barbados | (3,000.00) |
| | Trinidad | (3,000.00) |
| | Other fleets ¹ | (3,000.00) |
| | East Atlantic shore-based sampling: | |
| | Senegal | (3,000.00) |
| | Ghana | (3,000.00) |
| | São Tomé | (2,000.00) |
| | Côte d'Ivoire | (3,000.00) |
| | Other fleets ¹ | (3,000.00) |
| | Collection of genetic samples ² | (2,000.00) |
| | Mailing genetic samples ² | (1,000.00) |
| | Processing genetic samples ² | (2,000.00) |
| | Lottery rewards - billfish tagging | (500.00) |
| | Coordination travel ¹ | (6,500.00) |
| | Bank charges | (300.00) |
| Total Expenditures | | (52,300.00) |
| Estimated year-end balance | | 278.44 |

¹ Expenditures contingent on available funds.² Number of samples collected and processed will depend on the final budget of the programme.

ICCAT SMALL TUNAS YEAR RESEARCH PROGRAMME (SMTYP)

Programme objectives

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 thus providing the Commission with appropriate scientific advice for their sustainable exploitation, are generally incomplete and not updated for these species.

The ICCAT Year Research Programme for Small Tunas (SMTYP) was adopted by the SCRS in 2011 and approved by ICCAT during its 2012 annual meeting in Agadir (Morocco). The main objectives of the programme at short term are the recovery of historical series of Task I and Task II data and collecting the biological data for the main species of small tunas.

This programme has a wide geographical sampling coverage:

- Mediterranean and Black Sea: bullet tuna, Atlantic bonito, little tunny and plain bonito;
- West Africa: Atlantic bonito, little tunny, tuna, West African Spanish mackerel, frigate tuna, wahoo;
- Caribbean Sea and south-west Atlantic: blackfin tuna, king mackerel and Serra Spanish mackerel and dolphinfish.

2015 Activities

To implement the main activities scheduled in 2015, in particular continuing the recovery of historical Task I and Task II data series and conducting the biological sampling for the main small tunas' species, a draft call for tenders was sent to the Secretariat in February 2015. After discussing the proposal with the SCRS Chair, the Secretariat decided to postpone the call for tenders, until the Group would define the priority stocks to be covered by the biological sampling during its data preparatory meeting that took place in June 2015. Furthermore, during the small tuna data preparatory meeting the Secretariat asked the members of the Group that desire participating in the biological sampling activities to be organized within a consortium to better achieve the objectives of the programme and facilitate the administrative procedures related to the contract to be granted to the consortium. As there was not enough time during that meeting to discuss about the details of this possible consortium, this matter has been delayed to next year.

Following a request from the Group in the 2014 SCRS meeting, in May 2015 the Japanese project for capacity building (JCAP/ICCAT) financed a training course on the identification of species and the biological sampling of small tunas. Ten (10) scientists from eight (8) CPCs of North West Africa (Algeria, Cabo Verde, Côte d'Ivoire, Guinea, Mauritania, Morocco, Senegal and Tunisia) attended this workshop. This training was of great importance for the participants who significantly improved their knowledge in terms of species identification and biological sampling and estimation methodologies of the biological parameters according to ICCAT recommendations. This basic course would allow the participants to conduct the biological sampling activities planned within the SMTYP.

Activities planned for 2016

In 2016, it is planned to continue the recovery of historical Task I and Task II data of small tunas in other areas: West Atlantic and the Mediterranean Sea. This reinforcement of data mining would be necessary to improve the Task I and Task II necessary for the stock assessment of small tunas.

It is also highly recommended to launch collecting biological data and samples, including the size data for the main species in the whole Atlantic and the Mediterranean. Nevertheless, these objectives could not be achieved without financial support from ICCAT. **Table 1** shows the estimated costs related to the activities planned for 2016.

Budget for 2015 and expenditures

There was no activities carried out in 2015 because of the reasons explained above (2015 Activities), so the total budget available for the SMTYP, which is €60.000,00 is still available to cover about 50% of the expenditures expected for 2016 (**Table 1**).

Budget for 2016 and expected expenditures

To implement all the activities planned within SMTYP in 2016, an additional budget about €60,000.00 is needed from ICCAT or other financial resources. The details of costs related to activities to be carried out in 2016 are shown in the **Table 1**.

Table 1. Estimated costs related to activities planned for 2016 under the ICCAT SMTYP.

| <i>Planned activities</i> | <i>Species</i> | <i>Estimated costs (€)</i> |
|---|---|---|
| 1. Recovery Task I and Task II data: - Eastern Mediterranean: EU-Greece, Turkey - Central Mediterranean: EU-Italy, Tunisia - Western Mediterranean: EU-Spain - South West Atlantic & Caribbean Sea: Brazil, Venezuela - East Atlantic: Mauritania | Atlantic bonito (BON) Little tunny (LTA) King mackerel (KGM) Frigate tuna (FRI) Bullet tuna (BLT) | €15,000 €15,000 €7,500 €15,000 €7,500 |
| 2. Supporting biological sampling in the Atlantic and the Mediterranean: size and biological data: - Senegal - Côte d'Ivoire - Morocco - Mauritania - Tunisia - Algeria - Venezuela - Mexico - Cabo Verde - EU (Spain and Portugal) | Atlantic bonito (BON) Little tunny (LTA) King mackerel (KGM) Frigate tuna (FRI) Bullet tuna (BLT) | €7,500 €7,500 €7,500 €7,500 €7,500 €7,500 €7,500 €7,500 €7,500 €15,000 |
| Total | | €142,500 |

ICCAT SHARK RESEARCH AND DATA COLLECTION PROGRAMME

Background and programme objectives

During the 2014 Commission meeting it was decided that an overall budget of €135,000 would be allocated to the Shark Research and Data Collection Programme (SRDCP). During the 2015 Blue Shark Data Preparatory meeting, the Shark Species Group reviewed the proposal for implementation of the SRDCP that had been prepared in 2014 and identified national scientists who would be in charge of preparing proposals for receiving funds to carry out each of the research topics listed in the original proposal. For the first two years the programme focuses on biological and other aspects of the shortfin mako and contemplates extensive collaborative work among national scientists with the aim of contributing information to the forthcoming 2016 shortfin mako stock assessment. It was noted, however, that it was unlikely that all aspects of the projects would be completed in time for consideration in the stock assessment, due to the fact that the Commission moved up the assessment to an earlier date (2016) than originally anticipated by the Group (2017).

2015 Activities

During the 2015 Blue Shark Stock Assessment meeting and shortly thereafter, four project proposals covering different aspects of the life history, stock structure, and fisheries of the shortfin mako were presented: a pan-Atlantic age and growth study; a population genetics study to estimate the stock structure and phylogeography of Atlantic shortfin mako; a post-release mortality study focusing on pelagic longline fisheries; and a satellite tagging study for determining movements and habitat use. A fifth project, to study the trophic relationships of Atlantic mako sharks through stable isotope analysis and possibly fatty acid analysis, was also expected.

Age and growth of shortfin mako in the Atlantic Ocean

The project leader for this study is Dr Rui Coelho, National Scientist from EU-Portugal. There still remain uncertainties about the age and growth parameters of shortfin mako and this project aims to update the available estimates by ageing specimens from multiple areas in the Atlantic. To that end, an inventory of existing vertebral samples available at each national laboratory was compiled, which currently includes a total of 444 vertebrae: 269 from the Northwest Atlantic, 84 from the Northeast Atlantic, 60 from the southwest Atlantic, and 31 from the Southeast Atlantic. All those samples have been, or are currently being processed and digital images will be uploaded to an ICCAT online repository by the end of 2015. At least one biologist from each participating Institute will read and estimate the ages from those samples, and growth models will be developed based on those readings.

Genetic analysis of shortfin mako in the Atlantic Ocean

The project leader for this study is Dr Kotaro Yokawa, National Scientist from Japan. This is an ongoing study by Japanese scientists whose main goal is to estimate the stock structure and phylogeography of the Atlantic shortfin mako using mitochondrial and microsatellite DNA of specimens collected across the Atlantic Ocean. To date 350 samples are available, covering four large areas: Mediterranean Sea, Northwestern Atlantic, Gulf of Mexico and Caribbean Sea, and Southwestern Atlantic. It is hoped that additional samples will be made available by other national scientists to assess the validity of the North and South stocks hypothesis from a genetics standpoint. Assuming a timely availability of samples, all DNA analyses are expected to be completed by October 2015.

Post-release mortality of shortfin mako in the Atlantic Ocean

The project leader for this study is Dr Andrés Domingo, National Scientist from Uruguay. The main purpose of this project is to quantify the post-release mortality of Atlantic shortfin makos on pelagic longlines, which is currently non-existent, to potentially contribute to their assessment and management. To that end a total of 14 Survivorship Popup Satellite Archival Transmitting Tags (sPATs) will be acquired and deployed on both adult and juvenile specimens of both sexes in three main areas of the Atlantic: the Northwest Atlantic, the tropical Northeast Atlantic and equatorial region, and the Southwest Atlantic. Tags will be deployed by scientific observers from DINARA (Uruguay), IPMA (EU-Portugal) and NOAA (USA). Additional tags from another project involving the same partners may also be deployed in these same areas, which cover both hemispheres and both sides of the Atlantic. The tags will be purchased by the ICCAT Secretariat by the end of 2015.

Movements, stock boundaries and habitat use of shortfin mako in the Atlantic Ocean

The project leader for this study is Dr Rui Coelho, National Scientist from EU-Portugal. The main purpose of this study is to use satellite telemetry to gather and provide information on stock boundaries, movement patterns and habitat use of shortfin mako in the Atlantic Ocean, to potentially contribute to their assessment and management. To that end, a total of nine mini Pop-up Satellite Archival Transmitting Tags (miniPATs) will be acquired and deployed on both adult and juvenile specimens of both sexes in three main areas of the Atlantic: the Northwest Atlantic, the tropical Northeast Atlantic and equatorial region, and the Southwest Atlantic. It might also be possible to deploy some tags in the temperate Northeast. Tags will be deployed by scientific observers from DINARA (Uruguay), IPMA (EU-Portugal) and NOAA (USA). The tags will be programmed for 120 to 150 days, collecting data on depth, temperature and light levels. Additional tags from another project involving the same partners may also be deployed in these same areas, which cover both hemispheres and both sides of the Atlantic. The tags will be purchased by the ICCAT Secretariat by before the end of 2015.

Trophic relationships of shortfin mako in the Atlantic Ocean

The project leader for this study is Dr Andrés Domingo, National Scientist from Uruguay. The main purpose of this project is to characterize the trophic relationships of Atlantic shortfin makos using stable isotope analysis. The final proposal is still being developed and it may also include the use of other techniques (e.g., fatty acid analysis) to determine trophic relationships. It is expected that the plan of proposed activities will be completed by the end of 2015.

2016 plan and activities

Age and growth of shortfin mako in the Atlantic Ocean

It is hoped that age estimation and all data analysis will be completed by the end of 2016. This will entail a vigorous collaboration among national scientists for cross-reading of vertebral samples. A final report is expected to be completed in time for the planned 2017 shortfin mako stock assessment meeting.

Genetic analysis of shortfin mako in the Atlantic Ocean

All data analysis is expected to be completed by May 2016 and a final report submitted by August 2016, provided additional samples are available on time.

Post-release mortality of shortfin mako in the Atlantic Ocean

It is expected that all tags will be deployed during 2016. All analyses and a final report are also expected to be completed by the planned 2017 shortfin mako stock assessment meeting.

Movements, stock boundaries and habitat use of shortfin mako in the Atlantic Ocean

It is expected that all tags will be deployed during 2016. All analyses and a final report are also expected to be completed by the 2017 shortfin mako stock assessment meeting.

2015 budget and expenditures

This section presents a summary of the contributions for the SRDCP during 2015. The Shark Species Group developed a budget of €135,000 for Year 1 of the SRDCP that was subsequently funded (**Table 1**). Although all funds have not yet been disbursed, some planned activities of the programme have already been carried out while others are scheduled to take place between October and December. In-kind contributions from CPCs to the programme for Years 1 and 2 include €20,000 for the age and growth study, €55,000 for the post-release mortality study, €100,000 for the genetics study, and €20,000 for the isotopes study.

2016 budget and requested contributions

The proposed budget for Year 2 of the SRDCP (2016) totals €65,000 (**Table 1**), distributed as follows: €15,000 for the age and growth study, €10,000 for the post-release mortality study, €20,000 for the genetics study, and €20,000 for the isotopes study.

Table 1. Summary budget of the SRDCP for 2015 and 2016.

| <i>Project</i> | <i>Participating CPCs</i> | <i>Project leader</i> | <i>Budget (€) 1st year</i> | <i>Budget (€) 2nd year</i> | <i>In-kind contributions from CPCs (€)*</i> |
|--|---|-----------------------------------|---------------------------------------|---------------------------------------|---|
| Life history (Age, growth and reproduction) | Brazil, EU, Japan, Uruguay, US, Venezuela, etc. | Coelho | 5,000 | 15,000 | 20,000 |
| Post-release mortality (PSATs) | Brazil, EU, Japan, Uruguay, US, Venezuela, etc. | Domingo | 40,000 | 10,000 | 55,000 |
| Stock boundaries (Genetics; Movements-PSATs) | Brazil, EU, Japan, Uruguay, US, Venezuela, etc. | Yokawa (genetics); Coelho (PSATs) | 80,000 | 20,000 | 100,000 |
| Isotopes (Trophic relations) | Brazil, EU, Japan, Uruguay, US, Venezuela, etc. | Domingo | 10,000 | 20,000 | 20,000 |
| Total | | | 135,000 | 65,000 | 195,000 |

* In-kind contribution from CPCs includes portion of investigator salaries, fishery observer time, and research vessel time.

Appendix 8**2015 REPORT OF THE SUB-COMMITTEE ON STATISTICS***(ICCAT Secretariat, 21-22 September 2015)***1. Opening, adoption of Agenda and meeting arrangements**

The Sub-committee on Statistics met at the ICCAT Secretariat (Madrid, Spain) on 21-22 September 2015. The ICCAT Executive Secretary, Mr. Driss Meski, welcomed the Sub-committee and highlighted the importance of its work. The meeting was chaired by Dr Guillermo Diaz (USA). The Agenda was discussed, accepted and adopted without any modifications (**Addendum 1** to **Appendix 8**). The following participants served as rapporteurs:

| <i>Section</i> | <i>Rapporteur</i> |
|----------------|-------------------|
| 1, 2, 3 | G. Diaz |
| 4, 5 | M. Schirripa |
| 6, 7 | R. Coelho |
| 8, 9 | A. Hanke |
| 10, 11, 12, 13 | G. Diaz |

2. Review of fisheries and biological data (new and historical revisions) submitted during 2014

The Secretariat presented information contained in the Secretariat Report on Statistics and Coordination of Research in 2015 related to fisheries and biological data submitted for 2014, including revisions to historical data.

