INTERNATIONAL COMMISSION FOR THE CONSERVATION OF ATLANTIC TUNAS
COMMISSION INTERNATIONALE POUR LA CONSERVATION DES THONIDES DE L'ATLANTIQUE
COMISIÓN INTERNACIONAL PARA LA CONSERVACIÓN DEL ATÚN ATLÁNTICO

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

(Madrid, Spain, 28 September to 2 October 2015)

October 2015

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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, Cape Verde, China (P. R.), 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 (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). 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 the CPCs, they will make 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

Les captures algériennes des thonidés et des espèces voisines enregistrées pour l’année 2014 sont de l’ordre de 556,79 tonnes pour l’espadon, de 243,83 tonnes pour le thon rouge et de 1873,55 tonnes pour les thonidés mineurs. Nous notons une augmentation des productions de l’espadon pour l’année 2014 ainsi que pour les thonidés mineurs, en comparaison avec celles de l’année 2013.

S’agissant de la pêche au thon rouge, huit (08) thoniers nationaux de type senneurs dont les longueurs sont comprises entre 25 et 40 m, ont participé à la campagne de pêche au thon rouge vivant en 2014. La totalité du quota alloué à l’Algérie a été capturée, soit 243,8 tonnes. Un échantillonnage de 44 spécimens de thon rouge capturés morts a fait l’objet de mensuration de taille et de sexage à bord du navire de pêche.

Concernant l'espadon ***Xiphias gladius***, des échantillons de taille et de poids ont été effectués au niveau des ports de débarquement sur un échantillon de 52 individus.

S'agissant de la collecte des données statistiques de l'activité de pêche, un dispositif harmonisé de suivi et de collecte est opérationnel à l'échelle nationale, il permet à l'Administration des pêches ainsi qu'aux institutions scientifiques de disposer de la meilleure information disponible afin d'estimer le niveau de captures d'effort de pêche et de travailler en concertation pour la mise en place des mesures de gestion appropriées.

Ce dispositif qui permet une évaluation indirecte est renforcé par la réalisation régulière, annuellement, par des scientifiques nationaux relevant du Centre National de Recherche et de Développement de la Pêche et de l'Aquaculture (CNRDPA) de deux campagnes d'évaluations des ressources halieutiques l'une pélagique et l'autre démersale (évaluation directe) et ce, le long du littoral algérien. Concernant, les grands migrateurs halieutiques dans le cadre des axes de recherches du CNRDPA sur l'étude de juvéniles de thon rouge, des informations sont collectées et en cours d'analyse. Il est aussi question de prendre en charge l'étude de la croissance. Par ailleurs, un dispositif d'échantillonnage biologique d'espadon au niveau de ports pilotes est fonctionnel.

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 bait-boat 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 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 the bigeye tuna, dolphin fish and the 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 bycatch of seabirds and sea turtles in the longline fishery, however, has continued, including the development of measures to avoid their catches.

Canada

Bluefin tuna are harvested in Canadian waters from July through December. The adjusted Canadian quota for 2014 was 487.3t which includes an 86.5t 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 402.20t. An additional 60.70 t was harvested as bycatch in the pelagic longline fleet in the swordfish and other tunas fishery. These figures include 0.273t 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 1892.5t with landings reaching 1604.2t. The tonnage taken by longline gear was 1371.2t while 233.0t 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).

Cape Verde

En 2014, la flottille thonière semi industrielle et industrielle cap-verdienne est composée de quatre grands senneurs et soixante-cinq plus petits (MIS, HS, LL, LHP et BB) qui exploitent essentiellement l'albacore (*Thunnus albacares*), le thon obèse (*Thunnus obesus*) et le listao (*Katsuwonus pelamis*). Par ailleurs, certaines pêcheries artisanales et la pêche sportive capturent aussi les petits thonidés (Auxide, thazard bâtard, thonine, etc.) et les poissons porte-épée (marlins et espadon) respectivement. Le total des captures de thon a augmenté en 2014, à environ 28.000 tonnes (4.507 tonnes d'albacore, 15.254 tonnes de listao, 2.271 tonnes de patudo et 5500 tonnes d'auxide). Il est à souligner la capture accrue d'Auxis spp., qui a atteint en 2014, environ 5.500 tonnes. Les captures ont connu une hausse par rapport à 2013 (15.000). Une flotte étrangère autorisée opère aussi, dans la ZEE du Cap-Vert, sur la base d'accords ou de contrats de pêche. Les navires appartiennent surtout aux pays de l'Union Européenne et des pays asiatiques. Les demandes de licence des navires étrangers, indiquent, généralement, comme espèces cibles, les thons, mais les principales espèces pêchées continuent à être des requins et l'espadons, selon les captures déclarés par quelques embarcations de l'Union européenne. Dans la pêche nationale, le requin n'est pas dépassé 0,9% du total des débarquements, comme capture accessoire. La pêche sportive continue avec une grande importance économique, sociale, culturale et politique, mais n'existe pas encore un suivi de cette pêcherie. L'INDP est le responsable pour le suivi régulier des activités de pêche des thoniers et le travail consiste en collecter des statistiques de captures et d'effort de pêche. Ce travail est complété par des informations de diverses sources (usines, Direction des ressources marins, Douane etc.). Des échantillonnages multispécifiques sont également réalisés en pêche industrielle et pêche artisanale.

China (P. R.)

The number of vessels from China operated in the Atlantic Ocean decreased from 17 in 2013 to 13 in 2014. The 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 bycatch. 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 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

Les captures totales de thonidés et espèces associées débarqués aux différents quais s'élèvent à 4108611,096 Kg. Avec respectivement 3132656,94kg de thonidés majeurs, 724438,123kg de thonidés mineurs, 197384,41kg d'espèces associées et 129115,64kg de requins. Les espèces majoritaires pour les différents groupes étaient : *Katsuwonus pelamis* (2370470,69kg) pour les thonidés majeurs, *Auxis thazard* (291724,13 kg) pour les thonidés mineurs, *Istiophorus albicans* 99211,36kg pour les espèces associées et *Prionace glauca* 93359kg pour les requins. Aucun dépassement de quota n'a été observé pour les espèces concernées. Ainsi la Côte d'Ivoire adhère pleinement aux travaux de l'ICCAT et elle respecte les règlements et les traités en vue d'une meilleure gestion des ressources existant. Pour y parvenir, une connaissance de la biologie et un renforcement du personnel enquêteur est indispensable.

Equatorial Guinea (Rep.)

La República de Guinea Ecuatorial posee una zona económica exclusiva (ZEE) de unos 314.000Km^2, con 644 km de costa, de total soberanía para fines de explotación de recursos halièuticos disponibles. Las aguas jurisdiccionales del país se dividen en dos zonas de pesca: una zona insular y otra zona continental. La pesca marítima en Guinea Ecuatorial está dirigida a la captura de los principales recursos disponibles. Los recursos pesqueros disponibles son: Pequeños pelágicos costeros como sardinas, arenques, entre otros; grandes pelágicos oceánicos: Túnidos y especies afines; especies demersales costeras: pargos, besugo, colorado, **y** finalmente, las especies de aguas profundas, como: Corvina, gambas, entre otras. De las dos modalidades de pesca que se practican, la Pesca Artesanal es llevada a cabo por la población costera de larga tradición y experiencia en ese subsector, mientras que la industrial es desarrollada por los barcos de las sociedades privadas, extranjeros mayoritariamente al menos europeos y asiáticos, mediante acuerdos y/o contratos que llegan con el Ministerio de Pesca y Medio Ambiente. A nivel de las investigaciones, el Ministerio de Pesca y Medio Ambiente espera la pronto ejecución del Proyecto UTF/EQG sobre la asistencia técnica de la FAO. En la estadística, la Dirección General de Recursos Pesqueros, tiene elaborado un borrador de anteproyecto de "Establecimiento de un Control Estadístico Pesqueros Nacional". Para la conservación del ecosistema marino y garantizar la reproducción de las especies biológicas, la Ley Reguladora de la Actividad Pesquera en la República de Guinea Ecuatorial prohíbe el uso de redes de arrastre, cerco, palangres de la pesca industrial dentro de la zona situada a cuatro (4) millas marinas, medida a partir de la línea de base, es decir, línea de bajamar.

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 et Miquelon

Le montant total des captures réalisées sur les quotas de la CICTA attribués à la France (au titre de Saint-Pierre-et-Miquelon - SPM) s'élève à 3,41 tonnes de thonidés et espèces apparentées pour l'année 2014. Il convient de noter que les problèmes techniques du navire rencontrés tout au long de l'année et la problématique de trouver un équipage spécialisé dans la pêche aux thonidés ont empêché le bon déroulement de la campagne de pêche 2014. Les quotas attribués à la France (au titre de SPM) ne permettant à un armement local d'exploiter qu'une unité, les captures françaises de thonidés et espèces apparentées sont réalisées par un navire de pêche de type palangrier de 28 mètres. Ce navire, acquis par un armement de Saint-Pierre, navigue sous pavillon français depuis le 9 mars 2011 pour exploiter les quotas français de thonidés (espadon du Nord principalement). Il a également la possibilité de pêcher du thon rouge de l'Ouest. La pêche est réglementée par le biais de l'attribution d'autorisations de pêche par le représentant de l'État sur l'archipel. Les navires sont soumis à obligation de déclaration des captures et peuvent également embarquer ponctuellement un observateur des pêches. Tous les débarquements font l'objet d'un contrôle, de même que la totalité des produits exportés. La France (au titre de SPM) dispose de moyens de contrôle de plusieurs administrations (affaires maritimes, gendarmerie, marine nationale, etc.). Des campagnes de contrôle des pêches, tant en mer qu'à terre, sont régulièrement effectuées. Aucune infraction n'a été relevée en 2014 dans le cadre de ces pêcheries.

Gabon

Le Gabon possède une façade maritime longue de 800 km et une Zone Economique Exclusive ZEE qui s'étend sur 213000 km². Cette étendue abrite au cours de l'année une diversité de thons et d'espèces apparentées. Toutefois, ne disposant pas des capacités pour exploiter particulièrement sa ressource thonière qui migrent vers d'autre ZEE, le Gabon conclue des Accords de pêche afin de tirer profit des retombées financières issues de l'exploitation de cette ressource. C'est la Direction Générale des Pêches qui gère cette ressource halieutique.

Ghana

The Tuna industry in Ghana comprises the 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 the Black skipjack (*Euthynnus alletaratus*). During the year under review, Skipjack catches were the highest 68%) followed by Yellowfin (26%), Bigeye (5%) and other tuna-like species including (1%) respectively. Catches of the principal tuna species for the year 2014, rose slightly to 76844 mt from 62290 mt in 2013. Both fleets employ Fish Aggregating Devices (FADs) in fishing and collaborate extensively 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 11) in relation to innovations observed in the fishery.

An observer programme was organized in 2014 on board with 6 Purse seine vessels with the aim of training officers on proper methods of estimating catches and filling out of 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 – February 2014.

Guinée (Rép.)

La République de Guinée jouit d'une situation privilégiée en matière de ressources halieutiques. Deux types de pêche (artisanale et industrielle) exploitent les ressources que recèlent les eaux maritimes guinéennes. La pêche artisanale est totalement dominée par les pêcheurs nationaux alors que la pêche industrielle est tributaire de flotte étrangère composée de navires alignés sous le couvert d'arrangements divers (Accords de pêche, Affrètements, Consignations).

Ce sont trois thoniers senneurs battants pavillons guinéens qui ont été alignés en 2014 dans le cadre de la convention de l'ICCAT. Il s'agit de navires suivant : Avra, Belouga et Harmonia anciennement appelé Mervent qui débarquent généralement leurs captures à Abidjan en Côte d'Ivoire et parfois à Dakar au Sénégal et occasionnellement au port de Tema au Ghana.

Les captures totales déclarées par les trois thoniers guinéens en 2014 s'élèvent à 7 559 935 kg toutes espèces confondues soit une baisse de 14,32 % par rapport à 2013 au cours de laquelle 8 822 955 kilogrammes de thons ont été déclarées.

Les captures ainsi déclarées sont composés majoritairement de listao (*Katsuwonus pelamis*) représentant 90,78 % de la prise totale et d'une proportion relativement faible d'albacore (*Thunnus albacares*) avec 9,22 %.

Depuis 2010, des mesures appropriées sont prises par les autorités du Ministère de la Pêche et de l'Aquaculture pour le suivi de l'activité des thoniers battants pavillons guinéens et la fourniture régulière des statistiques à l'ICCAT.

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 has been 90 – 100 % before 2013. The current coverage for 2014 is estimated to be about 98%. In 2014, fishing days was 15,200, which was 64% of average value in recent ten years. The catch of tunas and tuna-like fishes (excluding sharks) is estimated to be about 24,000 t, which are about 82 % of the past ten years average catch. 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 occupied 16% and third species was bluefin tuna (6%). Observer trips on longline boats in the Atlantic were conducted. 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 and declined 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 complying with the Act on Fisheries Information and Data Reporting revised and put into effect from 5 December 2012. Electronic data reporting system is changed from a weekly to a daily basis since the 1st of September 2015. It includes the recording in the logbook the discards/release for target and bycatch species and also the method of bycatch mitigation used and obligates the daily submission of it 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

En Mauritanie, la flotte thonière opérant dans la zone économique exclusive est entièrement étrangère, elle est composée essentiellement de navires espagnols, japonais et sénégalais. Ces flottilles sont dotées d'un régime d'accès libre et débarquent leur production à l'étranger. Ces espèces sont également pêchées accessoirement par les unités industrielles pélagiques, étrangères à cent pour cent. Les captures de ces espèces déclarées par ces pêcheries sont étroitement corrélées avec celles des sardinelles (proie préférentielle) qui sont ciblées par ces flottilles. Ces statistiques montrent que la capture accessoire du thon hauturier réalisée par la pêche industrielle a atteint, en 2011, 16 mille tonnes composée essentiellement de *Sarda sarda* avec une contribution de 76% contre 12% pour l'*Auxis thazard*. Depuis 2012 les captures sont en chutent suite au non renouvellement de l'accord de pêche entre la Mauritanie et l'UE. L'accord signé en 2015 et qui prévoit un quota annuel de 20 mille tonnes de thons contre 15 mille tonnes dans l'accord précédent, ne prendra effet qu'en fin 2015 ou début 2016 après son validation par le parlement européen.

Les captures déclarées par la pêche artisanale et côtière sont en augmentation depuis 2010 pour atteindre 1648 tonnes en 2013 et 1253 tonnes en 2014. En 2012 les captures étaient composées essentiellement de *Sarda Sarda* (à hauteur de 77%) débarqué à Nouadhibou. En 2013 et 2014, les prises sont dominées par l'*Acanthocybium Solandri* et le *Scomberomerus tritor*.

Mexico

El presente informe describe las características de la pesca del atún aleta amarilla o rabil (*Thunnus albacares*) con palangre en el Golfo de México, y las especies que integran la captura incidental, destacando el cumplimiento a las regulaciones nacionales y/o aplicación de las recomendaciones y resoluciones emanadas de la Comisión Internacional para la Conservación del Atún Atlántico (CICAA).

La Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación (SAGARPA) a través de la Comisión Nacional de Acuacultura y Pesca (CONAPESCA) es la autoridad nacional encargada de implementar las políticas, programas y normatividad que faciliten el desarrollo competitivo y sustentable del sector pesquero y acuícola de México. Por su parte, el Instituto Nacional de Pesca (INAPESCA) es el responsable de desarrollar la investigación científica y recopilar las estadísticas sobre la pesca del atún con palangre en el Golfo de México.

La pesca de atún aleta amarilla o rabil (*Thunnus albacares*) en el Golfo de México se lleva a cabo por embarcaciones de mediana altura a través del palangre. En ésta además de la especie objetivo, se capturan incidentalmente otras especies como: el barrilete o listado (*Katsuwonus pelamis*), el patudo o bigeye (*Thunnus obesus*), el atún aleta azul o atún rojo del Atlántico (*Thunnus thynnus*), tiburones y pez espada, entre otros.

El marco legal normativo que regula esta pesquería incluye a la Ley General de Pesca y Acuacultura Sustentables (LGPAS), y la Norma Oficial Mexicana que regula el aprovechamiento de las especies de túnidos con embarcaciones palangreras en aguas de Jurisdicción Federal del Golfo de México y Mar caribe (NOM-023-PESC-1996), la cual se actualizó en febrero de 2014 para actualizar e incorporar las regulaciones adoptadas por CICAA.

Morocco

La pêche des espèces de thonidés et des espèces apparentées a atteint une production de 6792,09 tm au cours de l'année 2014 contre 7815,1 tm au cours de l'année 2013, soit une baisse d'environ 13 % en terme de volume. Toutefois, le quota du thon rouge alloué par l'ICCAT a été consommé à 100 %.

Les principales espèces exploitées le long des côtes marocaines sont le thon rouge, l'espadon, le thon obèse, l'albacore, le germon, les thonidés mineurs, autres thonidés et des requins et squales.

La collecte de données statistiques de pêche et d'effort, se fait pratiquement d'une manière exhaustive, à travers les structures administratives des pêches (Département des Pêches et l'Office National des Pêches), implantées tout au long des côtes atlantique et méditerranéenne du Maroc. Un contrôle se fait également en aval par l'Office des Changes, en ce qui concerne les exportations des produits de la pêche.

Sur le plan scientifique, l'Institut National de Recherche Halieutique -INRH-, à travers ses Centres Régionaux (au nombre de six), couvrant tout le littoral marocain, a renforcé la collecte de données biologiques des principales espèces (thon rouge et espadon). Le Centre Régional de l'INRH à Tanger sert de coordinateur de collecte de toutes ces données. Au cours de ces dernières années, d'autres espèces ont commencé à être suivies, notamment celles des thonidés tropicaux (thon obèse entre autres) et les thonidés mineurs, avec une extension des travaux de recherche vers les zones situées au Sud du Maroc.

Un grand progrès a été ainsi enregistré en matière de collecte de données statistiques et biologiques, tel qu'en témoignent la série de documents scientifiques, ainsi que des bases de données de la Tâche 2, soumises par les chercheurs marocains aux différentes réunions scientifiques du SCRS, à des fins d'évaluation de stocks de thonidés.

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 RFMO's 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), Big-eye 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 (**Table 1**).

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 RFMO's and International Organisations.

Norway

Norway caught one specimen of Atlantic bluefin tuna (*Thunnus thynnus*) as bycatch 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 group “Small Tunas” occurred in trawls as a by-catch, from a few individual specimens up to a few dozens ones. Data on frigate tuna, bullet tuna, Atlantic black skipjack, Oceanic skipjack and Atlantic bonito was collected in the amount of 2585 specimens for weight measurements and 468 - for biological analyses.

Implementation of ICCAT Conservation and Management Measures. During fishery in the areas where tunas and tuna-like species occurred in the catches, the ICCAT requirements and recommendations concerning restrictions on tuna fishery and a ban on fishery of quoted species were observed.

Senegal

En 2014, la flottille thonière industrielle sénégalaise est composée de six (6) canneurs qui ciblent essentiellement les thons tropicaux notamment l’albacore (*Thunnus albacares*), le thon obèse (*Thunnus obesus*) et le listao (*Katsuwonus pelamis*) et un (1) palangrier qui cible l’espadon. Cependant, une partie des pêcheries artisanales (la ligne à la main, la ligne de traîne et la senne tournante) et la pêche sportive capturent les poissons porte-épée (marlins, espadon et voilier) et les petits thonidés (thonine, maquereau, bonite, auxide etc.) et les requins.

Les prises totales des canneurs sénégalais sont estimées à4196 tonnes dont 500tonnes d’albacore, 3252 tonnes de listao, 361 tonnes de patudo et 83 tonnes de thonine et d’auxide. Les captures de 2014ont connu une baisse de -29% par rapport à 2013(5910 tonnes tonnes).Concernant la pêche palangrière, les prises de 2014sont estimées à 246 tonnes soit une réduction de -42 % par rapport à 2013 (424 tonnes). Les captures sont constituées essentiellement de l’espadon 192 tonnes, requins 22 tonnes, marlins 10 tonnes et 2 tonnes de voiliers. Concernant aux pêcheries artisanales, les prises de petits thonidés et espèces apparentées en 2014 sont estimées à6850 tonnes. Les requins sont estimés à 885 tonnes.

Pour la pêche sportive, les captures ont été estimées à 28 tonnes (31 en 2013), dont 22tonnes de marlins, 4 tonnes de voiliers et 2 tonnes d’albacore.

Pour la recherche et les statistiques, le Centre de Recherches Océanographiques de Dakar – Thiaroye (CRODT) assure le suivi des activités de pêche de la totalité des thoniers qui fréquentent le port de Dakar. Le travail consiste au recueil des statistiques de captures et d’effort de pêche à travers les carnets d’activité de pêche. Ce travail est complété par des informations de diverses sources (usines, armements, Direction des pêches maritimes, Douane etc.). Des échantillonnages multispécifiques sont également réalisés au port lors des débarquements des thoniers. Le suivi des débarquements et l’échantillonnage des istiophoridés sont toujours menés au niveau des principaux ports de la pêche artisanale.

Tunisia

Les plans de gestion et de conservation des thonidés et des espèces accessoires sont régis essentiellement par les dispositions de la loi N° 94-13 du 31 Janvier 1994 et de ses textes d’application.

En 2014, comme pour les années précédentes, ces plans ont été soutenus par la mise en œuvre de tous les programmes de contrôle (programme des observateurs à bord) et les programmes d'inspection en mer et dans les ports notamment pendant les périodes d'interdiction de la pêche de thon rouge et d'espadon.

Dans le cadre de l'ajustement de la capacité de pêche de thon rouge, la Tunisie a conservé le même nombre des thoniers qu'en 2013, soit 21 navires soit une réduction totale de la surcapacité sachant que la flottille de thon rouge est passée de 42 navires en 2010 à 21 navires en 2014.

Dans ce contexte et dans le cadre de l'amélioration de la collecte des statistiques de prise de thon rouge et le suivi de la mise en œuvre des mesures prises en vue d'atténuer les prises accessoires et les rejets dans les pêcheries thonières et d'espadon, l'autorité compétente, outre la documentation des captures, a couvert 5 % de ses pêcheries thonières et artisanales par des observateurs scientifiques.

L'allocation de quotas pour la pêche de thon rouge et la perfection des engins ciblant l'espadon ont minimisé énormément les captures accidentelles sachant qu'en 2014 aucune prise accessoire de tortues marines ou de mammifères marins n'a été relevé par le programme des observateurs nationaux.

Il est à signaler que les captures totales du thon rouge en 2014 ont atteint 1056,566 tonnes, soit un taux de réalisation de 99.96 % du quota national ajusté à 1057 tonnes. 88.85 % de ces captures ont été mises en cage dans les établissements d'élevage et 11.15 % des prises ont été exportées vivantes à la Turquie.

Turkey

Total catch amount of marine fishes of 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, catch amount of the 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 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 in end of May and finished 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 MT, a decrease of about 9% from 7,534 MT in 2013. Swordfish catches (including estimated dead discards) decreased from 2,944 MT in 2013 to 1,962 MT in 2014, and provisional landings from the U.S. fishery for yellowfin tuna increased in 2014 to 2,666 MT from 2,332 MT in 2013. U.S. vessels fishing in the northwest Atlantic caught in 2014 an estimated 810 MT of bluefin tuna, an increase of about 149 MT compared to 2013. Provisional skipjack tuna landings decreased by about 40 MT to 77 MT from 2013 to 2014, bigeye tuna landings decreased by 15 MT compared to 2013 to an estimated 866 MT in 2014, and albacore landings decreased from 2013 to 2014 by 140 MT to 459 MT.

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 bycatch rates and survival.

Uruguay

Durante el año 2014, la flota atunera uruguaya no mantuvo actividades. Diversos factores ocasionaron esta inactividad que se prolonga hasta el presente, previéndose una recuperación del sector a partir del 2016. Se continuó con el análisis de estadísticas de captura y esfuerzo de las especies de interés de la Comisión. Se realizó una campaña de investigación, a bordo del B/I de DINARA, dirigida a grandes recursos pelágicos. Durante la misma se registró la captura, se realizaron muestreos de talla y sexo, se tomaron muestras biológicas, y se marcaron un total de 285 individuos, siendo el tiburón azul la especie más representada (n=271). También se realizaron experimentos para evaluar medidas de mitigación de la captura incidental. Uruguay participó y aportó trabajos en diversas reuniones del SCRS, incluyendo la reunión del grupo de especies de tiburones (1 documento), ecosistemas (2 documentos) y grupo de especies de istiofóridos (1 documento). En 2013 Uruguay comenzó el proceso de revisión y actualización de sus Planes de Acción Nacional de Aves Marinas y Tiburones. Este trabajo continuó durante 2014, y se finalizó a comienzos de 2015, encontrándose ya disponible en la página web de DINARA (www.dinara.gub.uy). Se continuó con el trabajo de control en puerto de buques de tercera bandera iniciado durante 2009. Se realizaron inspecciones en puerto para determinar cuáles son las especies desembarcadas, cuál es su origen y controlando aspectos formales de la documentación de los barcos. Todas las Recomendaciones de la CICAA aprobadas durante la Reunión de la Comisión en el año 2014 han sido internalizadas en Uruguay, y actualmente rigen bajo decreto.

Venezuela

La flota venezolana orientada a los recursos pelágicos que operó en el océano Atlántico estuvo conformada en 2014 por 83 unidades industriales: 73 palangreros, 4 cerqueros y 6 cañeros; y se registran además 49 embarcaciones artesanales que operan con redes de enmalle en el Litoral Central de Venezuela, desde la comunidad de Playa Verde. Ese año se produjeron capturas de tunidos y afines provenientes del Océano Atlántico por 6476,7 t, dentro de los cuales 6296,9 t corresponden a desembarques y 179,822 t a descartes. El 88,9% de los desembarques lo representan los atunes, entre los cuales el más importante fue el aleta amarilla (*T. albacares*) con 59,9 %, mientras que el bonito listado (*K. pelamis*), el abacora (*T. alalunga),* el ojo gordo (*T. obesus*), el aleta negra (*T. atlanticus*) y la carachana (*A. thazard*), alcanzaron 19.1 %, 4.5 %, 2.3 %, 1.4 % y 1.1 %, respectivamente. La captura incidental estuvo conformada por peces de pico, entre los que se destacan el pez vela (*Istiophorus albicans*) con 3,3 % y la aguja azul (*Makaira nigricans*) con 2,2 % y tiburones cuyos desembarques representan el 2.4 %. El 62,3 % de los desembarques provinieron de la pesquería de cerco, 7 % de la de caña, 24,7 % de palangre y 5,9 % de las pesquerías artesanales. En 2014 continuaron las investigaciones sobre la pesquería de los grandes pelágicos; éstos incluyen los atunes, peces de pico y tiburones; y se mantuvo el programa de observadores científicos a bordo de embarcaciones industriales de palangre, caña y cerco.

- Cooperating 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 researches 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 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 Cape 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 Program (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 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 5,000t 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 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 10ºS, 5ºW-5ºE 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 (1ox1o) 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 on 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 long-term sustainable yield, the Committee continues to recommend that effective measures be found to reduce FAD-related and other fishing mortality of small yellowfin.

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

YFT-Table 1. Estimated catches (t) of yellowfin *(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	0	1	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	
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	
		Cambodia	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Cape Verde	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	
		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	
		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	
		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	
		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	
		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	
		Faroe Islands	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	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	
		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	
		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	0	892	892	199	0	0	11
		Guinée Rep.	0	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	
		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	
		Maroc	0	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	
		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	
		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	
		Namibia	0	0	0	0	35	14	72	69	3	147	59	165	89	139	85	135	59	28	11	1	9	90	0	6	15
		Nigeria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	3	1	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	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	0	4	42	211	42	33	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	
		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
		Cape 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	
		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	
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
	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
		Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Mexico	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	
		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	

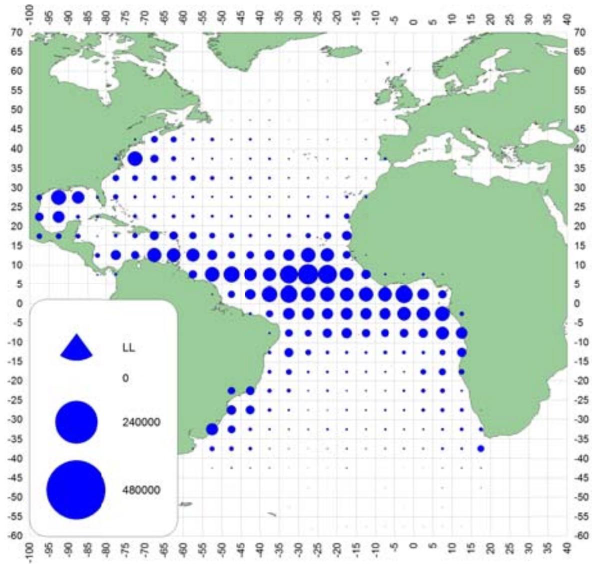
1. Brazilian Task I catches from 2012 to 2014 are preliminary and under revision.

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

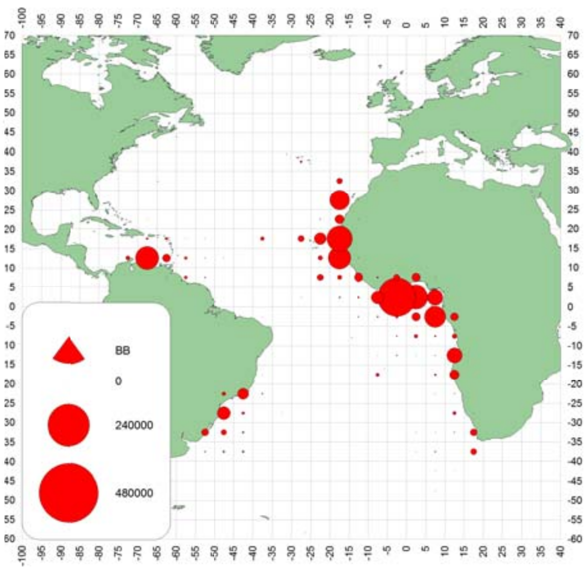
YFT-Table 2. Kobe II matrices giving the probability that the biomass will exceed the level that will produce MSY and the fishing mortality will fall below the fishing mortality rate that would maintain MSY, in any given year, for various constant catch levels based on combined model results.

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

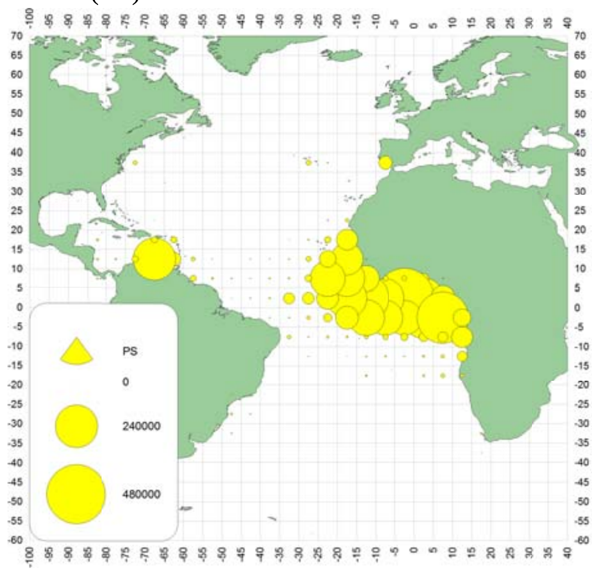
a)



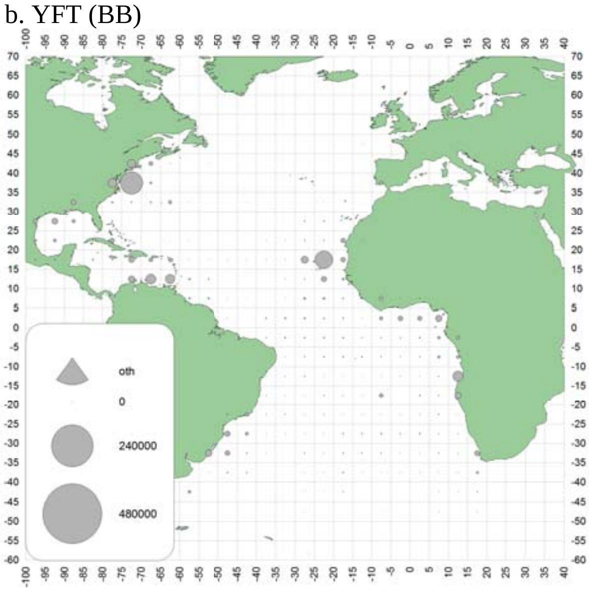
a. YFT (LL)



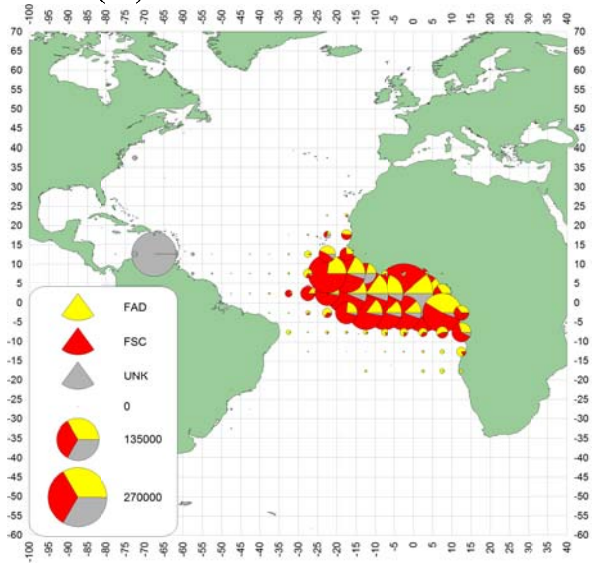
b. YFT (BB)



c. YFT (PS)

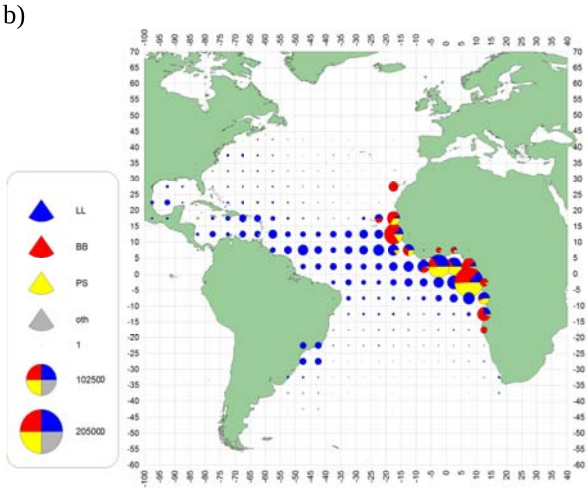


d. YFT (oth)

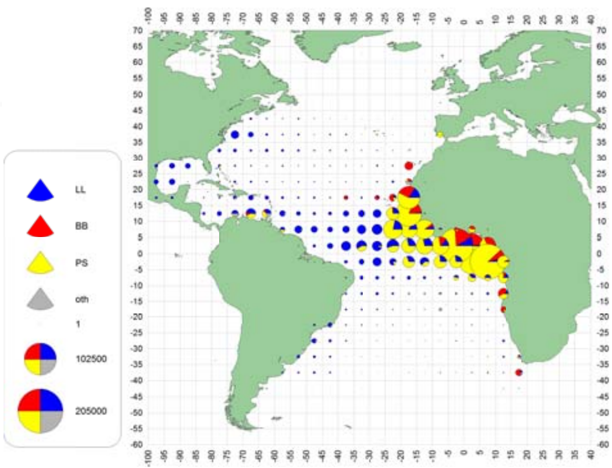


e. YFT (FAD/FREE 1991-2013)

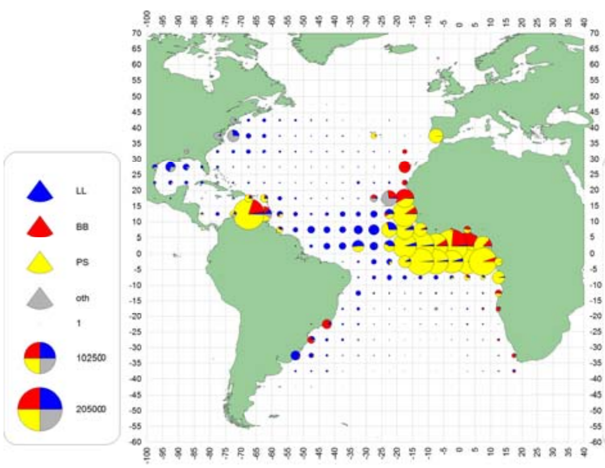
b)