The activities and information included in this report refer to the period between 1 December 2014 and 4 September 2015 (the reporting period). All the basic fisheries, biological statistics and data compliance related information have been presented by the Secretariat to the SCRS Working Groups during SCRS inter-sessional and species meetings. The Secretariat continues to note the improvements in terms of data submission using the ICCAT electronic forms. Regarding the activities conducted by the Secretariat, in the most recent years, in addition to the normal activities developed on statistics, publications, data funds management and others, the Secretariat is dedicating (apart from the usual preparation of the majority of the datasets required by each assessment) a lot of additional work to stock assessment activities, whether participating actively in the assessment or coordinating and managing external support to the SCRS work. In addition, the statistical work requested to the Secretariat in the last five years, together with some lack of adherence to deadlines established for data submission, have constituted an enormous amount of work for the Secretariat, which is not sustainable.

The Secretariat applied, to the 2014 datasets reported, the SCRS filtering criteria to accept/reject statistical forms (2014 Report of the Sub-committee on Statistics, Addendum 2 to Appendix 8, Filters 1 & 2) adopted in 2014. The results are based in a total of 68 flags (from 49 CPs and four NCCs: 47 CPs + 13 EU members + four UK-OT members + four NCCs) with possibly reporting obligations. The forms, impossible to be corrected, were considered unreported data, and flags reporting “zero” catch were understood as accomplishing the reporting task.

2.1 Task I (nominal catches and fleet characteristics)

The Secretariat presented 2014 data reporting status (Secretariat Report on Statistics and Coordination of Research in 2015, Table 1 and 2) of the two datasets of Task I statistics (T1FC: fleet characteristics; T1NC: nominal catches).

The information requested on Task I fleet characteristics (T1FC), was object of a large revision in 2014 (information now requested by individual vessel), aiming to collect better information on fishing capacity by fishery, fleet structure, and yearly based (gear independent) global effort (effective fishing days). Forty six flags submitted T1FC information (form ST01-T1FC) for 2014, during the reporting period (42 by the reporting deadline and four after). The reporting ratio (number of flags reporting this dataset) reached 75% with about 15,000 vessels (length overall ranging from two meters to 220 meters) reported as being actively fishing in at least one of the ICCAT major fisheries.

The Secretariat noted that there are currently four different TIFC reporting deadlines (i.e. BFTE, SWOM, ETRO, SCRS) and that the SCRS should consider proposing that the only deadline for all those submissions be 31 July.

Task I nominal catch data (T1NC) on landings and discards by species, stock, gear, fleets and year, is a fundamental piece of information used in all the stock assessments. The availability of timely data is essential for the SCRS work. Table 2 in the Secretariat Report on Statistics and Coordination of Research in 2015 summarizes, for the 13 major ICCAT species (ten tuna and tuna-like species and three shark species) and the group of small tuna species (any of 14 species, including dolphin fish), the T1NC information provided during the reporting period. In summary, the Secretariat received T1NC data from 56 flags during the reporting period.

The Sub-committee also noted that the number of CPCs that are explicitly reporting “zero” catch in Task I (above-mentioned report, Table 8c) has increased.

2.2 Task II (catch & effort and size samples)

The 2014 data related report cards of the two datasets of Task II statistics (T2CE: catch & effort; T2SZ: size samples) were also presented (Secretariat Report on Statistics and Coordination of Research in 2015, Table 3 and 4). The reporting status of Task II, after applying the filtering criteria agreed by the SCRS in 2013, shows worse results for T2CE than for T2SZ datasets. In general, those datasets have poor (less information) reporting ratios compared to Task I. Both T2CE and T2SZ datasets are analyzed by major ICCAT species (major tunas, major sharks, and any of the 13 small tuna species and dolphin fish).

The T2CE dataset reporting status shows that only 49 flags reported data. However, some of those reports did not pass the data filters (see Section 3.1 of this report). T2CE information from 14 flags were not yet reported. The Sub-committee noted that almost one fifth of the flags required to report failed to provide any information.

On the other hand, T2SZ dataset reporting status shows that 28 flags reported data in good conditions (26 in time and 2 after deadline). The T2SZ information from 25 flags is still missing. The Sub-committee acknowledged the progress in reporting T2SZ in good conditions, despite the continuing high number of flags missing size data reports.

The Sub-committee reiterated that the Species Groups should review the Task II data to ensure accuracy, identify data gaps, and recover missing historical data when possible.

2.3 Tagging

Conventional and electronic tagging information (release and recovery data) continues to be reported to ICCAT on a regular basis. During the reporting period, ICCAT CPCs have reported tagging data from 716 specimens released and recovery data from 290 individuals (Secretariat Report on Statistics and Coordination of Research in 2015, Table 5a). However, the large number of tags associated to the ICCAT GBYP has yet to be included in the tagging database. As in previous years, the ICCAT Secretariat has, at disposal of the ICCAT scientific community (scientists or scientific institutions from ICCAT CPCs), conventional tags for tagging experiments. During 2014/2015 the Secretariat distributed 2,550 tags to the ICCAT scientific community (above-mentioned report, Table 5b). A large portion was directly associated with ICCAT GBYP.

The Secretariat also indicated that U.S. tagging data for the past few years has yet to be incorporated into the ICCAT-DB. The Secretariat further indicated that to complete that task it requires the assistance of U.S. National Scientists. The Sub-committee encouraged the U.S. to assist the Secretariat on this task since U.S. tagging data encompasses the majority of the ICCAT tagging data.

2.4 ICCAT GBYP related data

The ICCAT GBYP presented a short summary of its data related activities in 2015 and discussed the need to create new specific databases for this project for various datasets in an agreed format so they can be made available to all interested scientists.

The new databases that need to be developed for ICCAT GBYP data include: i) Market, auction and commercial data; ii) Electronic tagging data; iii) Research Mortality Allowance data; iv) Biological data and studies (ageing, microchemistry, genetics, otolith shape analyses, maturity); and v) Aerial survey data. Developing these new databases will require significant investments of time and will result in an increased workload for ICCAT GBYP staff. The Sub-committee agreed that this work is essential, particularly taking into consideration that most of these data are needed for the new Modelling MSE approaches.

The Secretariat informed that trap data submitted to ICCAT GBYP has been provided in a number of different formats which cannot be included in standard ICCAT databases. In a preliminary comparison with the ICCAT databases, many errors and inconsistencies in ICCAT GBYP data were found including: typographical errors, the use of different weight types, inconsistent number formats and inadequate naming conventions for traps.

The Secretariat presented a document describing additional ancient trap data recovered in ICCAT GBYP Phase 4 and 5, and summarized the results of various methodologies for converting number of fish into weight (SCRS/2015/148). The results are sensitive to the method applied. The Sub-committee recommended that the Bluefin Tuna Species Group review these methodologies and determine best practices.

2.5 ICCAT biometric relationships and other conversion factors, revision and update work plan

The Secretariat informed the Sub-committee on updates with respect to the biometric relationships used by the different species groups. It was indicated that the Bluefin Tuna Species Group has updated such relationships which have been already uploaded to the ICCAT web site; while the Swordfish and Southern Albacore Species Groups are currently working on updating the biometric relationships. The Sub-committee reiterates that the species groups, which have not yet done so, should review the current values and elaborate a multi-annual work plan to update the biometric relationships and other conversion factors. The work plan should establish priorities by species.

2.6 Other relevant statistics including newly submitted observer data

In 2015, the Secretariat made Form ST09-NatObPrg available. This form was developed to facilitate the reporting catches, including by-catch, effort, gear characteristics, and other relevant information collected by National Observer Programmes. It is expected that this form will change in the near future after CPCs have the opportunity to work with it and provide input for potential improvements. The Secretariat has already received suggestions from the Sub-committee on Ecosystems with regard to potential changes to the form. A database to store the data submitted using ST09-NatObPrg is currently under development by the Secretariat as well as the dedicated applications needed to facilitate importing the submitted data. In 2015, the Secretariat received submissions using form ST09-NatObPrg from only five CPCs. Table 6a in Secretariat Report on Statistics and Coordination of Research in 2015 summarizes the by-catch data submitted during the reporting period. Tables 7a and 7b summarises data submitted for sea turtles and seabirds. The Secretariat indicated that some CPCs have reported observer data, including sea turtle and seabird data, using means other than the electronic form ST09-NatObPrg. The Sub-committee asked the Secretariat to reach out to these CPCs and request that the data be re-submitted using form ST09-NatObPrg.

The Secretariat summarized improvements made to the forms, including new fields to report required seabird by-catch mitigation measures, the ability to record the number of hooks or sets for longline trips, and improved linkages for the various datasets. The Secretariat will continue to cooperate with data providers to improve the ST09-NatObPrg form as needs arise and encouraged CPCs to submit by-catch data using the form. The importance of CPCs informing their statistical correspondents of data needs was highlighted. It was noted that a separate data call will be distributed by the Secretariat for by-catch species (seabirds and turtles).

The Sub-committee briefly discussed linking the Observer data with the T1NC data. It was pointed out that some CPCs might report catches/discards on both forms and therefore joining both datasets can potentially result in data duplications.

The Sub-committee acknowledged the excellent work that the Secretariat did preparing the electronic forms to report observer data particularly taking into consideration the complex nature of the data collected by scientific observer programmes.

2.7 Development of web based tutorial for ICCAT data submission

In 2014, the Sub-committee agreed that the Secretariat should explore the development of a web based tutorial for data submission. This decision was in response to the preliminary results of applying data filters 1 and 2 to the 2013 submitted data which showed that a significant proportion of the data submitted did not pass the filters.

The Secretariat presented a tutorial video “Introduction to ICCAT Statistical Forms” developed by the ICCAT Japan Capacity Building Assistance Project (JCAP). Currently, the tutorial is only available for the form ST02-T1NC in English language. The video will be translated into all official ICCAT languages, and similar videos will be made for each of the Task I and II electronic forms. The Secretariat will post the videos in its web site, advertise their availability, and monitor the number of times they are viewed and/or downloaded to determine their utility.

3. Review of criteria applied to ICCAT statistics

These criteria are provided in the Secretariat Report on Statistics and Coordination of Research in 2015.

3.1 Application of Filters 1 and 2 on data submission

The Secretariat used two filtering protocols (Secretariat Report on Statistics and Coordination of Research in 2015) intended to identify data submissions that do not comply with the formatting requirements. In general, the Secretariat has noted a slight improvement in reporting quality in 2014. For all ICCAT forms, the major causes of Filter 1 rejections (more than 80%) were: incomplete headers; not using the ICCAT standard codes, not using the most up-to-date ICCAT forms or valid formats. The Secretariat noted that out-of-date Task I areas are still being used, and reminded that CPCs must use the current sampling areas. While “Filter 1” is currently fully implemented, the Secretariat will continue to test “Filter 2” as described in the above-mentioned report for potential implementation in 2017.

The Sub-committee recommended the following additions to “Filter 1” protocols: that data submissions be accepted only from identified statistical correspondents (i.e. the name specified in the header must be an official statistical correspondent). That is because according to ICCAT rules, data submitted by others other than the official CPC statistical correspondent are not considered official submissions. To implement this filter, the Secretariat will include in the annual report of the SCRS the list of current statistical correspondents for CPCs to review and, if warranted, an update.

With regard to the results of applying Filter 1 to the submitted data, Tables 1 to 4 in the above-mentioned report show those data that did not pass the filter (orange cells with the number ‘-0.2’).

For the T1FC data, the submission for eight flags failed to pass the filter either completely or partially. With regard to the T1NC data, all the data reported by eight flags did not pass the filter, while for five flags only some of the data submitted passed the filter but not all. Similarly, for the T2CE data 12 flags failed to pass the filter for all the data or part of the data they submitted. In the case of the T2SZ data, all the data or part of the data for 12 flags has also been rejected by the filters.

3.2 Changes to ICCAT coding systems

The Sub-committee identified several issues related to the ICCAT species list. More specifically, the Sub-committee requested the Secretariat to review the list to be sure that only Atlantic species are included, and to include a species code for generic pilot whale and generic spearfish. The Sub-committee also requested that the Shark Species Group discuss if the coastal sharks that were deleted from the list should be included once again given that they are by-catch of some ICCAT fisheries. It was also recommended that the Billfish Species Group review any historical submission of Indo-Pacific sailfish and decide if that species should be kept in the list of ICCAT species. Finally, the Sub-committee also agreed that the Sub-committee on Ecosystems review the current list of by-catch species.

The Sub-committee agreed that the gear codes in the new ST01-T1FC form should replace the gear codes used in the other Task I and Task II forms. This change (in conjunction with enlarging from 3 to 4 the fisheries activity section: “Fishery4Cd”) should be introduced in the 2016 electronic form.

It was noted that the Task I tables that are included in the Executive Summaries include the gear code SPORT(HL+RR), but the landings included under that gear category include both commercial and recreational/sport landings. Hence, the Sub-committee requests the Secretariat to provide the Sub-committee with a recommendation on the best way to report separately in the Task I tables commercial and recreational/sport catches from handline and rod and reel gears.

The Secretariat presented to the Sub-committee its proposal to reduce the number of ICCAT sampling areas for skipjack, bigeye and yellowfin. The Sub-committee agreed with the proposed changes and urged the Tropical Tunas Species Group to review and, if warranted, adopt the Secretariat's proposal as soon as possible.

4. Review of Secretariat yearly based fishery datasets estimations and dissemination

4.1 Catch Distribution (CATDIS)

The Secretariat has continued to improve the detail level in CATDIS. A full revision of CATDIS was made available in July 2015 for the nine major species, aimed to include various historical T2CE catch series recovered during 2014 and 2015, and also, specific revisions that were made to Task I since the prior version. The resulting maps were published in the ICCAT Statistical Bulletin, Vol. 42(II) (<http://www.iccat.int/sbull/SB42-2-2015/index.html>).

The Sub-committee recommended that the species group review the newly available CATDIS and communicate to the Secretariat any potential necessary changes/improvements.

4.2 CAS (catch-at-size) and CAA (catch-at-age)

The Secretariat reported (Secretariat Report on Statistics and Coordination of Research in 2015) that the CAS database has been completed and it is now functional with connectivity between the size data and the substitution tables used to estimate CAS. In 2015, the Secretariat updated the CAS and CAA for bigeye tuna in support of the stock assessment conducted for this species. However, that revision did not include newly submitted historical data by EU scientists for the period 2006-2013.

4.3 New Effort Distribution (EFFDIS) estimates

The current EFFDIS covers estimated total nominal effort for longline for the period 1950-2009 and was used for the 2009 seabird assessment. Per SCRS recommendation, a contractor was hired to develop a new statistical modeling approach to update the EFFDIS for longline gear for the period 1950-2014. The contractor presented a report of the completed tasks (SCRS/2015/206) which include a series of R codes that could be used to extract data and different EFFDIS products. National Scientists were encouraged to test the R codes and provide recommendations for their improvement. The contractor discussed the modeling approach used to estimate EFFDIS and the limitations of the methodology. The Sub-committee reiterated the recommendation from the Sub-committee on Ecosystems that required National Scientists to review the results of EFFDIS. The contractor indicated that the work will be completed before the end of October 2015 and the Secretariat will discuss how to make data and estimates available to CPCs.

The Sub-committee was pleased with the progress made in the estimation of EFFDIS given how essential this database is for advancing some of the ongoing work with by-catch species.

4.4 Others

Document SCRS/2015/164 presented an example of the analysis and comparison of fisheries data information provided by ISSF tuna canning participating companies and the ICCAT current databases. Results show that data submitted by ISSF participating companies represent a partial coverage of total catches and that catch species composition and size (weight) frequencies do not align in all cases with those derived from ICCAT Task I and Task II databases. However, these data are regarded as useful complementary data and it is recommended that canning data be compiled (in a more standard format) also from other canneries processing tuna caught in the Atlantic Ocean, so as to improve the usefulness of this type of database.

The Sub-committee discussed the usefulness of using data from canneries to compare with data in the ICCAT-DB. There was a general agreement that while recognizing the limitations of the data from canning companies, the proposed comparison can be very useful and can help to identify data errors in the ICCAT-DB.

5. Review of existing data submission policy

5.1 Statistics reporting formats (e-FORMS)

All the electronic forms used to collect Task I and Task II data (ST01-T1FC, ST01-T1NC, ST03-T2CE, ST04-T2SZ, and ST05-CAS) were updated to version “2015a” to incorporate the changes required by the SCRS (codes, structures, filtering criteria, etc.). In 2014 the Secretariat developed four new electronic forms:

- a) Form ST08-FadsDep was created in response to Rec. 13-01 that requires CPCs to report information on the number and characteristics of the FADs deployed on a quarterly basis. In 2015, the Secretariat only received submissions from seven CPCs: Belize, EU-France and EU-Spain, Curaçao, Ghana, Panama, St. Lucia and UK-OTs.
- b) Form ST07-TropSupVes was also created in response to Rec. 13-01 that requires CPCs to report information regarding support vessels associated to purse seine and baitboat in the tropical tuna fisheries. In 2015, the Secretariat received information from four CPCs: Curaçao, EU-Spain, EU-Italy, EU-France, St. Lucia and UK-OTs.
- c) Form ST09-NatObPrg was developed for the submission of data collected by National Observer Programmes. See Section 2.6 of this report.
- d) Form ST01-T1FC was redesigned to integrate a number of vessel lists that were required to be submitted by CPCs which created duplication of effort.
- e) Form ST10-PortSamp only Canada provided information.

For 2016, the Secretariat will update all the statistical forms (ST01 to ST10, version “2016a”) aiming to incorporate all the changes (codes, zero sub-form, sampling areas, etc.) described in this report.

5.2 Data submission deadlines

The Sub-committee reiterates that all data submissions should be done using the approved electronic forms. Task I and II data submission done using other means (e.g., fax, Annual Reports) are not considered official data submissions. For compliance purposes, the deadline for the submission of Task I and II data is 31 July. The deadline for the submission of data for data preparatory and stock assessment meetings that are conducted before 31 July is three weeks before the start of the meeting. While acknowledging that 31 July is the data submission deadline for compliance purposes, the Sub-committee requests that CPCs make all the necessary efforts to provide data on time for those meetings that are conducted before 31 July.

5.3 Proposed protocol to report zero catches

In 2011, the Commission adopted the *Recommendation by ICCAT on Penalties Applicable in Case of Non-Fulfilment of Reporting Obligations* (Rec. 11-15). The Recommendation required that CPCs not only report positive catches, but also zero catches. Since then, there has been confusion with regard to how to report zero catches. More specifically, in which cases the reporting of a zero catch is required and when it is not. Based on the experience gained since the adoption of Rec. 11-15, the characteristics of the ICCAT databases, and the existing ICCAT coding system (e.g., species codes, gear codes, area codes), the Sub-committee developed a protocol for the reporting of zero catches (see **Addendum 2 to Appendix 8**).

In summary, the Secretariat will create an electronic form with a matrix of stocks and gear groups. For each combination of stock/gear, CPCs will have to enter a ‘0’ to indicate a zero catch (real zero), a ‘1’ to indicate positive catches, and a ‘-1’ to indicate that no fishing activity was conducted for that stock/gear combination (global zero). Once this matrix is in use, CPCs will not have to report real zero catches in the form ST02-T1NC any longer. Real zero catches reported using the matrix will then be automatically uploaded to the Task I ICCAT-DB.

The Sub-committee discussed the merits of the proposed protocols. There was some concern that CPCs will now have another form to fill and submit. The Secretariat indicated that the proposed matrix can be made part of the ST02-T1NC, which will not increase the number of forms currently in use. The discussion with regard to the definition of ‘global zero’, and if not targeting a particular species, was considered a ‘global zero’. The Sub-committee convener indicated that ‘global zeros’ are not defined based on targeting, but they indicate the lack of fishing activity on a particular stock due to the CPCs not fishing in the area occupied by the stock or not fishing with a particular gear.

6. Evaluation of data deficiencies pursuant to Rec. 05-09

6.1 Current data catalogues of major species by stock

The Secretariat presented the data catalogues for major ICCAT species, noting that this year those tables also include small tunas (Secretariat Report on Statistics and Coordination of Research in 2015, Tables 2 to 4). The Sub-committee acknowledged improvements in data submissions. However, major deficiencies still exist for some ICCAT stocks, particularly for the historical data. Once again, the Sub-committee agreed that this information should be reviewed by the species groups, in particular by those that are scheduled to conduct stock assessments in 2016.

Rec. 05-09 recognized the need to establish a clear process and procedures to identify data gaps, particularly those that limit the ability of the SCRS to conduct robust stock assessments, and to find appropriate means to address those gaps and evaluate the effectiveness of the ICCAT conservation and management measures. MSE, e.g. as conducted by the Albacore Species Group to evaluate limit reference points, could be used to conduct cost benefit analyses. Particularly to evaluate how reducing uncertainty can help reduce the risk of failing to meet management objectives.

The Sub-committee expressed particular concerns regarding the very limited data that has been provided from coastal fisheries (i.e., coastal longlines and gillnets) on vulnerable by-catch such as seabirds and sea-turtles. The Sub-committee on Ecosystems, in particular, is concerned that this will be a limiting issue when assessing the impacts of the ICCAT fisheries on the status of those populations.

7. Review ICCAT-DB (ICCAT relational database system)

7.1 Progress made and future plans

The Secretariat presented to the Sub-committee a description of the current status of the ICCAT-DB system and the progress made during the year (from December 2014 to September 2015). The Sub-committee recognized the excellent work (optimization in some databases, entire redesign of others, new ones implemented, new tools, etc.) of the Secretariat in keeping up-to-date the ICCAT-DB system, having always as objective its continuous (long-term) and sustained evolution over time, and fully supported that the Secretariat should continue this work. More details can be found in the Secretariat Report on Statistics and Coordination of Research in 2015.

The SCRS is using Cloud based tools to develop interactive tools (rscloud.iccat.int/effdis), make stock assessment datasets available (rscloud.iccat.int/kobe) and run assessments and other analyses (rscloud.iccat.int/rstudio). In addition, under action 1.3 of the strategic plan, the software catalogue is being placed on a github repository (github.com/ICCAT/software/wiki/1.-Introduction).

The Sub-Committee agreed that a priority for future work should be the integration of tagging data between U.S. scientists and ICCAT. Presently there is a data exchange protocol to update data between the U.S. tagging programme and ICCAT, which is important considering that most of the ICCAT conventional tagging database comes from U.S. tags. This is a process that currently is done manually and as such is very time consuming, so a priority should be to develop tools for this data exchange and updates.

The Sub-Committee noted that the JAVA code developed is transferable and the Secretariat can provide applications (executables) that can perform specific tasks for the CPCs in a user friendly environment. Specifically, tools for pre-validation of forms that CPCs have to submit to the ICCAT Secretariat, can be developed. This would require some testing, and the preliminary testing versions could be available and distributed by June/July next year.

7.2 Status of the code migration (VBA to JAVA) Project

The “JavaMig” (majorly the migration of 12 VBA client-server applications to Java technologies) started in February 2015. The Secretariat presented the work carried out up-to-date, showing some examples of applications already functioning. Several important previewed tasks were implemented (by the Secretariat) in parallel with the “JavaMig” project. These basically involved synchronisation of the ICCAT-DB system with the eBCD system (vessels, traps, farms, ports, joint fishing operations) and also with the tRFMO CLAV (Consolidated List of Active Vessels) database. The Secretariat expressed how pleased they were with the current achievements of the “JavaMig” project, emphasizing the development approach adopted (“in-situ” and full time Java Expert). The daily assimilation of knowledge on Java technologies by the IT Department is an extremely valuable gain. However, one year to learn Java is not sufficient. The Sub-committee appreciated and recognized the importance of the work done until now and proposed its continuity in the future.

7.3 Advances on ICCAT-DB documentation (user guides & reference manual)

The Secretariat informed the Sub-Committee that three sources of documentation related to the ICCAT-DB are now running in parallel: a) The “JavaMig” project, with a User’s Guide (MS-Word) for each application developed; b) The Java code documentation (“javadoc” standard web format); c) The database Reference Manuals (“docbook” XML schema). Handling them separately (maintenance, update, etc.) could be really problematic in the future. In consequence, the Secretariat spent some time studying the best option to merge them all in a single system. The ICCAT-DB documentation should evolve in parallel and synchronized with its evolution over time. It should be considered in the future as, a continuous yearly task of the Secretariat IT Department. The Group acknowledged and thanked the Secretariat for the progress made as regards to this.

7.4 Status of ICCAT cloud infrastructure

The Secretariat informed that the ICCAT cloud infrastructure has now four dedicated Linux (Ubuntu 15.04) servers deployed in a RackSpace datacentre (London): A webserver, a database server, a cloud computing machine, and a new server for *OwnCloud* testing future use. In addition, several new services were tested and deployed of which the most important were the “Shiny” web application framework for R, and, the EFFDIS GIS framework and tools (details in SCRS/2015/206) in some of the servers. The Group acknowledges the importance of the ICCAT cloud infrastructure in the future for the Secretariat having direct benefits to the SCRS and Commission. Therefore, it supports its progress.

7.5 Status of ICCAT VMS system

The Secretariat provided an update on the status of the ICCAT VMS system. The Secretariat made the Sub-committee aware of the fact that the current system has been in operation since 2008. As the system is in constant operation (24 hours a day for seven days a week) and the system is currently fairly old, there is a very real risk of a system failure. This system failure would prevent the reception of VMS messages, could result in loss of existing messages, and would greatly compromise the functionality of the important VMS system. As such the Secretariat has requested a proposal from the service provider (CLS) to update the software and hardware of the current outdated system. This request did not include any changes to the existing functionality of the system but purely updates the system in order to prevent any crucial failures and data loss. A preliminary proposal was received, but the Secretariat has responded with some revisions to the original proposal and is at present awaiting a revised proposal. The Sub-committee acknowledged the importance of the system and fully supported the Secretariat’s proposal to update the system to ensure its continued functionality.

8. National and international statistical activities

8.1 International and inter-agency coordination and planning

Due to schedule conflicts between SCRS intersessional meetings and the Coordinated Working Group on Fishery Statistics (CWP) meeting, no Secretariat staff attended the CPW 2015 meeting. With regards to the Monitoring System for Fishery Resources (FIRMS), in 2015 the Secretariat updated the fact sheets for skipjack and Mediterranean swordfish which were evaluated by the SCRS in 2014. The iMarine is an open initiative to support the implementation of EBFM and the conservation of living marine resources. In 2015, the Secretariat attended an online seminar entitled ‘iMarine Support to Tuna Atlas: from scattered data to integrated indicators and SmartForms prototype for mobile data collection of on-board scientific observer data’. The Secretariat attended the DG MARE EU workshop on reporting obligations. CITES reached an agreement with ICCAT to provide small scale funding for two training workshops in West Africa on species identification, collection of biological samples, and collection of fishery statistics data. ICES and ICCAT will also continue to have joint training courses, agree to conduct joint shark assessment and joint meetings of the methods and MSE Working Groups.

GEF-Open Ocean ABNJ tuna project will provide funding for a joint meeting of tRFMOs to discuss MSE, and also for another joint meeting of tRFMOs to advance the implementation of EBFM. ICCAT will lead this last Group.

9. Report on data improvement and data recovery activities

9.1 Data recovery activities

The Secretariat informed that several CPCs have submitted historical revisions to TINC for tuna and tuna-like species, sharks and other by-catch species. Those revisions are summarised in the Secretariat Report on Statistics and Coordination of Research in 2015, Table 8a (TINC updates having an SCRS document and provisionally integrated into the ICCAT-DB system). The *faux poisson* TINC catch series were revised and updated again (SCRS/2015/072), covering two distinct periods (1982-2004, with flag combined catches; 2005-2014 with catches separated by flag). The ICCAT GBYP research mortality allowance Task I catch series was updated (2012-2014) to incorporate the gear.

There is also another set of TINC data (covering both, historical revisions and recent years) in the above-mentioned report, Table 8b for albacore from EU-France and for several species from Ghana which were not integrated into the ICCAT-DB system. Therefore, the Sub-committee recommends that the pertinent species groups review these TINC data and decide if they can be integrated to the ICCAT-DB system.

In relation to T2CE, the Secretariat indicated that only a few historical revisions were provided (Côte d'Ivoire and EU-France) during the reporting period. All the datasets (above-mentioned report, Table 9) were provisionally integrated into the databases of ICCAT and have pending SCRS approval.

The Secretariat has received some important historical T2SZ datasets which are summarized in the above-mentioned report, Table 10, the majority of which were already approved by SCRS. However, there is still approval pending for bluefin tuna size data submitted by EU-Spain.

9.2 National data collection systems and improvements

The U.S. informed the Sub-committee that since in 1 June 2015, all U.S. pelagic longline vessels are required to carry an Electronic Monitoring System (EM) on-board consisting of two cameras and VMS units that allows for real time reporting of bluefin tuna catch and effort data. The U.S. further indicated that these EM are for monitoring compliance with bluefin tuna U.S. domestic regulations.

A substantial component of United States catches of yellowfin tuna are made by recreational anglers using rod and reel gear. The U.S. monitors these catches using various (creel) angler surveys. For instance, the Marine Recreational Information By-catch (MRIP) survey collects data on U.S. marine recreational fishing, including much of the data used for Task I and II reporting to ICCAT. Recently, the Gulf of Mexico coastal State of Louisiana implemented a new recreational creel survey, achieving an increased level of overall sampling in the intercept survey, including sites from which offshore fishing trips are conducted, when compared to MRIP. As part of ongoing effort to improve estimates of recreational catches of offshore and pelagic species, NOAA Fisheries is supporting a peer review of the new survey programme, and cooperating with the Louisiana Department of Wildlife and Fisheries to conduct a side-by-side benchmarking of the Louisiana Recreational Creel Survey against the MRIP survey.