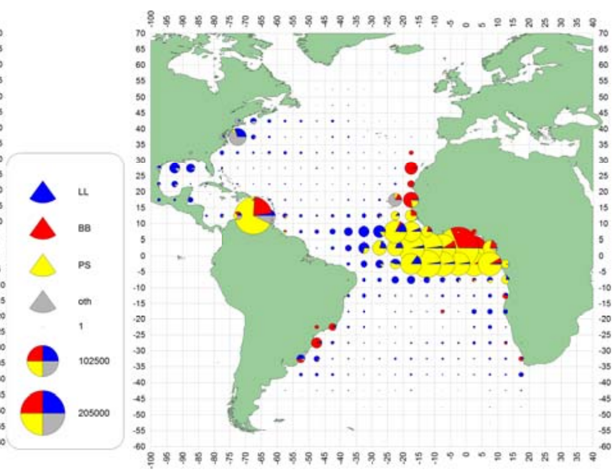
a. YFT(1960-69)



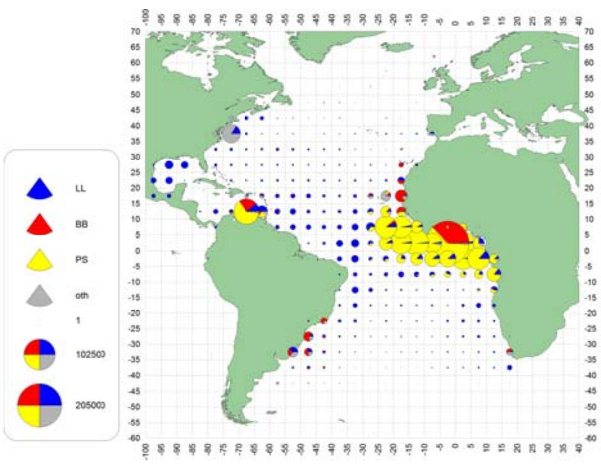
b. YFT(1970-79)



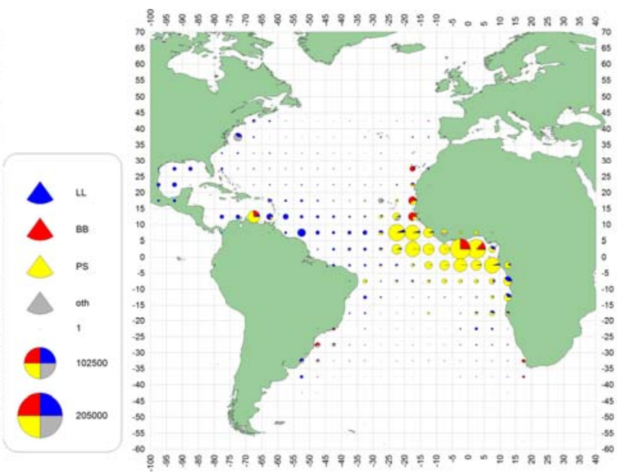
c. YFT(1980-89)



d. YFT(1990-99)

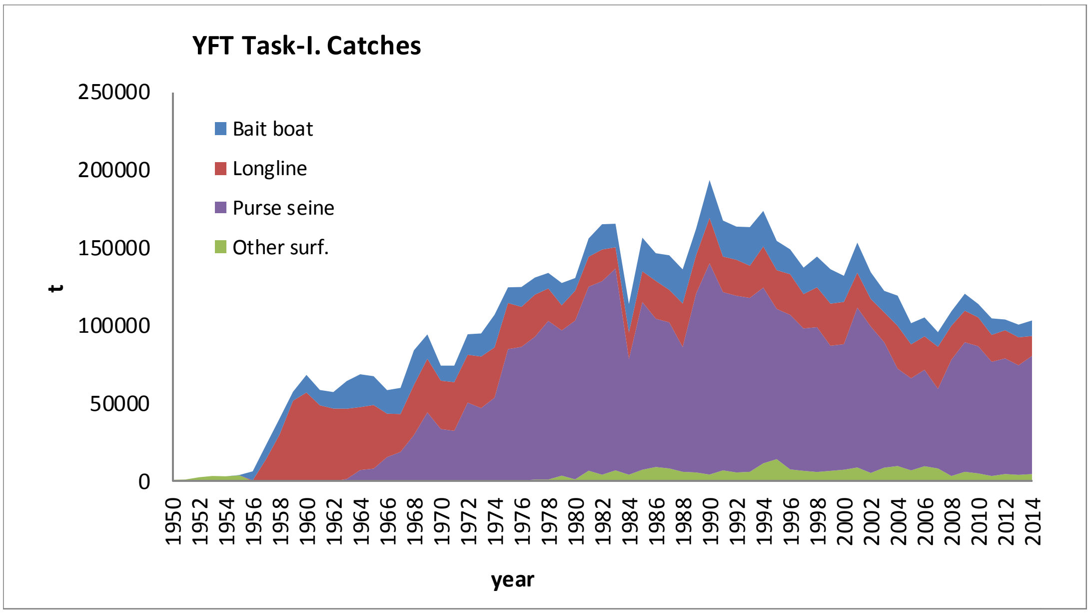


e. YFT (2000-09)

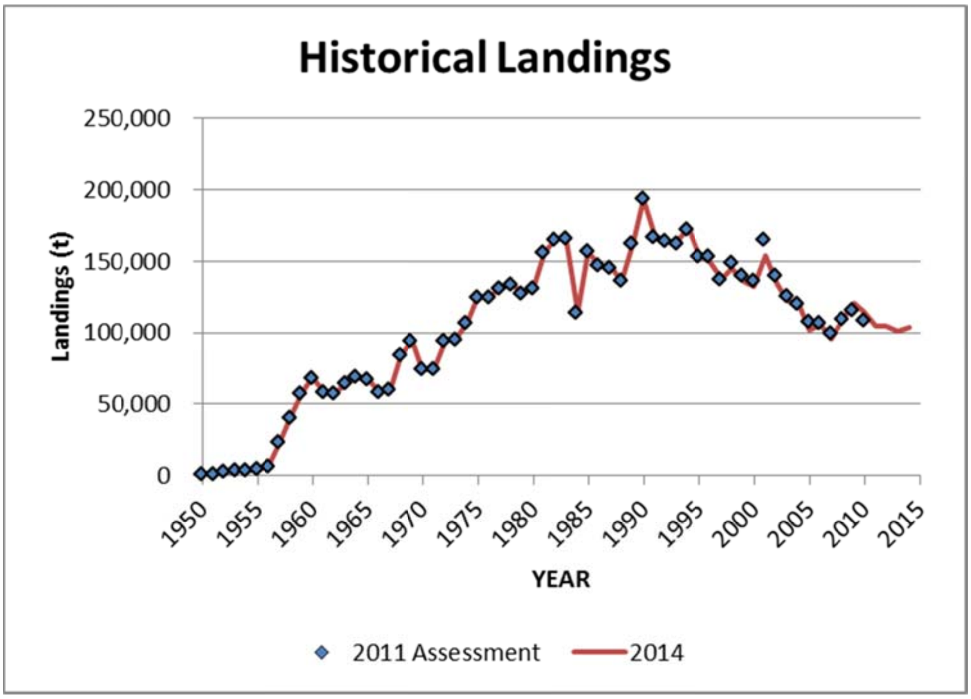


f. YFT(2010-13)

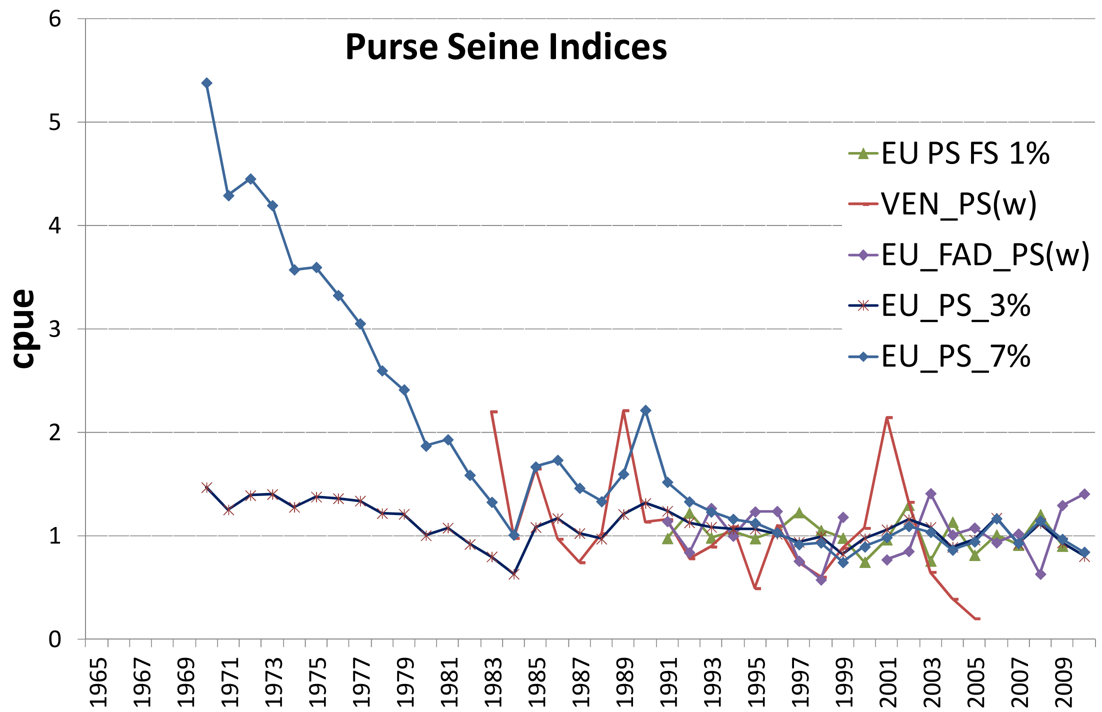
YFT-Figure 1. Geographical distribution of yellowfin tuna catches a) by major gears [a-e] and b) decade [a-f]. The maps b) are scaled to the maximum catch observed during 1960-2013.



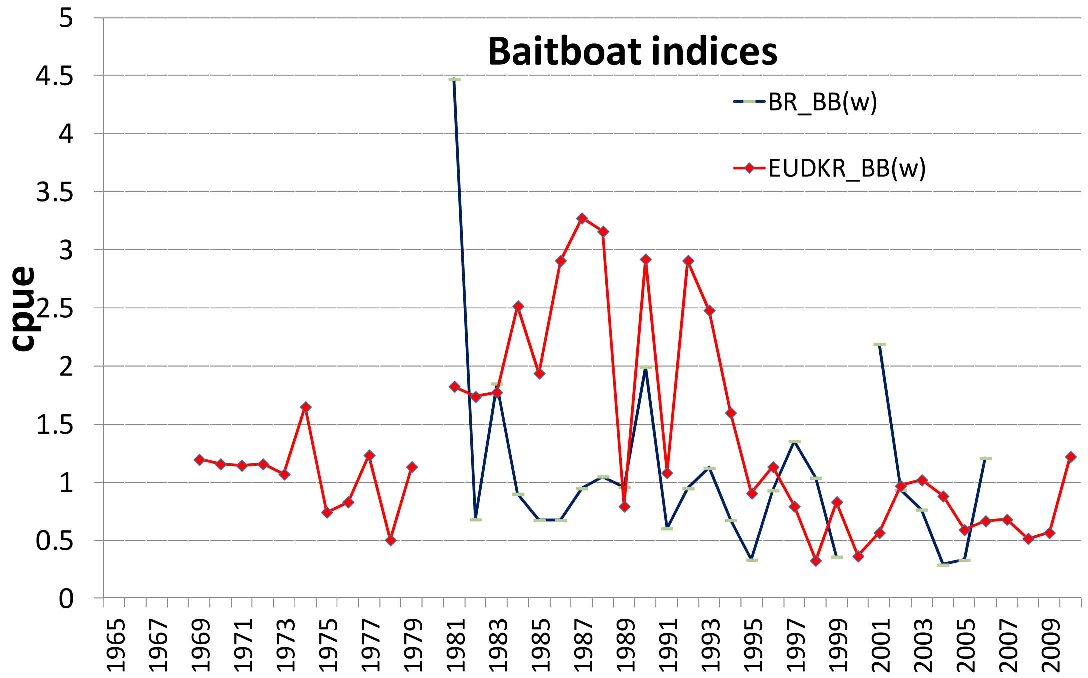
YFT-Figure 2. Estimated annual catch (t) of Atlantic yellowfin tuna by fishing gear, 1950-2014.



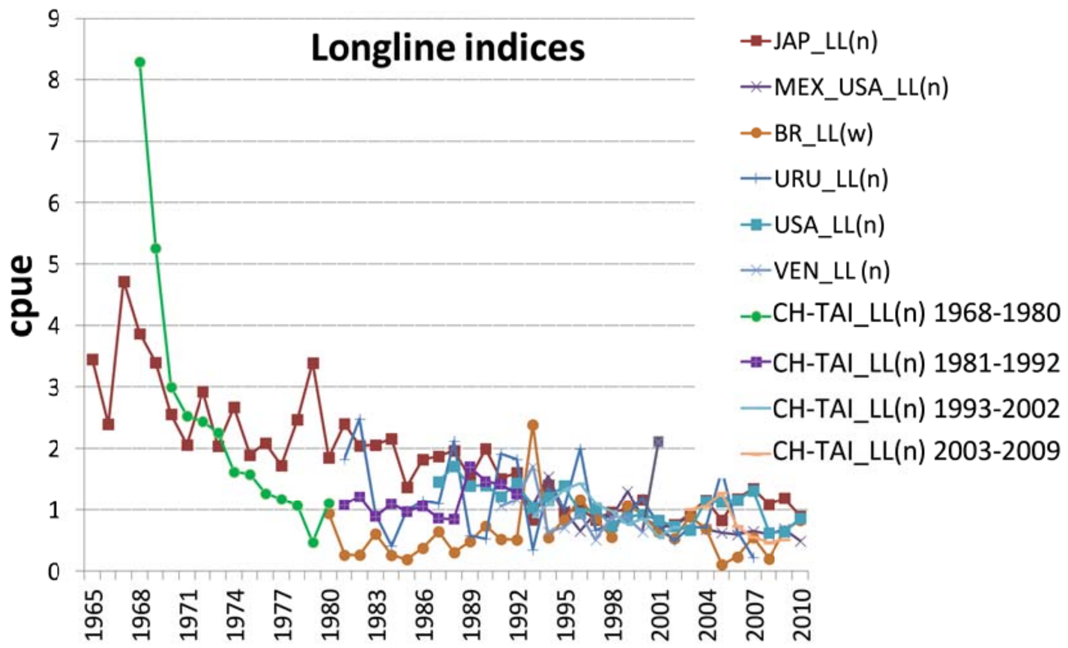
YFT-Figure 3. Comparison of the current estimated historical total catch trend with that available for the 2011 assessment.



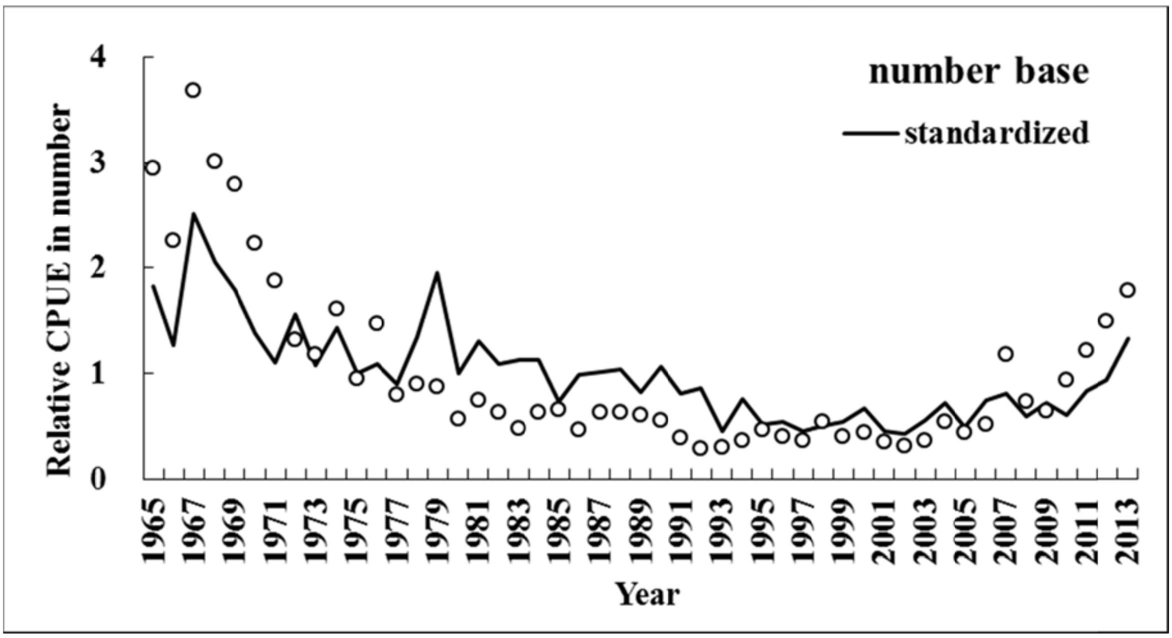
YFT-Figure 4. Yellowfin relative catch rate trends (both nominal and applying various annual increases in effectiveness) from purse seine fleets, in weight.



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

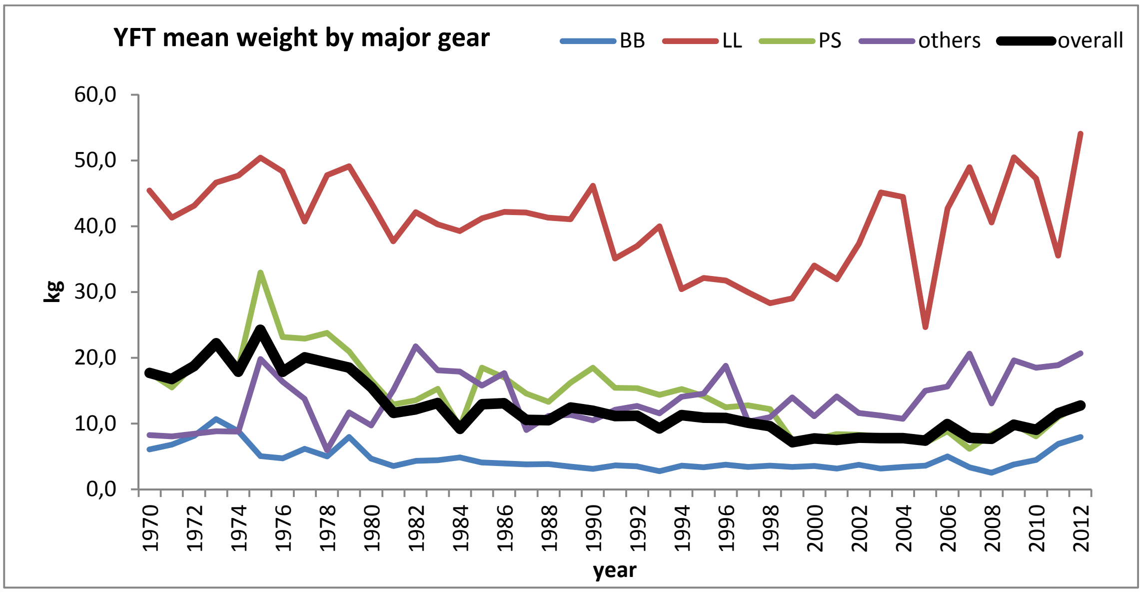


YFT-Figure 6. Yellowfin standardized catch rate trends from longline fleets, in weight (w) and numbers (n).

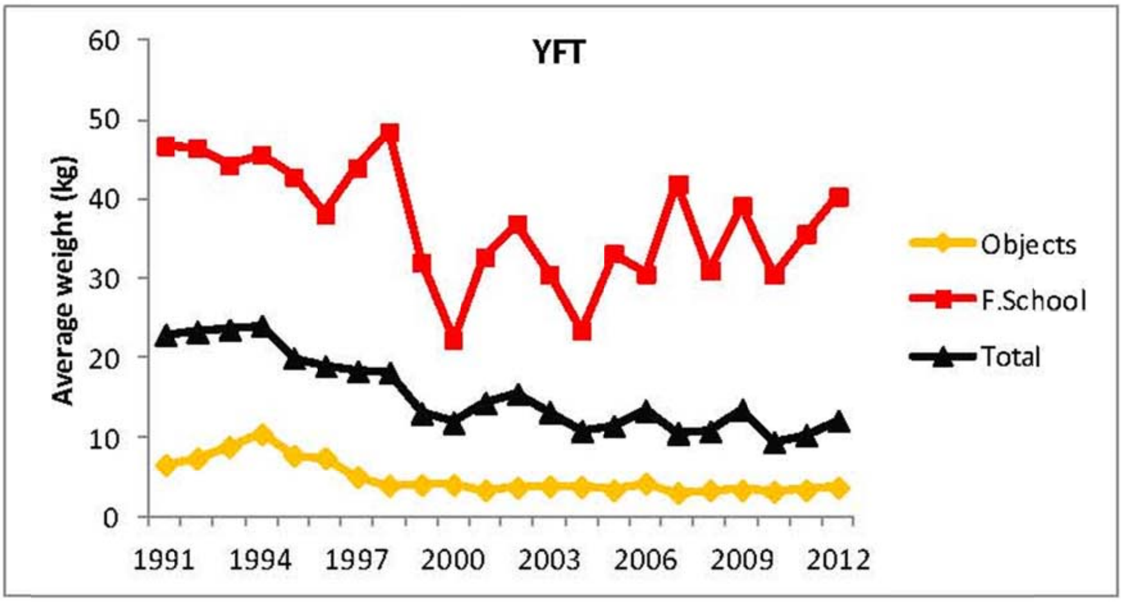


YFT-Figure 7. Yellowfin standardized catch rate trends from the Japanese longline fleet (in numbers), updated through 2013.

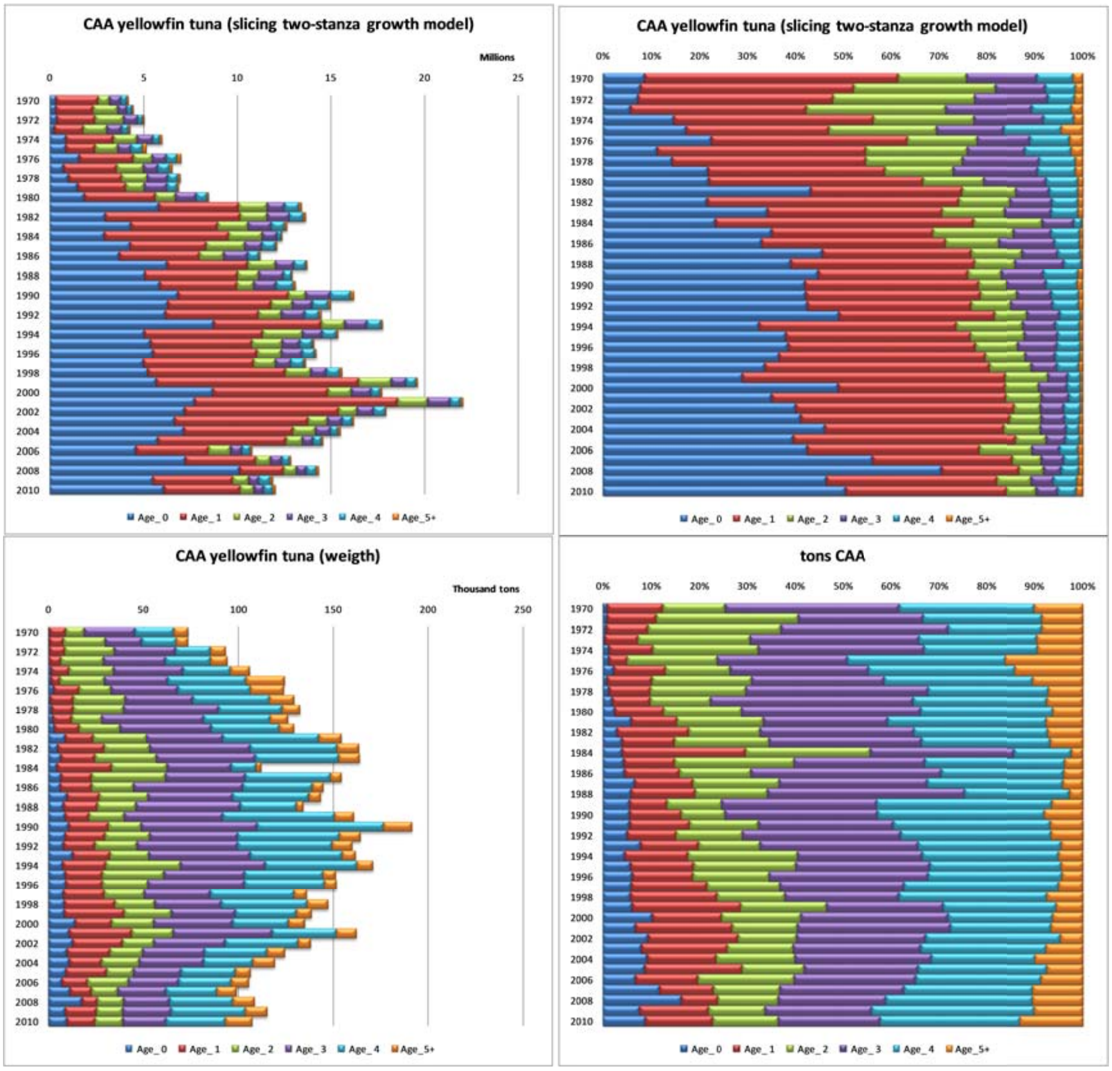
a)



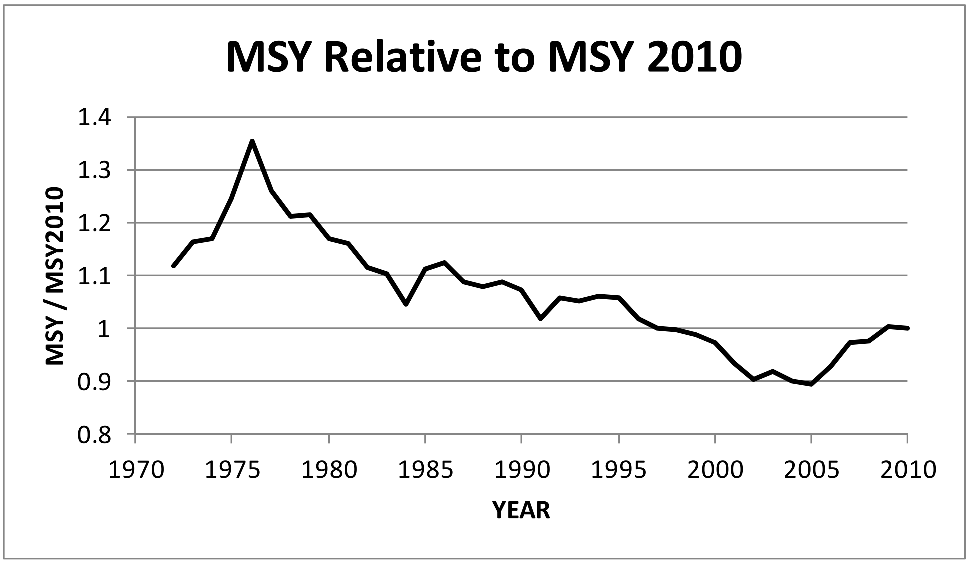
b)



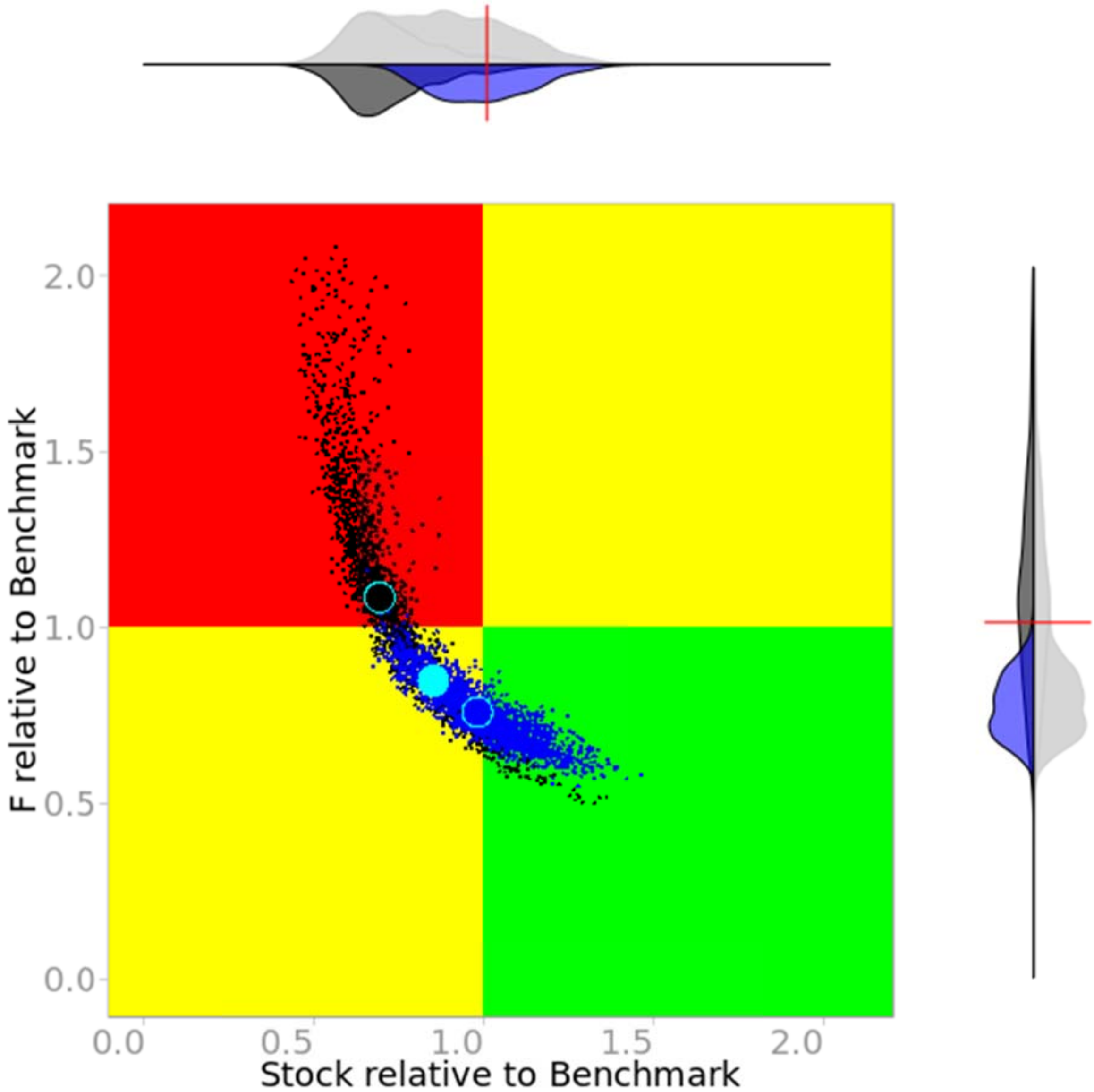
YFT-Figure 8. Trend of mean weight for yellowfin tuna based on the catch-at-size data a) by major fisheries (1970-2012) (NOTE: 2011 and 2012 are preliminary values based on some reported CAS series) and b) for European purse seiners (total) and separated between free schools and FAD associated schools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



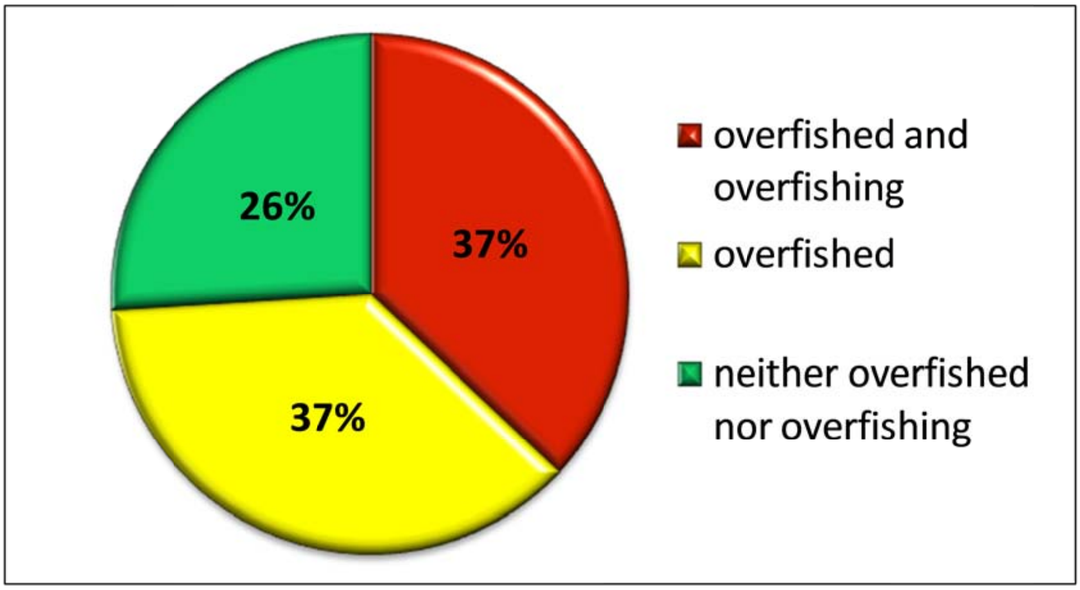
YFT-Figure 9. Distribution of Atlantic yellowfin catches by age (0-5+) in numbers of fish (top row) and in weight (bottom row) for 1970-2010.



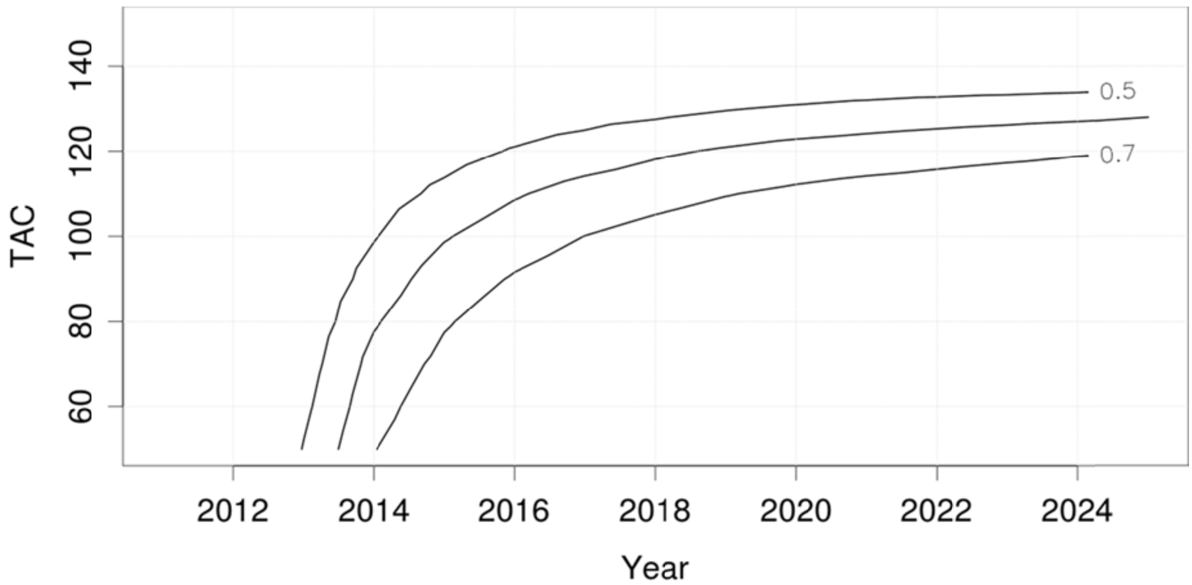
YFT-Figure 10. Estimates of historical MSY values, relative to the MSY estimated for 2010, for Atlantic yellowfin obtained through the age-structured model analysis, which considers the changes in selectivity that have occurred.



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 (Anon. 2015a) and an assessment meeting in July (Anon. 2015b). 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 50ºN and 45ºS, but not in the Mediterranean Sea. This species swims at deeper depths than other tropical tuna species and exhibits extensive vertical movements. Similar to the results obtained in other oceans, pop-up tagging and sonic tracking studies conducted on adult fish in the Atlantic have revealed that they exhibit clear diurnal patterns: they are found much deeper during the daytime than at night. In the eastern tropical Pacific, this diurnal pattern is exhibited equally by juveniles and adults. 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 group 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 man-made 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 group 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. 2011) 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 was 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 Group 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 of 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 70,000t. 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 consisted 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 ($1^{o}x1^{o}$) 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 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 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 long-term 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]
Overfished	Yes
Overfishing	Yes
Conservation & management measures in effect:	[Rec. 14-01] − Total allowable catch for 2012-2015 is set at 85,000 t for Contracting Parties and Cooperating non-Contracting Parties, Entities or Fishing Entities. − 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, 10º S, 5ºE and 5ºW.

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.

BET-Table 1. Estimated catches (t) of bigeye tuna (*Thunnus obesus)* by area, gear and flag. (v2, 2015-09-25). The last column (SA(v2), 2014) shows the Task I catches used in the BET stock assessment (differences shaded in yellow).

		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	SA(v2) 2014
TOTAL	A+M	85264	97207	100117	113862	134936	128018	120751	110261	107804	121643	103680	91201	75726	87702	90534	67964	64263	72874	66094	82864	81988	84768	73380	67984	72585	68390
Landings	Bait boat	18280	17750	16248	16467	20361	25576	18300	21276	18999	22301	12365	14540	8523	11450	20812	13058	10383	10507	5995	10489	6847	11909	9967	8788	8657	8885
	Longline	56537	61556	62403	62871	78898	74852	74930	68310	71856	76527	71193	55265	46438	54466	48396	38035	34182	46232	41063	43985	42925	38204	35005	32062	37246	33395
	Other surf.	293	437	607	652	980	567	357	536	434	1377	1226	1628	1138	1340	1301	717	552	448	220	257	461	977	678	838	1975	540
	Purse seine	9407	15524	19223	31582	32665	25355	26624	19147	15525	20254	17533	19511	19414	19578	19005	15128	18604	14995	18045	27052	30761	32402	26894	25642	24079	24942
Landings(FP)	Purse seine	747	1941	1636	2290	2032	1667	540	993	989	1184	1363	257	214	867	1019	1026	542	692	772	1082	994	1277	823	632	609	609
Discards	Longline	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	18
Landings	Angola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	476	75	0	0	0	452	410	320	394	375	372	363
	Argentina	78	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Barbados	0	0	0	0	0	0	0	24	17	18	18	6	11	16	19	27	18	14	14	7	12	7	15	11	26	11
	Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	60	70	234	249	1218	1242	1336	1502	1502
	Benin	10	10	7	8	9	9	9	30	13	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Brazil	591	350	790	1256	601	1935	1707	1237	644	2024	2768	2659	2582	2455	1496	1081	1479	1593	958	1189	1151	1799	1400	1159	3475	1451
	Cambodia	0	0	0	0	0	0	0	0	0	32	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Canada	10	26	67	124	111	148	144	166	120	263	327	241	279	182	143	187	196	144	130	111	103	137	166	197	218	218
	Cape Verde	52	151	105	85	209	66	116	10	1	1	2	0	1	1	1	1077	1406	1247	444	545	554	1037	713	1333	2271	2204
	China PR	0	0	0	70	428	476	520	427	1503	7347	6564	7210	5840	7890	6555	6200	7200	7399	5686	4973	5489	3720	3231	2371	2232	2232
	Chinese Taipei	5755	13850	11546	13426	19680	18023	21850	19242	16314	16837	16795	16429	18483	21563	17717	11984	2965	12116	10418	13252	13189	13732	10805	10316	13272	13272
	Congo	15	12	12	14	9	9	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Cuba	62	34	56	36	7	7	5	0	0	0	0	0	16	16	0	0	0	0	0	0	0	0	0	0		
	Curaçao	0	0	0	0	0	0	1893	2890	2919	3428	2359	2803	1879	2758	3343	0	416	252	1721	2348	2688	3441	2890	1964	2315	1585
	Côte D'Ivoire	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	790	576	47	507	635	441	323
	Dominica	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0		
	EU.España	10355	14705	14656	16782	22096	17849	15393	12513	7110	13739	11250	10133	10572	11120	8365	7618	7454	6675	7494	11966	11272	13100	10914	10082	10736	10736
	EU.France	5023	5581	6888	12719	12263	8363	9171	5980	5624	5529	5949	4948	4293	3940	2926	2816	2984	1629	1130	2313	3329	3507	3756	3222	3549	3549
	EU.Ireland	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	33	0	0	0	0	0	0	0	0		
	EU.Poland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	EU.Portugal	6233	5718	5796	5616	3099	9662	5810	5437	6334	3314	1498	1605	2590	1655	3204	4146	5071	5505	3422	5605	3682	6920	6128	5345	3869	3922
	EU.United Kingdom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	32	0	0	0	0		
	FR.St Pierre et Miquelon	0	0	0	0	0	0	0	0	0	0	0	0	21	0	28	6	0	2	3	0	2	0	0	0	0	
	Faroe Islands	0	0	0	0	0	0	0	0	0	11	8	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Gabon	0	0	0	1	87	10	0	0	0	184	150	121	0	0	0	0	0	0	0	0	0	0	0	0		
	Ghana	5031	4090	2866	3577	4738	5517	4751	10165	10155	10416	5269	9214	5611	8646	17744	8860	7429	5923	6102	10603	11922	11764	7027	6130	4369	6130
	Grenada	0	65	25	20	10	10	0	1	0	0	0	0	0	0	0	0	0	10	31	0	0	0	0	0		
	Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	998	949	836	998	913	1011	282	262	163	993	993
	Guinea Ecuatorial	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	50	0	58	0	0	10	10
	Guinée Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	328	322	1516	1429	902	902
	Honduras	0	0	44	0	0	61	28	59	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Iceland	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Japan	35231	30356	34722	35053	38503	35477	33171	26490	24330	21833	24605	18087	15306	19572	18509	14026	15735	17993	16684	16395	15205	12306	15390	13397	13700	10855
	Korea Rep.	2690	802	866	377	386	423	1250	796	163	124	43	1	87	143	629	770	2067	2136	2599	2134	2646	2762	1908	1151	1039	1123
	Liberia	16	13	42	65	53	57	57	57	57	57	57	57	57	57	0	0	0	0	0	0	0	0	0	0		
	Libya	0	0	508	1085	500	400	400	400	400	400	400	31	593	593	0	0	4	0	0	0	0	0	0	0		
	Maroc	0	0	0	0	0	0	0	0	0	700	770	857	913	889	929	519	887	700	802	795	276	300	300	308	300	300
	Mexico	0	0	0	1	4	0	2	6	8	6	2	2	7	4	5	4	3	3	1	1	3	1	1	2	1	
	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		
	NEI (ETRO)	959	1221	2138	4594	5034	5137	5839	2746	1685	4011	2285	3027	2248	2504	1387	294	42	0	0	0	0	0	0	0		
	NEI (Flag related)	5856	8982	6151	4378	8964	10697	11862	16569	24896	24060	15092	8470	531	0	0	0	0	0	0	0	0	0	0	0		
	Namibia	0	0	0	0	715	29	7	46	16	423	589	640	274	215	177	307	283	41	146	108	181	289	376	135	240	232
	Nigeria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	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	5258	7446	9991	10138	13234	9927	4777	2098	1252	580	952	89	63	0	1521	2310	2415	2922	2263	2405	3047	3462	1694	2774	2315	2315
	Philippines	0	0	0	0	0	0	0	0	1154	2113	975	377	837	855	1854	1743	1816	2368	1874	1880	1399	1267	532	1323	1964	1964
	Russian Federation	0	0	0	0	0	0	13	38	4	8	91	0	0	0	0	1	1	26	73	43	0	0	0	0		
	S. Tomé e Príncipe	6	3	4	4	3	6	4	5	6	5	4	4	4	4	11	6	4	0	92	94	97	0	0	0		
	Senegal	0	15	5	9	126	237	138	258	730	1473	1131	1308	565	474	561	721	1267	805	926	1042	858	239	230	646	371	371
	Seychelles	0	0	0	0	0	0	0	0	0	0	58	0	162	0	0	0	0	0	0	0	0	0	0	0		
	Sierra Leone	0	0	0	0	0	0	0	0	0	0	6	2	0	0	0	0	0	0	0	0	0	0	0	0		
	South Africa	296	72	43	88	79	27	7	10	53	55	249	239	341	113	270	221	84	171	226	159	145	153	47	435	332	212
	St. Vincent and Grenadines	0	0	1	3	0	0	4	2	2	1	1216	506	15	103	18	0	114	567	171	292	396	38	25	16	30	26
	Sta. Lucia	0	0	1	0	0	0	0	0	0	0	0	1	2	2	0	2	0	0	0	0	0	0	0	0		
	Togo	12	6	2	86	23	6	33	33	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Trinidad and Tobago	57	263	0	3	29	27	37	36	24	19	5	11	30	6	5	9	12	27	69	56	40	33	33	37	59	58
	U.S.A.	623	975	813	1090	1402	1209	882	1138	929	1263	574	1085	601	482	416	484	991	527	508	515	571	722	867	881	866	711
	U.S.S.R.	95	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	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
	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**	
	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
	Cape 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		
	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		
	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		
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	14	22	18	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	

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<Fmsy)

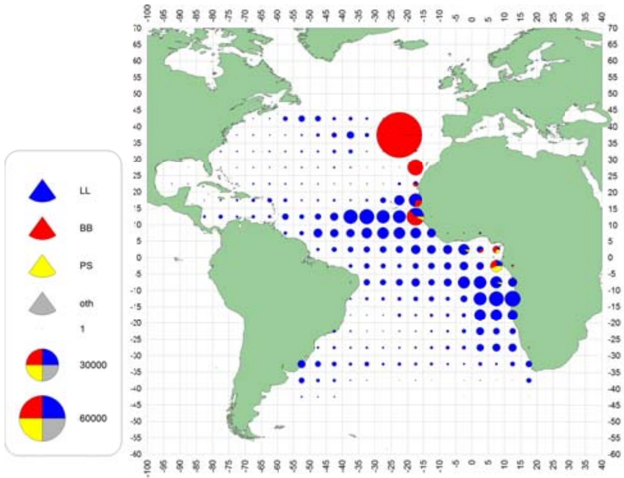
Catch (000 t)	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
0	29	100	100	100	100	100	100	100	100	100	100	100	100	100
40	29	84	89	92	93	94	95	95	96	96	97	97	97	97
45	29	72	80	84	88	89	91	92	93	94	94	94	95	95
50	29	61	70	75	79	83	85	87	89	90	91	92	92	93
55	29	52	59	65	69	73	76	79	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>Bmsy)

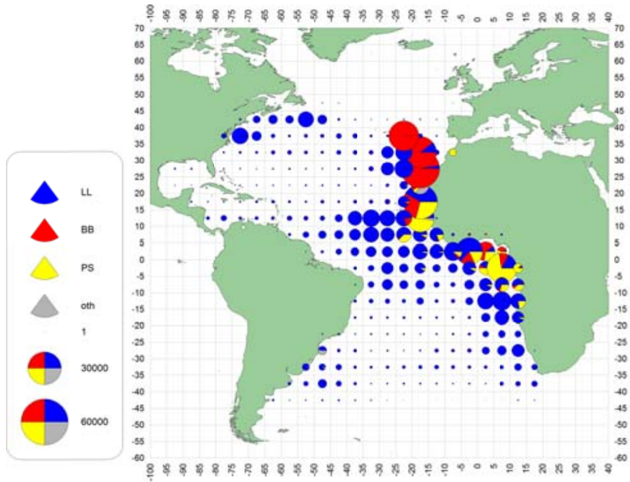
Catch (000 t)	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
0	17	17	21	33	57	74	85	92	95	97	98	98	99	99
40	17	17	18	22	31	40	51	60	67	73	78	81	84	87
45	17	17	18	21	29	37	46	53	60	66	71	76	79	81
50	17	17	18	20	27	34	41	48	53	59	65	69	72	76
55	17	17	18	20	25	31	37	42	47	52	56	61	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>Bmsy and F<Fmsy)

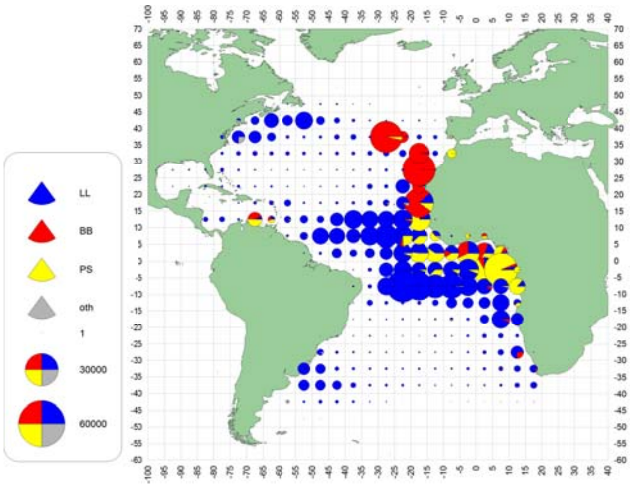
Catch (000 t)	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
0	17	17	21	33	57	74	85	92	95	97	98	98	99	99
40	17	17	18	22	31	40	51	60	67	73	78	81	84	87
45	17	17	18	21	29	37	45	53	60	66	71	76	79	81
50	17	17	18	20	27	34	41	48	53	59	64	69	72	76
55	17	17	18	20	25	31	37	42	47	51	56	60	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



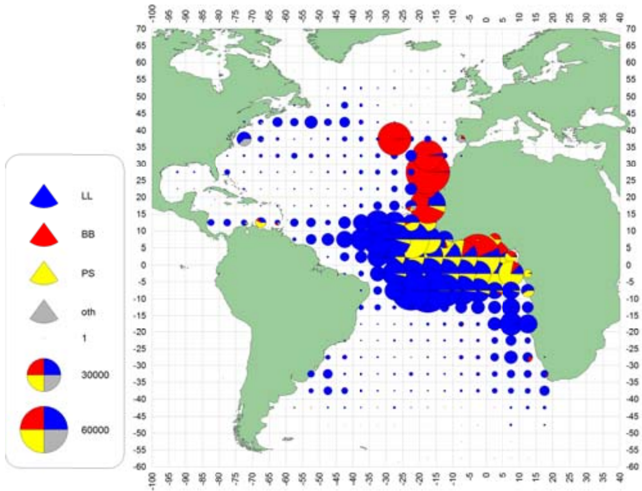
a. BET(1960-69)



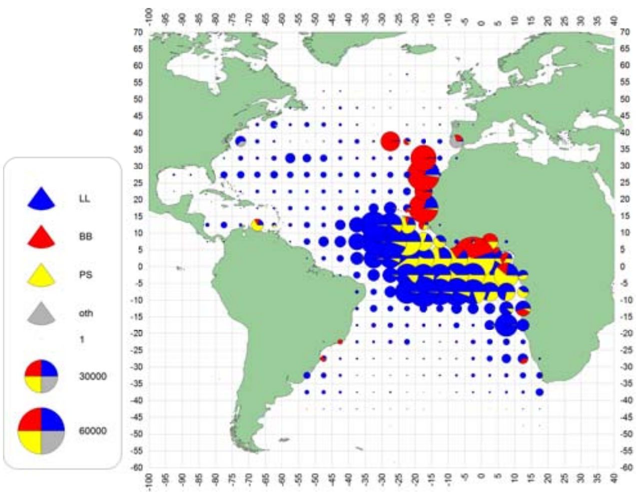
b. BET(1970-79)



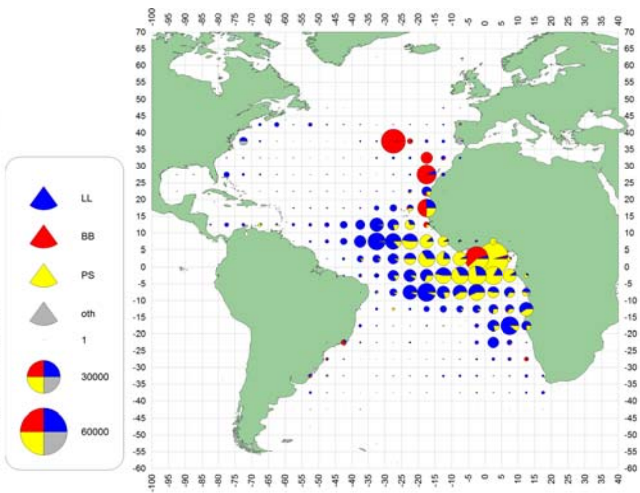
c. BET(1980-89)



d. BET(1990-99)

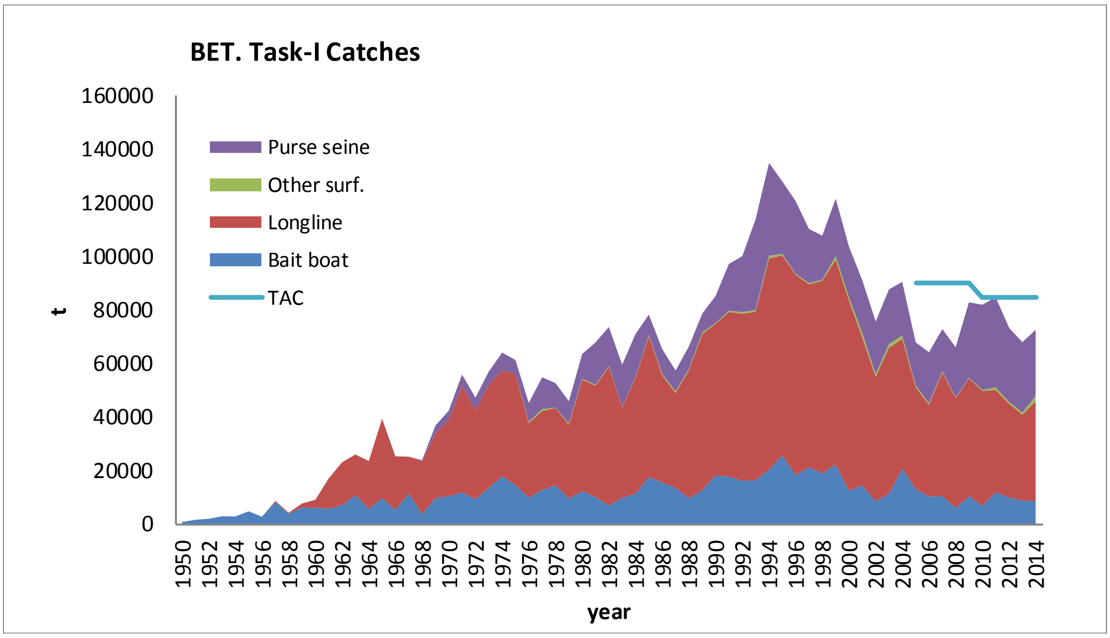


e. BET (2000-09)

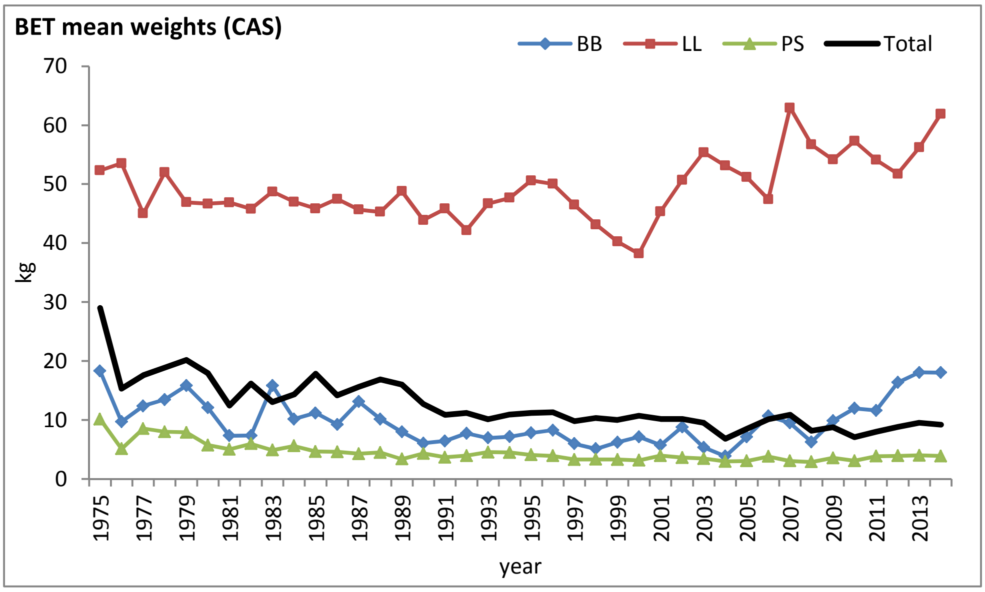


f. BET(2010-13)

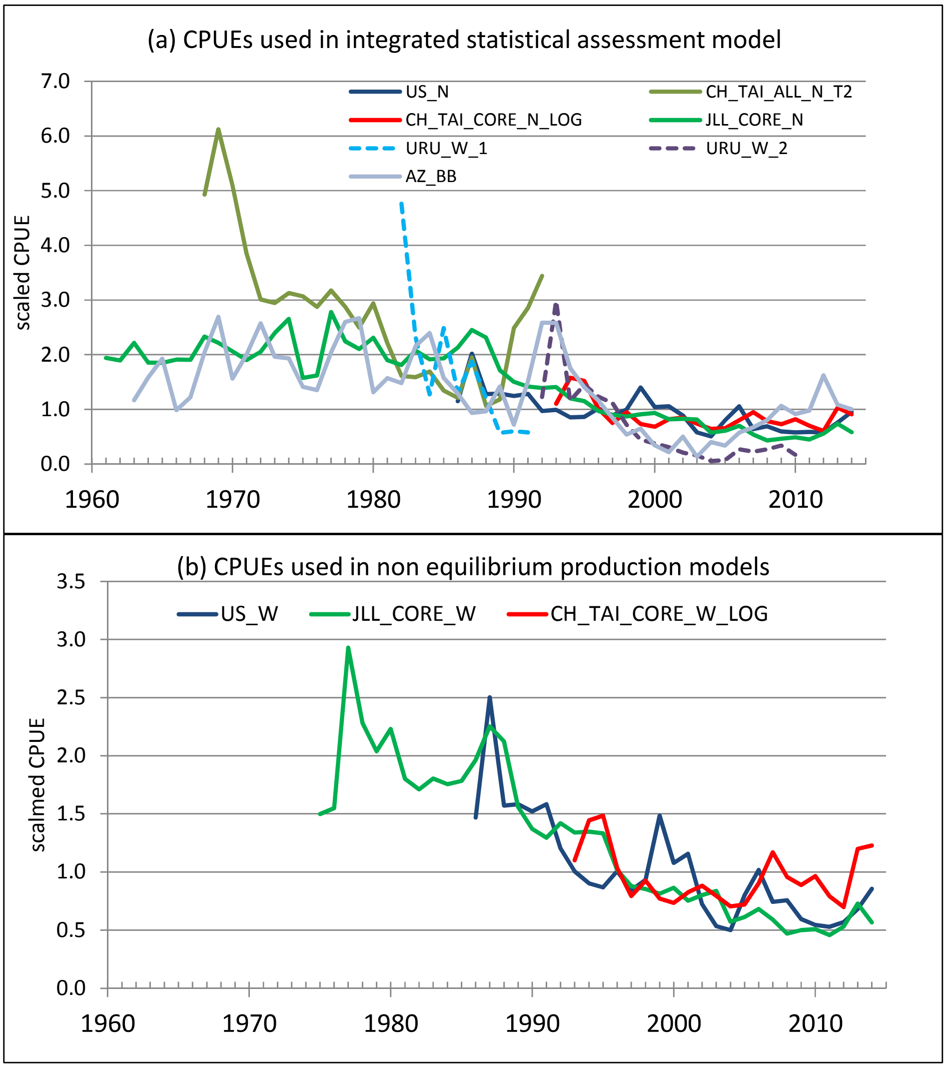
BET-Figure 1 [a-f]. Geographical distribution of the bigeye tuna catch by major gears and decade. The maps are scaled to the maximum catch observed during 1960-2013.



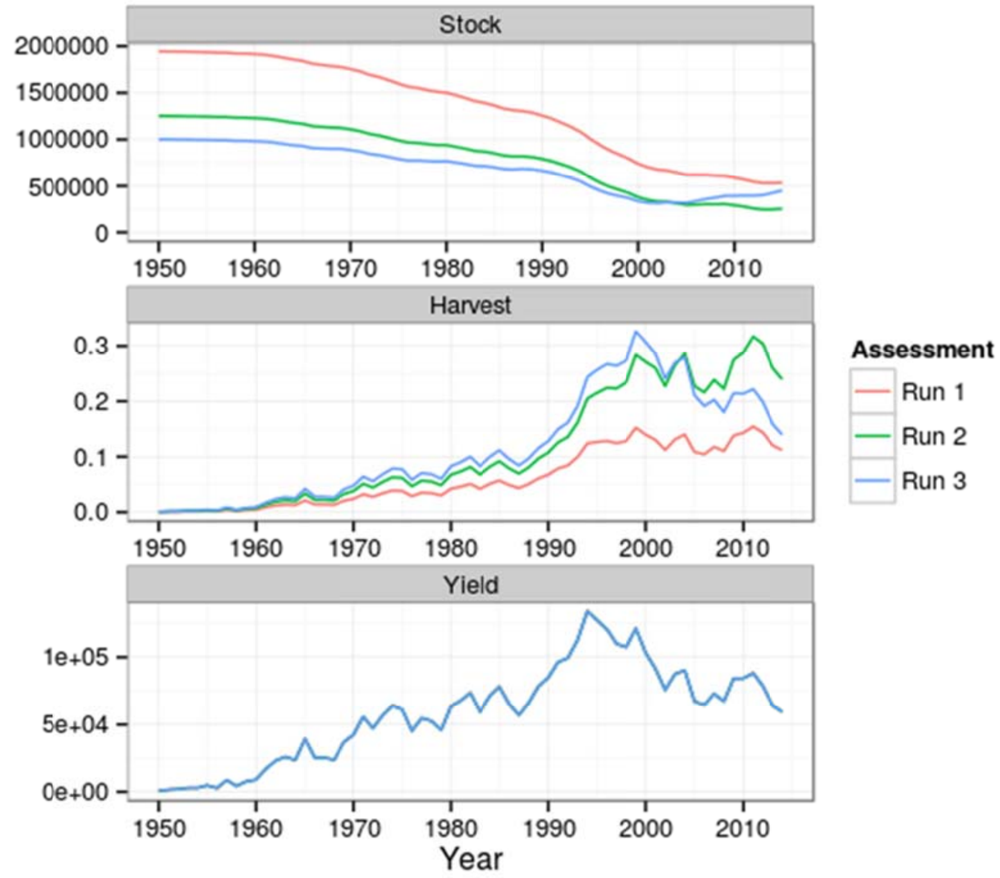
BET-Figure 2. Bigeye estimated and reported catches for all the Atlantic stock (t). The value for 2014 represents preliminary estimates because some countries have yet to provide data for this year or are under revision.



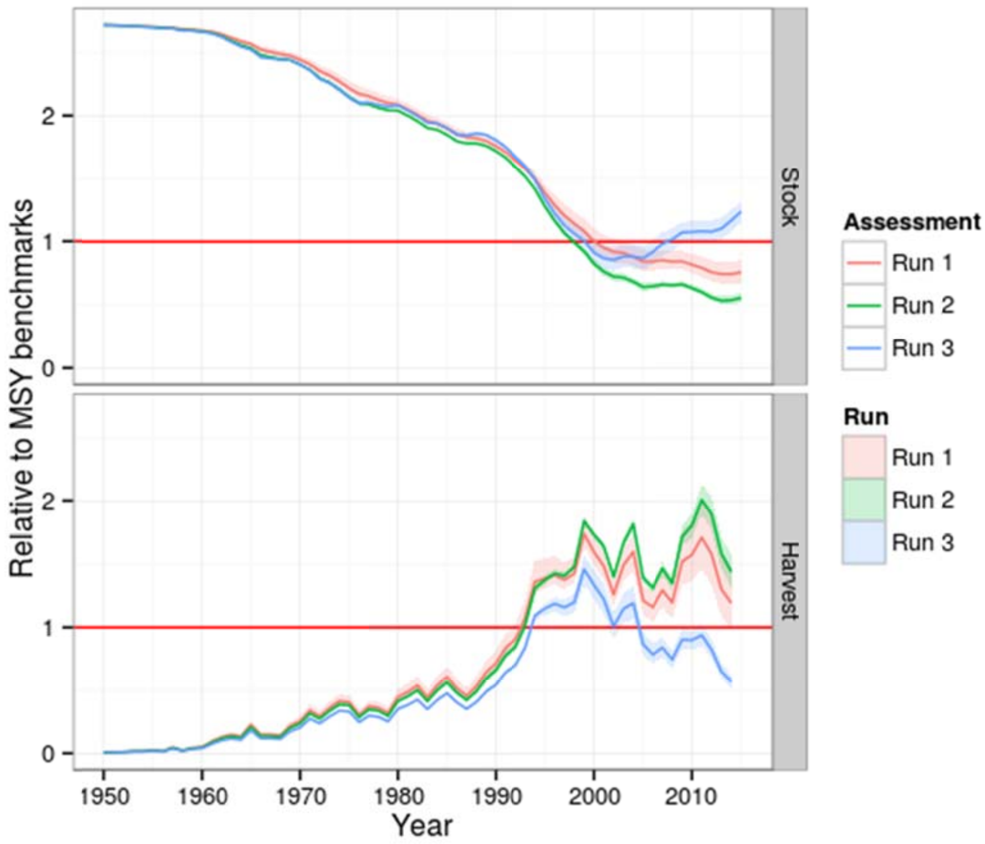
BET-Figure 3. Trend of mean weight for bigeye based on the catch-at-size data for 1975-2014 by major fisheries (BB=Baitboats, LL=Longlines, PS=Purse seine).



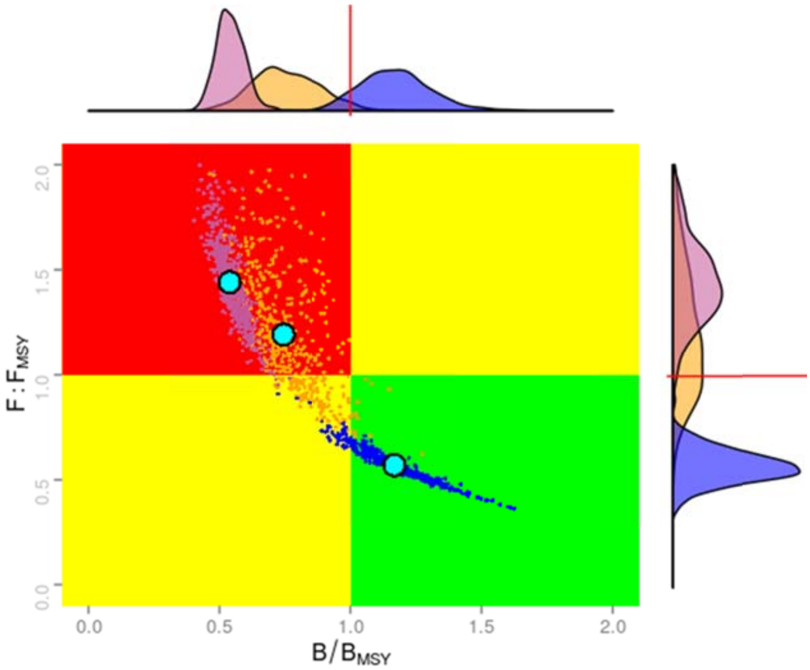
BET-Figure 4. (a) Indices used in the integrated statistical assessment model. Note that these are the annual means but the indices were calculated by area and season for input into the model. (b) Indices used in the non-equilibrium production assessment model.



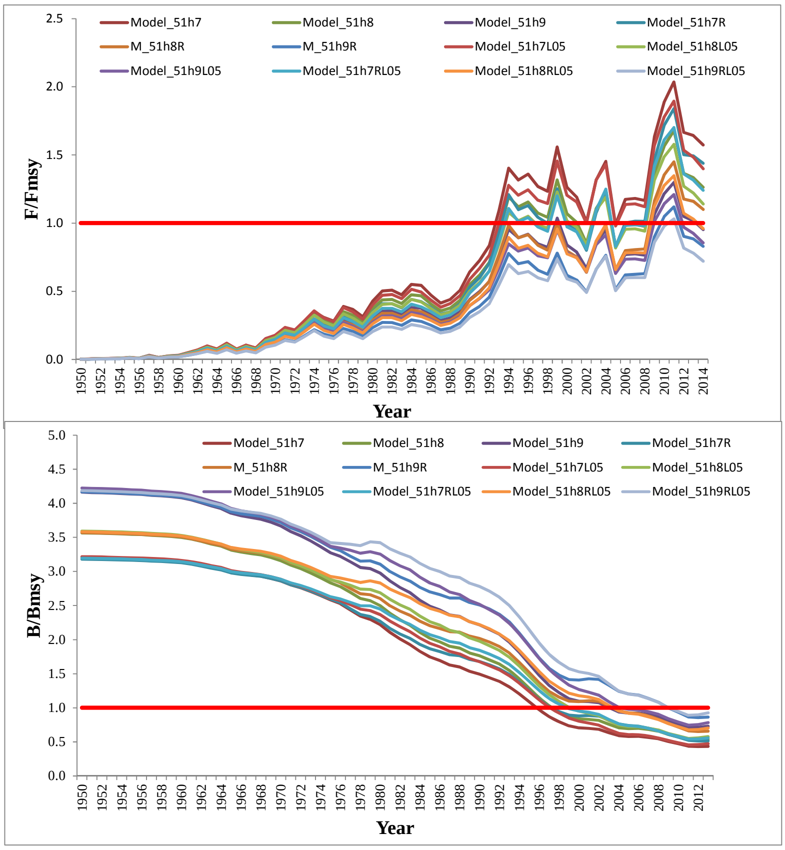
BET-Figure 5. Trajectories of Biomass, fishing mortality and yield from different ASPIC scenarios. Run 1: using USA LL CPUE; Run 2: using Japanese LL CPUE; and Run 3: using Chinese Taipei LL CPUE.



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.

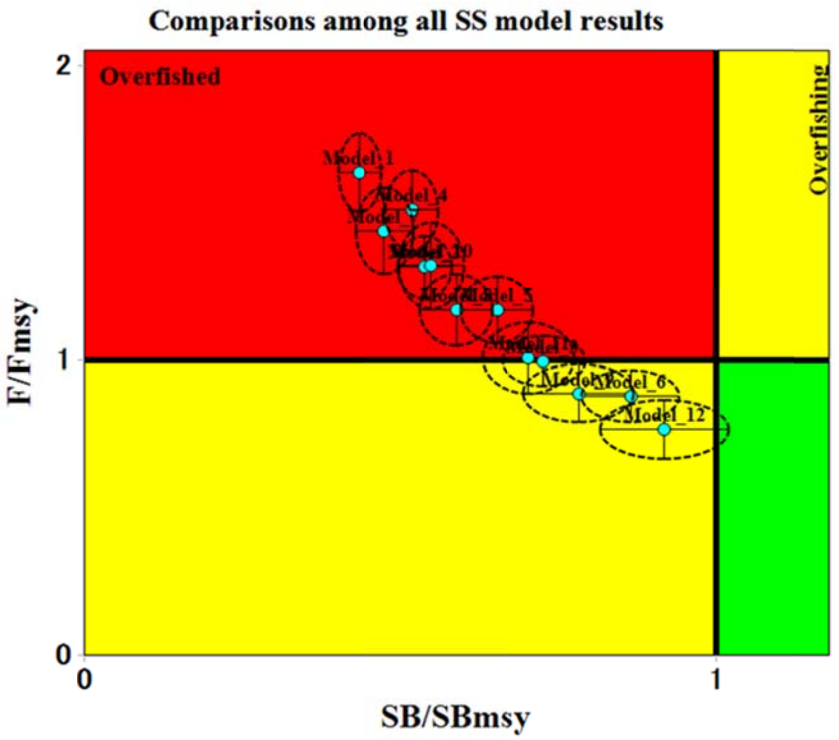


BET-Figure 7. ASPIC: Current status (2014) of bigeye tuna based on ASPIC. Graph combines results for the 3 runs considered. The clouds of points depict the bootstrap estimates of uncertainty for the most recent year (purple = Japan LL run, brown = US LL run, blue= Chinese Taipei LL run). The median point 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).