Canada reported that it has purchased six onboard camera systems that will be used to monitor the catch of its bluefin tuna charter boat fishery in the Gulf of St. Lawrence. Systems are waiting on contractors to make the installation.

The EU indicated that the EU purse seiners operating in the tropical tuna fisheries continue to have 100% observer coverage and e-monitoring systems, and that further results will be presented in the future for both purse seine and longline. Last year some preliminary results on e-monitoring in purse seine were presented (Monteagudo *et al.*, 2015, and SCRS/2014/138). It was emphasized that the complete coverage was very important for detecting rare by-catch events and that in terms of reporting an integrated report, rather than flag by flag, should be implemented.

9.3 Proposals for data recovery plans and improvements on data collection systems

The SCRS Shark Species Group has recommended that efforts be made to recover shark Task I and II historical data and that the process used to recover historical data be reviewed and, if warranted, be improved (See Section 10 of this report). The Shark Species Group also requested that the Commission provide funding to complete this data recovery task. The Sub-committee agreed that since most of the expertise on shark Task I and II data resides within the Shark Species Group, that this Group should develop and propose a plan for shark data recovery together with an accompanying budget to complete the task.

The Small Tunas Species Group indicated that Task I and II data recovery activities were conducted in Côte d'Ivoire, Morocco and Senegal in 2013. The Group indicated that Task I and II data recovery activities will resume in 2016 with particular emphasis in Mediterranean and some western Atlantic fisheries.

The Sub-committee discussed that the amount of dead discards of some species (i.e. sharks) can be very significant, and that some emphasis should be placed on the recovery of dead discard historical data. While the importance of this data was recognized, each Species Group must decide if it is a priority.

10. Consideration of recommendations from the 2015 intersessional meetings

A number of recommendations made during various intersessional meetings in 2015 of pertinence to the Sub-committee were made. The following were reviewed and endorsed by the Sub-committee:

Bluefin tuna

- The Group recommended that the Secretariat request revisions to the Task I and II data submitted to ICCAT from each CPC with important bluefin tuna fisheries. Specifically, the CPCs are requested to:
 - a) Provide detailed metadata describing the quality of the available Task I and II data in accordance with the specifications from the Appendix 5 of the 2014 Report of the Methods Working Group.
 - b) Revise their submissions of Task II size data to include the actual size samples used to estimate the catch at size (rather than only the catch at size) and, where appropriate, using the weight/length conversions adopted herein (in accordance with the provisions given in Appendix 4 of the above-mentioned report).
 - c) Considering that the adoption of the new L/W relationships can have implications in the Task I nominal catches, in particular to those series that utilized length-weight conversions factors to estimate catches, the Group recommended to CPCs involved, to update their Task I series through a multi-annual work plan.
- The submission of data from individual electronic tags should include, at a minimum, resolution of days per stock region (eight box model) summarized by sequential month and year.

Sharks

- The Group reiterated the need that any historical Task I (including discards) and Task II data be estimated and incorporated into the official ICCAT Task I and Task II database.
- The Group recommends that ICCAT makes funds available for the recovery of historical datasets on catches of sharks in the ICCAT area. Furthermore the Group recommends that the SCRS discuss the processes used by ICCAT to recover historical data in the past to see whether there are ways to improve the efficacy of such data recovery actions.
- In light of the Commission request to have a shortfin mako assessment in 2016, the Species Group recommends that the Commission support a second year of funding for the SCRS Shark Research and Data Collection Programme, as specified in the initial proposal developed by the SCRS in 2014. Such funding will be essential in supporting the preparation of data for such assessment and subsequent shark assessments.
- The Group requested that, when possible, the estimation of the new EFFDIS be made at fleet level to account for fleet specific characteristics.

Bigeye tuna

- Statistical analysis of the logbook and sampling data of the EU purse seiners (and of the fleet of associated flags) should be conducted by EU scientists in order to review current methodology to estimate catches and sizes by species of the purse seine fleet. This study should be focused in order of priority: (a) the revision and identification of best time and area strata that should be used in the data processing, and (b) the revision of basic criteria to be used in an improved data processing system (e.g. concerning the minimum levels of samples used, sampling rate and number of fish measured and, when needed, the rules used in strata substitution).

- The Group recommends continuing with the recovery of fisheries statistics from Angola in particular for tropical tuna species. The Group supports the efforts of the Secretariat and the JCAP programme to continue working with Angolan scientists and the CPCs involved with tropical tuna catches within the Angolan EEZ (foreign fleets) to confirm the level of catches and if these have or not already been reported to ICCAT. The Group requests a report be made available for review for the next species group.
- The Group reviews the update of *faux poisson* by species and country and integrated the revision of *faux poissons* by species and country in Task I data of *faux poisson* landings. However, the Group was concerned about the possibility that some fraction of these catches could be double counted in Task I as they can be reported also in logbooks. Therefore, the Group recommends that CPCs review and identify whether the *faux poisson* catches are included in the logbook to avoid the double-counting of catches. The Group also considered to substitute the term *faux poisson*, currently used as category in the ICCAT databases, by a more descriptive name such as local market. However, the Group considered that this decision should be postponed to the next Sub-committee on Statistics meeting.
- The Group inquired about the quality of the fisheries statistics (Task I and II) submitted by the different CPCs to the Secretariat. A form has been designed to be circulated to the main catching CPCs, asking for details of their sampling and data collection programmes as well as the protocols for fisheries statistics estimation in other ICCAT species groups. It was recommended that a similar form be proposed for the tropical tuna fisheries, in order to provide the Group with some information which can be used for evaluation of the quality of the fisheries data submitted.
- Within the overall plan of improving Ghana statistics, in 2014, the SCRS recommended developing and applying software necessary for the treatment of Ghana statistics. At its 2014 annual meeting, the Commission considered that this activity could be funded by other sources and did not include it in the list of activities eventually approved by the Commission. Thus, the Group recommends that the Secretariat seek alternative funds to complete this activity.
- The raw size information of the European purse seine sampling from 1980 to 2014, as requested by the SCRS, has been partly provided to ICCAT since all French Task II size samples (all species) from 1980 onwards were submitted. Thus, the Group recommends that the raw size information of other purse seine sampling programmes be provided to ICCAT.
- The Group noted that the change in the size composition of Chinese Taipei longline fleet catches around 2005, showing larger fish from that period onwards, could be related to changes in fishing strategy due to the introduction of control and surveillance in domestic regulations. The Group recommends that the length frequencies of Chinese Taipei be reviewed relative to potential changes in the sampling strategies due to domestic regulations.
- The Group reviewed and compared the updated bigeye tuna catch-at-size provided by Japan and the current available at the Secretariat. Differences were found in the size frequency distributions by years and total estimated numbers of fish caught by year. When estimated landings were compared to reported Task I significant differences were also found for some years. The Group is requesting Japan to review these differences and report to the Group the reasons for such differences, indicating what will be the best scientific estimates of total catch.

Ad Hoc Working Group on FADs

- Request the SCRS to review the current template including the detailed information to be collected. The review should use the CECOFAD project template as a starting point to select the most important variables to be collected.

Sub-committee on Ecosystems

- The Sub-committee recommended that CPC scientists should, where possible, validate the EFFDIS estimations by analyzing and comparing the outputs from that study with their own data.
- The Sub-committee recognized that very little Task II or by-catch data have been submitted for gillnet fisheries and thus the Sub-committee recommended that CPCs who have gillnet fisheries should submit Task II and by-catch data.

- The Sub-committee recommended that the next priority for EFFDIS estimations include the gillnet fisheries.
- CPCs should collaborate on work and data exchange in 2016 on by-catch rates of sea turtles and seabirds between fleets for use in impact assessments.
- The Sub-committee recommended that the current observer templates be modified to include the number of hooks observed in Form C (at the set level), and to use drop down menus for the three seabird by-catch mitigation measures listed in Rec. 11-09.
- The Sub-committee recommended that the Secretariat make a special data request to CPCs with current and historic fishing effort south of 25°S to submit seabird by-catch and associated fisheries data using a revised observer form for the years 2010-2014 in time for the 2016 Sub-committee meeting at which Rec. 11-09 will be reviewed.
- The Sub-committee recommended that the Secretariat contact CPCs to fill and verify data gaps in sea turtle by-catch rates for their longline fleets to further advance the sea turtle impact assessment.

Small tunas

- National scientists should review the estimations of nominal catches (mostly in the form of carry overs, as shown in the 2015 Report of the Small Tunas Species Group Intersessional Meeting, Table 2) made by the species group aiming to provisionally replace T1 official statistics. These Task I revisions (which should also focus, whenever possible, on the elimination of the small tuna “unclassified gear” problem, see the 2015 Report of the Small Tunas Species Group Intersessional Meeting, Table 3) should be presented in a scientific document, as required by the SCRS.
- The Secretariat should continue its work on the data recovery and inventory process of tagging data for small tunas. This process will require the active participation of the national scientists that hold such data.
- CPCs should report frigate tuna catches (FRI) in the Mediterranean as bullet tunas (BLT) because the most recent published genetic studies indicate that only *Auxis rochei* exists in the Mediterranean.

11. Other matters

The SCRS will continue to implement peer reviews of selected stock assessments in 2016. SCRS/2015/207 presents a comparison of the peer review system used in ICCAT and those in other tuna RFMOs. It also provides a list of previous reviewers of tuna stock assessments that can be used to select candidates for future ICCAT peer reviews.

Document SCRS/2015/210 presented a review of purse seine logbooks used in the ICCAT area and recommendations for a harmonized form. Logbooks for industrial fisheries are key in collecting valuable data for scientific, stock assessment and management purposes. ICCAT Recommendations 03-13, 11-01 and 14-01 require the use of logbooks for data collection on fishing activities and establish minimum data requirements for the purse seine fleet. However, no ICCAT recommendation for a particular logbook template currently exists. The objective of this study is to review logbook models in use by the various Atlantic tropical purse seine fleets and compare them against ICCAT’s minimum data requirements, in particular the most recent ones listed in Rec. 14-01. Considering that the existence of a common ICCAT logbook template could, among other benefits, improve the accuracy and uniformity of data, the findings of this review will serve to recommend a logbook to be used by the ICCAT tropical tuna purse seine fleet.

The Sub-committee agreed that the Tropical Tunas Species Group should review this document and consider if making a recommendation to harmonize purse seine logbooks is warranted. It was also discussed that developing logbooks that require fishers to enter large amount of data can result in a decrease of the quality of the data being reported.

11.1 Review progress on prior year recommendations of the Sub-Committee on Statistics

The following recommendations were made by the Sub-committee in 2014.

- The Sub-Committee notes that a proposal by the Secretariat to develop web-based training videos was discussed and recommended. It was also noted that in addition to the three official languages, translation into other languages (e.g. Arabic, or others) could facilitate data reporting. The Sub-committee recommended that in addition to web-based training videos, a series of regional workshops be implemented starting in early 2015 to assure that adequate training in the currently adopted reporting obligations and proper utilization of electronic reporting forms be undertaken. Conducting such workshops would require financial support for trainers and material preparations as well as support for attendees requiring travel assistance.

Refer to Section 2.7 of this report.

- In light of the limited man power and time required for completion of the work plan identified in the Sub-committee on Ecosystems Work Plan (**Appendix 11**), choices will obviously have to be made with regard to how to prioritize the activities. The current rate of tasks is unsustainable and the Sub-committee reiterates prior recommendations to increase staff to conduct this work so as not to further reduce the required support of the SCRS. It is unfortunate that this recommendation has been largely ignored over the past five or so years and is taken as a sign of a continuing decline in support for the work of the SCRS.

The Sub-committee was pleased to learn that the ICCAT Secretariat has hired new staff on a temporary basis to alleviate the workload of the permanent staff with regard to the most urgent tasks that need completion.

- In view of the necessity for code migration (due to the lack of backward compatibility in the most recent version of Microsoft Office) for the numerous applications that interact with various databases of the ICCAT-DB system, the Secretariat has started the process in 2014. This work must be outsourced since staff are already severely overburdened and must be continued next year until the complete migration of all applications necessary for the numerous database summaries and analyses undertaken by the Secretariat has been achieved. The Sub-committee agreed the need of doing this migration and strongly recommended to finalize this task as soon as possible in order to ensure the full operation of the ICCAT-DB system. This will require financial support of around €150,000 to be completed.

Refer to Section 7 of this report.

- The Sub-committee favorably reviewed the report on investigation into current and recent investments by various groups aimed toward improvement of information from artisanal fisheries of West Africa which exploit tuna and tuna-like species. It is obvious from the work described in Kebe, 2015 that multiple and large investments have and are being made, which seem not well coordinated. The Sub-Committee recommends that broader oversight of these programmes by groups such as the FAO and/or the ATLAFCO to improve their efficiency and efficacy. The Sub-committee noted that similar inventories for other regions in the ICCAT Convention area are lacking and reiterated its prior recommendation to develop such inventories for other regions (e.g. Central and South America, the Caribbean and the North African Mediterranean coast). The Sub-Committee noted that the inventory reported upon in Kebe, 2015 was achieved at a cost of about €20,000. It is expected that inventories for other regions could require about the same financial commitment.

No progress has been made to create inventories of artisanal fisheries in areas other than West Africa.

- In view of the recent advancements on the use of electronic monitoring systems for at-sea data collections, the Sub-committee agreed that the SCRS should adopt minimum standards for Electronic Monitoring Systems given that, according to recent analyses conducted, they can provide very useful information on fishing trips and be a complement to port sampling and human observer programmes for tropical tuna purse seine fisheries. Since there are several vendors and multiple possible system configurations, these standards would aim to standardize the implementation of electronic monitoring systems and to ensure that the systems can result in collecting useful information for fisheries monitoring. The ISSF's technical report 2014-08 "Updated guidance on Electronic Monitoring Systems for tropical tuna purse seine fisheries" could be used as a starting point for this objective. The Sub-committee also noted the need to determine best practices for the integration of information from electronic monitoring systems, human observer, and port sampling programmes. A task group should provide additional advice on this topic in 2015.

No progress has been made on this issue, as the task group mentioned in this recommendation, has never been formed.

12. Future plans and recommendations

12.1 Work Plan

The work plan for 2015 is included in item 17.1 of the 2015 SCRS Report.

12.2 Recommendations

Recommendations with financial implications are included in item 18.1 of the 2015 SCRS Report.

- The Sub-committee reiterates that the species groups which have not yet done so should review the current values and elaborate a multi-annual work plan to update the biometric relationships and other conversion factors. The work plan should establish priorities by species.
- The Sub-committee urged the Tropical Tunas Species Group to review and, if warranted, adopt the Secretariat's proposal to reduce the number of ICCAT Sampling Areas.
- The Sub-committee reiterates the decision made by the SCRS that the chairs of all the SCRS species groups and the Sub-committee on Ecosystems must attend the meeting of the Sub-committee on Statistics.
- The Sub-committee recommends that the Shark Species Group develop a plan and a budget for shark Task I and II data recovery activities.
- The Sub-committee recommends that National Scientists review the results of the newly estimated EFFDIS to ensure accuracy.
- Recommendation for the Secretariat and USA scientists to work together to fully integrate the USA and ICCAT tagging databases.