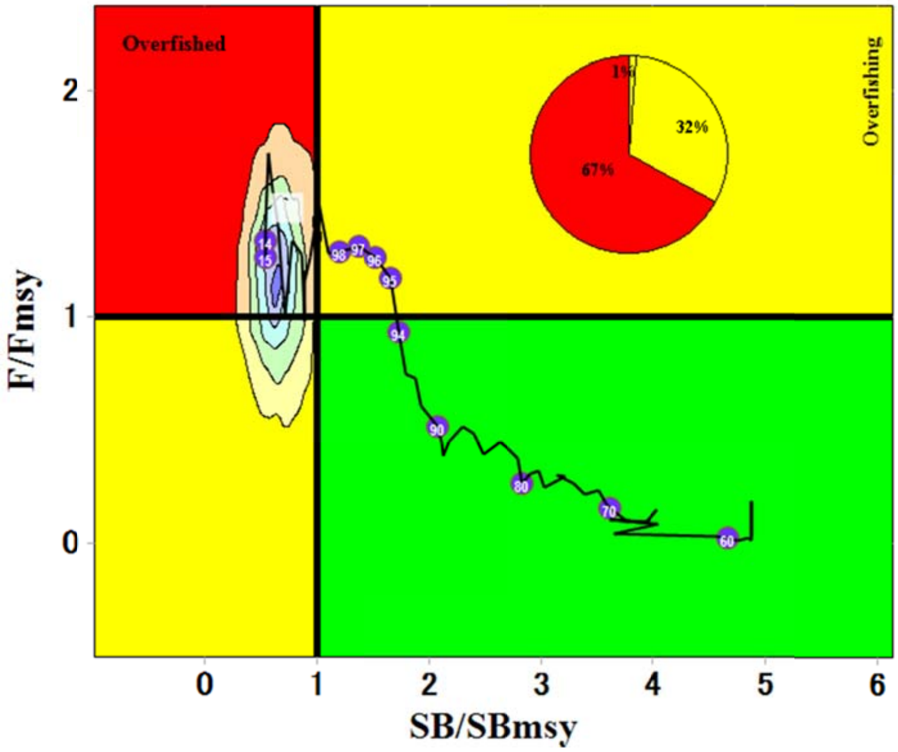


BET-Figure 8. Estimated Spawning Stock Biomass relative to MSY benchmark (B/B_{MSY}) and fishing mortality (F/F_{MSY}) both based on 2014 selectivity patterns for the 12 SS3 selected runs.

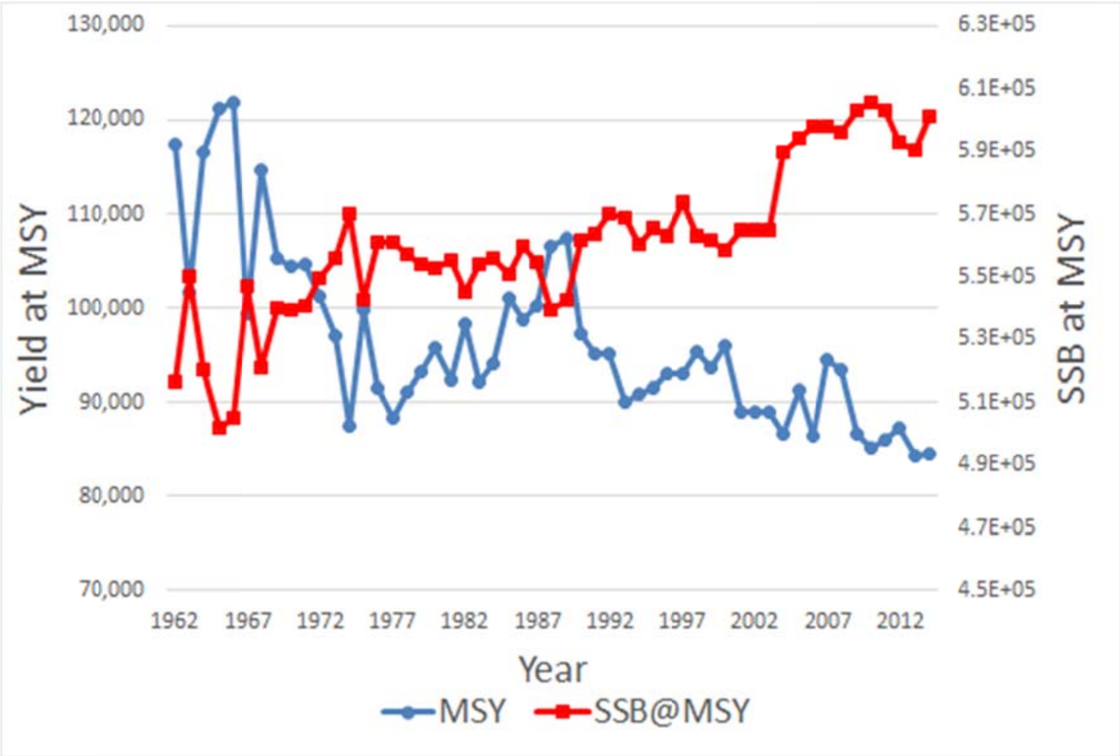
(a)



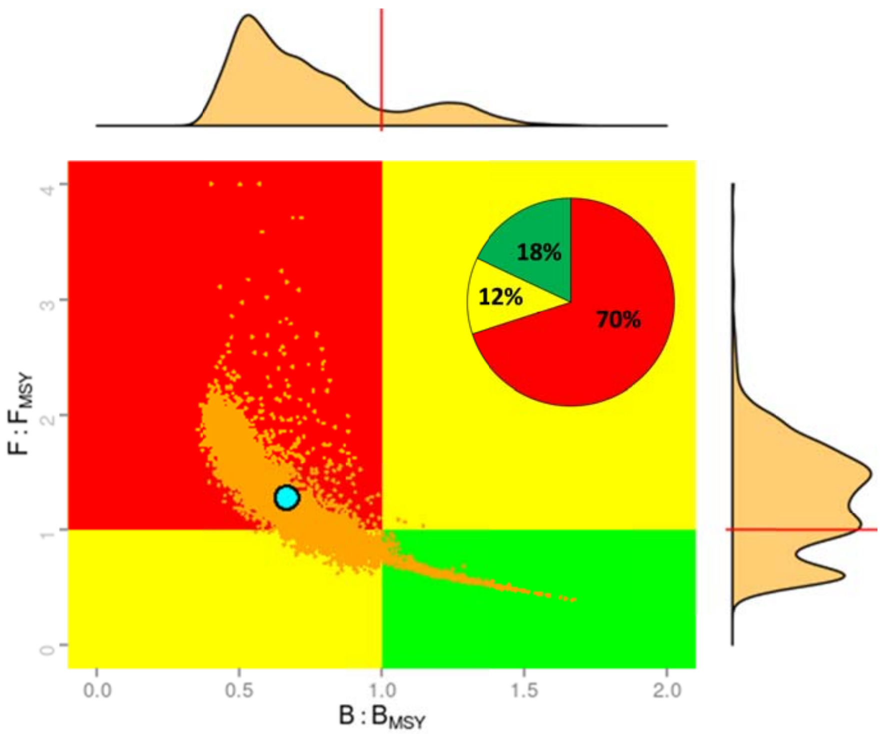
(b)



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, 2014) using catch data available to 2013. The previous assessment of skipjack stocks was only conducted in 2008 (Anon. 2009a). 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 25ºC 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 aggregation 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 Altantic 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 Cape 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 10ºN 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 profiles 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 10ºS and 5ºW latitude to 5ºE 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
Overfished	Not likely	
Overfishing	Not likely	
Relative Biomass (B_{2013}/B_{MSY})	Likely >1	Probably close to 1.3
Mortality due to fishing (F_{2013}/F_{MSY})	Likely <1	Probably close to 0.7
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.

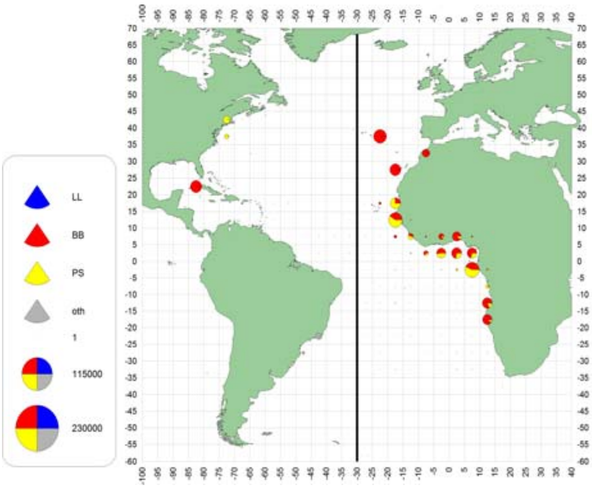
SKJ-Table 1. Estimated catches (t) of skipjack tuna (*Katsuwonus pelamis*) by area, gear and flag. (v2, 2015-09-25)

			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	
		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	
	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	
		Canada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Cape Verde	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	
		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	
		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	
		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	
		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	
		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	
		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	
		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	0	1500	1473	7942	7363	5484
		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	
		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	
		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	
		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	
		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	
		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	
		Senegal	134	652	260	95	59	18	163	455	1963	1631	1506	1271	1053	733	1333	4874	3534	2278	3661	4573	2447	4823	4339	4183	4091
		South Africa	17	15	7	6	4	4	1	6	2	1	7	1	1	2	2	1	0	0	4	4	2	6	8	2	5
		St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	

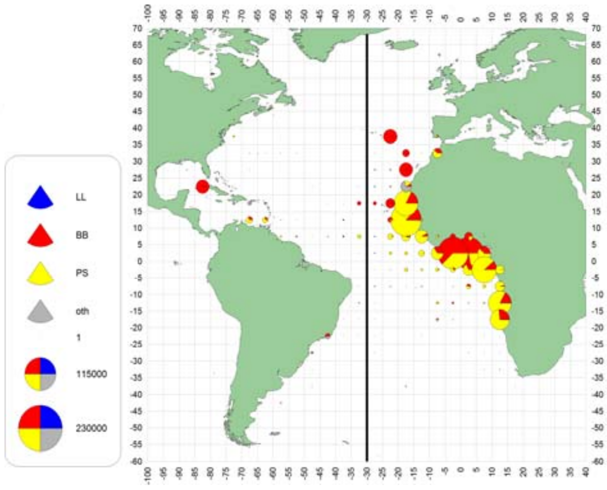
			1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
		U.S.A.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		U.S.S.R.	3635	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		UK.Sta Helena	171	24	16	65	55	115	86	294	298	13	64	205	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	
	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	
		Barbados	11	14	5	6	6	6	5	5	10	3	3	0	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	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	
		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	
		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	
		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	
		EU.España	0	1592	1120	397	0	0	0	0	0	1	1	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	
		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	
		EU.Portugal	0	0	0	0	0	0	0	0	0	0	4	1	0	3	3	5	21	11	0	6	0	8	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	
		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	
		Japan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0
		Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Mexico	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	
		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	
		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	
		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	0	8	2	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	
		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	
		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	0	15	17	
Landings(FP)	ATE	Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	114	395	368	179	636	301
		Cape 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	0	42	562	544	202
		EU.España	1888	4876	4455	5959	4719	2899	453	1990	2562	3802	3700	0	0	1738	1907	713	437	366	1158	1994	1394	1842	983	998	1623
		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	3003	2998	2624	3427	2372	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	
	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.

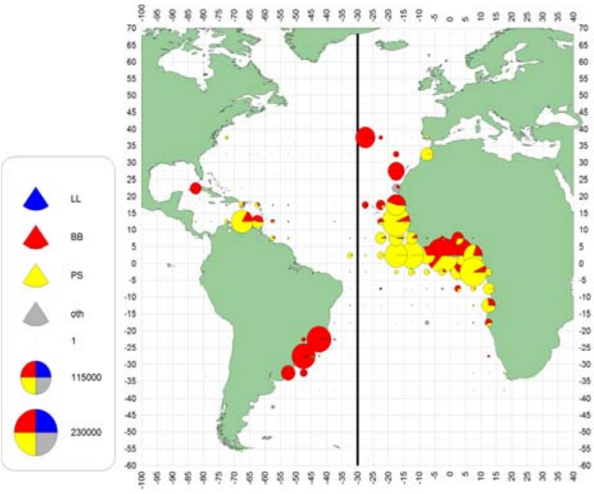
2. Ghanaian Task I catches from 2013 and 2014 are provisional and could be revised.



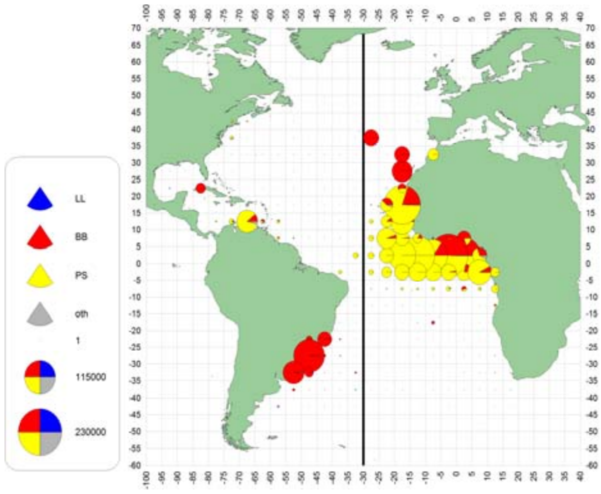
a. SKJ(1960-69)



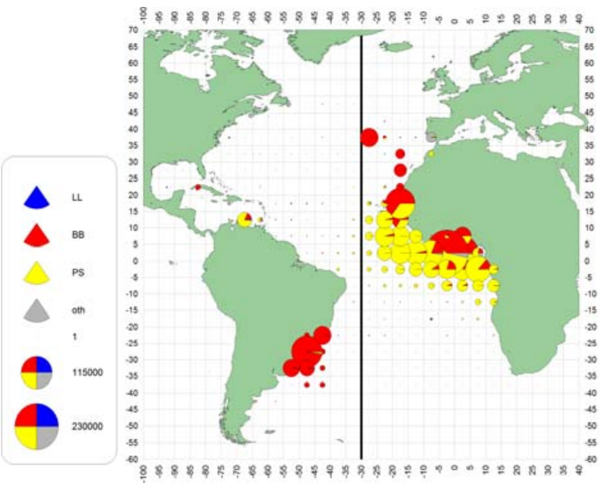
b. SKJ(1970-79)



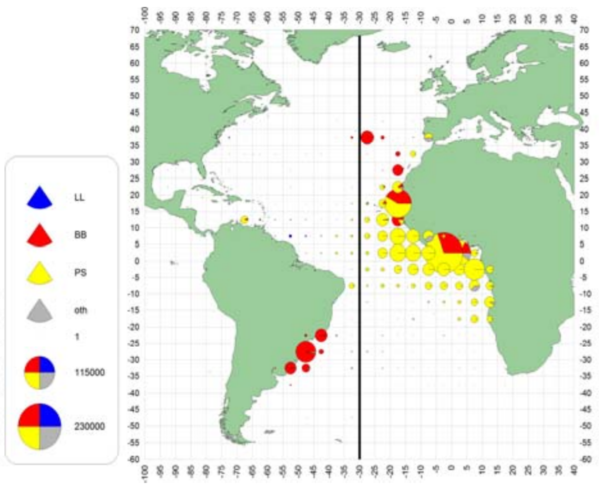
c. SKJ(1980-89)



d. SKJ(1990-99)

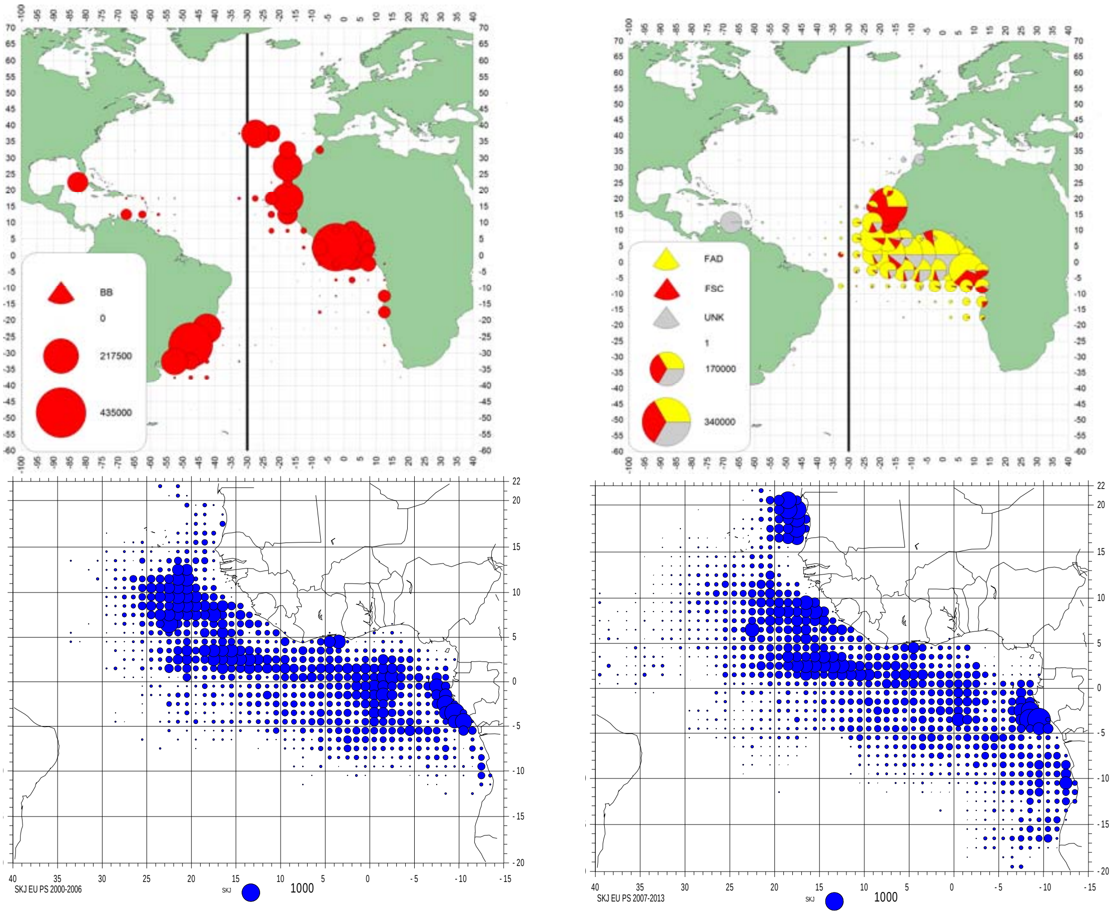


e. SKJ (2000-09)

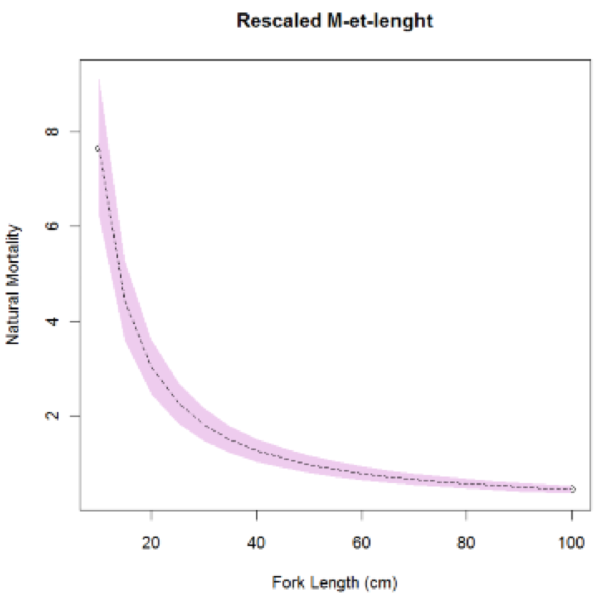


f. SKJ(2010-13)

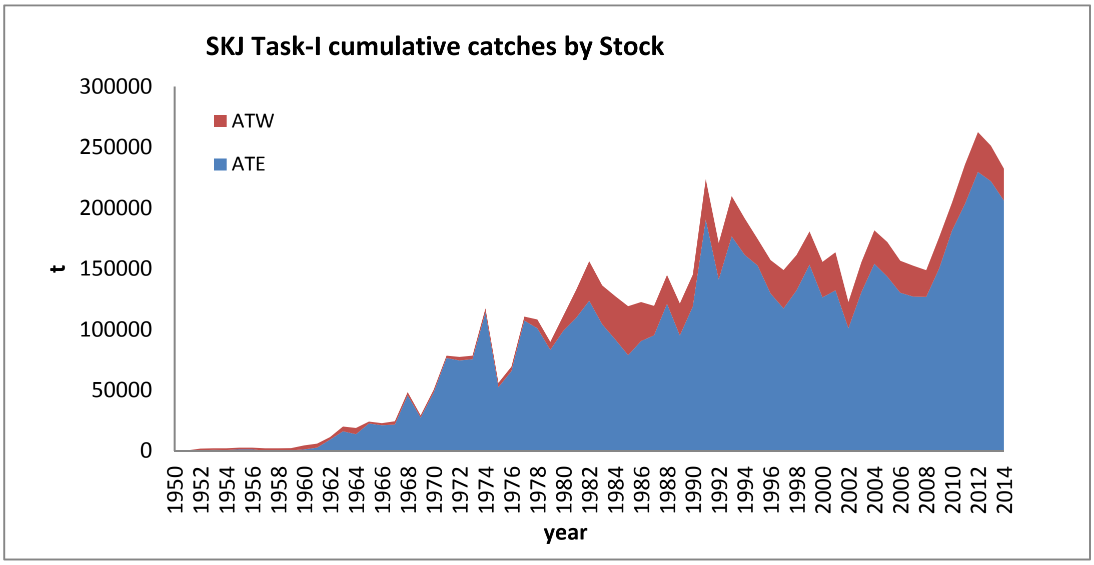
SKJ-Figure 1A [a-f]. Geographical distribution of the skipjack catch by major gears and decade. The maps are scaled to the maximum catch observed during 1960-2013.



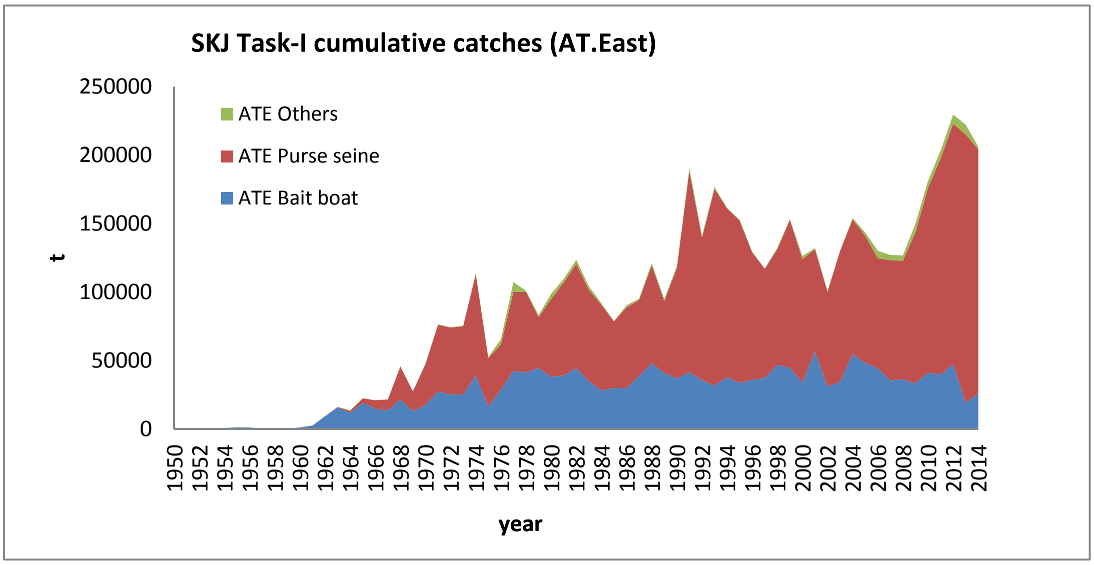
SKJ-Figure 1B. Distribution of skipjack catches in the Atlantic for baitboat (upper left panel) between 1950 and 2014 and for purse seiners (upper right panel) by fishing mode (free schools vs. FADs) between 1991 and 2014. Skipjack catches made by European and associated purse seiners (about 75% of the 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 15oN latitude.



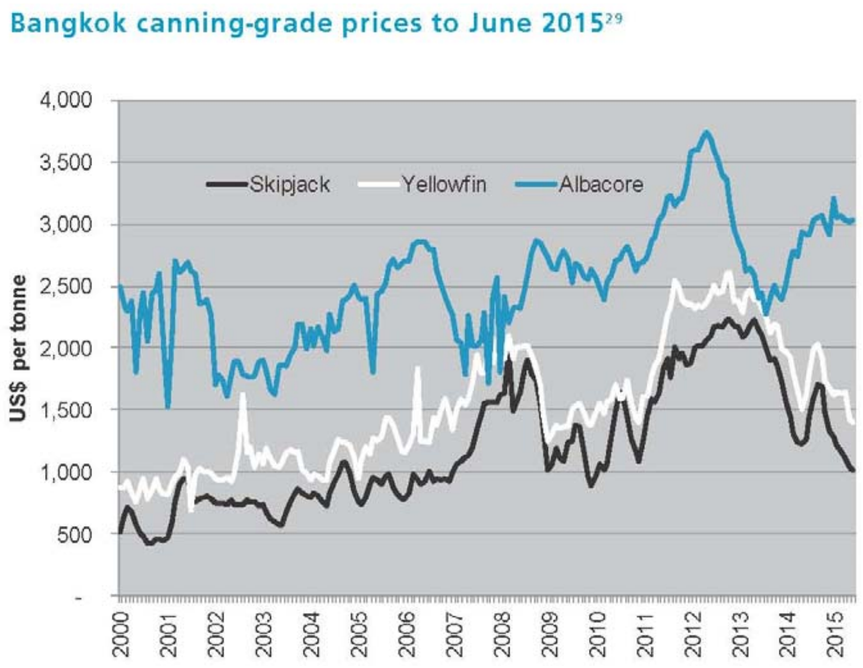
SKJ-Figure 2. Estimates of natural mortality by size of Atlantic skipjack calculated by empirical relationships between mortality and some biological parameters (which show different values from those traditionally used in the East.



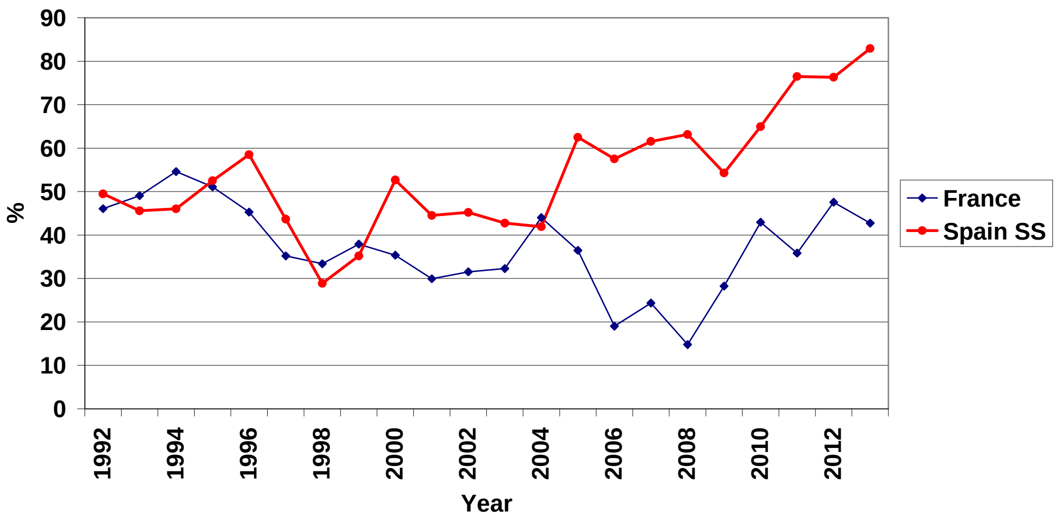
SKJ-Figure 3. Total skipjack catches (t) in the Atlantic and by stock (East and West) between 1950 and 2014. Skipjack estimates in the *faux poissons* landed in Côte d'Ivoire were included in the skipjack trade catches in the eastern Atlantic. It is possible that skipjack catches taken in the eastern 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.



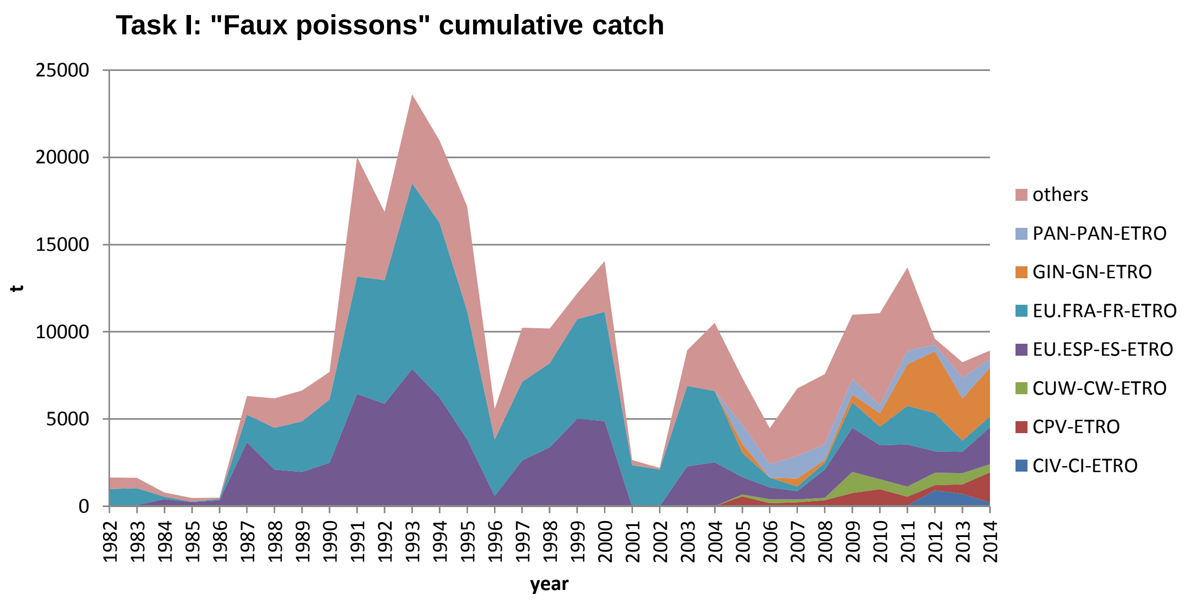
SKJ-Figure 4. Skipjack catches in the eastern Atlantic, by gear (1950-2014), after correction of Ghana's data by species (1996-2012).



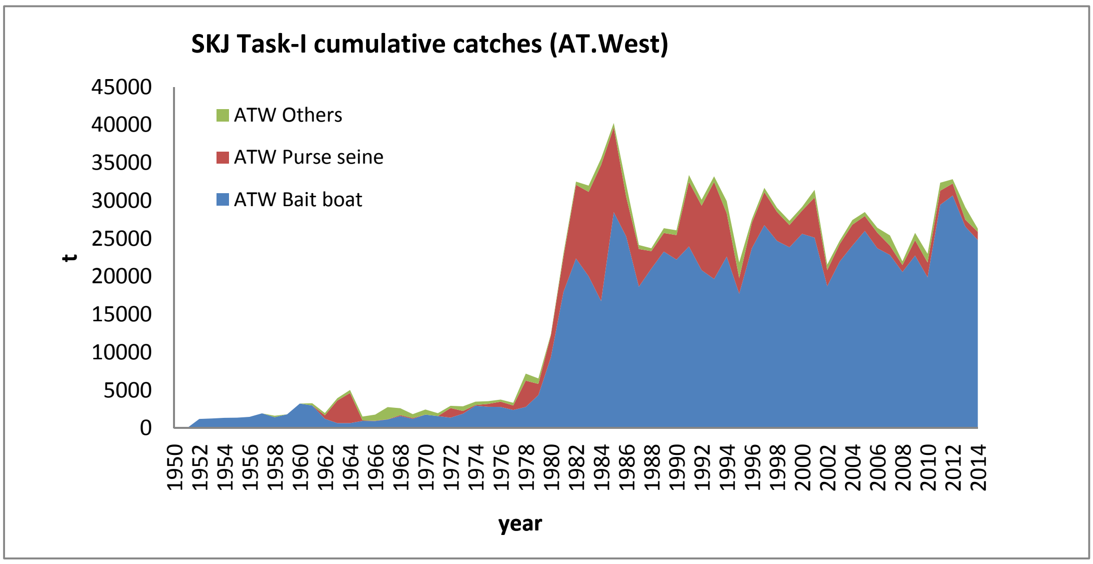
SKJ-Figure 5. Average prices of skipjack and yellowfin in U.S. dollars (adjusted for inflation and converted into the value of the 2013 $US) in the Bangkok market. Source: FFA



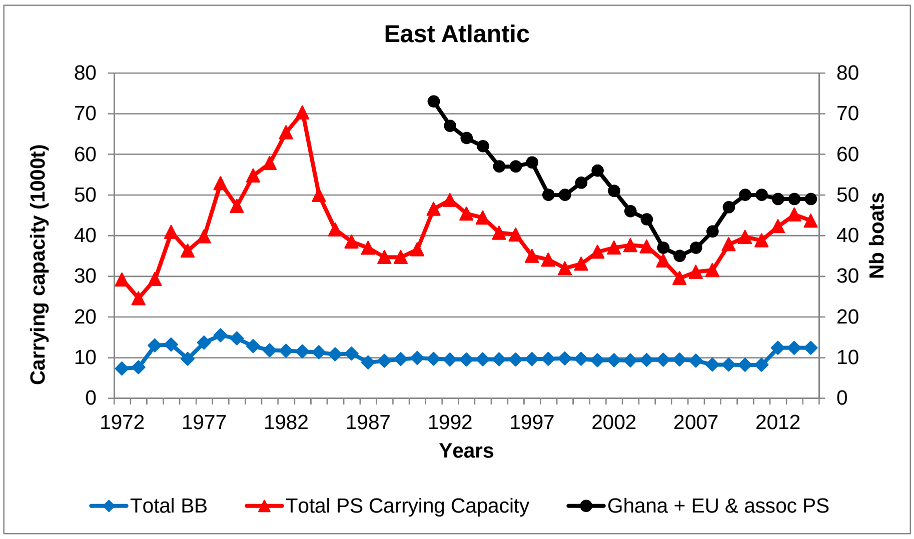
SKJ-Figure 6. Changes in the proportion of skipjack catches made by French and Spanish purse seiners under FADs (1991-2014). The increase in the percentage of catches under FADs coincides with the shift from the Senegal area, known for its seasonal fishing on free schools (see **Figure 1**), and with the increase of skipjack prices.



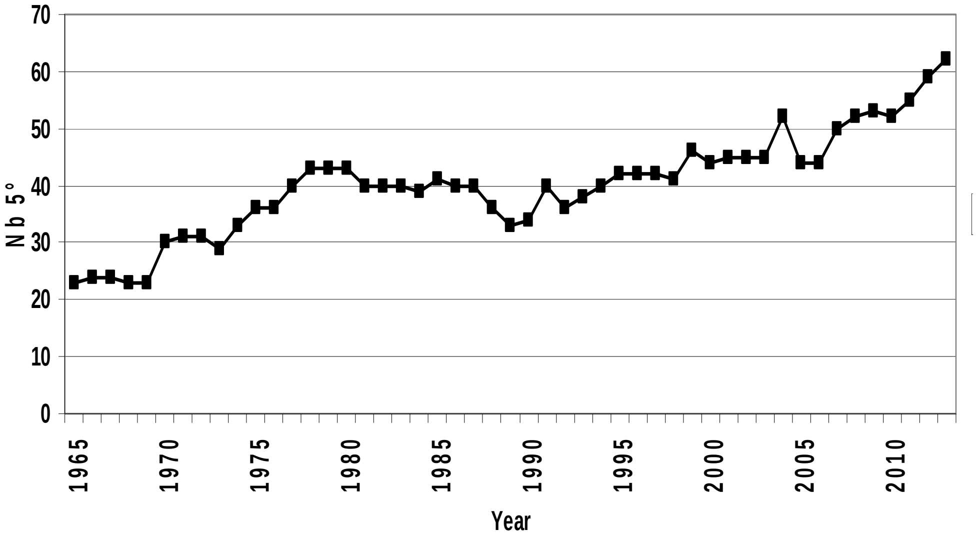
SKJ-Figure 7. Cumulative estimated landings of *faux poissons* (1981-2014) for the European or associated purse seiners for the three major species of tropical tunas in the local market of Abidjan (Côte d'Ivoire).



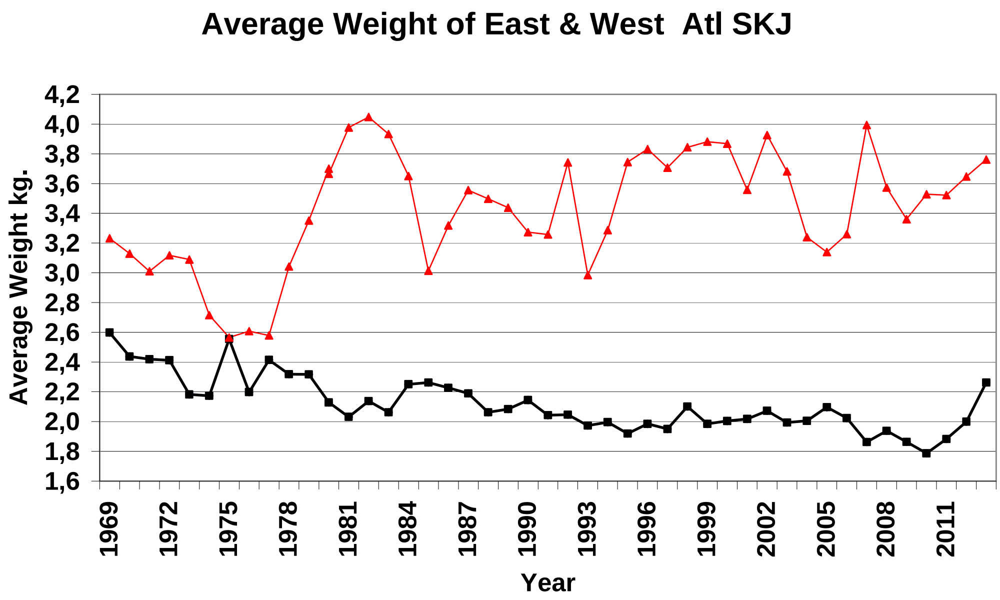
SKJ-Figure 8. Cumulative skipjack catches in the western Atlantic, by gear (1950-2014). The values for 2014 are preliminary.



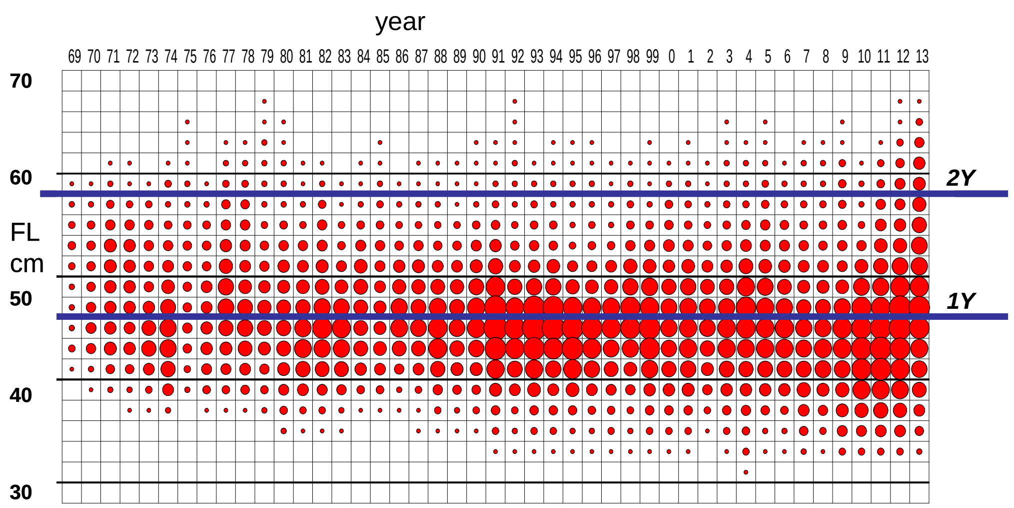
SKJ-Figure 9. Changes over time in the carrying capacity, corrected by the annual percentage of time at sea, (left axis) for the overall purse seiners and baitboats operating in the eastern Atlantic (1971-2014) and in number of boats for the European purse seiners, associated and Ghanaian fleets (right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



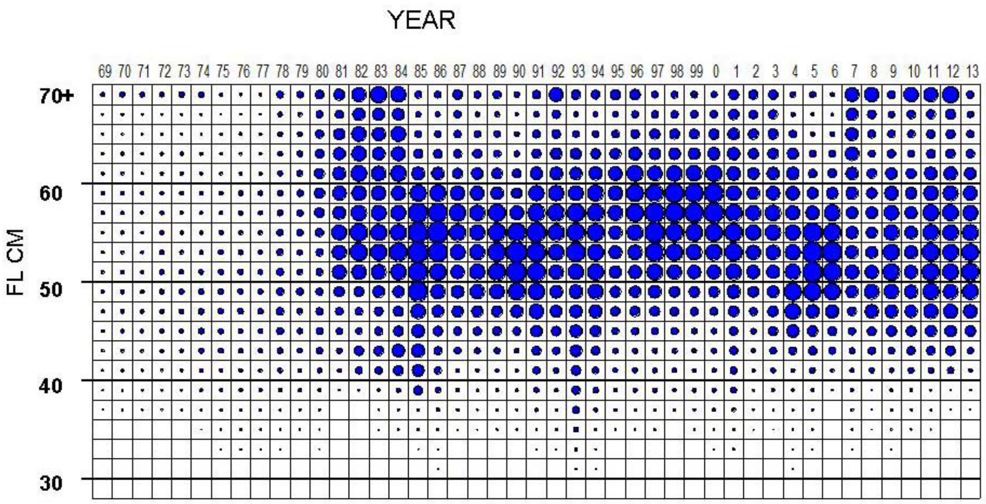
SKJ-Figure 10. Number of 5°x5° squares with annual skipjack catches above 10 t for the European and associated purse seiners operating in the eastern Atlantic (1969-2014). The great increase observed in 1991 could be due to a modification of the species composition correction procedure of the catches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



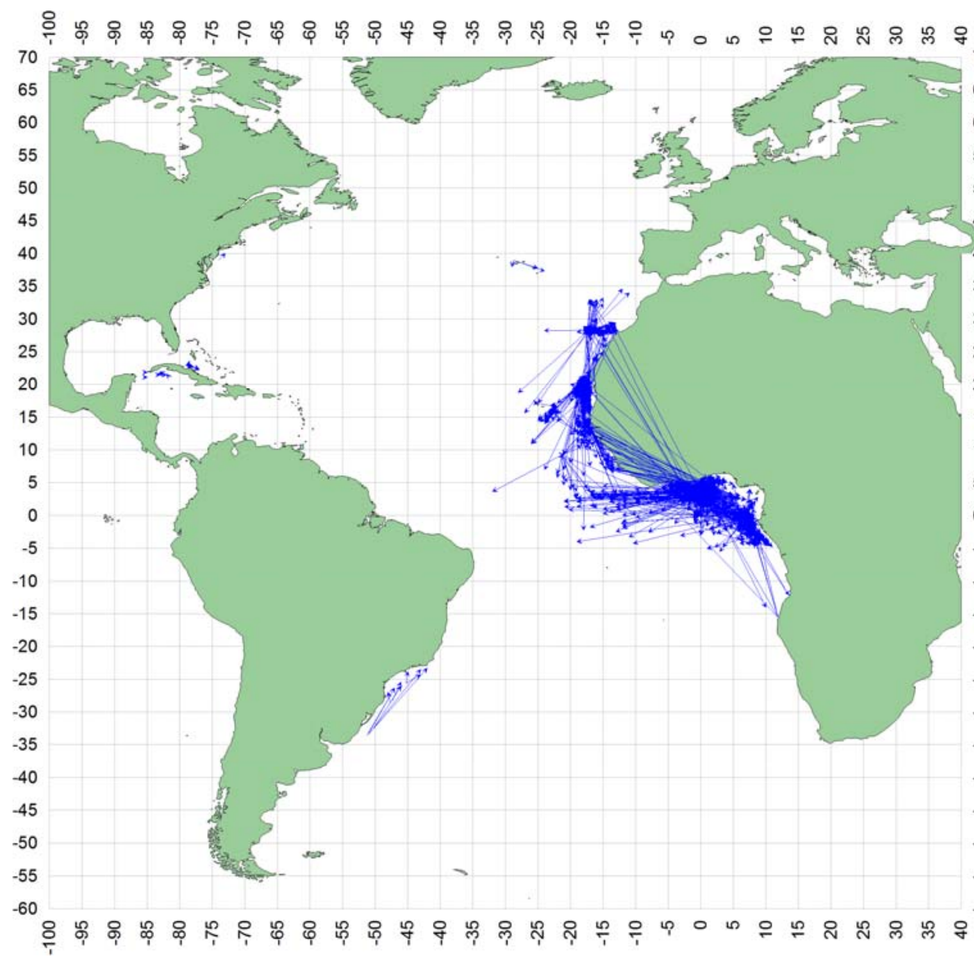
SKJ-Figure 11. Changes in the average weight of skipjack in the eastern (black) and western Atlantic (red).



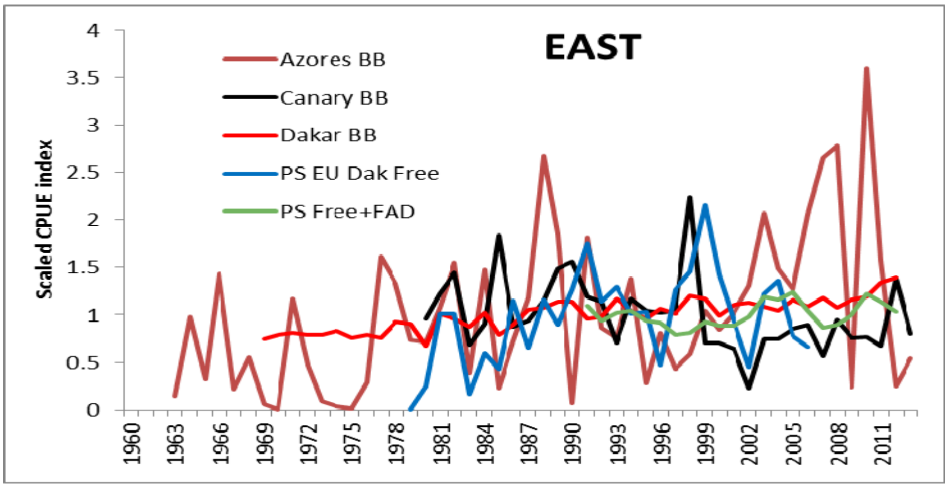
SKJ-Figure 12. Annual catch (in weight) by skipjack size class in the eastern Atlantic and approximate size limits of ages 1 and 2 (blue). The size at first sexual maturity (50%) is estimated at 42 cm.



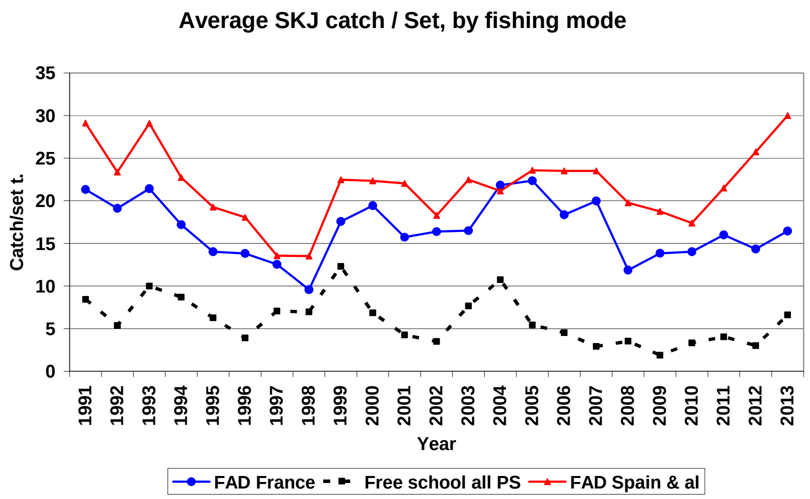
SKJ-Figure 13. Annual catch (in weight) by skipjack size class in the western Atlantic.



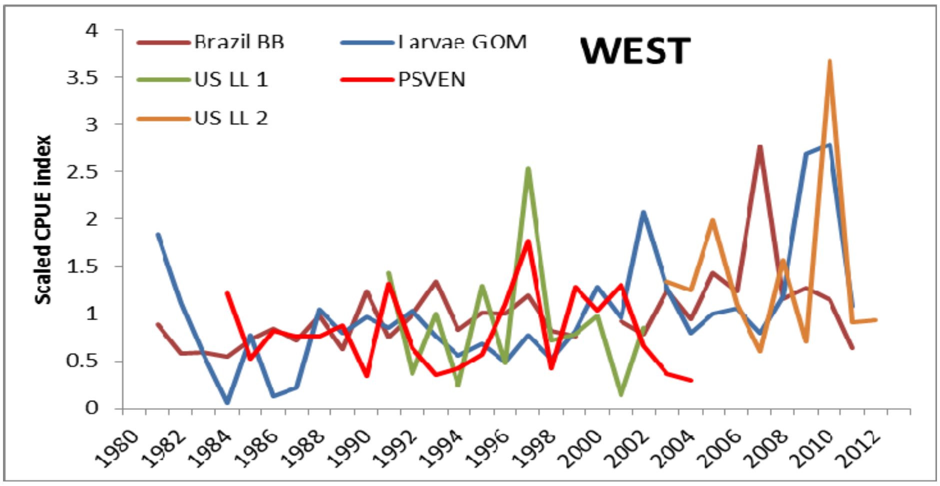
SKJ-Figure 14. Apparent movements (straight line distance between the tagging location and that of recovery) calculated from conventional tagging.



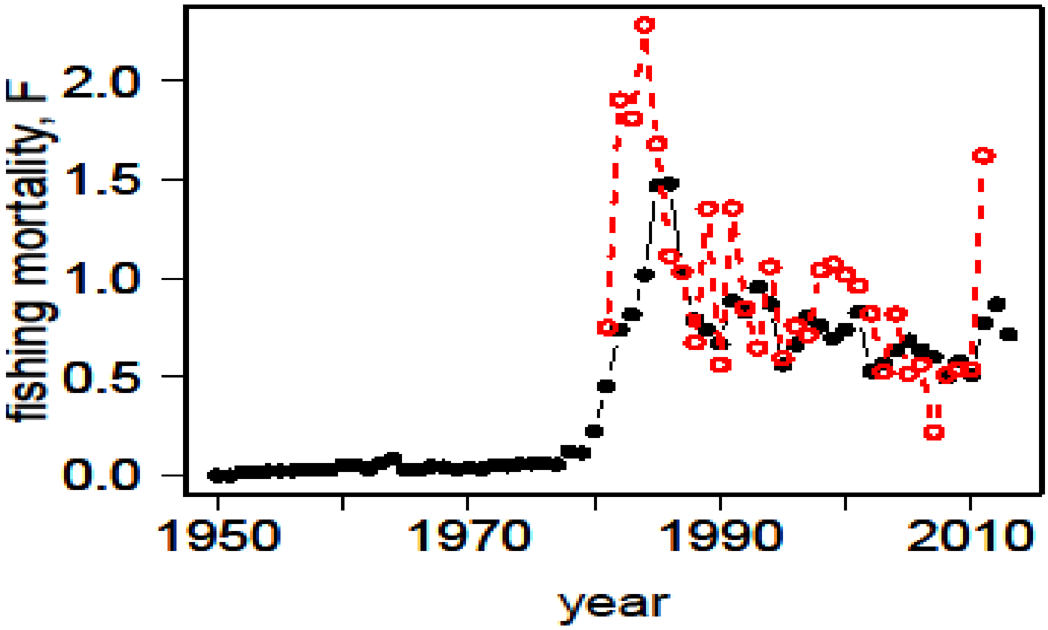
SKJ-Figure 15. Relative abundance indices for the eastern skipjack stock. Each index has been adjusted to its own average level given that to resolve problems regarding scaling, the indices for purse seine have been adjusted to the same level as the Azorean baitboat series.



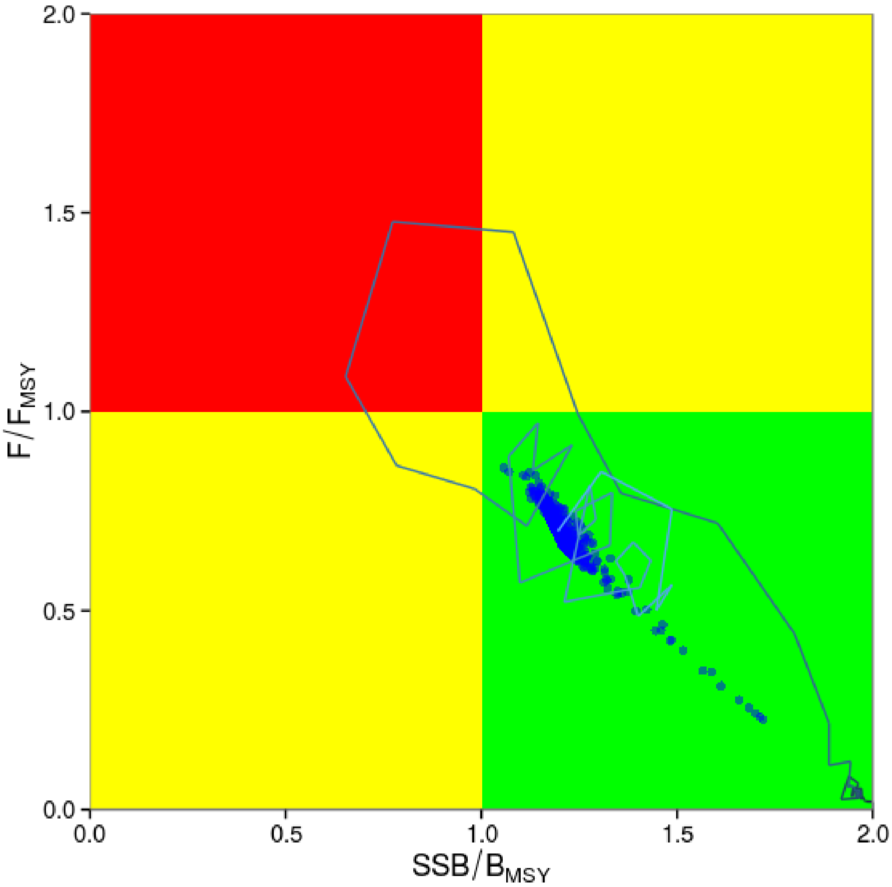
SKJ-Figure 16. Catches by set (t) of eastern Atlantic skipjack and on FADs (France and Spain + associated fleets) and on free schools (all purse seiners).



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 5ºN) 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 5ºS and 20ºS, being likely related to favorable environmental conditions for spawning, particularly of sea surface temperature. The longline Chinese Taipei fleet operates over a larger area and throughout the year, and consists of vessels that target albacore and vessels that take albacore as by-catch, in bigeye directed fishing operations. On average, the longline vessels catch larger albacore (60 cm to 120 cm FL) than the surface fleets.

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 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 time-frame 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*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 28,000t. 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<FMSY in as short a time as possible. A range of time-frames 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 .9F_{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	Overfished: Yes	Overfished: ?
	Overfishing: No	Overfishing: Yes	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}.

ALB-Table 1. Estimated catches (t) of albacore (*Thunnus alalunga*) 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			67491	56326	69615	73086	71812	67517	60379	59585	59039	67063	70088	69919	60095	61466	53378	57728	67407	48841	42320	41661	40857	48789	52788	45317	42593
	ATN		36881	27931	30851	38135	35163	38377	28803	29023	25746	34551	33124	26253	22741	25567	25960	35318	36989	21991	20483	15375	19509	20039	25680	24634	26539
	ATS		28714	26016	36562	32813	35300	27552	28426	28022	30595	27656	31387	38796	31746	28002	22543	18882	24453	20283	18867	22265	19225	24129	25061	19180	13681
	MED		1896	2379	2202	2138	1349	1587	3150	2541	2698	4856	5577	4870	5608	7897	4874	3529	5965	6567	2970	4021	2124	4621	2047	1503	2373
Landings	ATN	Bait boat	18624	8968	12436	15646	11967	16411	11338	9821	7562	8780	11072	6103	6638	7840	8128	10458	14273	8496	7931	4994	6026	5530	8816	4975	7341
		Longline	2683	5315	3152	7093	7309	4859	4641	4051	4035	6710	7321	7372	6180	7699	6917	6911	5223	3237	2647	2619	3913	3666	3759	6514	2977
		Other surf.	3865	3999	5173	7279	7506	3555	3337	4378	6846	6817	5971	2828	422	551	697	624	625	525	274	427	324	412	352	596	162
		Purse seine	1	222	139	229	292	278	263	26	91	56	191	264	118	211	348	99	188	198	70	84	74	0	167	7	35
		Trawl	1033	469	2603	1779	2131	3049	2571	2877	1318	5343	3547	5374	5376	3846	2369	7001	6385	3429	4321	2811	2026	6852	6678	6558	9184
		Troll	10675	8959	7348	6109	5959	10226	6652	7870	5894	6845	5023	4312	4007	5419	7501	10224	10296	6105	5239	4440	7146	3578	5909	5891	6660
	ATS	Bait boat	5981	3454	6490	7379	8947	7091	6960	8110	10353	6709	6873	10355	9712	6973	7475	5084	5876	3375	4350	7926	3748	5938	6710	5223	4741
		Longline	21590	22008	27162	23947	24806	20040	21000	19547	19799	20640	24398	28039	21671	20626	14735	12977	17740	15087	13218	12113	13471	16445	17846	13863	8890
		Other surf.	1139	137	393	39	483	10	209	127	0	73	58	377	323	82	299	288	395	1762	1219	2066	1651	1538	66	2	7
		Purse seine	4	416	2517	1448	1064	412	257	117	434	183	58	25	39	309	16	534	442	58	81	160	355	208	437	91	42
		Trawl	0	0	0	0	0	0	0	120	9	52	0	0	0	12	18	0	0	0	0	0	0	0	0	0	
	MED	Bait boat	83	499	171	231	81	163	205	0	33	96	88	77	29	0	0	0	0	0	0	0	0	0	0	0	
		Longline	624	524	442	410	350	87	391	348	194	416	2796	2597	3704	4248	2335	1997	3026	4119	2694	1582	1719	2317	1959	1392	2316
		Other surf.	1098	1198	1533	879	766	1031	2435	1991	2426	4271	2693	2196	1757	3171	2187	1215	2723	1401	250	2414	404	2245	8	18	31
		Purse seine	91	110	6	559	23	0	0	0	0	0	0	0	1	478	353	317	214	1046	24	26	0	34	68	86	13
		Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
		Troll	0	48	50	59	129	306	119	202	45	73	0	0	117	0	0	0	1	0	1	0	1	0	6	0	3
Discards	ATN	Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	93	180
	ATS	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	0
	MED	Longline	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
Landings	ATN	Barbados	0	0	0	0	0	0	0	1	1	1	0	2	5	8	10	13	9	7	7	4	6	4	20	22	13
		Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	26	39	416	351	155	230	79
		Brazil	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Canada	6	5	1	9	32	12	24	31	23	38	122	51	113	56	27	52	27	25	33	11	14	28	34	32	47
		Cape Verde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		China PR	0	0	0	0	14	8	20	0	0	21	16	57	196	155	32	112	202	59	24	27	142	101	21	81	35
		Chinese Taipei	3005	4318	2209	6300	6409	3977	3905	3330	3098	5785	5299	4399	4330	4557	4278	2540	2357	1297	1107	863	1587	1367	1180	2394	947
		Cuba	2	0	0	0	0	0	0	0	0	0	0	0	1	322	435	424	527	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	53	39	146	0	
		Dominican Republic	0	0	0	0	0	0	0	323	121	73	95	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.España	25792	17233	18175	18380	16998	20197	16324	17295	13285	15363	16000	9177	8952	12530	15379	20447	24538	14582	12725	9617	12961	8357	13719	10502	11607
		EU.France	3625	4123	6924	6293	5934	5304	4694	4618	3711	6888	5718	6006	4345	3456	2448	7266	6585	3179	3009	1122	1298	3348	3361	4592	6716
		EU.Ireland	40	60	451	1946	2534	918	874	1913	3750	4858	3464	2093	1100	755	175	306	521	596	1517	1997	788	3597	3575	2231	2485
		EU.Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	
		EU.Portugal	3185	709	1638	3385	974	6470	1634	395	91	324	278	1175	1953	553	513	556	119	184	614	108	202	1046	1231	567	2609
		EU.United Kingdom	0	0	59	499	613	196	49	33	117	343	15	0	0	0	0	6	19	30	50	67	118	57	50	133	136
		FR.St Pierre et Miquelon	0	0	0	0	0	0	0	0	0	0	0	0	4	0	7	2	0	3	0	0	0	0	0	0	0
		Grenada	0	0	0	0	0	2	1	6	7	6	12	21	23	46	25	29	19	20	15	18	18	18	0	0	
		Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	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	
		Japan	737	691	466	485	505	386	466	414	446	425	688	1126	711	680	893	1336	781	288	402	288	525	336	400	1745	279
		Korea Rep.	34	1	0	8	0	2	2	1	0	0	0	0	0	0	0	59	45	12	59	82	110	60	200	184	64
		Maroc	0	0	0	0	0	0	0	0	0	0	0	0	55	81	120	178	98	96	99	130	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	3
		NEI (Flag related)	0	11	19	13	10	8	11	3	8	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Panama	0	0	29	60	117	73	11	5	0	0	0	0	0	0	0	0	96	298	113	45	154	103	0	246	
		Philippines	0	0	0	0	0	0	0	0	151	4	0	0	0	0	0	9	0	8	19	54	0	0	83	0	
		Sierra Leone	0	0	0	0	0	0	0	0	0	0	0	91	0	0	0	0	0	0	0	0	0	0	0	0	
		St. Vincent and Grenadines	0	0	0	2	0	0	0	0	0	1	704	1370	300	1555	89	802	76	263	130	135	177	329	305	286	328
		Sta. Lucia	0	0	1	1	0	1	1	0	0	0	1	3	2	10	0	2	2	2	2	0	130	2	3	2	
		Suriname	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	249	216	
		Trinidad and Tobago	4	0	247	0	0	0	0	2	1	1	2	11	9	12	12	9	12	18	32	17	17	23	47	67	71
		U.S.A.	357	479	438	509	741	545	472	577	829	315	406	322	480	444	646	488	400	532	257	189	315	422	418	599	459
		U.S.S.R.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		UK.Bermuda	0	0	0	0	0	0	0	1	0	2	2	2	0	0	1	1	0	0	0	0	0	1	0	0	1
		UK.Turks and Caicos	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
		Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	414	507	235	95	20	140	187	196	172	228	195
		Venezuela	94	302	193	246	282	279	315	75	107	91	299	348	162	346	457	175	321	375	222	398	288	247	312	181	285

			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	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	
		Cape 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	
		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	
		Curaçao	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	
		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	
		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	
		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	
		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	
		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	
		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	
		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	
		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	
		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	
		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	0	65	160	71	51	31	94	92	97	110
		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	
		U.S.S.R.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		UK.Sta Helena	1	5	28	38	5	82	47	18	1	1	58	12	2	0	0	0	62	46	94	81	3	120	2	2	
		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	
		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	
		Maroc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	120	0	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	
		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	
		Turkey	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27	30	73	852	208	631	402	1396	62	71	0
		Yugoslavia Fed.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Discards	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	
		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: 3 years	Cumulative Catch over: 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>SSBMSY and F<FMSY 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}

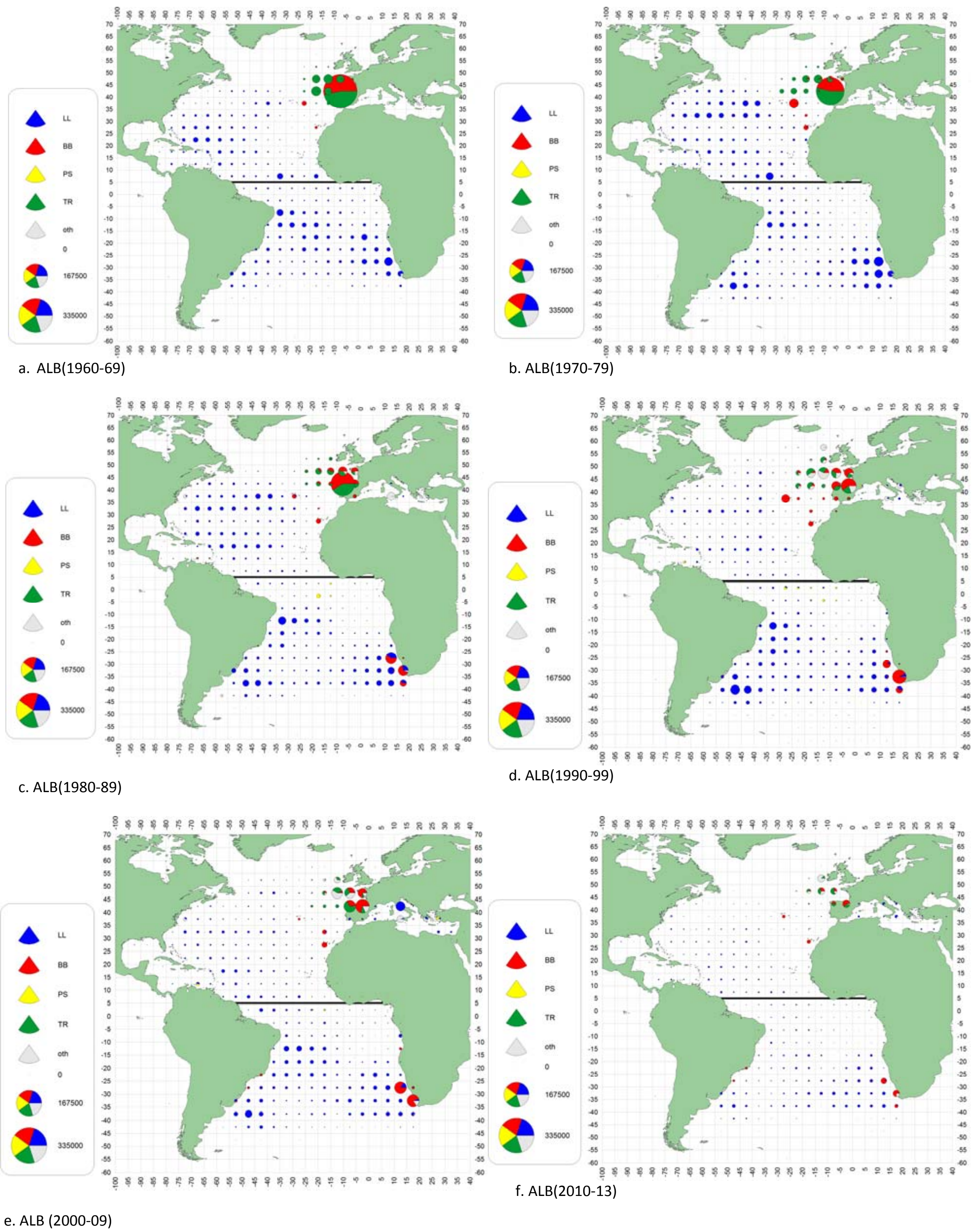
Harvest	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
14000	91	91	92	92	92	92	93	93	93	93	93	93	93
16000	86	86	87	87	88	88	89	89	90	90	90	90	90
18000	80	81	82	83	83	83	84	84	84	85	85	85	85
20000	68	70	71	72	73	74	75	75	76	77	77	78	78
22000	59	60	61	62	63	63	64	64	65	65	66	66	66
24000	51	51	52	53	53	53	54	54	54	54	55	55	55
26000	41	41	41	41	42	42	42	42	42	42	42	42	42
28000	34	33	33	32	32	31	31	30	30	30	29	29	28
30000	29	27	26	25	24	23	22	21	21	20	19	19	19
32000	24	22	21	19	18	18	17	17	16	16	15	15	15
34000	20	18	17	17	16	15	14	14	13	13	13	12	12

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

Harvest	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
0.75 Fmsy	47	54	60	64	68	70	73	75	78	81	82	84	85
0.8 Fmsy	47	53	58	61	64	68	69	72	74	76	78	80	81
0.85 Fmsy	46	51	55	58	61	63	66	68	70	71	72	74	76
0.9 Fmsy	46	49	52	55	57	59	61	63	64	66	67	68	69
0.95 Fmsy	46	48	49	51	53	54	56	57	58	59	60	61	62
1.0 Fmsy	45	46	46	47	48	48	48	49	49	49	50	50	50
14000	48	58	64	70	73	76	79	82	84	85	86	86	87
16000	47	56	62	66	70	72	75	77	79	80	82	83	84
18000	47	54	59	62	65	68	70	72	74	75	76	78	79
20000	47	52	56	59	61	63	64	66	67	68	69	70	71
22000	46	50	53	55	57	58	59	60	61	62	62	63	64
24000	46	48	49	50	51	52	52	53	54	54	54	55	55
26000	46	45	45	45	45	44	44	44	44	44	44	44	44
28000	45	43	41	40	38	37	36	35	35	34	33	32	32
30000	45	41	37	35	33	31	29	27	25	24	23	23	22
32000	45	39	34	31	27	24	22	21	20	19	19	18	18
34000	44	37	31	26	22	21	19	18	18	17	16	16	15

(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	47	54	60	64	68	70	73	75	78	81	82	84	85
0.8 Fmsy	47	53	58	61	64	68	69	72	74	76	78	80	81
0.85 Fmsy	46	51	55	58	61	63	66	68	70	71	72	74	76
0.9 Fmsy	46	49	52	55	57	59	61	63	64	66	67	68	69
0.95 Fmsy	46	47	49	51	53	54	56	57	58	59	60	61	62
1.0 Fmsy	16	17	17	18	19	19	19	20	20	20	21	21	21
14000	47	58	64	69	73	76	79	81	83	85	85	86	87
16000	47	56	61	66	70	72	75	76	79	80	82	83	84
18000	46	53	58	62	64	67	70	71	73	74	76	77	78
20000	45	51	55	58	60	62	64	65	66	67	68	69	70
22000	45	48	51	54	56	57	58	59	60	61	62	62	63
24000	43	45	46	48	48	50	50	51	52	52	53	53	53
26000	39	40	40	40	40	40	41	41	41	41	41	41	41
28000	34	33	32	32	32	31	31	30	30	30	29	29	28
30000	29	27	26	25	24	23	22	21	21	20	19	19	19
32000	24	22	21	19	18	18	17	17	16	16	15	15	15
34000	20	18	17	17	16	15	14	14	13	13	13	12	12