13. 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 agreed to adopt the report by correspondence and the meeting was adjourned on 22 September 2015. The Convener thanked those that served as rapporteurs and all participants for their work.

Addendum 1 to Appendix 8**2015 Agenda of the Sub-committee on Statistics**

1. Opening, adoption of Agenda and meeting arrangements
2. Review of fisheries and biological data (new and historical revisions) submitted during 2015
 - 2.1 Task I (nominal catches and fleet characteristics)
 - 2.2 Task II (catch & effort and size samples)
 - 2.3 Tagging
 - 2.4 GBYP related data
 - 2.5 ICCAT biometric relationships and other conversion factors, revision and update work plan
 - 2.6 Other relevant statistics including newly submitted observer data
 - 2.7 Development of web based tutorial for ICCAT data submission
3. Review of criteria applied to ICCAT statistics
 - 3.1 Application of Filters 1 and 2 on data submission
 - 3.2 Changes to ICCAT Coding Systems
4. Review of Secretariat yearly based fishery datasets estimations and dissemination
 - 4.1 CATDIS
 - 4.2 CAS (catch-at-size) and CAA (catch-at-age)
 - 4.3 New EFFDIS estimate
 - 4.4 Others
5. Review of existing data submission policy
 - 5.1 Statistics reporting formats (e-FORMS) and deadlines
 - 5.2 Proposed protocol to report zero catches.
 - 5.3 Review of the e-forms for metadata/data quality information proposed by the bluefin species group
 - 5.4 Other related matters
6. Evaluation of data deficiencies pursuant to [Rec. 05-09]
 - 6.1 Current data catalogues of major species by stock
7. Review of ICCAT-DB (ICCAT relational database system)
 - 7.1 Progress made and future plans
 - 7.2 Status of the code migration (VBA to JAVA) project
 - 7.3 Advances on ICCAT-DB documentation (user guides & reference manuals)
 - 7.4 Status of the ICCAT cloud infrastructure
8. National and international statistical activities
 - 8.1 International and inter-agency coordination and planning (FAO, CLAV, CWP, FIRMS)
9. Report on data improvement and data recovery activities
 - 9.1 Data recovery activities
 - 9.2 National data collection systems and improvements
 - 9.3 Proposals for data recovery plans and improvements on data collections systems
10. Consideration of recommendations from 2015 intersessional meetings
11. Other matters
 - 11.1 Review progress on prior year recommendations of the Sub-committee on Statistics
12. Future plans and recommendations
13. Adoption of the report and closure

SCRS protocol to report zero catches for the main ICCAT species in Task I

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Background:

The Commission, the Secretariat, and the SCRS had faced in the past the difficulty to identify if the ICCAT CPCs are in compliance with the ICCAT statistical reporting obligations, in particular with respect to the Task I annual catches. The problem lies in anticipating with a reasonable confidence, the expected Task I species catch composition (both positive and zero catches) that need to be reported by each ICCAT CPC in each one of their fisheries (fleet/gear combinations, able to fish any of the ICCAT major species). This difficulty was exacerbated with the adoption by the Commission of the *Recommendation by ICCAT on penalties applicable in case of non-fulfillment of reporting obligations*, Rec. 11-15 which explicitly requires the submission of zero catches. Since the SCRS and the Secretariat acknowledged that the reporting of zero catches for each species/gear/area combination is a nearly impossible task, there has been confusion on the rules to report zero catches. This protocol is aimed to clearly establish the rules for the reporting of zero catches in the submission of Task I catch data.

Definitions:

Two types of “zero catch” were identified:

- a) *Real “zero”*: effective annual based zero catches of a given species having behind a fishing activity (fleet/gear combination) in a given region of the ICCAT Convention area.
- b) *Global “zero”*: informative zeros, reported by an ICCAT CPC aimed to inform that no fishing activity took place in the ICCAT convention area (ALL species/gears/fleets).

While the both types of zeros are important in terms of compliance; Type (a) zeros are the most useful for scientific purposes.

Protocol to report “zeros”:

The following criteria shall be applied:

- A “*real zero*” catch shall be reported:
 - i) By stock/management unit, flag, year, and gear
 - ii) For the following species:

| | |
|-----------------------------|--|
| - 10 tuna & like species: | BFT, ALB, BET, YFT, SKJ, SWO, BUM, WHM, SAI, SPF |
| - 3 sharks: | BSH, POR, SMA |
| - 6 small tuna: | BON, LTA, KGM, FRI, SSM, BRS |
| - shark prohibited species: | FAL, SPZ/SPL/SPK/, OCS, ALV/PTH/BTH |
 - iii) The real zero catch represents the entire removals (landings + dead discards).
- A “*global zero*” (a) requires that:
 - i) The reporting CPC inform the Secretariat that, no fishing activity (National & chartered fleets) catching any of the major ICCAT species took place in the ICCAT area in a particular year.

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Reporting Rules:

The Secretariat will prepare an electronic form with a matrix containing rows with each stock/management unit for the species listed above and columns with the major ICCAT gear groups (see **Table 1**). CPCs will then be required to fill the matrix as follows:

1. A value of ZERO (0) will be entered to indicate a REAL ZERO for that particular stock/gear combination. The real zero values reported using the above mentioned matrix do not have to be reported using the form ST02-T1NC.
2. A value of ONE (1) will be entered to indicate that the CPC had an annual positive catch for that particular stock/gear combination. The positive catches have to be reported using the form ST02-T1NC.
3. A value of NEGATIVE ONE (-1) will be entered to indicate that the CPC had no fishing activity associated to that particular stock/gear combination.

Validation

All the “*Eligible zeros*” reported in fulfillment with the abovementioned “*Reporting rules*” are considered “*Valid*”. Only the “*valid*” zeros will pass the current SCRS filtering (Filters 1 and 2) criteria and therefore will be considered for compliance purposes. The Secretariat should ensure a systematic validation process by developing the proper tools that ensures an effective and transparent scrutiny of the zeros and its appropriate storage (storing the valid ones and eliminating the non-valid ones).

Table 1. Matrix of stocks and gear groups to report real zero catches, positive catches, and global zeros. Refer to the text for an explanation of how to fill the matrix (preliminary example).

| | <i>Gear Groups</i> | | | | | | | | |
|-------|--------------------|-----------|-----------|-------------|-------------|-------------|-------------|-------------|-------------|
| | <i>LL</i> | <i>PS</i> | <i>BB</i> | <i>HAND</i> | <i>GILL</i> | <i>TRAW</i> | <i>TROL</i> | <i>TRAP</i> | <i>HARP</i> |
| BFT-E | | | | | | | | | |
| BFT-W | | | | | | | | | |
| BET | | | | | | | | | |
| ALB-N | | | | | | | | | |
| ALB-S | | | | | | | | | |
| ALB-M | | | | | | | | | |
| YFT | | | | | | | | | |
| SKJ-E | | | | | | | | | |
| SKJ-W | | | | | | | | | |
| BUM | | | | | | | | | |
| WHM | | | | | | | | | |
| SAI-E | | | | | | | | | |
| SAI-W | | | | | | | | | |
| SPF-E | | | | | | | | | |
| SPF-W | | | | | | | | | |
| BSH-N | | | | | | | | | |
| BSH-S | | | | | | | | | |
| POR | | | | | | | | | |
| SMA | | | | | | | | | |
| BON | | | | | | | | | |
| LTA | | | | | | | | | |
| KGM | | | | | | | | | |
| FRI | | | | | | | | | |
| SSM | | | | | | | | | |
| BRS | | | | | | | | | |
| FAL | | | | | | | | | |
| SPZ | | | | | | | | | |
| SPL | | | | | | | | | |
| SPK | | | | | | | | | |
| OCS | | | | | | | | | |
| ALV | | | | | | | | | |
| PTH | | | | | | | | | |
| BTH | | | | | | | | | |

REPORT OF THE MEETING OF THE SUB-COMMITTEE ON ECOSYSTEMS

An Intersessional Meeting of the Sub-committee on Ecosystems was held in Madrid, Spain, 8-12 June 2015. The meeting was held in conjunction with the Small Tunas Working Group in order to address issues that both groups had in common. A guest speaker, Dr Rainer Froese (Helmoltz Center for Ocean Research), provided expertise on assessing and managing data-poor and data-rich species. During this meeting, the Sub-committee discussed the following:

Tasks pertaining to by-catch:

1. Review the methodology to be used to update the longline EFFDIS data and develop similar effort information for other major gears.
2. Determine “best practices” for estimation of total extrapolated by-catch.
3. Map sea turtle by-catch rates against EFFDIS effort estimates.
4. Review and compile indirect by-catch mortality estimates for sea turtles, and the estimation methodologies.
5. Review the efficacy of seabird by-catch mitigation measures (Rec. 11-09).
 - a) Review the extent that ICCAT mitigation measures reflect best practices;
 - b) Propose candidate indicators to evaluate the efficacy of mitigation measures;
 - c) Identify data insufficiencies.
6. Review data received by CPCs reporting by-catch. Make recommendations to revise the data collection forms as needed.

Discussion

The Sub-committee reviewed the work initiated under the short-term EFFDIS contract. The objectives of the contract are to develop a robust statistical modeling approach to estimate overall Atlantic fishing effort, update the current EFFDIS estimations for longline gear (1950 to 2014) using the new approach, and develop an estimation procedure for other gears. The Sub-committee acknowledged the importance of this dataset and expressed its support of the process to update this information. A preliminary dataset to be presented at the 2015 blue shark stock assessment session will be revised based on feedback by the SCRS prior to finalization in October. The Sub-committee also discussed the proposal by the 2013 Working Group on Stock Assessment Methods (WGSAM) regarding the additional gears that should be included in the EFFDIS estimation. Previously, it was requested that additional estimations should be conducted for purse seine and baitboat fleets. It was pointed out, however, that EFFDIS is only used to assess the fishing impacts of ICCAT fleets on by-catch species including sharks, and as by-catch in baitboat fisheries is extremely limited, there is little point in conducting this exercise for that gear. It was thus agreed that the contractor should rather focus on the important longline and purse seine estimations under the current contract, with consideration given in future EFFDIS estimations (not the current contract) to gillnet fisheries which are believed to have far higher levels of by-catch.

Several studies pertaining to sea turtles were presented at the meeting. A potential approach for the estimation of the number of interactions of longline fleets operating in the ICCAT Convention area with sea turtles was also discussed. This could provide ideas for future directions and work such as estimating total sea turtle interactions, which agreed to be the next step for the final objective of the Sub-committee and the SCRS. The Sub-committee commented that sea turtle CPUEs are available only for some fleet/area/season combinations and many of them were obtained by observer data which has apparently lower coverage than logbook. This should assign that CPUEs from one fleet to another or across areas may be a problem. This is a limitation of the method but it can be refined with more contributions from other CPCs with specific fleet/area information. Information from EFFDIS could be a powerful support for this work. A preliminary work using statistical models to estimate the species composition and fate of sea turtles captured in the Portuguese pelagic longline fishery operating in the equatorial and tropical north Atlantic was then presented. This type of approach could be used for the estimation of sea turtle interactions if an appropriate way of data substitutions and extrapolations become available. The

Sub-Committee noted that the next step should be to explore factors, like gear and time-area, affecting turtle by-catch rate as well as to estimate the rate of interactions by factors. This could be done through analysis of turtle by-catch data of each fleet as well as comparative works of by-catch data between different fleets. An ongoing analysis of existing United States shallow set longline fisheries observer data to assess the efficacy of sea turtle by-catch regulations implemented in U.S. Atlantic and Pacific longline fisheries was reviewed.

A proposal for an analysis of mitigation options for longline by-catch of sea turtles was made. The Sub-committee agreed to review the proposed workplan for sea turtles developed in 2014 (Anon. 2015b) to determine the overlap in tasks with this proposal by Common Oceans ABNJ Tuna Project and to determine whether it should be accomplished using the resources provided by the project, or whether it should continue independently within the Sub-committee according to its own schedule.

Regarding seabirds, a number of activities were identified at the 2014 meeting of the Sub-committee regarding key elements of the review of Rec. 11-09. These include:

- Review the extent to which the by-catch mitigation requirements in Rec. 11-09 reflect current best practice for pelagic longline fisheries
- Request and review new data on seabird by-catch rates
- Develop indicators for monitoring Rec. 11-09 over time
- Update the EFFDIS database

The Sub-Committee discussed the planned review in 2016 of Rec. 11-09, and agreed that the assessment of the efficacy of Rec. 11-09 should include the estimation of a) seabird by-catch rates per unit fishing effort (e.g. birds per 1000 hooks) and b) the total number of birds killed. The Sub-committee noted with concern the paucity of information that has been submitted to the Secretariat, both in relation to seabird by-catch rates and numbers, and the combinations of mitigation measures used by the fleets, and highlighted that this information is crucial to enable an effective review of Rec. 11-09. Consequently, the Sub-committee outlined a work plan for 2016 to evaluate ICCAT's seabird by-catch mitigation measures (Rec. 11-09), including the identification of information that CPCs with longline fishing effort south of 25°S should submit to the Secretariat in advance of the 2016 meeting. The Sub-committee recommended that the Secretariat make a special data request to CPCs with current and historic fishing effort south of 25°S to submit seabird by-catch and associated fisheries data, if possible using a revised observer form, for the years 2010-2014 in time for the review at the 2016 Sub-committee meeting.

The Sub-committee discussed the importance of harmonising approaches to seabird by-catch monitoring and assessment of the effect of new mitigation measures across tuna RFMOs, and agreed that a two-tiered approach to seabird by-catch monitoring, in which each tuna RFMO conducts basic monitoring on a regular basis, complemented by more detailed assessments conducted collaboratively by all the tuna RFMOs less frequently (every three to five years), is sensible. The exact frequency and approach of the basic monitoring tier should be determined by each tuna RFMO. The Sub-committee recognised the importance of conducting a wider-scale (than the ICCAT Convention area) assessment of the impacts of tuna fisheries on seabirds, and the importance of working towards a collaborative assessment across tuna RFMOs. It was noted that funding available through the BirdLife component of the FAO Common Oceans ABNJ Tuna Project is available to support national scientists and experts for a series of capacity building workshops regarding by-catch estimation methods, and thereafter the implementation of a cross-tuna RFMO seabird by-catch assessment.

The Sub-committee were provided with an update on the Seabird By-catch Mitigation fact sheets produced by BirdLife and ACAP, and were informed of the imminent availability of the Seabird By-catch Identification Guide produced by ACAP in collaboration with the Japanese Fisheries Research Agency. It was agreed that once available, the Seabird By-catch Identification Guide and the current versions of the fact sheets for the three mitigation measures listed in Rec. 11-09 be circulated to CPCs for their use, and their consideration of making these available as resources on the ICCAT website.