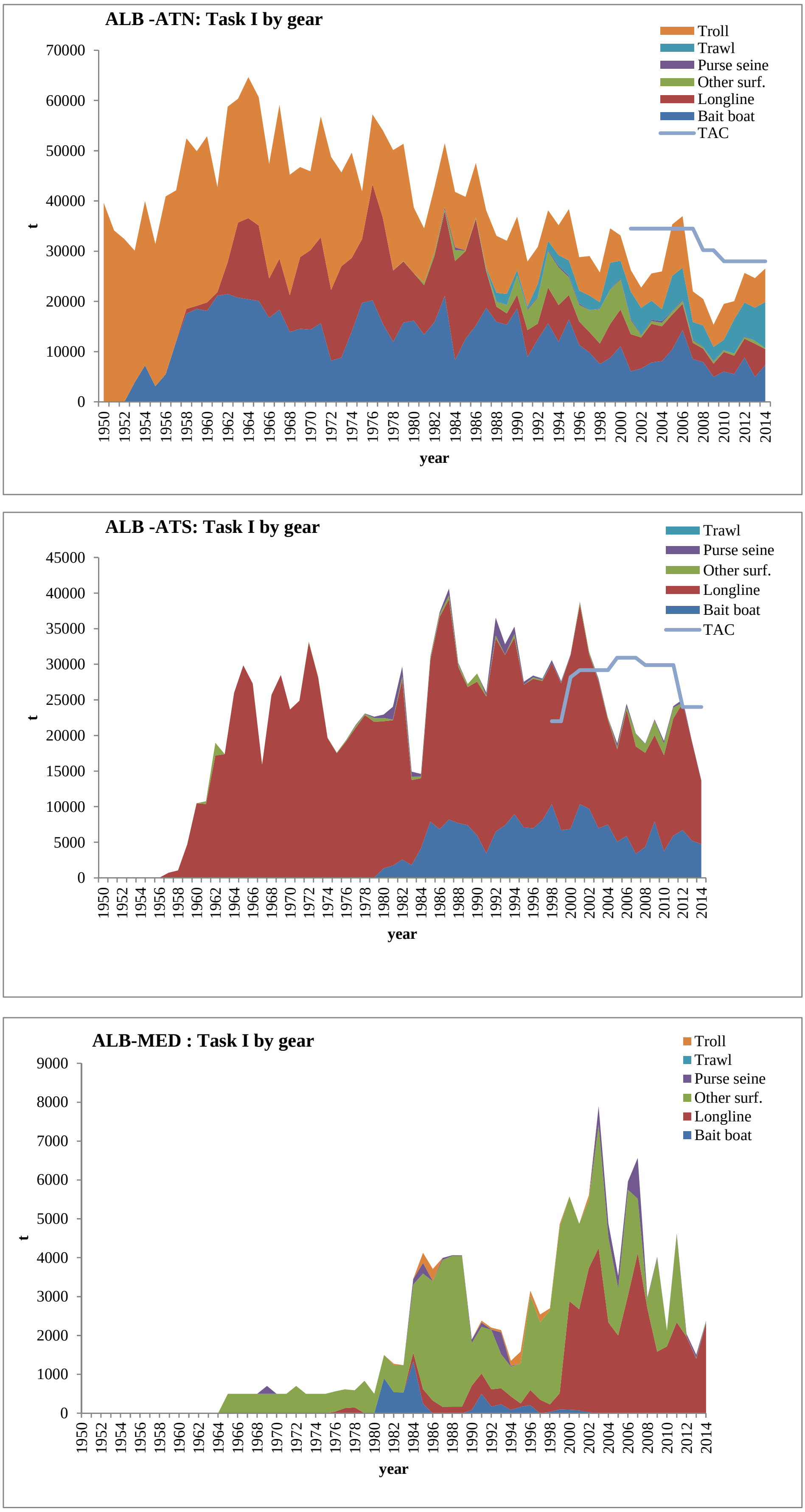


ALB-Figure 1. Geographic distribution of albacore accumulated catch by major gears and decade (1960-2013). Baitboat and troll catches prior to the 1990s, these catches were assigned to only one 5ºx5º stratum in the Bay of Biscay. Plots are scaled to the maximum catch observed from 1960 to 2013.

a)

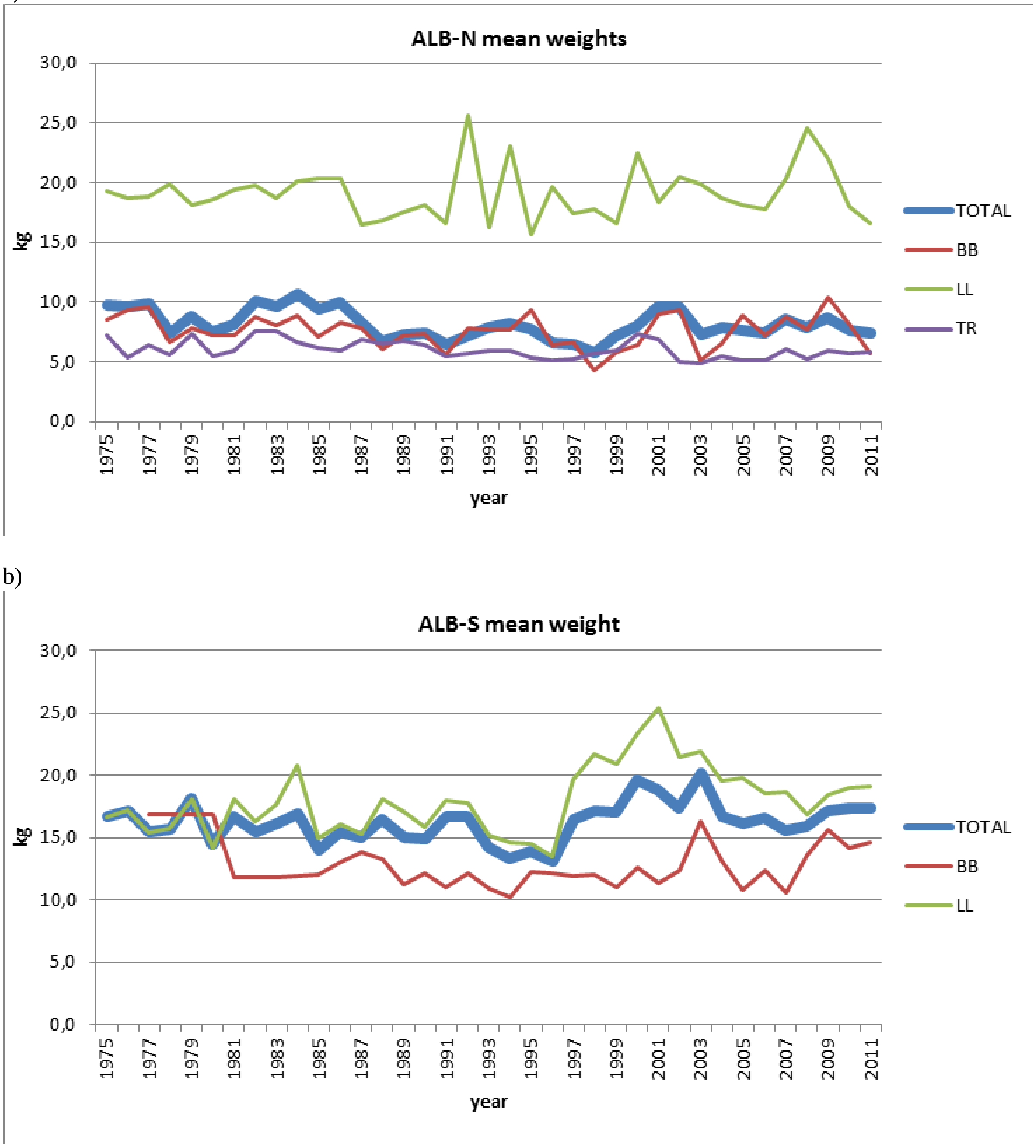
b)

c)

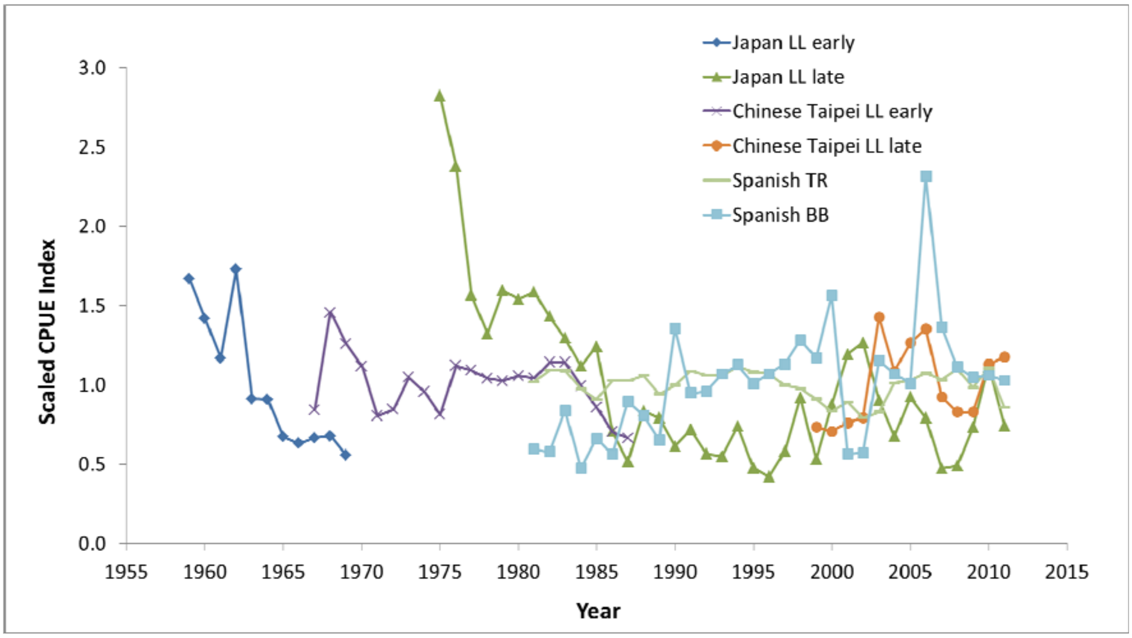


ALB-Figure 2a, b, c. Total albacore catches reported to ICCAT (Task I) by gear for the northern, southern Atlantic stocks including TAC, and the Mediterranean stock.

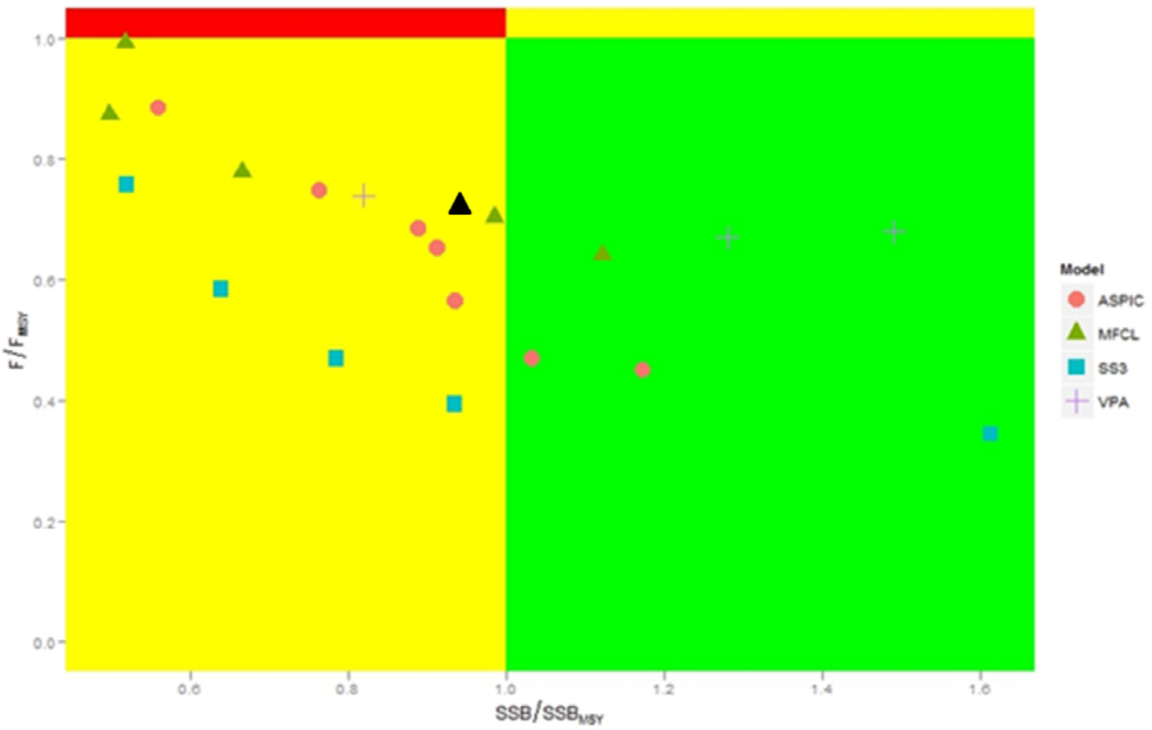
a)



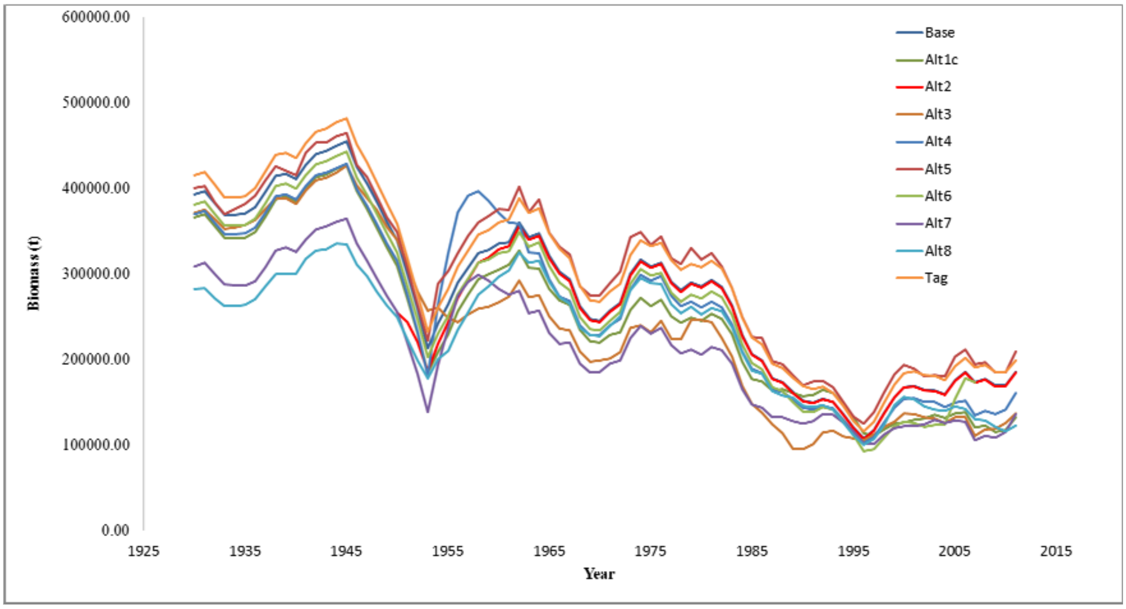
ALB-Figure 3a, b. North Atlantic and South Atlantic albacore. Mean weight trend by surface and longline fisheries in North Atlantic (a) and South Atlantic (b) stocks.



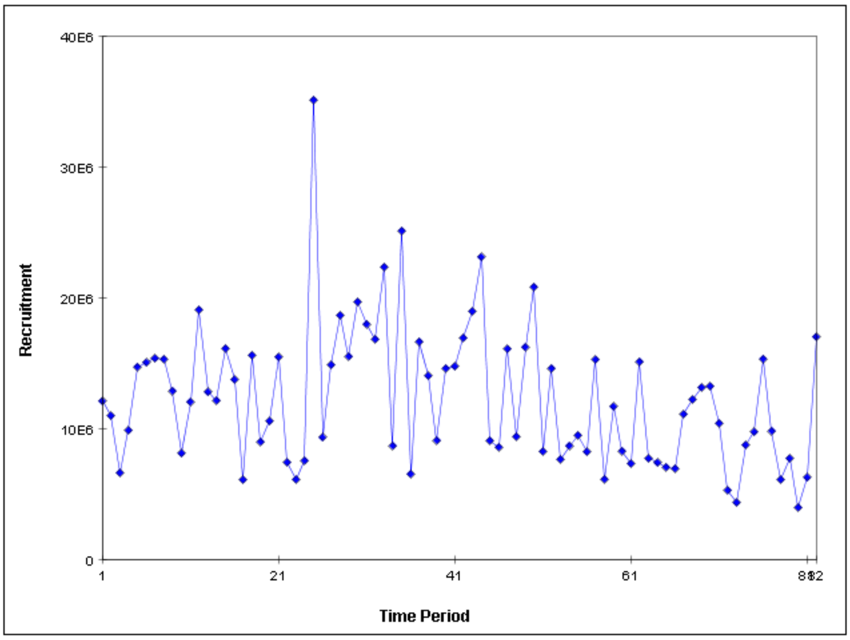
ALB-Figure 4. Standardized catch rate indices used in the 2013 northern albacore stock assessment from the surface fisheries, which take mostly juvenile fish, and from the longline fisheries, which take mostly adult fish.



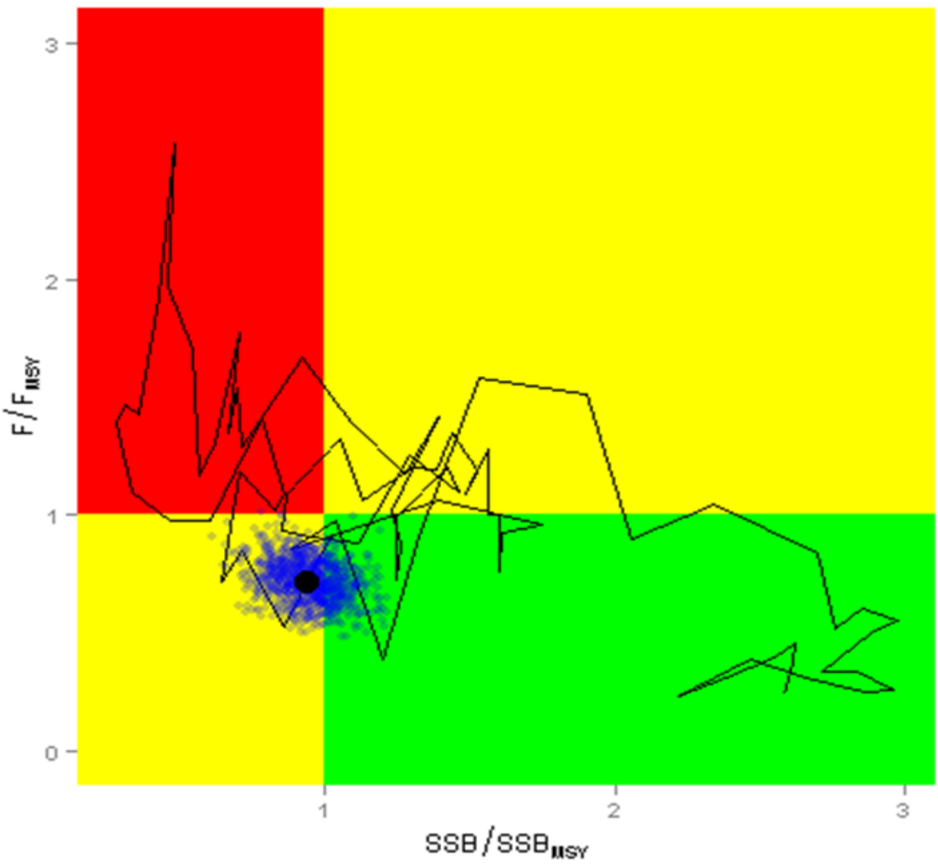
ALB-Figure 5. Stock status of Northern albacore tuna according to base case (black triangle) as well as different models and runs considered during the assessment.



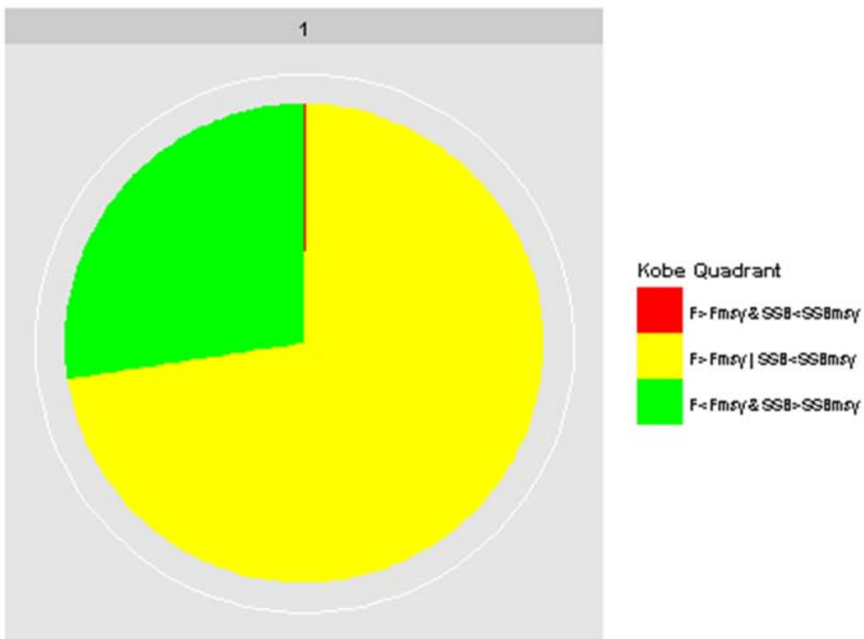
ALB-Figure 6. Estimates of northern Atlantic albacore spawning stock size between 1930-2011 according to the Multifan-CL Base Case and the different sensitivity runs considered in the assessment.



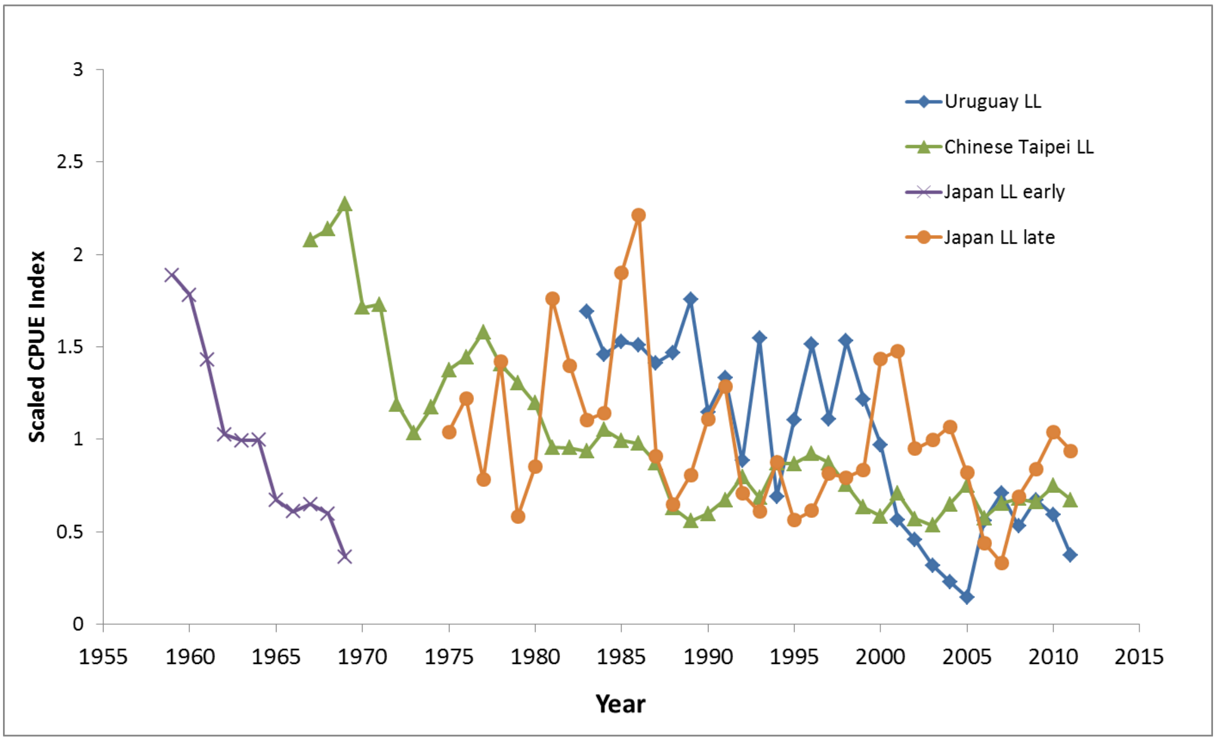
ALB-Figure 7. Estimates of northern Atlantic albacore recruitment (age 1) between 1930-2011 from Multifan-CL base case. Uncertainty in the estimates has not been characterized, but the uncertainty in recent recruitment levels is considered to be higher than in the past.



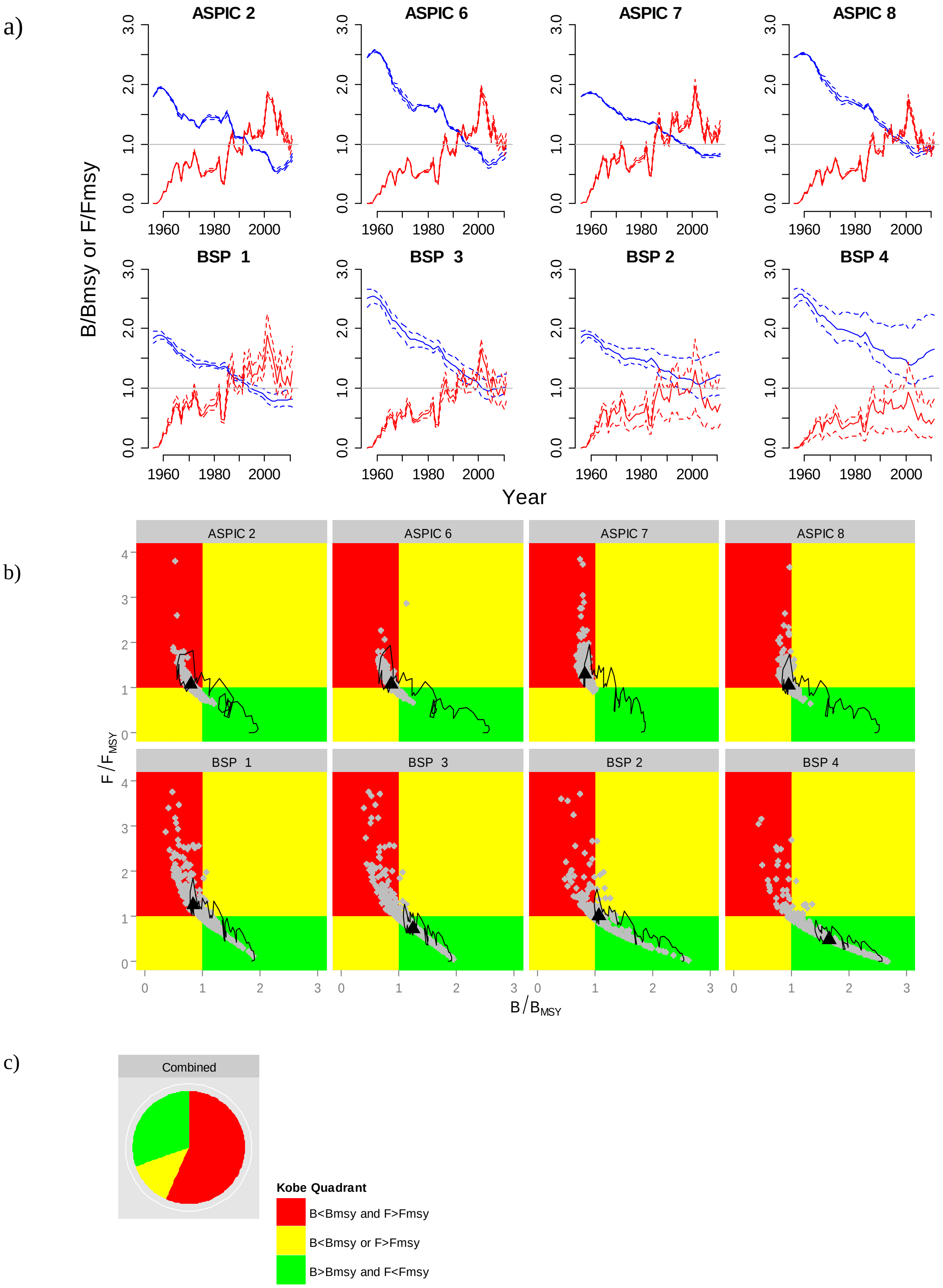
ALB-Figure 8. Joint trajectories of SSB/SSB_{MSY} and F/F_{MSY} over time and current stock status of northern albacore according to the estimated Multifan-CL Base Case. The black point represents the stock status in 2011, and the blue points represent the uncertainty on the current stock status.



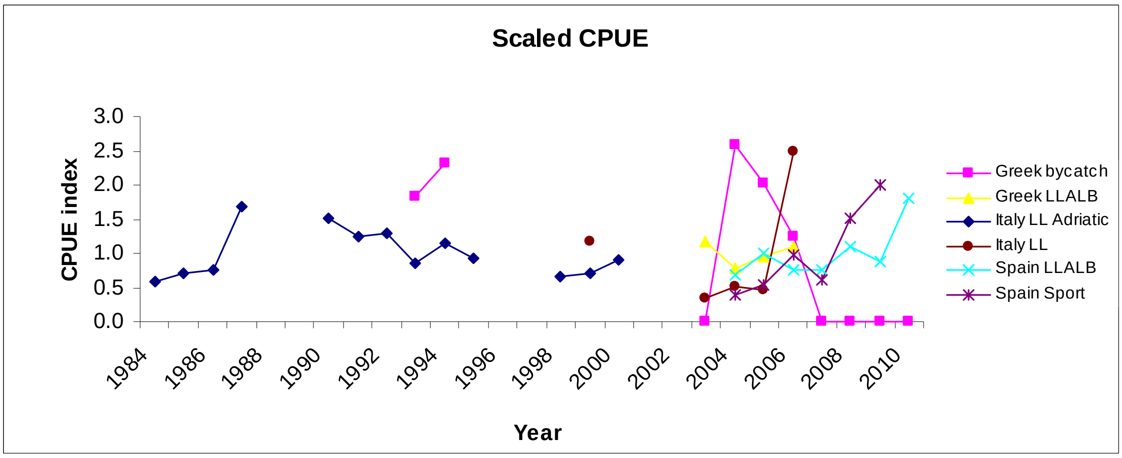
ALB-Figure 9. North Atlantic albacore probability of being overfished and overfishing (red, 0.2 %), of being neither overfished nor overfishing (green, 27.4%), and of being overfished or overfishing, but not both (yellow, 72.4%), according to the Multifan-CL Base Case.



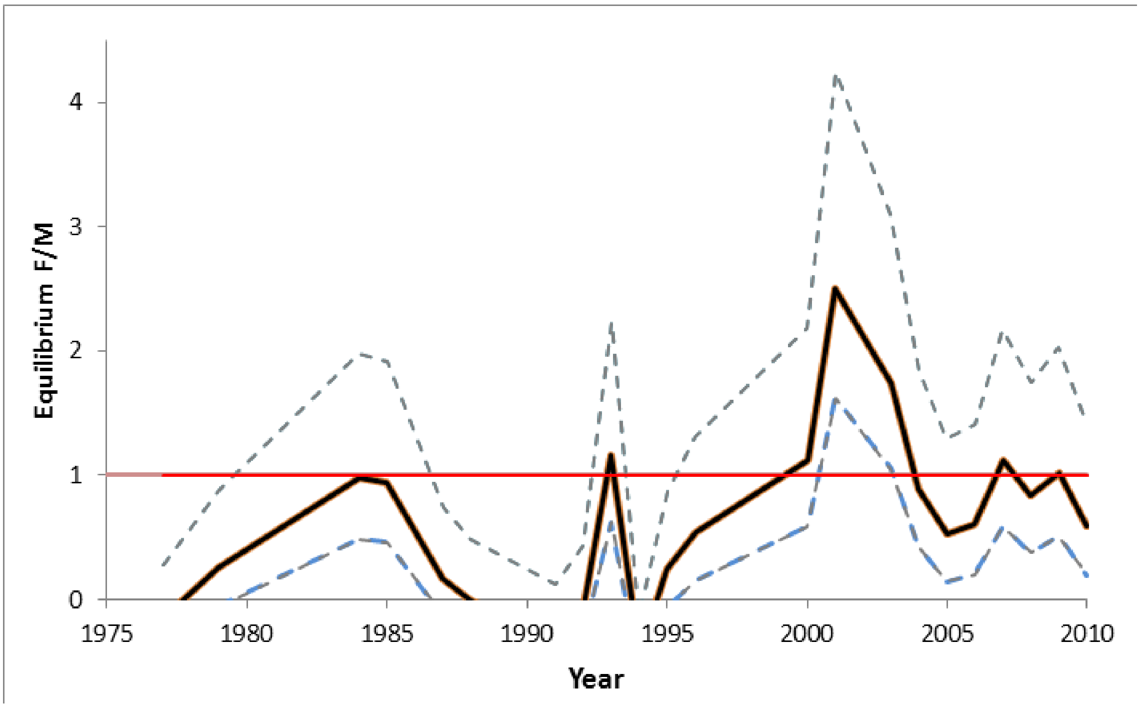
ALB-Figure 10. Standardized catch rates used in the 2013 southern albacore stock assessment.



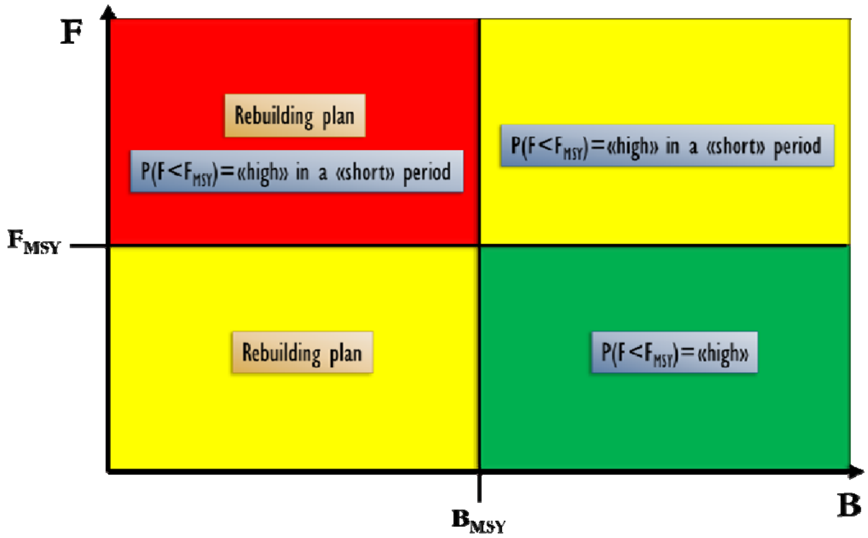
ALB-Figure 11. South Atlantic albacore. a) Median biomass (in blue) and fishing mortality rates (in red) relative to MSY levels, with 50% credibility intervals, for the 4 base case Bayesian Surplus Production (BSP) models and the point estimate biomass and 50% credibility intervals for the 4 base case 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%).



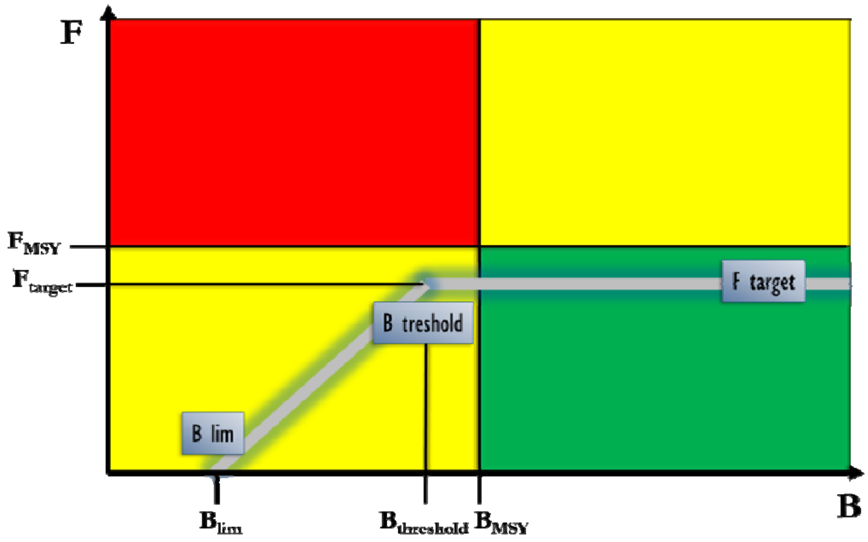
ALB-Figure 12. Set of standardized and nominal CPUEs used in the assessment of the Mediterranean albacore stock. The "Greek by-catch" indicates the probability of albacore by-catch in the swordfish fishery, practically null in some years. This series is the only one that is not included in the base case 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 (SCRS, 2011). 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. 2013d). 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 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. 2013e).

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 adults 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 40ºN) and the Mediterranean Sea displayed a recent increase after a general decline since the mid-1970s (**BFTE-Figure 2**). However, this index has not been updated since 2009 because this fleet did not operate in the Mediterranean and rarely in the East Atlantic (South of 40ºN) in recent years. Indicators from Japanese longliners targeting medium to large fish in the northeast Atlantic were available since 1990 and has 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 (SCRS/2014/018). 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. 2013d) 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 SCRS/2014/113). 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, SCRS/2014/018, **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, SCRS/2014/018). 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 $SSB_{F0.1}$ (i.e. the equilibrium SSB resulting in fishing at $F_{0.1}$) by the end of 2022, with at least 60% of probabilities, is 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 $SSB_{F0.1}$ 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, SCRS/2014/018). 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 BMSY through 2022 with at least 60% of probability.

In 2014, the Kobe matrices were presented indicating the probabilities of *i*) $F<F_{MSY}$ (**Table 1**) *ii*) $SSB>SSB_{MSY}$ (**Table 2**) and *iii*) ($F<F_{MSY}$ and $SSB>SSB_{MSY}$) (**Table 3**) for quotas from 0 to 30,000 t for 2014 through 2022. Shading in **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, SCRS/2014/018.

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. F0.1, Fmax, 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]	$0.07 yr^{-1}$	$0.07 yr^{-1}$
$F_{2013}/F_{0.1}$	0.40	0.36
$SSB_{F0.1}$		
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
$SSB_{2013}/SSB_{F0.1}$		
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
	Overfished	
Low recruitment scenario	Yes	
Medium recruitment scenario	Yes	
High recruitment scenario	No	
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 long-term 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	ATW		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	
		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	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	
Landings	ATE	Cape Verde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		China 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	
		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	
		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	
		EU.Greece	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Ireland	0	0	0	0	0	0	0	14	21	52	22	8	15	3	1	1	2	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	
		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	
		EU.United Kingdom	0	0	0	0	0	1	0	1	1	12	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	
		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	
		ICCAT (RMA)	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	
		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	
		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	
		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	

		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	
	Senegal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	
	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	
	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	
	U.S.A.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MED	Albania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	
	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	
	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	
	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	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	
	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	
	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	
	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	
	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	
	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	
	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	
	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	
	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	
	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	
ATW	Argentina	2	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	
	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	
	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	
	EU.Poland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	EU.United Kingdom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	FR.St Pierre et Miquelon	0	0	0	0	0	0	0	0	0	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	
	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	
	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	
	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	
	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	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	
		Trinidad and Tobago	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		U.S.A.	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	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	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	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	10
		Turkey	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	
		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 30,000t 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%.

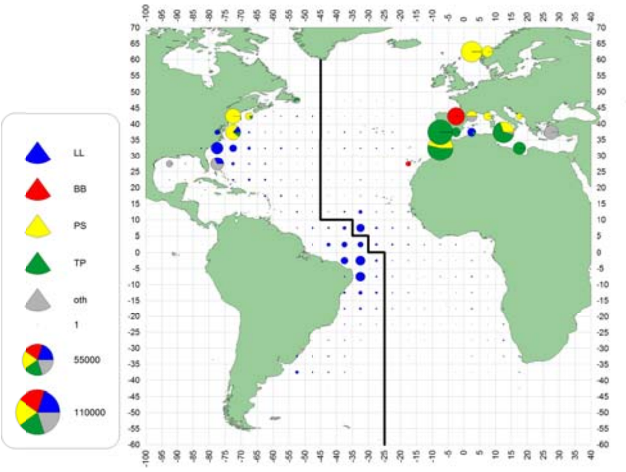
TAC	2014	2015	2016	2017	2018	2019	2020	2021	2022
0	100	100	100	100	100	100	100	100	100
2000	100	100	100	100	100	100	100	100	100
4000	100	100	100	100	100	100	100	100	100
6000	100	100	100	100	100	100	100	100	100
8000	100	100	100	100	100	100	100	100	100
10000	100	100	100	100	100	100	100	100	100
12000	100	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%.

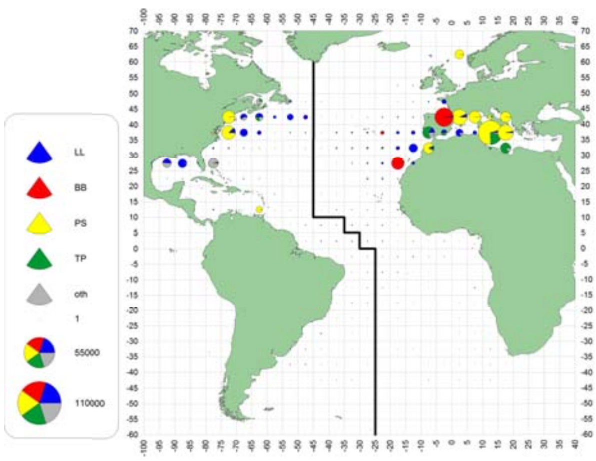
TAC	2014	2015	2016	2017	2018	2019	2020	2021	2022
0	63	67	73	80	89	94	98	99	100
2000	63	67	73	80	88	94	97	99	100
4000	63	67	72	79	87	93	97	99	100
6000	63	67	72	79	87	93	97	99	100
8000	63	67	72	79	86	92	96	98	99
10000	63	67	72	78	86	92	96	98	99
12000	63	67	72	78	85	91	95	98	99
13500	63	67	71	77	84	91	94	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%.

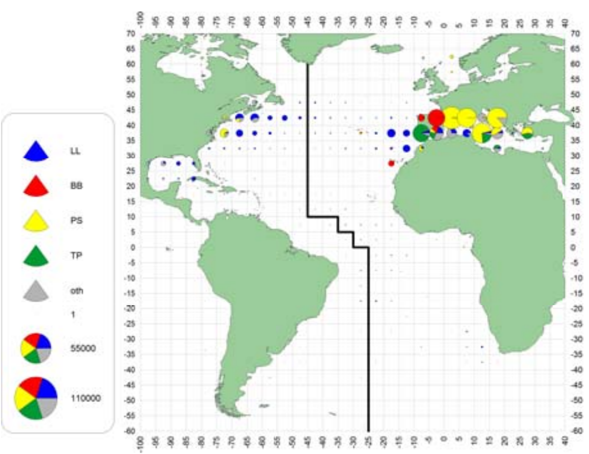
TAC	2014	2015	2016	2017	2018	2019	2020	2021	2022
0	63	67	73	80	89	94	98	99	100
2000	63	67	73	80	88	94	97	99	100
4000	63	67	72	79	87	93	97	99	100
6000	63	67	72	79	87	93	97	99	100
8000	63	67	72	79	86	92	96	98	99
10000	63	67	72	78	86	92	96	98	99
12000	63	67	72	78	85	91	95	98	99
13500	63	67	71	77	84	91	94	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



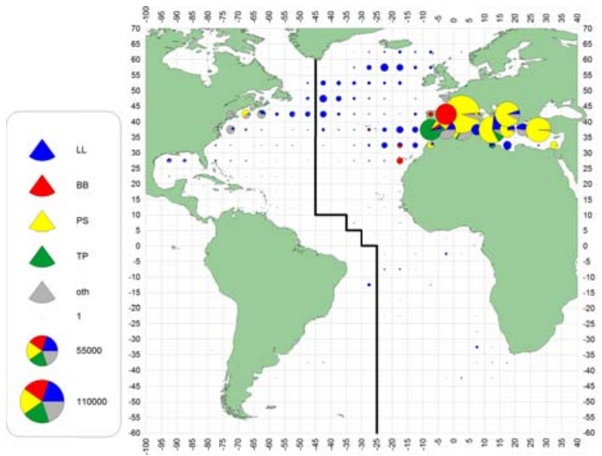
a. BFT (1960-69)



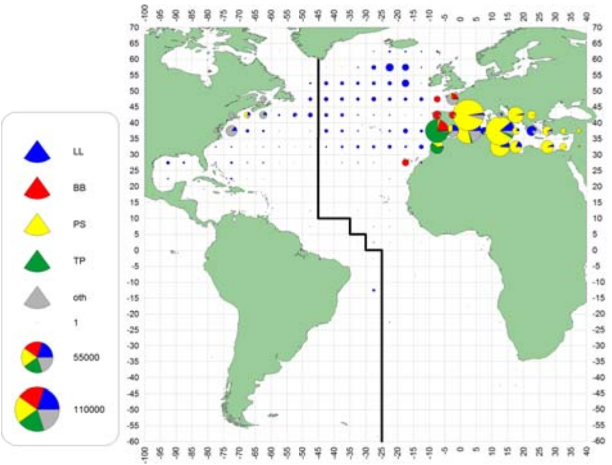
b. BFT (1970-79)



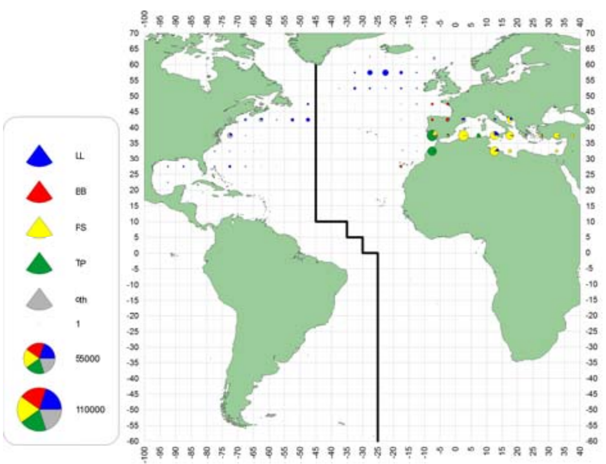
c. BFT (1980-89)



d. BFT (1990-99)

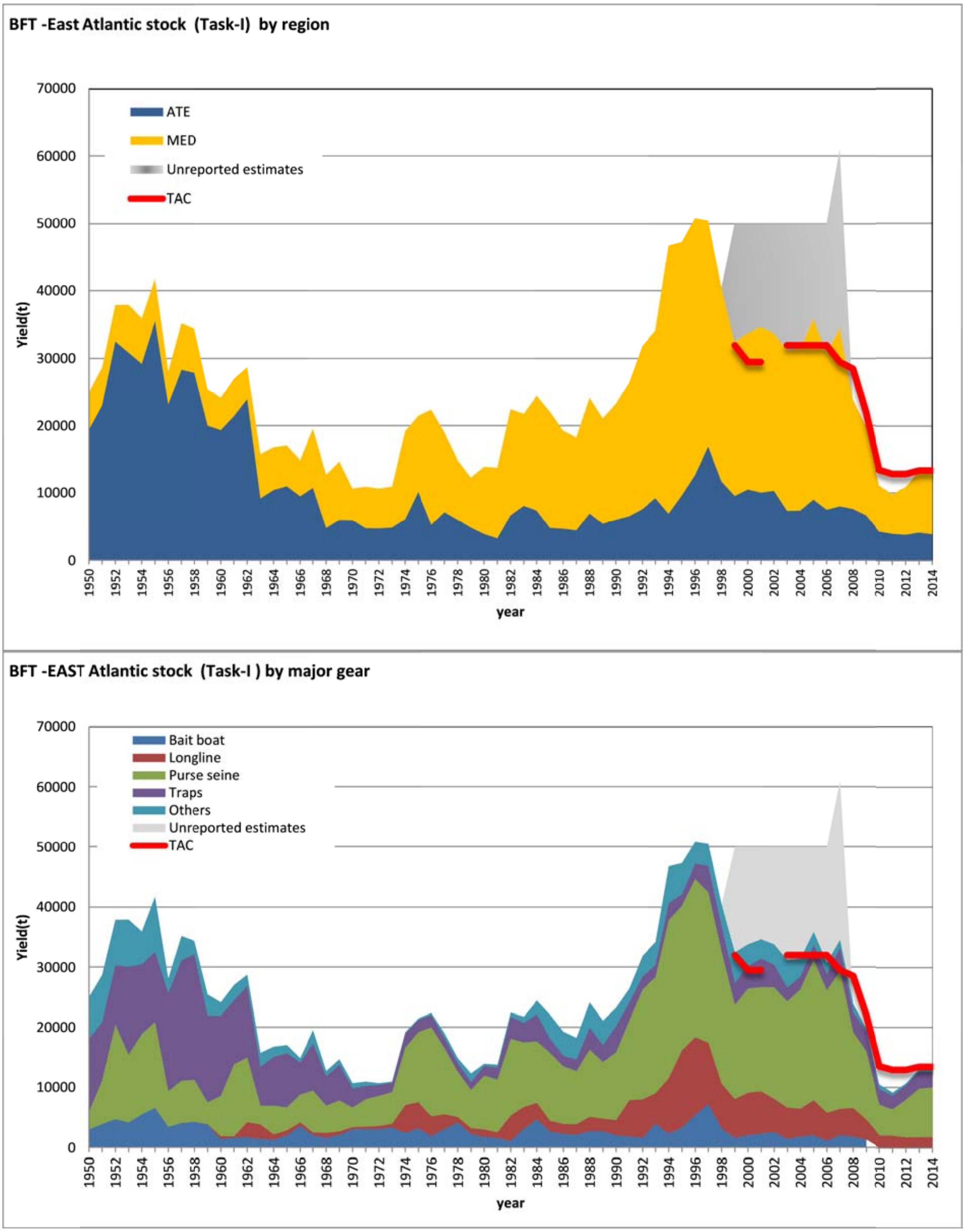


e. BFT (2000-09)

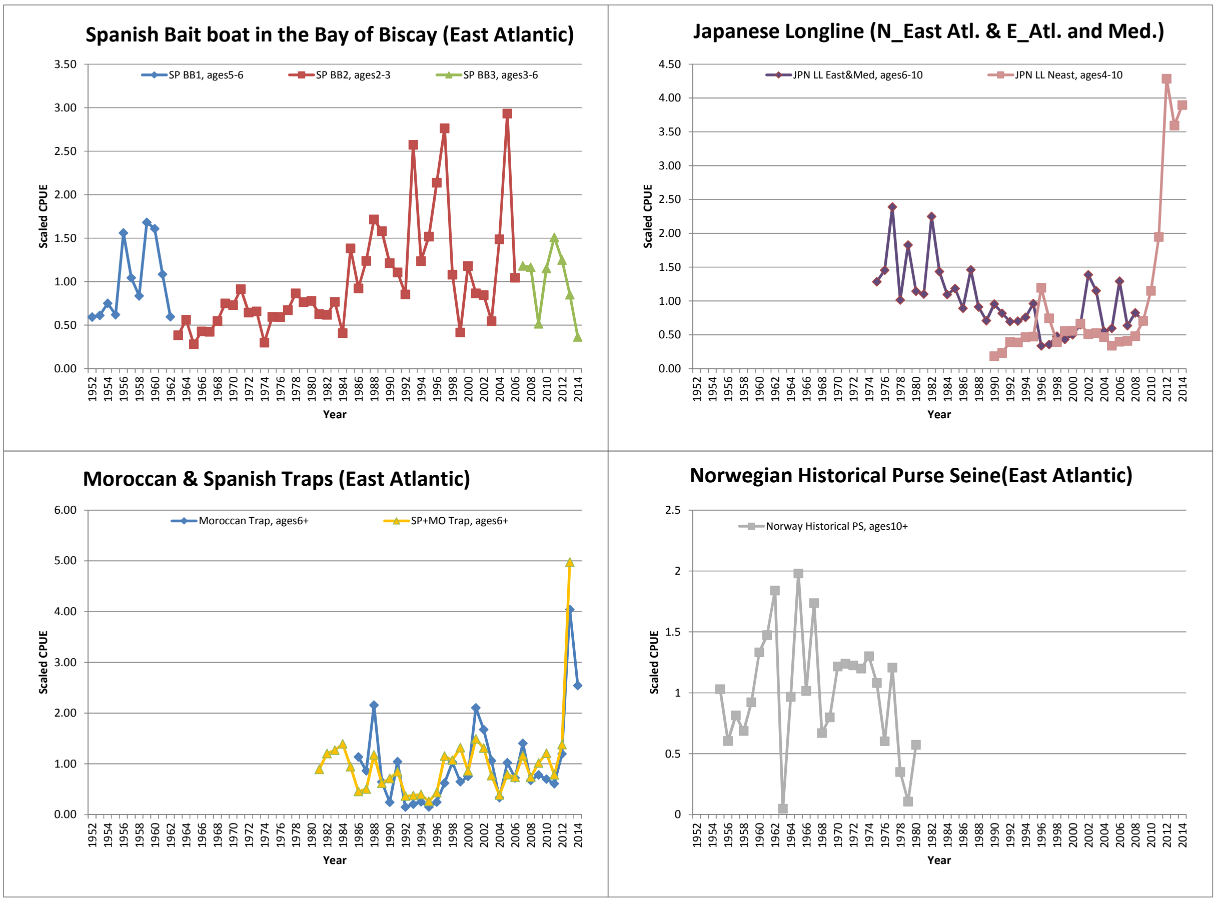


f. BFT (2010-13)

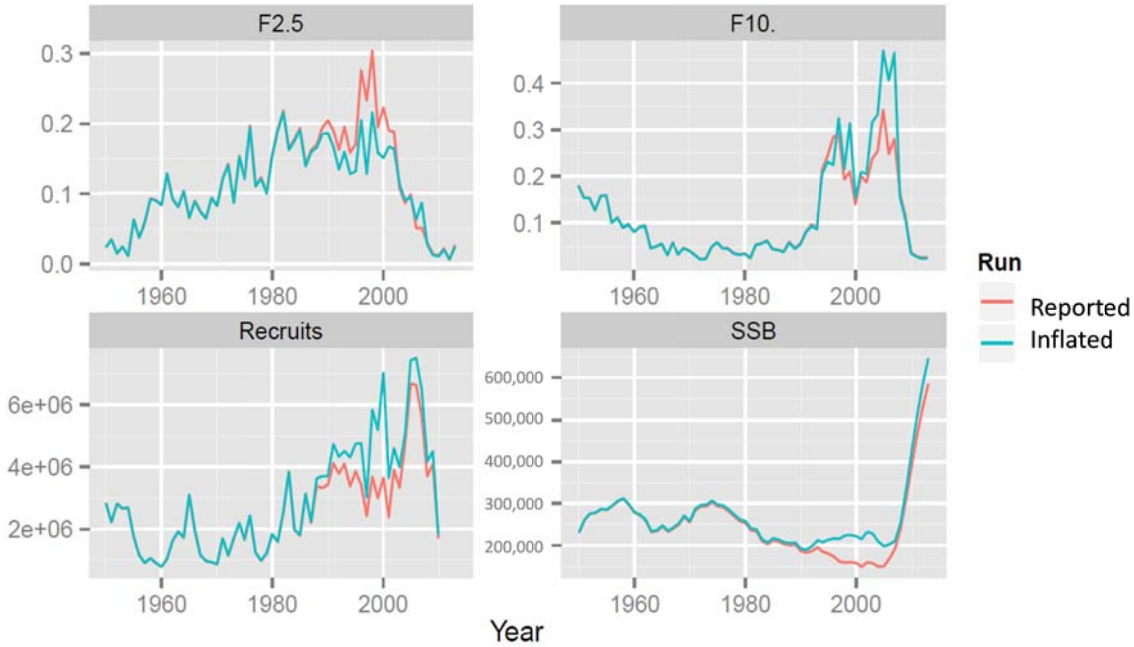
BFT-Figure 1. Geographic distribution of bluefin tuna catches per 5x5 degrees and per main gears from 1950 to 2013.



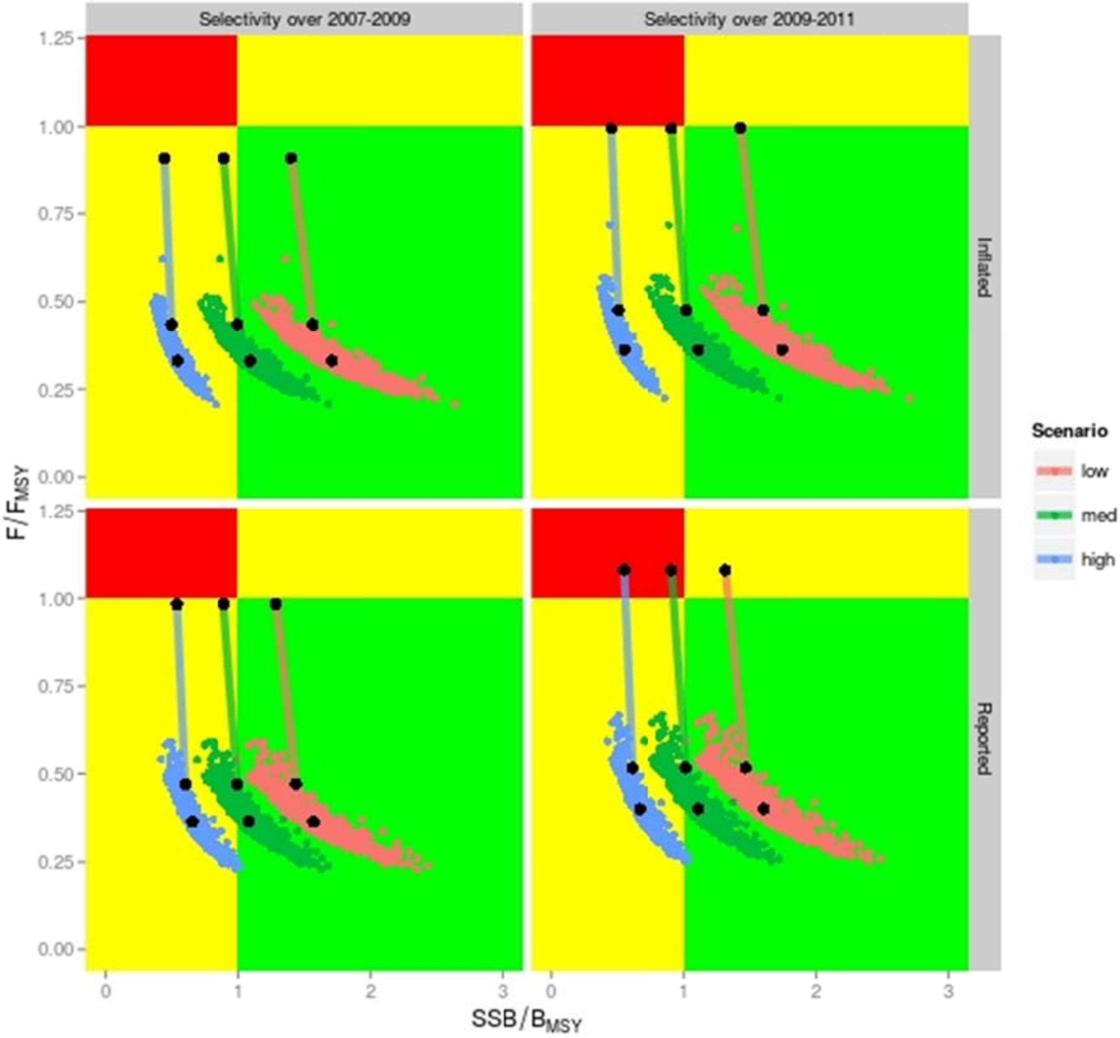
BFTE-Figure 1. Reported catch for the East Atlantic and Mediterranean from Task I data from 1950 to 2014 split by main geographic areas (top panel) and by gears (bottom panel) together with unreported catch estimated by the SCRS (using fishing capacity information and mean catch rates over the last decade)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



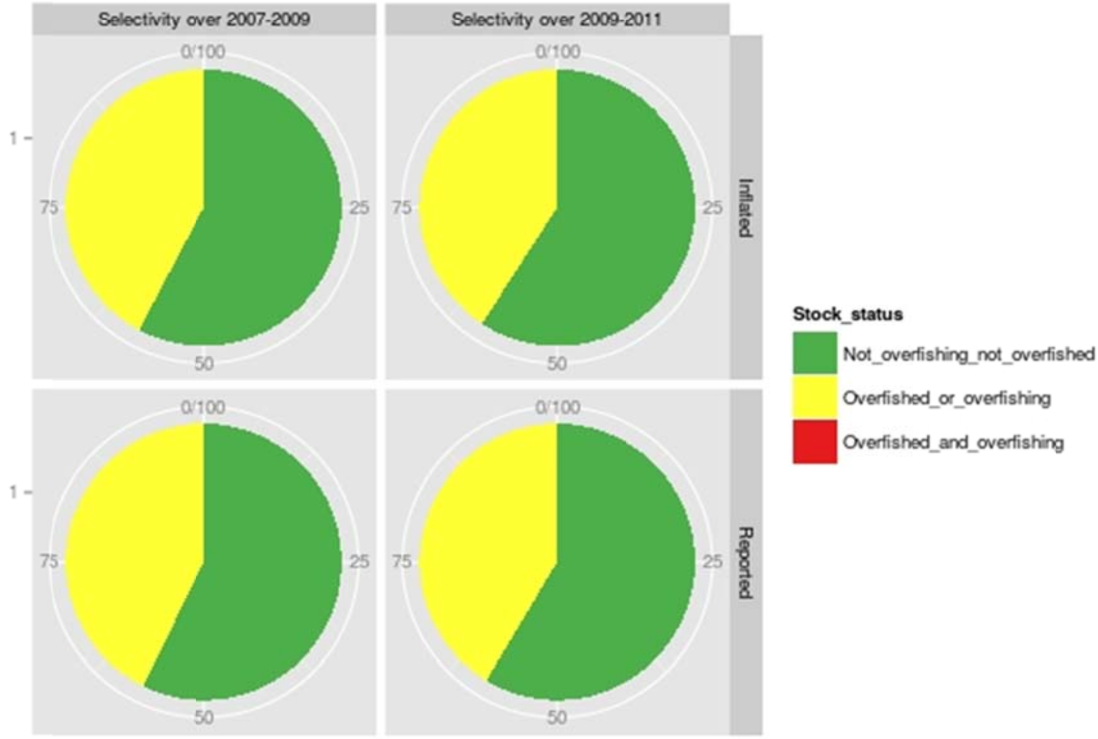
BFTE-Figure 2. Plots of the updated CPUE time series fishery indicators for the East Atlantic and Mediterranean bluefin tuna stock. All CPUE series are standardized series except the nominal Norway PS index. The Spanish BB series (top left panel) was split in three series to account for changes in selectivity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



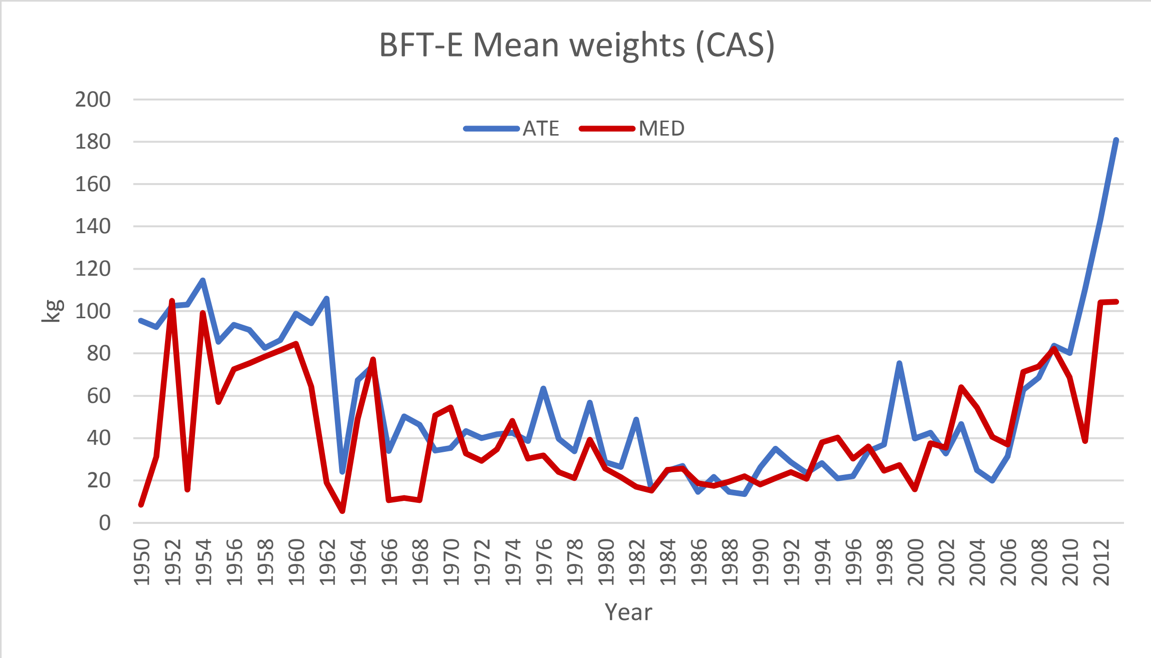
BFTE-Figure 3. Fishing mortality (for ages 2 to 5 and 10+), spawning stock biomass (in metric ton) and recruitment (in number of fish) estimates from VPA continuity run (considered as the base case in the 2014 stock assessment). Red line: reported catch; blue line: inflated (from 1998 to 2007) catch.



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 US longline in the Gulf of Mexico, **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 long-term 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 (SCRS/2014/018). 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 (**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 long-term 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 (SCRS/2014/200), 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 long term 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 long term 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)
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]
$F_{2010-2012}/F_{0.1}$	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.

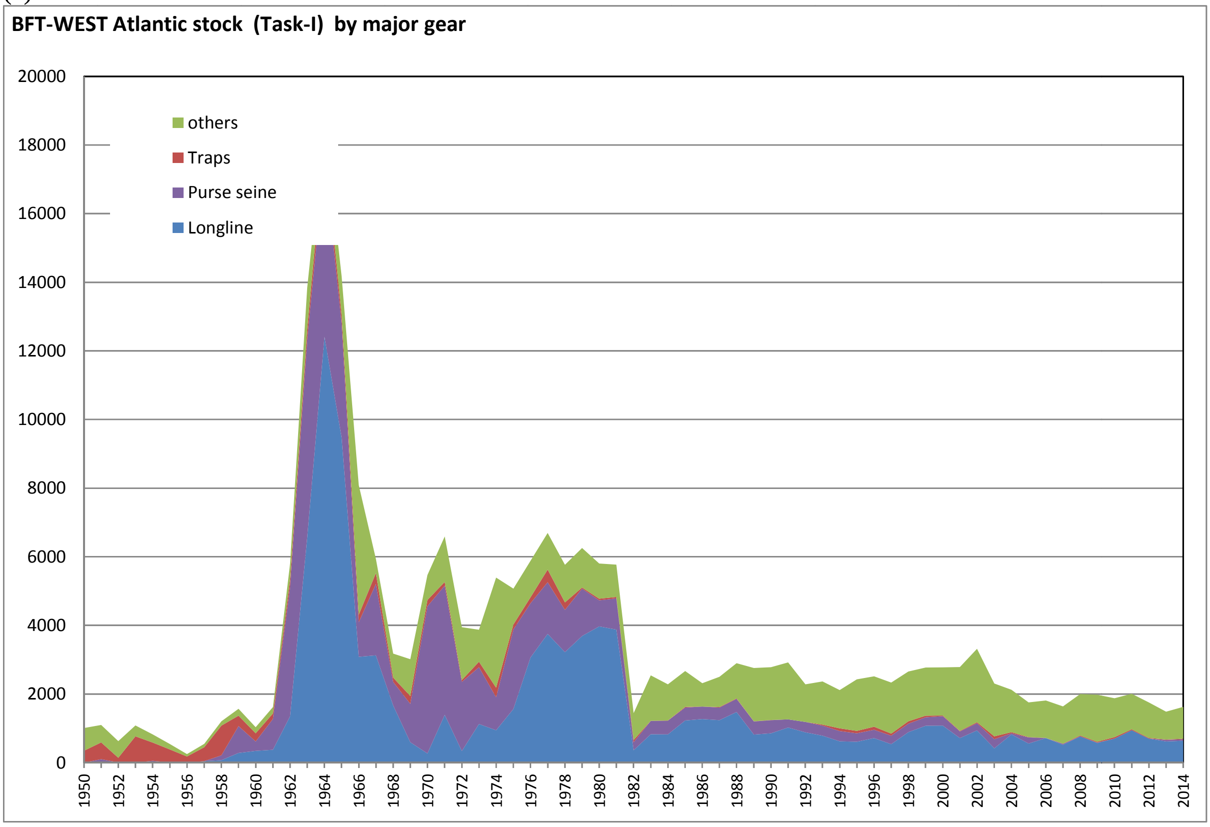
Low Recruitment

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%

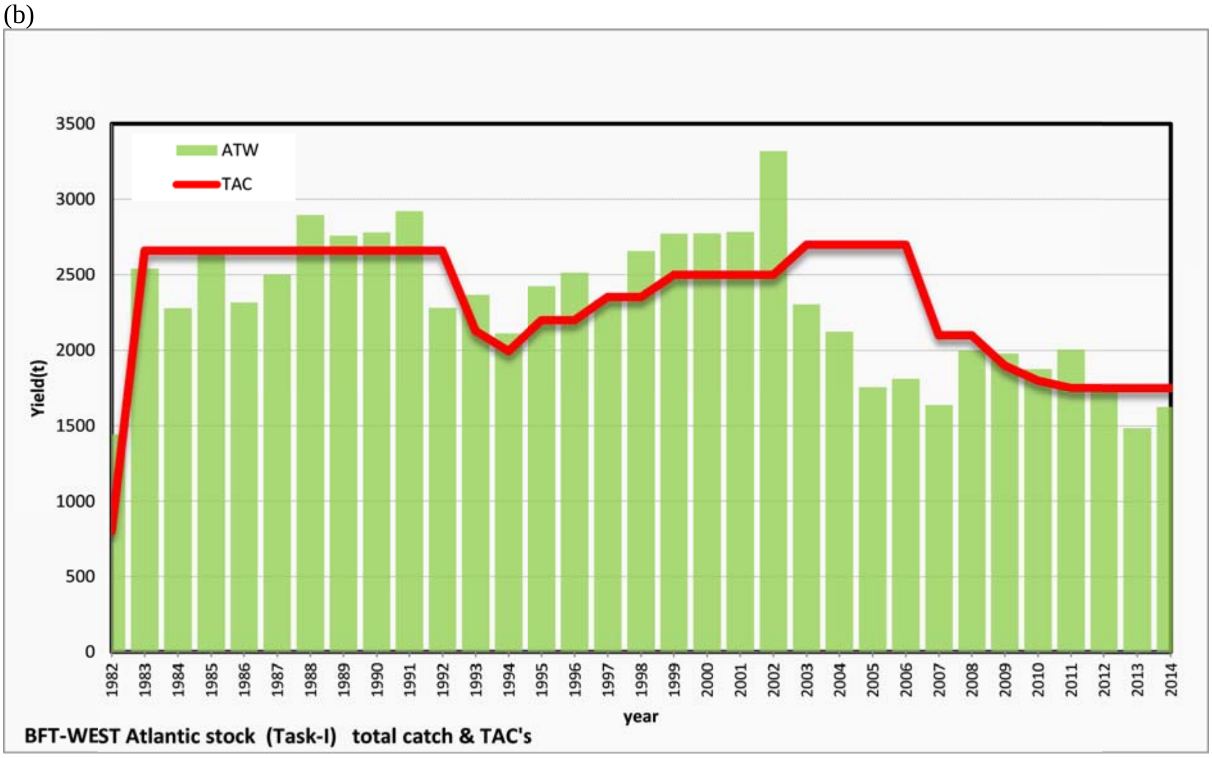
High Recruitment

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%

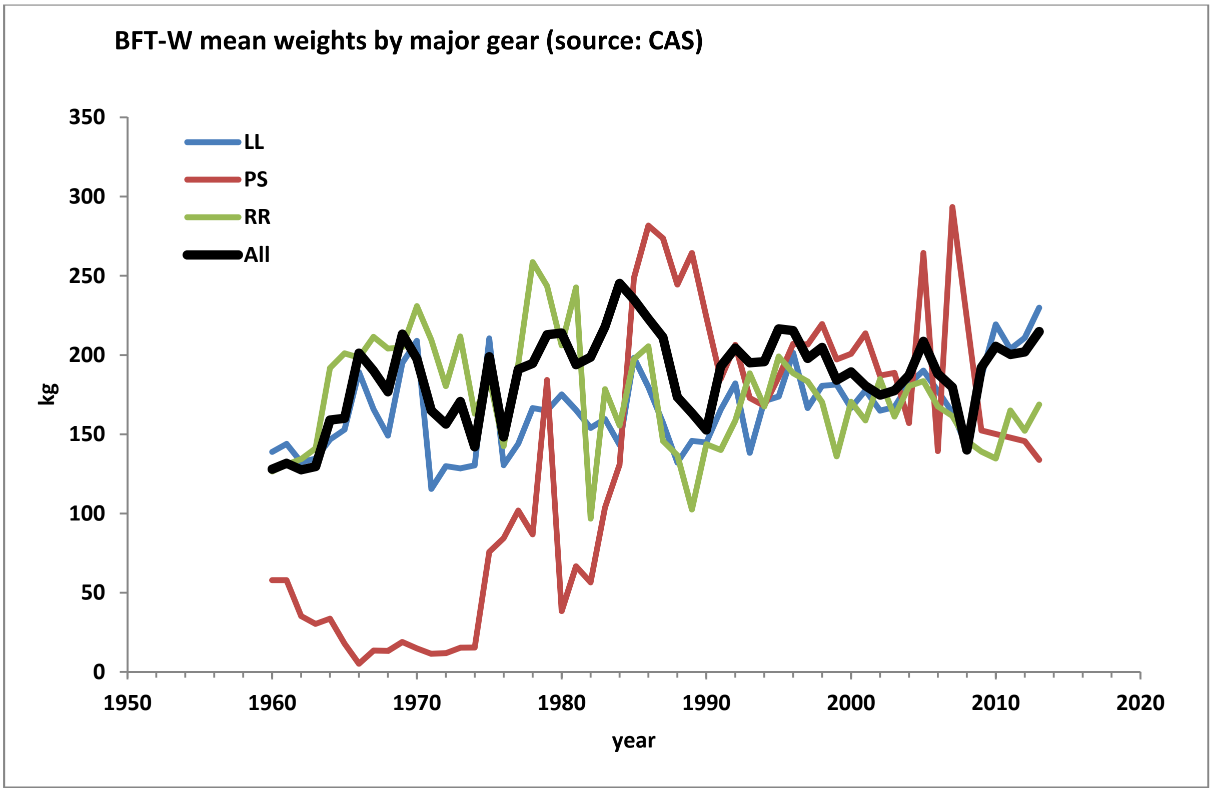
(a)