The Secretariat provided a brief summary of the state of the new ST09 observer data collection forms. It was clarified that the use of these forms had been approved by the Commission in 2014 and that they are now being used in 2015. It was again clarified that all observer data including by-catch information should be submitted using these forms, with some minor modifications needed (especially for the seabird review in 2016). For example, the number of hooks observed should be recorded at the level of the set (fishing operation), rather than for the entire trip.

Tasks pertaining to ecosystems:

1. Continue to assess the importance of the Sargasso Sea ecosystem to ICCAT species as per Resolution 12-12.
2. Review the progress that has been made in implementing ecosystem based fisheries management and enhanced stock assessments.
3. Develop a list of ecosystem objectives that are practical and measurable to present to the Commission so that they can guide the Group as to which objectives are of highest priority. This will inform the generation of the tool/framework used to manage the system.
4. Request input from the other SCRS Working Groups and the Commission with regard to the implementation of EBFM.

Discussion

The Sub-committee reviewed three papers that provided more information on the ecological value of the Sargasso Sea ecosystem for ICCAT managed species and related species as per Resolution 12-12. These papers provided evidence of spawning occurring within the Sargasso Sea, contrasted the historical catches within the spawning area to the entire Sargasso Sea and provided evidence that bluefin tuna from both the eastern and western stocks frequent the area in contrast to the catch data.

Based on all the information that has been presented to the Sub-committee until present, it was agreed that the Sargasso Sea is an important and unique ecosystem for ICCAT species. At the same time, the Sub-committee acknowledged that there are other ecosystems in the Atlantic ocean that are also important and unique for ICCAT species. The Sub-committee pointed out the significant progress that was made in the past few years to advance the understanding of the importance of the Sargasso Sea for ICCAT species (see Response to the Commission with regard to Res. 12-12), and it recommends continuing collecting and reviewing information from the Sargasso Sea.

A presentation providing a candidate list of environmental/climatological indicators that depict a generalized view of the Atlantic Ocean and offered a means of explaining variations in observational data as well as a means of testing various biological hypotheses was reviewed. The Sub-committee recognized the relevance of these indicators to the improvement of stock assessments and as important considerations for management strategy evaluations. An example of how these indicators could inform the analysis of CPUE trends using a state space modeling approach was also provided. Applied in this way, the method was shown to be useful in gleaned information on stock dynamics from indices and justifying why indices for different parts of a stock have different trends. Consequently, the Sub-committee found value in the fact that the method could: inform on the issue of combining separate abundance indices, estimate commonalities in species' responses to the environment, test for species interactions, identify structural breakpoints in a time series and make one-step-ahead predictions in abundance. Further examination of the approach and the indicators by the WGSAM in the context of ICCAT's single species stock assessments was recommended.

The progress in the development of ecosystem models to test the effects of fishing on the ecosystem was exemplified by work that estimated the effects of the FAD fishery in the eastern tropical Atlantic. The impacts were modeled using an elaborate ECOPATH model involving 27 functional groups and 4 major fisheries. This model is intended to form the basis of an ECOSIM model fit to the tropical tuna catch and relative abundance indices which will subsequently allow for an investigation of the effects of FADs on the ecosystem. Once complete, the Sub-committee expressed an interest in validating the model outputs and developing similar models in other areas in support of EBFM.

Efforts to operationalize the conceptual ecosystem based management objectives proposed last year were supported by presentations by guest speaker Dr Rainer Froese. He introduced the Sub-committee to simple principles for managing stocks which would allow for both healthy stock biomass and more natural age compositions. These principles allow species to be managed within an EBFM framework with a lower requirement for data and without disrupting the single species assessment framework. The Sub-committee recognized the value and potential of applying the rules and analysis presented for ICCAT data-poor species and suggested to use size-based ecosystem models such as OSMOSE to test the impact of implementing these three rules on target species and its resultant effects on the ecosystem.

The role of MSE in the context of an EBFM framework was introduced to the Sub-committee and it was emphasized that MSE is about designing simple rules, not complex models that can be applied to provide advice given the data, the assumptions, the algorithms for decisions rules and management recommendations. Thus, the approach was considered to provide useful support in terms of allowing one to investigate the value of say collecting different data types given a fixed budget and their respective effect on achieving management objectives.

Further to the objective of implementing an EBFM framework for ICCAT stocks, the Sub-committee reviewed a new method for estimating maximum sustainable yield, biomass trends and reference points from catch data and prior knowledge of the resilience of the stock. Data poor methods such as this were recognized by the Sub-committee to be of particular importance for managing ICCAT's data-limited stocks such as the small tuna species, which otherwise would have no representation within an EBFM framework.

The Sub-committee's progress in implementing an EBFM framework was evaluated relative to an "ideal implementation" and the WCPFC's efforts. Both tuna RFMOs were shown to share the same challenge of developing a formal mechanism to better integrate ecosystem considerations in the management decisions. The Sub-committee agreed that the evaluation could be a useful tool for moving forward with EBFM and for communicating the Sub-committee's needs to managers. To that end, it was agreed that the theoretical framework, along with the work done by the Sub-committee to date, would be useful to present at the upcoming *Second Meeting of the Standing Working Group to Enhance Dialogue between Fisheries Scientists and Managers* (SWGSM) where it can accompany a scheduled presentation that will highlight steps to implement EBFM in the European Union. Furthermore, support was given to the concept of a joint meeting between the five tuna RFMOs on implementing the EBFM approach. This meeting is to be held in 2016 and will illustrate each organizations philosophy on this concept as well as their successes and difficulties developing and EBFM framework.

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WORK PLANS OF THE SPECIES GROUPS AND OTHER WORKING GROUPS FOR 2016

Tropical Tunas Work Plan

The group proposes a yellowfin tuna assessment in 2016. This is consistent with the strategic plan of the SCRS and is considered a priority because: 1) the last assessment was conducted in 2011, 2) since the last assessment there have been significant changes to the historical landings and catch at size data, 3) since the last assessment there has been a large increase in FAD associated fishing, and an influx of purse seiners from the Pacific and Indian Oceans and 4) fishery indicators available for the period starting 2012 are insufficient to provide strong indication of changes in stock status that may have occurred since the last assessment.

Quarter 2, 2016: YFT Data Preparatory: The group considers the data preparatory meeting mandatory. The group requests that all data inputs be prepared through 2015. If the data meeting occurs before July 2016, the group recognizes that some data inputs may be available only through 2014.

1) *Data Requirements:*

- a) Complete the re-estimation of the historic Ghanaian statistics (landings and catch at size) for bigeye and yellowfin tuna by the end of the first quarter of 2016
- b) Update biological information. In particular, consider new information pertaining to:
 - i) Stock Structure and mixing
 - ii) Morphometric relationships
 - iii) Age and growth
 - iv) Natural Mortality
 - v) Reproduction
- c) Update yellowfin catches for all CPCs and fleets up until the year 2015
- d) Update standardized CPUE series through 2015, including:
 - i) Japanese Longline
 - ii) Mexico/USA Longline
 - iii) Brazilian Longline
 - iv) Uruguay Longline
 - v) USA Longline (outside GOM)
 - vi) Chinese Taipei Longline
 - vii) EU Purse Seine (Free School)
 - viii) EU Purse Seine (FAD)
 - ix) Venezuela Purse Seine
 - x) Brazil Baitboat
 - xi) EU Dakar Baitboat

Note: To permit examination of more complex model structures, all indices should consider as factors: year, quarter and area.

- e) Update tagging information

2) *Stock Assessment Preparation:*

- a) Review CPUE diagnostics and select indices to be used in stock assessment
- b) Prepare and adopt required model diagnostics (SCRS documents required)
- c) For new models (e.g. SS), review proposed model structures and procedures, including:
 - i) Time step (Annual/Quarter)
 - ii) Spatial Structure
 - iii) Fleet Configuration
 - iv) Gender specific?

Quarter 3, 2016: YFT Stock Assessment Meeting:

- 1) Develop final stock assessment models (ASPIC, VPA, others)
- 2) Review diagnostics and select models to be used for management advice
- 3) Review projections for accepted models
- 4) Develop management advice
- 5) Review detailed report and executive summary

Conduct studies into the yellowfin and bigeye reproductive biology

Collate and analyse yellowfin and bigeye reproductive (biological) data that will allow to investigate the maturity ogives and fecundity of both species. For yellowfin, this work will allow to include new reproductive data in the 2016 yellowfin stock assessment.

Responsibility: EU. **Deadline:** Yellowfin data preparatory meeting. **Deliverable:** SCRS document

Explore the prospects for developing Management Strategy Evaluation (MSE) frameworks for Atlantic bigeye

In ICCAT, MSE frameworks are only being developed in temperate water stocks (albacore, swordfish and bluefin). However, exploring the development of this type of frameworks could contribute to analyse the impact of the many sources of uncertainty currently involved in this stock's management, including analysing the effects of FADs, the impact of conflicting CPUE indexes and direct/indirect impacts from the management of other tropical stocks (yellowfin and skipjack). The development of this species MSE would align with other tropical species MSE currently under development at other RFMOs (IOTC/IATCC). In addition, the most recent stock assessment (2015), which was made with two models with significant differences in complexity (SS3 and ASPIC) will facilitate the development of the numerical tools to assess the potential impact of harvest control rules, the availability of data and potential conflicts with other stocks' management.

The following tasks are planned in this regard: Selection of the components of the bigeye MSE including:

- Operating Models, Management Procedure (Stock assessment models, observation error models and Harvest Control Rules) (Responsible: EU, in collaboration with ICCAT Secretariat. Deadline: 2016 SCRS. Deliverable: SCRS document.)
- Running preliminary simulations with tentative management actions

Responsibility: EU, in collaboration with ICCAT Secretariat. **Deadline:** 2017 SCRS. **Deliverable:** SCRS document

The working group recommended the continuation of the working group on FADs to:

- Review and adopt minimum elements necessary for the incorporation of a typical logbook for the purse seine fleet (also proposed by ISSF)
- Estimate the present numbers of buoys and FADs deployed by each country in the fishery and changes in FAD-related technologies
- Evaluate ways to improve and provide the necessary information related to FADs in the process of stock assessment

Albacore Work Plan

During 2013, the north and south albacore stocks were evaluated and an interim Limit Reference Point was proposed for the northern stock, as well as several alternative HCRs that allow the Commission to choose desired levels of risk and recovery timeframes. Several models were used, including age structured and statistical catch at age models that required substantial data preparatory work by the Secretariat and other members of the group.

In 2016, the Albacore Tuna Species Group plans to produce a stock assessment of the northern Atlantic and southern Atlantic stocks as well as the Mediterranean stock (assessed in 2011). The methods to be used include surplus production models for northern and southern albacore, and data poor methods for Mediterranean albacore. The group also plans to further develop and test Limit Reference Points and HCRs for north Atlantic albacore. Given the large amount of work envisaged for 2016, an intersessional stock assessment meeting is envisaged (eight days, possibly in April).

North Atlantic Stock Proposed Work Plan

The intention is to, at a minimum, update of the surplus production models, up until 2014, following the general procedures followed during the 2013 stock assessment and data preparatory meetings.

Following is a list of actions, responsibilities and deadlines:

- Submit all 2014 T2 data. **Deadline:** before end of 2015 SCRS meeting. **Responsibility:** CPCs.
- Prepare T1, T2CE, T2Sz, CATDIS, and mean weights per fishery and year. **Responsibility:** Secretariat. **Deadline:** one month before the meeting (except CATDIS).
- Update (until 2014) the following yearly standardized CPUEs, in weight. **Deadline:** one month before the meeting. **Deliverable:** SCRS documents, following the standards provided by the WGSAM. **Responsibility:** CPCs.
 - Japanese longline
 - Chinese Taipei longline
 - US longline
 - Spanish troll
 - Spanish baitboat
 - Irish MWT
- Evaluate the indices against the standards provided by the WGSAM: Albacore Chair and ICCAT Secretariat. **Deadline:** Stock assessment meeting.
- Update the surplus production models up until 2014, following the 2013 assessment specifications. **Responsibility:** EU-Spain. **Deadline:** Stock assessment meeting. **Deliverable:** SCRS document.

Test Harvest Control Rules and Limit Reference Points

- Select candidate harvest control rules (including those proposed by the WGSAM, those used in the 2013 assessment, and considering Rec. 11-13).
- Use a MSE simulation framework to evaluate a series of management procedures (including the Limit Reference Points and Harvest Control Rules mentioned above) against predefined indicators (e.g. probability of being in the green zone, average catch, stability in yield and effort, etc.).
 - **Responsible:** EU-Spain, in collaboration with ICCAT Secretariat. **Deadline:** Stock assessment meeting. **Deliverable:** SCRS document.

South Atlantic Stock Proposed Work Plan

The intention is to, at a minimum, update the ASPIC and BSP models, up until 2014, following the procedures of the 2013 stock assessment. Following is a list of actions, responsibilities and deadlines:

- Submit all 2014 T2 data: **Deadline:** before end of 2015 SCRS. **Responsibility:** CPCs.
- Prepare T1, T2CE, T2Sz, CATDIS, and mean weights per fishery and year for south Atlantic albacore. **Responsibility:** Secretariat. **Deadline:** one month before the meeting (except CATDIS).
- Update (until 2014) the following yearly standardized CPUEs (2013 Report of Data Preparatory Meeting, Table 14). **Deadline:** one month before the meeting. **Deliverable:** SCRS documents, following the standards provided by the WGSAM. **Responsibility:** CPCs.
 - Uruguayan longline
 - Japanese longline
 - Chinese Taipei longline
 - South African baitboat
 - Brazilian longline
 - Namibian baitboat

- Evaluate the indices against the standards provided by the WGSAM: Albacore Chair and ICCAT Secretariat. **Deadline:** Stock assessment meeting.
- Update the ASPIC and BSP models up until 2014. **Responsibility:** Secretariat and US. **Deadline:** Stock assessment meeting. **Deliverable:** SCRS documents.

Mediterranean Albacore Stock Proposed Work Plan

The intention is to, at a minimum, update the length-converted catch curve analysis used in the 2011 stock assessment, as well as the catch only method to produce an MSY estimate for this stock (SCRS/2015/159). Following is a list of actions, responsibilities and deadlines:

- Submit all 2014 T2 data: **Deadline:** before end of 2015 SCRS. **Responsibility:** CPCs.
- Prepare T1, T2CE, T2Sz, CATDIS, and mean weights per fishery and year for Mediterranean albacore. **Responsibility:** Secretariat. **Deadline:** one month before the meeting (except CATDIS).
- Update (until 2014, and, if possible, extend back in time) the following yearly standardized CPUEs. **Deadline:** one month before the meeting. **Deliverable:** SCRS documents, following the standards provided by the WGSAM. **Responsibility:** CPCs.
 - Greek by-catch
 - Greek longline albacore
 - Italy longline Adriatic
 - Italy longline
 - Spanish longline albacore
 - Spanish sport
- Evaluate the indices against the standards provided by the WGSAM: Albacore Chair and ICCAT Secretariat. **Deadline:** Stock assessment meeting.
- Update the length converted catch curve analysis as well as the catch based method until 2014. **Responsibility:** EU-Spain. **Deadline:** Stock assessment meeting. **Deliverable:** SCRS documents.

Participation in the albacore species group

Participation in the albacore species group has been poor in recent years (see the 2011 and 2013 assessment and data preparatory reports), with CPCs directly involved in the fisheries not participating in the assessment process. This made it difficult to evaluate the suitability of some data series or to address some uncertainties. 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 2016, when an assessment of all the three stocks is planned (responsibility: SCRS to identify this requirement to the Commission during the 2015 Annual meeting).

Bluefin Tuna Work Plan

Recommendation 12-03 for the eastern Atlantic and Mediterranean bluefin tuna required the SCRS to conduct an update of the stock assessment and provide advice to the Commission in 2014. Subsequently this Recommendation was extended to include the western Atlantic stock. The 2013 SCRS pointed out that it did not have sufficient resources to prepare the new data collected through the GBYP and other programs while also conducting an assessment in 2014. The Commission considered updating the 2014 assessment to be of higher priority than the data preparatory activities and agreed to postpone the next assessment to 2016 (Rec. 14-04). The SCRS has since held two data preparatory meetings to incorporate the new catch and effort information in ICCAT databases and to continue working on new modeling frameworks. Good progress has been made in a number of areas; however it has become evident that much of the available data has still to be fully processed and reviewed. The task of collecting data from the many activities conducted by multiple CPCs and research organizations has been particularly challenging and it is unfortunately now clear that the complete set of market statistics, tag recoveries, genetics and other data cannot be processed in time to conduct a 2016 assessment as originally planned.

In view of the limited availability of certain key data sets and recognizing that proposed new modeling frameworks are not yet fully developed, the SCRS proposes the following work plan for 2016:

1. Update the scientific advice at the species group meeting preceding the 2016 SCRS plenary based on (a) revised forecasts that take into account the actual catches in 2014 and 2015 and (b) updated fishery indicators (as prescribed by Rec. 12-03, paragraph 50). *Action National Scientists and Secretariat.*
2. Evaluate evidence for the existence of the extraordinary 2004-2007 recruitment years estimated for the eastern Atlantic and Mediterranean population (e.g., produce SCRS paper examining size frequency histograms such as in SCRS/2015/160). *Action National Scientists.*
3. Conduct an intersessional workshop that builds on the previous Joint Canada/U.S meeting (July 2015) to investigate approaches for combining raw catch/effort data. This meeting should occur prior to the data preparatory workshop and consist of a small working group with 1-2 scientific representatives from Canada, Japan, Mexico, and the USA. *Action National Scientists.*
4. Hold a meeting of the Core Modelling Group (at an appropriate venue prior 24 February 2016) to specify remaining characteristics of the operating model; define the scope of possible management procedures; and agree on a detailed time schedule for the next three years for use by GYBP, the SCRS, and the Commission. The Committee recommends that the GBYP support the continuation of modeling personnel beyond February 2016 to facilitate the actual MSE evaluations. A dialogue between scientists, stakeholders and Commissioners should be conducted to develop appropriate management objectives. This dialogue might be facilitated by alternatives such as the creation of a Commission working group that focuses on management strategy evaluations or a programme of scientific presentations to stakeholders. *Action GBYP, National Scientists.*
5. **Inter-sessional Data Preparatory Workshop** in June or July 2016 (6 days) that will focus on the items listed below. *Action National Scientists and Secretariat.*
 - a) Prepare summaries of the available catch data, catch-at-size and VMS data (i.e. effort by gear/year/month/area) by the start of the preparatory meeting. *Action Secretariat.*
 - b) Review and make final revisions to Task II by validating and integrating the catch at size statistics with new information from farms, harvesting and stereoscopic cameras, and other sources of information.
 - c) Review and continue to develop age-length keys for the next assessment.
 - d) Review and continue to develop stock composition keys for the next assessment (otolith microchemistry and shape, genetics, etc.).
 - e) Evaluate all indices available for use in the next assessment (including the index criteria table). This includes new indices such as acoustic surveys, larval indices, aerial surveys, trap information from Sardinia and Portugal, several purse seine indices (Tunisia and Balearic Islands) and the collaborative indices that emerge from item 3 above. Consider the implications of SCRS/2015/157 for the Bay of Biscay Baitboat fishery selectivity during the early years of the fishery.
 - f) Review and continue to analyze the tagging data to be used for the next assessment.
 - g) Review progress on life history studies such as fecundity schedules, natural mortality and stock structure.
 - h) Review progress on new modelling frameworks.
 - i) Elaborate workplan to be prepared for the next stock assessment.

There is thus a great deal of work to be done in 2016, i.e., final validation and incorporation of 10,000s of new files into the current ICCAT databases, calibrating and updating all the size and age conversion methods, evaluating new data and continuing the development of new modeling frameworks. Moreover, new data continues to come in that will improve our understanding of bluefin tuna biology and fisheries. Therefore, the proposed improvements to data and methods will have to be implemented incrementally over the next several assessment cycles. In order to ensure these incremental improvements continue, the assessments should not be more frequent than every three years. The Bluefin Species Group reiterates that a three to four year period between assessments is also appropriate because bluefin tuna is a long-lived species and it usually takes several years to detect changes in bluefin biomass in response to changes in exploitation or management. More frequent assessments would only be warranted in cases where there is evidence for a rapid change in the available fishery indicators, as per Rec. 12-03, paragraph 50.

Billfish Work Plan

Important sailfish catches occur in the tropical and subtropical central Atlantic where they are caught by some CPC and non-CPC artisanal fisheries. Obtaining standardized indices of abundance from these fisheries requires assistance from experts skilled in CPUE standardization techniques. Hence, providing this assistance is an essential factor for the successful preparation of the Atlantic-wide sailfish assessment in 2016. Considering that important research on stock structure are still underway, it is important that the working group focuses particular attention to resolve the above issues prior to undertaking a sailfish assessment in 2016.

The Working Group recognizes the variable rates of catchability present in the historical Japanese longline time series, and that further investigation is warranted relative to blue marlin, white marlin and sailfish catches.

In preparation for the sailfish assessment (2016), tasks to be accomplished during 2015-2016 and presented to the Species Working Group will be:

- a) Further work on estimation of catches from artisanal fleets from which there are known gaps;
- b) Standardized Catch Rates from artisanal fisheries in sailfish east to be completed for Ghana, Côte d'Ivoire and Senegal. **Deadline:** 30 April 2016;
- c) Assistance for developing standardized CPUEs for the artisanal fleets (Senegal, Ghana, Côte d'Ivoire) needs to be undertaken 2015 or early 2016. A support workshop which will be organized and funded through the ICCAT Data Improvement Project should be scheduled to occur at a reasonable time prior to the assessment meeting;
- d) Standardized catch rates are needed for sailfish west from recreational and longline fisheries from the West Atlantic;
 - i) Brazilian scientists will provide a standardized CPUE series of sailfish from longline using the new method which includes fishing strategy as an explanatory variable. **Deadline:** 30 April 2016.
 - ii) U.S. scientists will update standardized CPUE series of sailfish from recreational fisheries.
- e) Standardized CPUEs are also needed for both east and west stocks from the industrialized longline fleets from Chinese Taipei, EU and Japan. **Deadline:** 30 April 2016;
- f) In order to complete work on stock structure relative to sailfish for the 2016 stock assessment, the collection of tissue samples from Mexico, and the U.S. for sailfish west, and from the EU, Côte d'Ivoire and Ghana for sailfish east are needed to complete a comprehensive work on sailfish stock structure. Brazil will take responsibility for the genetic analyses. Funding from Billfish Programme will be used to collect and ship samples to Brazil.

Atlantic Swordfish Work Plan

Assessments for North and South Atlantic swordfish were conducted in 2013. The next assessment is proposed for 2017.

Proposed work

North and South Atlantic

A list of recommended work was identified as high priority areas where continued efforts are required:

Catch and effort data and reporting deadlines. All countries catching swordfish (directed or by-catch) should report catch, catch-at-size (by sex) and effort statistics by a small an area as possible, and by month. These data must be reported by the ICCAT deadlines, even when no analytical stock assessment is scheduled. Historical data should also be provided.

CPUE series. It is recommended that scientists from Japan, Chinese Taipei, Canada, Spain, Portugal and the United States (North Atlantic) and Japan, Chinese Taipei, Spain, Uruguay and Brazil (South Atlantic), as well as any other CPCs, coordinate their work before future data preparatory meeting (possibly using videoconference), with the goal of updating the index prior to the next assessment. Future data preparatory meetings should focus on resolving the conflicting indices to the extent possible prior to the next assessment. Consideration should be given to aggregating the CPUE trends by area (rather than the current method of aggregating by nation). For the South Atlantic in particular, 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).

Discards. Information on the number of fish caught, and the numbers discarded (dead and released alive) should be reported in order to quantify discarding in all months and areas so that the effect of discarding and releasing can be fully included in the next stock assessment. These data must be reported by the ICCAT deadlines for submission of Task I and II data. Additionally the group should investigate whether the available observer data provides some insights into the low reporting of dead discards.

Target species. All fleets should record detailed information on log records to quantify which species or species-group is being targeted. Compilation of detailed gear characteristics and fishing strategy information (including time of set) are very strongly recommended in order to improve CPUE standardization. The group recommended the investigation of alternative forms of analyses in the South Atlantic that deal with both the by-catch and target patterns, such as age- and spatially-structured models.

Weight-length relationships. The group recognized that the newly-adopted length-weight relationships for swordfish require validation with new field information. National Scientists are requested to collect and submit observed values of length (LJFL) and round weight data to the Secretariat to facilitate this task, aiming to finish the ongoing analysis by 2016.

South Atlantic Swordfish Research Plan. Given the poor understanding of population dynamics of swordfish in the South Atlantic, the group should develop a longterm plan for an enhanced program of research, focussing on independent estimates of fishing mortality, fraction mature by age, growth by sex and stock, movement and migrations, and improving available indices of abundance. This deficiency could be addressed within the context of the SCRS Strategic Plan.

Environmental effects. Given the possibility of spatial and environmental effects being partially responsible for the conflicting directions of some of the influential indices of abundance, the group should further study this hypothesis during the coming years, use existing PSAT data to compliment this work, and to determine how best to formally include these environmental covariates into the overall assessment process. The U.S. has taken a lead role in this investigation and likely collaborators would include scientists from Canada, Japan, the EU (Spain and Portugal) as their indices were the most appropriate for this work. Moreover, the review of historical size data and fishery data is necessary to decide appropriate modelling structure, which should be conducted by National Scientists and the ICCAT Secretariat. Expected deliverables would include quantified reduction in the conflicting indices of abundance from the temperate and tropic regions, which in turn should lead to a more stable assessment. Other products could include an increased understanding of the distribution of swordfish and perhaps a revisiting of the geographic structure of the data and the assessment. These works should be done before the next stock assessment.

Spatially explicit CPUE. Given evidence that swordfish distribution is influenced by environmental factors that vary spatially and that the indices would need to be spatially explicit to capture the distribution shifts, the group proposes to assess the north Atlantic swordfish stock using area specific, rather than flag specific, indices of abundance. The advantages of this approach could be demonstrated in relation to the current methodology and would incorporate effects of oceanographic and climatological processes. This item addresses the broader issue affecting all species working groups regarding the need to overcome data confidentiality issues that limit science's ability to accurately estimate stock status.

Fleet definitions. For CPUEs used as inputs of Stock Synthesis, spatial and temporal change of catch at size have to be considered in the CPUE standardization process, in order to provide single CPUE time series of each fleet with similar selectivity patterns. The available data (tagging, length compositions, CPUEs, etc.) should be examined spatially and temporally, in an attempt to derive biologically sound spatial and temporal structure, from which to provide appropriate fleet definitions with similar selectivity patterns.

Informative priors for carrying capacity. Given the sensitivity of assessment results in general to prior distributions for carrying capacity in situations where the data are uninformative, the group recommends that informative priors for K be developed based upon factors such as habitat area, population density and other life history factors. While borrowing a prior based upon the posterior for K from another assessment, e.g. using the posterior for K from the North for the South may have some scientific bases, the group recommends that future decisions such as this be based upon scientific analyses similar to the development of a prior for r.

Harvest Control Rules: Consider the application of Harvest Control Rules (HCR) for future stock assessments in the North Atlantic, taking into account the newly developed HCR for albacore which was also applied in the last assessment, in collaboration with the Secretariat.

Mediterranean Swordfish Work Plan

For the Mediterranean stock, the last assessment was conducted in 2014. The next assessment should take place during 2017, using data up to 2016 to allow a preliminary evaluation of the imposed management measures after 2008.

Given the questions raised during the latest assessment the group should develop a work plan aiming:

- To achieve the collection and recovery of historical data to increase the period covered by time series, the nominal data presented in past studies (e.g. De Metrio *et al.*, 1999) should be recovered and evaluated for possible standardization.
- To better identify the effects of the environment on swordfish biology, ecology and fisheries. Future CPUE analyses should focus on developing additional methods to explicitly incorporate environmental variability into the model, and the influence of environment on the distribution of spawners and juveniles.
- To improve stock delimitation and quantify stock mixing between the Mediterranean and North Atlantic swordfish stocks through multi-disciplinary research, including tagging (both electronic and conventional) and genetic investigations. A review of the existing relevant information (e.g. tagging and genetics) should be presented to the next working group meeting to identify current gaps and facilitate the development of future research regarding those issues.
- To continue the work on length-weight relationships. National Scientists should submit observed values of length (LJFL) and weight (round and/or gilled and gutted) to the Secretariat to facilitate this task, aiming to finish the ongoing analysis by 2016.

Small Tunas Work Plan

The following recommendations should be taken into account for improving statistical and biological data as well as the 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:

- National scientists should analyze historical fisheries indicators on small tunas (e.g. CPUE; development of simple indicators of stock sustainability such as: mean size, proportion of juveniles, etc.), which should be presented at the 2016 Small Tunas Species Group Intersessional Meeting;
- Improvements to the Task II data (under SMTYP program);
- To prepare a meta-database for small tunas in order to identify and apply the appropriate stock assessment methods for each species/stock identified as a priority;
- Encourage studies on stock structure and species distribution;
- Collaborate, as much as possible through joint working groups, with other RFMOs to improve and exchange basic fisheries data on small tunas.

ICCAT Small Tunas Year Program (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 thus providing the Commission with 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, an ICCAT Year Research Program for Small Tunas (SMTYP) was proposed by the SCRS in 2011 and adopted by ICCAT in its annual meeting in Agadir (Morocco). The main objective of the first two years of this program is the recovery of historical statistical and biological 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:

- Mediterranean and Black Sea: bullet tuna, Atlantic bonito, little tunny and plain bonito;
- West Africa: Atlantic bonito, little tunny, tuna, West African Spanish mackerel, frigate tuna, wahoo;
- Caribbean area and south-west Atlantic: blackfin tuna, king mackerel and serra Spanish mackerel and dolphinfish.

Planned activities for 2016

In 2016, it is planned to continue the recovery of historical Task I and Task II data of small tunas in other areas: West Atlantic and the Mediterranean Sea. This reinforcement of data mining would be necessary to improve the Task I and Task II necessary for the stock assessment of small tunas.

It is also highly recommended to launch collecting biological data, including the size data for the main species in the whole Atlantic and the Mediterranean. Nevertheless, these objectives could not be achieved without financial support from ICCAT. **Table 1** gives the estimated costs related to the activities planned for 2016.

Table 1. Estimated costs related to activities planned for 2016 under the ICCAT SMTYP.

| <i>Planned activities</i> | <i>Species</i> | <i>Estimated costs (€)</i> |
|---|---|--|
| 1. Recovery Task I and Task II data: – Eastern Mediterranean: EU-Greece, Turkey – Central Mediterranean: Tunisia, EU-Italy – Western Mediterranean: EU-Spain – South West Atlantic & Caribbean sea: Venezuela, Brazil – East Atlantic: Mauritania | Atlantic bonito (BON) Little tunny(LTA) King mackerel (KGM) Frigate tuna (FRI) Bullet tuna (BLT) | €15,000 €15,000 €7,500 €15,000 €7,500 |
| 2. Supporting biological sampling in the Atlantic and the Mediterranean: size and biological data: – Senegal – Côte d'Ivoire – Morocco – Mauritania – Tunisia – Algeria – Venezuela – Mexico – Cabo Verde – EU (Spain and Portugal) | Atlantic bonito (BON) Little tunny (LTA) King mackerel (KGM) Frigate tuna (FRI) Bullet tuna (BLT) | €7,500 €7,500 €7,500 €7,500 €7,500 €7,500 €7,500 €7,500 €7,500 €7,500 |
| Total | | €142,500 |

2016 Intersessional Meeting for Small Tunas

Context

In order to inform the Commission on the stocks status based on the fisheries indicators, the group proposes to organize a 5 day data preparatory meeting during 2016.

Objectives

The main objectives of this meeting are summarized as follow:

- Complete a metadata base for SMT documenting the available biological data and fishery information;
- Identify the appropriate stock assessment methods for each species/stock identified as a priority;
- To apply the stock assessment method to selected, high priority stocks;
- Doing the ERA for North Atlantic small tunas.

Identified tasks

- The revised Task I and Task II data for small tunas should be submitted to the Secretariat at least two months before the date of the meeting, if possible including the data for 2015. **Responsible: National Scientists.**
- Update the Task I and Task II data. **Responsible: ICCAT Secretariat.**

Sharks Work Plan

In preparation for a planned stock assessment of shortfin mako in 2017, the group will conduct the following activities:

- Hold an intersessional meeting to:
 - Review progress on the SRDCP (Shark Research and Data Collection Programme) projects on shortfin mako age and growth dynamics, genetics, post-release survival, movements, and trophic dynamics
 - Review progress on the CITES-ICCAT collaborative shark project in West Africa
 - Provide stock status indicators of shortfin mako (nominal CPUE and catch from Task II)
 - Start review of historical catches and available CPUE indices for SMA
 - Start review of spatial length composition data to help define fleets for SS3
 - Revise the list of species for which to collect catch statistics
- Finalize activities of the SRDCP Year 2

Working Group on Stock Assessment Methods Work Plan

The Working Group on Stock Assessment Methods (WGSAM) met in Miami, United States of America, in 2015. The next meeting is planned for early in 2016 at a location that has yet to be determined.

WGSAM proposed work in 2016

1. The WGSAM plans to continue making progress on MSE, Harvest Control Rules, Limit, Threshold and Target Reference points. The WGSAM will discuss and attempt to solidify and formalize a generalized framework from which to conduct future MSEs.
2. The WGSAM will analyze ways to facilitate the dialogue with the Commission about the concepts referred to in paragraph 1 (MSE, HCR, RP) to be considered by the Standing Working Group to Enhance Dialogue between Fisheries Scientists and Managers.
3. The WGSAM plans to continue its work on the simulation study on how best to bring spatially changing oceanographic and environmental conditions into the assessment process. The study was designed during the 2015 meeting with some progress made to date and work to continue in 2016.
4. The WGSAM will continue its efforts to develop a template for the task of the unifying the North Atlantic swordfish CPUE data towards the development of spatially explicit indices of abundance. This template will outline the various fields required and how areas are to be assigned. It will also take into account all applicable confidentiality requirements inherent in set-by-set data and will have accompanying it a description of how the confidentiality of the participating CPCs will be respected.
5. The WGSAM plans to continue cooperation with EffDis re-estimation effort. At this stage, this will entail participating in beta-testing the current draft product.
6. The WGSAM plans to continue to increase the ICCAT WGSAM involvement, cooperation, and interaction with other tuna RMFO Methods Working Groups and the Strategic Initiative on Stock Assessment Methods (SISAM). The WGSAM will extend an invitation to the Chair of the various tuna RMFOs to attend the next WGSAM meeting in order that a cooperative project can be designed to promote harmonization of assessment methods with the intent to be carried out in 2016.

Sub-committee on Ecosystems Work Plan

Work Plan Pertaining to the Ecosystems Component

1. Review the progress that has been made in implementing ecosystem based fisheries management and enhanced stock assessments.
2. Assess our research needs and prioritize our research plans.
3. Explore possibilities for obtaining GEF/ABNJ funding.
4. Through dialogue with the Commission, establish clear EBFM goals and objectives.
5. Review ecosystem indicators for use in stock assessments.
6. Explore adequacy of indicators and review new ones.
7. Review ecosystem drivers of abundance and mode of action.

Work Plan Pertaining to the By-Catch Component

The Sub-committee determined that the following by-catch related activities would be important to address in 2016:

Seabirds

The Sub-committee agreed to examine the trend of annual by-catch number and by-catch rate of seabirds as a first step in the evaluation of the effect of the new mitigation measures. For this purpose, the Sub-committee recommended that all CPCs submit the following information to the 2016 meeting relative to their longline effort in the area south of 25°S latitude after July 2013, which will be analysed during the meeting.

| Requested data/analyses for ICCAT SC-ECO 2016 | Lead |
|---|---|
| As required by Rec. 11-09: CPCs will continue to report “on how they are implementing these measures, and on the status of their National Plans of Action” | CPCs – data to be collated by Secretariat |
| <p>Seabird by-catch indicator 1 (by-catch rate) CPCs with current and historic longline fishing effort south of 25°S to report the following to the SC-ECO meeting 2016:</p> <ol style="list-style-type: none"> 1. Using a revised version of the ST09 forms, number of seabirds observed caught, number of hooks observed hauled, amount of effort by logbook in the area south of 25°S for the period 2010-2015, to compare pre and post implementation of Rec. 11-09; 2. Distribution map for (1); 3. General description of longline operation in the area south of 25°S (target species, shallow night/deep day sets, etc.); 4. Description of mitigation measures adopted by fishers pre and post implementation of Rec. 11-09 (2010-2015) in the area south of 25°S. | CPCs |
| <p>Seabird by-catch indicator 2 (total number of birds caught) CPCs to report the following to the SC-ECO meeting 2016: As far as possible, estimations of total number of seabirds caught by species (or lowest taxonomic group possible) per fishery per year in area South of 25°S, for years in which observer data is available (period 2010-2014), with explanation of methods used for calculation (form discussion on methodologies for most effectively making these estimations).</p> | CPCs |
| <p>Use EFFDIS data to:</p> <ol style="list-style-type: none"> (i) identify CPCs fishing in area of Rec. 11-09, Rec. 07-07; (ii) Summarise longline fishing effort by 5x5 grid by year, including an interpretation of how longline fishing effort has changed in area relevant to Rec. 11-09 and Rec. 07-07. | Secretariat |

| | |
|---|----------|
| Updated analysis of seabird distribution tracking data within ICCAT area (species vulnerable to by-catch in pelagic longline fisheries) and overlap with ICCAT fishing effort (from EFFDIS) by year and quarter. If possible, consider overlap between albatross and petrel groups. | BirdLife |
| ACAP paper on guidelines for seabird by-catch rate estimation and extrapolation to total number of birds killed (can be circulated after ACAP SBWG meeting April/May 2016). | ACAP |
| Birdlife to report the activities of seabird mitigations in the Mediterranean in relation to GFCM. | BirdLife |

Sea turtles

The Sub-committee agreed to conduct the estimation of total number of sea turtles by fishery as a first step in the evaluation of impact of ICCAT fisheries. In 2016, estimation for longline fishery will be the main topics. All CPCs are recommended to submit necessary data, especially those related to by-catch rate.

1. Explore “best practices” for estimation of total extrapolated by-catch and, where possible, by species. For this purpose, conduct comparative studies of sea turtle by-catch ratio and species composition among different longline fleets.
2. Map sea turtle by-catch rates against EFFDIS effort estimates.
3. Review and compile indirect by-catch mortality estimates for sea turtles, and the estimation methodologies.
4. Collect information from CPCs with gillnet fisheries about sea turtle by-catch data availability as well as existing data collection systems in relation to sea turtle by-catch. And also, with this information, develop a research plan for sea turtle by-catch by gillnets and artisanal longlines.

Standing Committee on Statistics Work Plan

During 2015, the Secretariat undertook an exhaustive work plan in terms of statistical related tasks, aiming to complete all the major SCRS demands and priorities for 2015. All major tasks were finalised in a timely manner, and the outcome used by the SCRS during 2015. In 2016, the following statistical tasks are envisioned. See Table below for details on the work plan:

| Type | Priority order | Major tasks | Current status | Portion (%) implemented | Time to finish (proxy) |
|------------------|----------------|---|------------------------------------|-------------------------|------------------------|
| Projects | 1 | Terminate redesign of T1 database (T1NC & new T1FC modules including history): "stTask1" | Ongoing (frozen 2015) | 50% | 2 months |
| | 2 | Incorporate the "zero" catch module into the new Task I database (stTask1) | new (?) | 0% | 3 months |
| | 3 | ICCAT-DB documentation (Reference manuals and User guides) -> merged with JavaMig project (manuals & javadocs) | Ongoing (partial freeze 2015) | 30% | continuous |
| | 4 | JavaMig project (migrate 12 VBA applications) to Java technologies | Started Feb/2015 (externalised) | 60% | 12 months |
| | 5 | Redesign T2 databases (T2CE, T2SZ, BFT size data module from farms): "stTask2" | Ongoing (frozen 2015) | 40% | 1 month |
| | 6 | Tune CAS database (storage of 2013 & 2014 estimations) & adapt for yearly Publication (SCRS) | Ongoing (frozen 2015) | 50% | 1 month |
| | 7 | Replace t2ce.mdb & t2sz.mdb (MS-ACCESS) with a MySQL (publication of databases on the ICCAT cloud) | Ongoing (frozen 2015) | 10% | 4 months |
| | 8 | Redesign/update the tagging database (new module for elect. tagging, integration of last 4 years, checks, etc.) | Postponed (3rd year) | 0% | 6 months |
| | 9 | GIS database design (including shapefiles for the new Sampling Areas - to be incorporated in Task I / II databases) | Postponed | 10% | 2 months |
| | 10 | Implement the client application to handle the Observer (by catch) data (database already made) | new (?) | 0% | 5 months |
| | 11 | New database for stereoscopic data on BFT | new (?) | 0% | ? |
| | 12 | New database for ISSF unloads (canning) | Externalised ? | 0% | 2 months |
| | 13 | ICCAT-DB system migration to MS-SQL server 2012 (from MS-SQL server 2008R2) | new (?) | 0% | 2 months |
| | 14 | Unattended statistical data processing framework (aimed to automatically validate/integrate STAT information) | Started (in parallel with JavaMig) | 10% | 4 months |
| | 15 | Project to develop a Web-Form prototype to report data (planned to start in 2015) | new (?) | 0% | 3/4 months |
| Continuous tasks | 16 | Task-I & Task-II yearly update (includes publication and various outputs) | yearly work | n/a | n/a |
| | 17 | Support on ICCAT-DB to other departments (development, training, etc) | yearly work | n/a | n/a |
| | 18 | Update of Compliance related databases (includes publication and various outputs) | yearly work | n/a | n/a |
| | 19 | Database maintenance (updates, error corrections, backups, code tuning, etc.) | yearly work | n/a | n/a |
| | 20 | CATDIS update (1950-2014) – include all revisions made to T1 and new T2CE data | yearly work | n/a | n/a |
| | 21 | Capacity building of the Statistical Department personal (programming on current & new technologies) | yearly work | n/a | n/a |
| | 22 | Improvements to the ICCAT website | yearly work | n/a | n/a |

In light of the limited man power and the time required for completion, choices will obviously have to be made with regard to how to prioritize the projects in the table.

OPENING ADDRESS BY MR. DRISS MESKI, ICCAT EXECUTIVE SECRETARY

Mr. Chairman,
Scientific Delegates,
Ladies and Gentlemen

Firstly, I would like to welcome you to the beautiful city of Madrid and wish you every success with the work of the 2015 SCRS session.

As I have often said and I reiterate on this occasion, the work of the SCRS is essential to the mission of our Commission. Yet the efforts of the SCRS can only yield results if all the Contracting Parties contribute efficiently and effectively. It is therefore crucial that the scientists from all Contracting Parties participate effectively in the work of the Scientific Committee. As you know, in recent years, great progress has been made both in terms of participation by scientists in SCRS meetings and data provision. This has been achieved as a result of the decisions of the Commission which has established support mechanisms for developing countries and of its support for the different recommendations of the Committee. I know that you have several issues to deal with this year, but I am confident that your proposals will provide response to the Commission requests.

As in previous years, 2015 has been characterised by numerous inter-sessional meetings and a diversification of tasks and issues to which the SCRS must provide response. I would like to take this occasion to congratulate the new SCRS Chairman, the new rapporteurs and all the scientists for the efforts made throughout the year and I would like to wish you every success for the remainder of your work.

As I already mentioned last week at the opening of the species groups meetings, there have been some changes at the Secretariat, in particular the retirement of Dr Pilar Pallarés and the arrival of Dr Miguel Santos, who you know very well. It is always difficult to replace people who are so competent and professional as Pilar to whom I pay great tribute for all that she has done for ICCAT, but I must say that we are lucky to have hired Miguel to succeed her.

Unfortunately, Miguel is currently going through difficult times following a very serious accident, and regrettably has been unable to contribute on this occasion to the work of this Committee. On your behalf, I wish him a speedy recovery so that he can continue his activities as soon as possible.

Thank you.

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