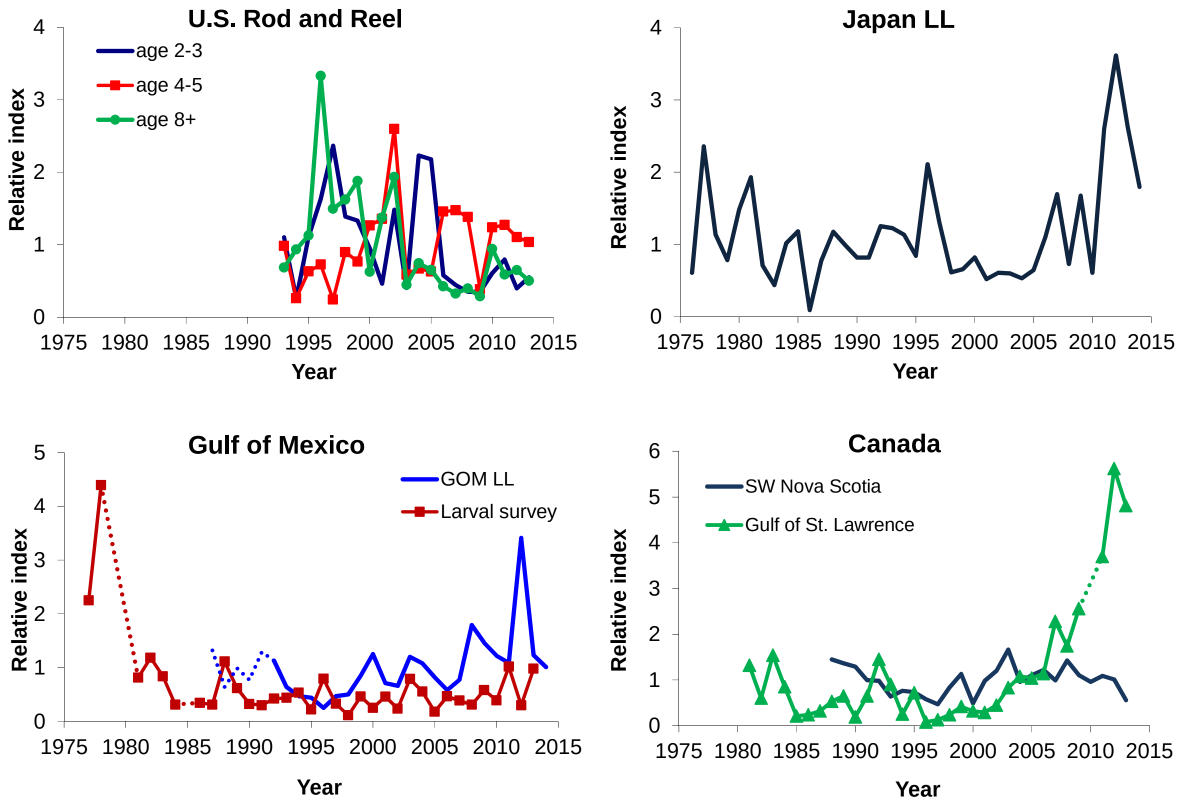
(b)



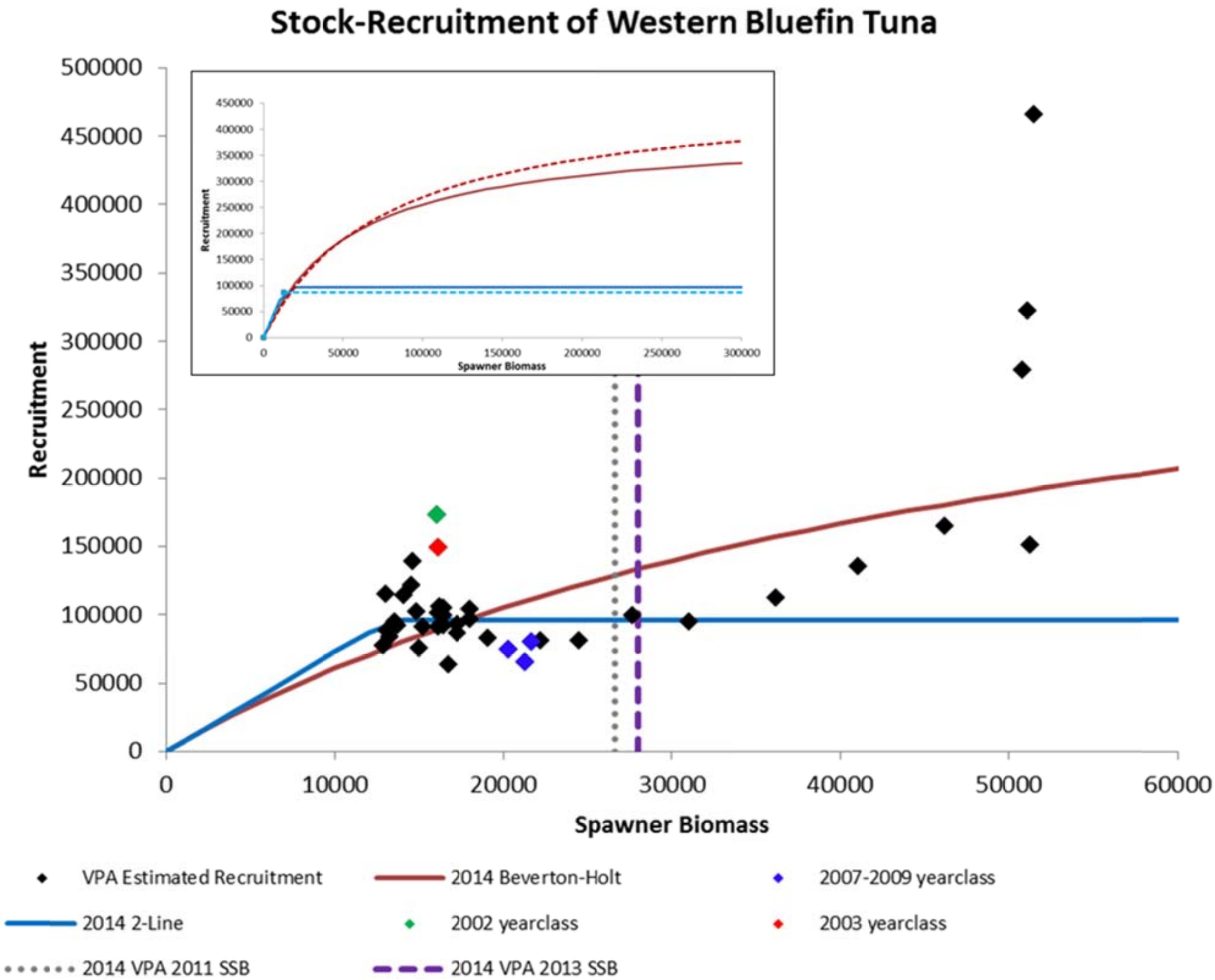
BFTW-Figure 1. Historical catches of western bluefin tuna: (a) by gear type and (b) in comparison to TAC levels agreed by the Commission.



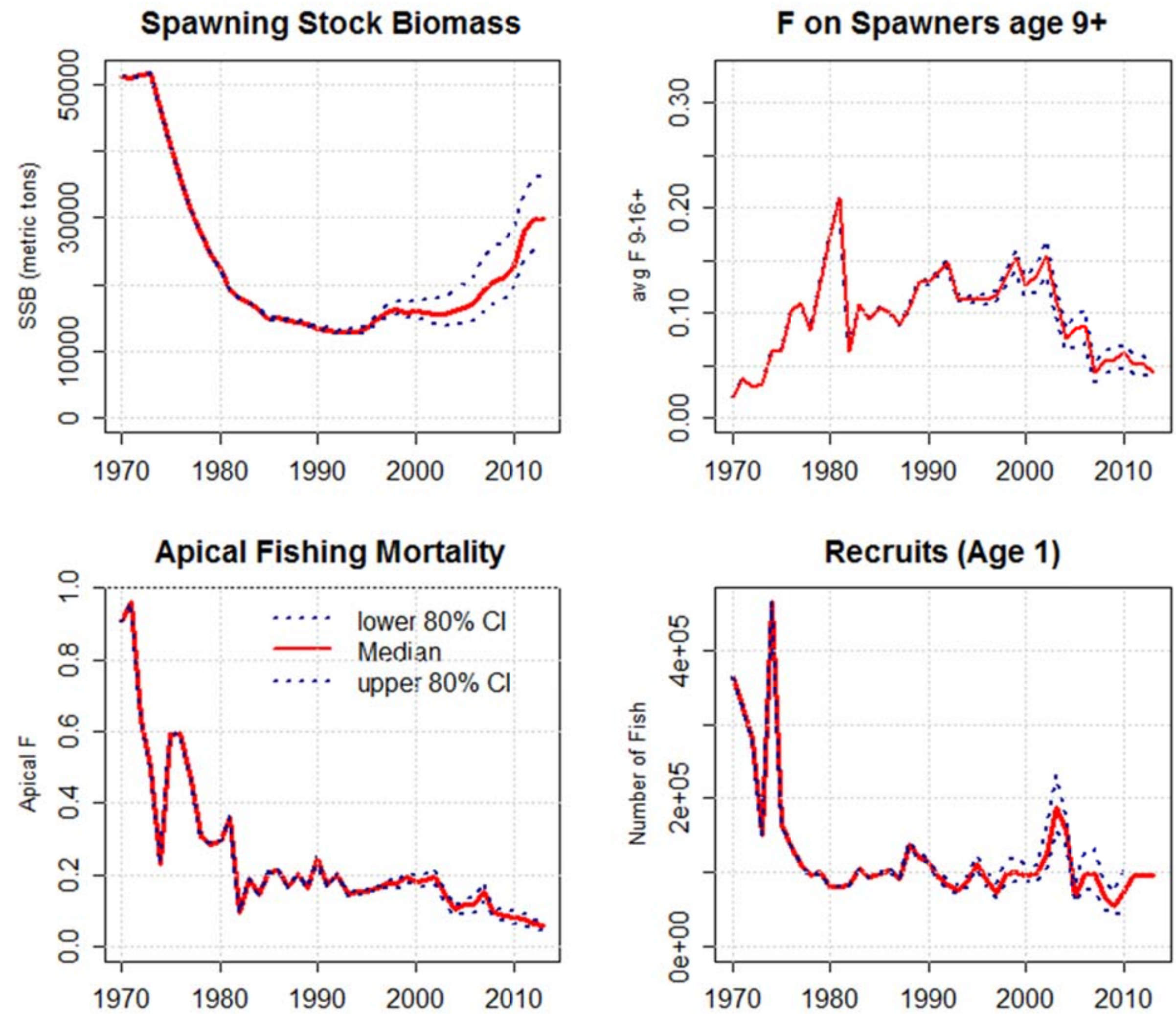
BFTW-Figure 2. Mean weight of western bluefin tuna catches by purse seine, longline, rod and reel, and all gears combined (estimated from the catch-at-size compiled information).



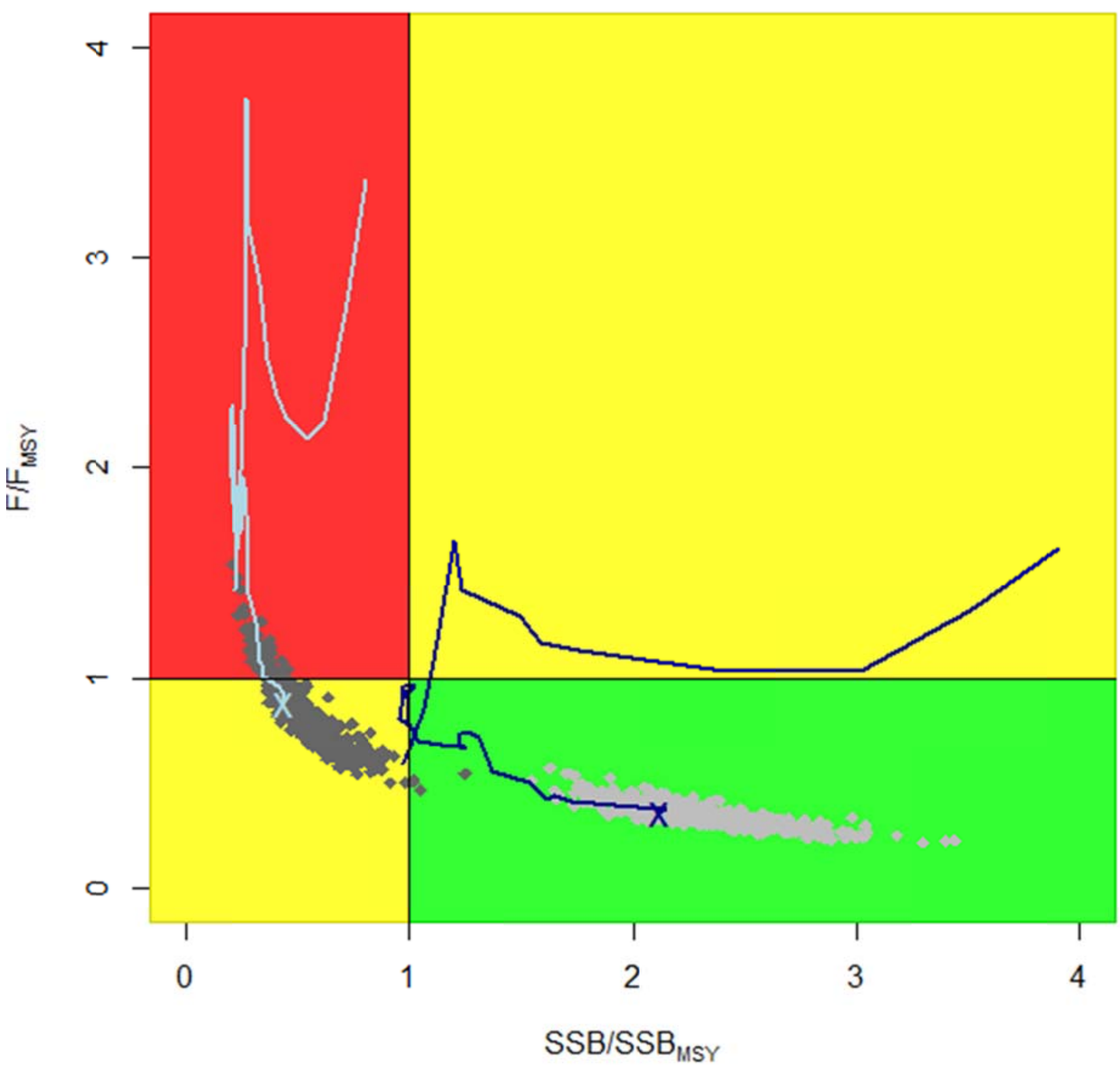
BFTW-Figure 3. Updated indices of abundance for western bluefin tuna. The dashed portions of the larval survey, U.S. Gulf of Mexico, and Canada Gulf of St. Lawrence indices bridge the gaps between years where data were missing or otherwise considered unreliable by the SCRS. The U.S longline in the Gulf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



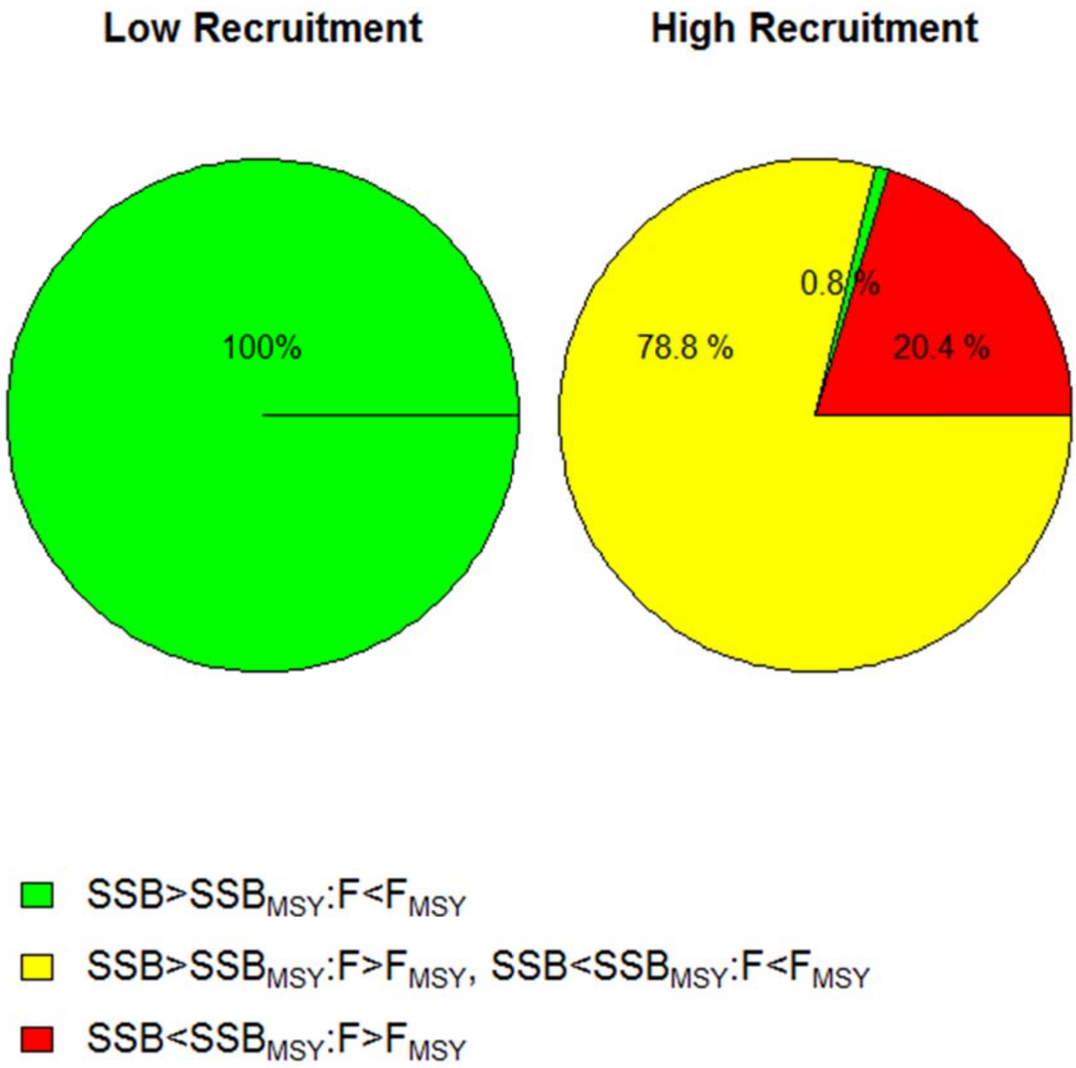
BFTW-Figure 4. Recruitment scenario derived from the 2014 stock assessment. The low recruitment potential scenario (2-line) implies future recruitment will remain near present levels even if stock size increases. The "high recruitment potential scenario" (Beverton-Holt) implies future recruitment increases 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.

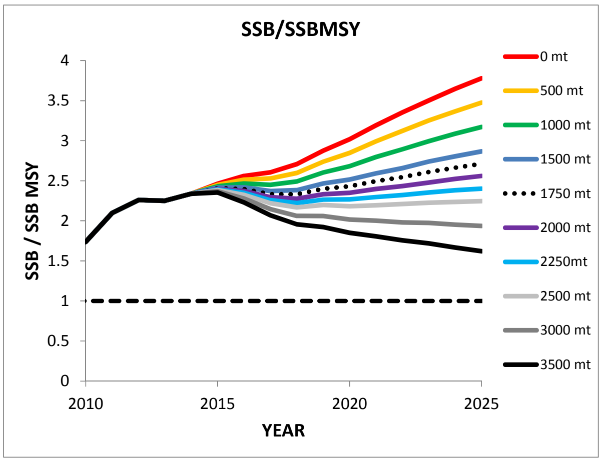


BFTW-Figure 6. Estimated status of stock relative to the Convention objectives (MSY) by year (1973 to 2013) and recruitment scenario (light blue=high recruitment potential, dark blue=low recruitment potential). The light gray dots represent the status estimated for 2013 under the low recruitment scenario, 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.

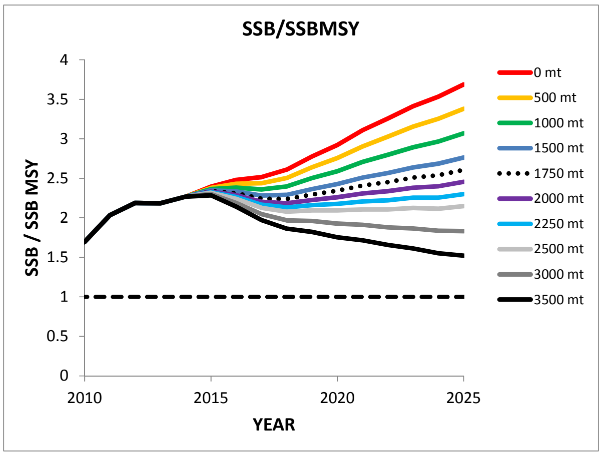


BFTW-Figure 7. Pie chart summarizing stock status, showing the proportion of model outputs that are not overfished and not undergoing overfishing (green), either overfished or undergoing overfishing (yellow) and both overfished and undergoing overfishing (red).

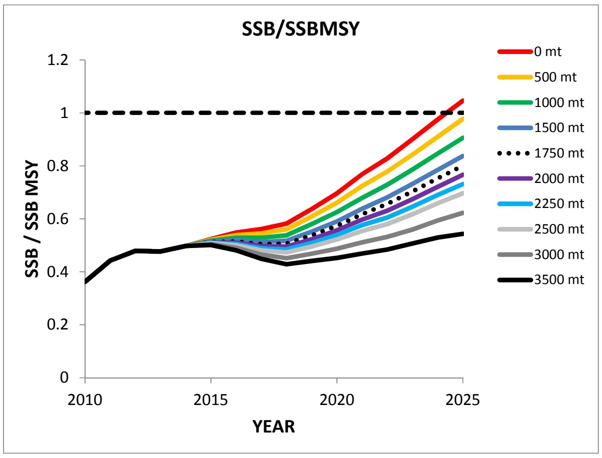
A) 50% probability
Low recruitment potential



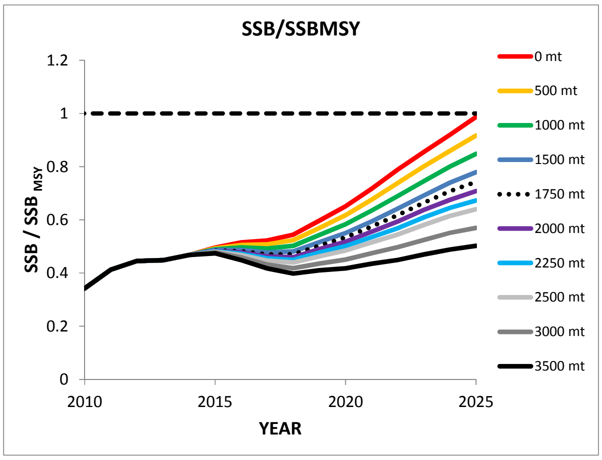
B) 60% probability
Low recruitment potential



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 32º-34º 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 render 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

BUM	
Maximum Sustainable Yield	2,837 t (2,343 – 3,331 t)[1]
Current (2014) Yield	1,981 t[2]
Relative Biomass (SSB_{2009}/SSB_{MSY})	0.67 (0.53 – 0.81)[1]
Relative Fishing Mortality (F_{2009}/F_{MSY})	1.63 (1.11 – 2.16)[1]
Overfished	Yes
Overfishing	Yes
Conservation and Management Measures in Effect:	Recommendation [Rec. 12-04]. 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)

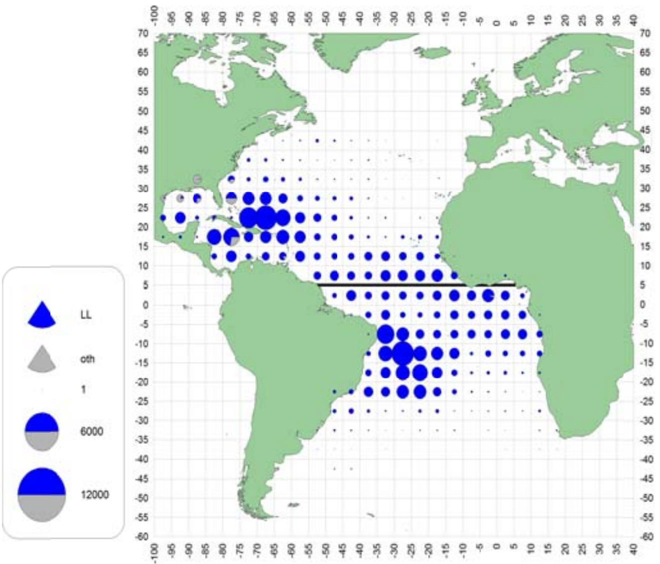
			1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
TOTAL			4650	4269	3142	3223	4318	4260	5451	5787	5791	5456	5377	4446	3733	4320	2854	3298	2948	3978	4497	3497	3207	2376	2185	1352	1981
	ATN		2055	1528	1237	1250	1728	1757	2213	2310	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	1	0	0	2	11	0	1	1	0	0	1	2	0	0	1	0	
	ATS	Longline	0	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	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	
		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	
		Dominica	0	0	0	0	0	0	0	0	0	0	0	64	69	75	36	44	55	58	106	76	76	60	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	**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	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	0	19	0	0	0	0	1	3	2	1	0	0	2	
		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	111
		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	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	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	15	3	5	1	2	2	2	2	2	2	2	2	2	0	1	2	2	3	3
		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	1
		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	139
	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	0	11
		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	0
		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	20
		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	28
		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	177
		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	139	212	177	157	222	182	275	206	196	78	109	115	107	178	150	991	463	450	42	23	26	44
		EU.España	0	12	40	37	49	38	133	117	159	110	115	86	27	6	24	12	68	25	32	54	151	14	30	40	124
		EU.Portugal	0	0	0	0	0	0	0	0	0	0	2	1	6	1	0	24	69	79	102	80	84	38	30	15	12
		Gabon	0	0	0	1	2	0	304	5	0	0	0	1	0	3	0	0	0	0	0	0	0	0	0	0	
		Ghana	324	126	123	236	441	471	422	491	447	624	639	795	999	415	470	759	405	683	191	140	116	332	234	163	236
		Japan	967	755	824	719	991	913	881	724	529	363	441	180	142	294	366	191	290	699	539	345	272	205	189	74	170

			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	
		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	
		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	
		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	
		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	
		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	
		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	
		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	
		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	
		U.S.S.R.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		UK.Sta Helena	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	
		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	
		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	

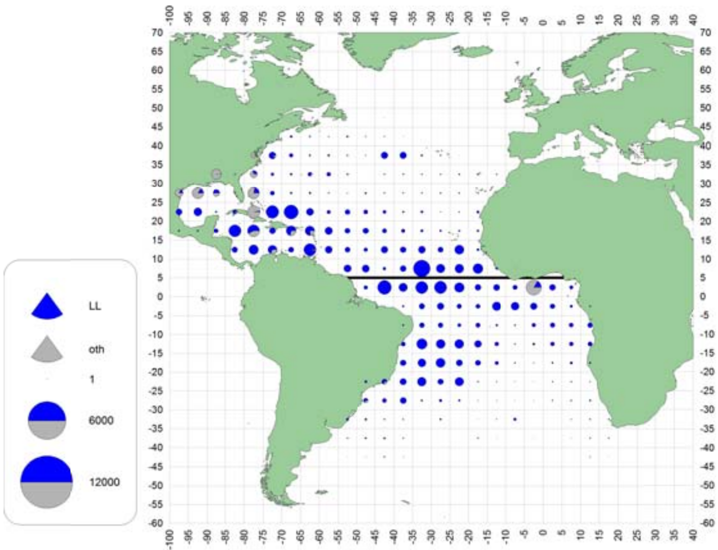
1. Brazilian Task I catches from 2012 to 2014 are preliminary and under revision.

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

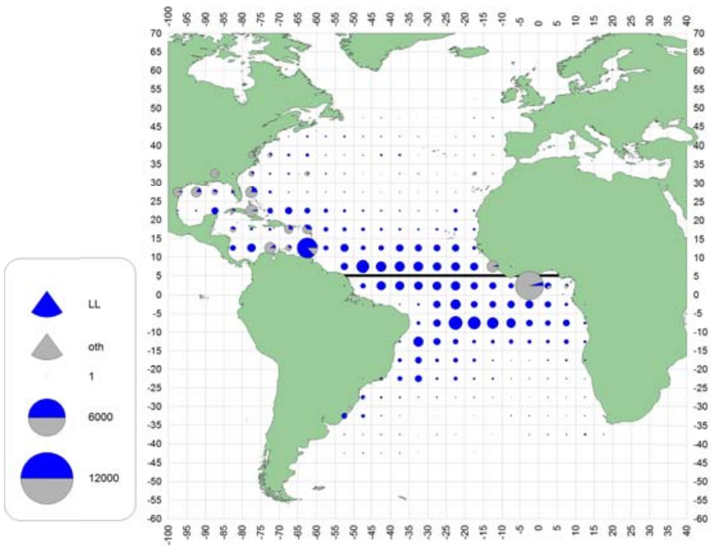
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
0	0	2	9	19	33	49	63	74	81	87	92	94	96	97	98
500	0	2	6	13	23	35	47	58	67	74	80	84	88	91	93
1000	0	1	4	9	15	22	31	40	49	56	63	68	73	77	81
1500	0	1	3	6	9	13	18	24	30	36	41	46	57	55	59
2000	0	1	2	3	5	7	10	12	16	18	21	24	20	29	32
2500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



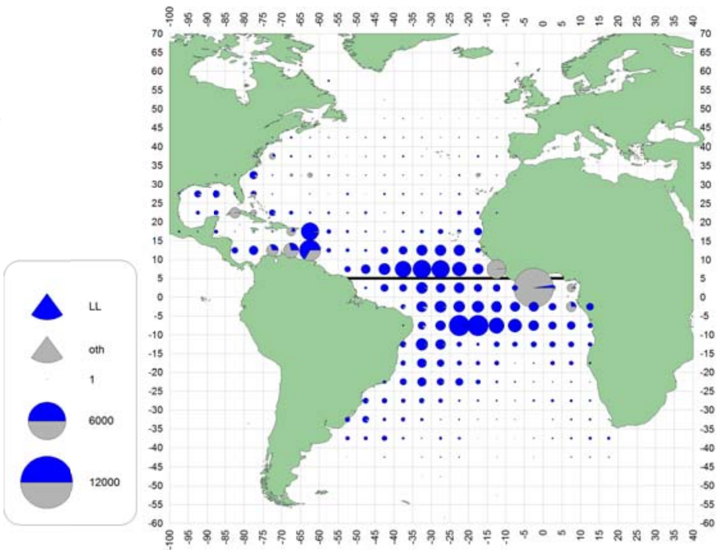
a. BUM (1960-69)



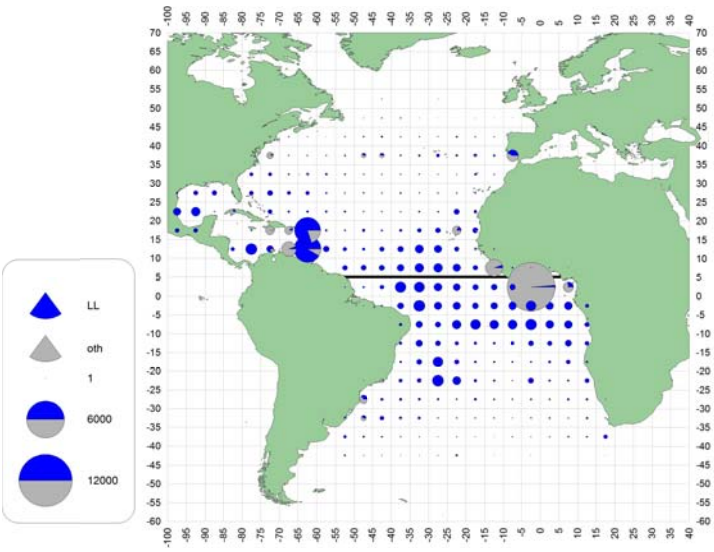
b. BUM (1970-79)



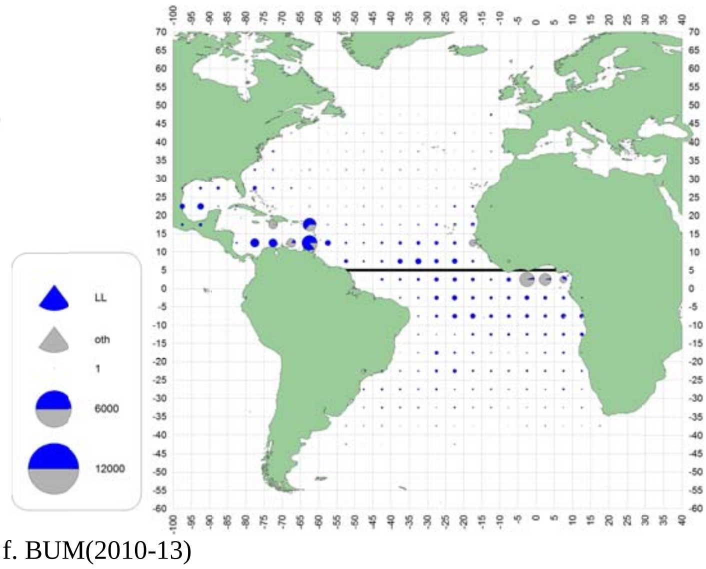
c. BUM (1980-89)



d. BUM (1990-99)

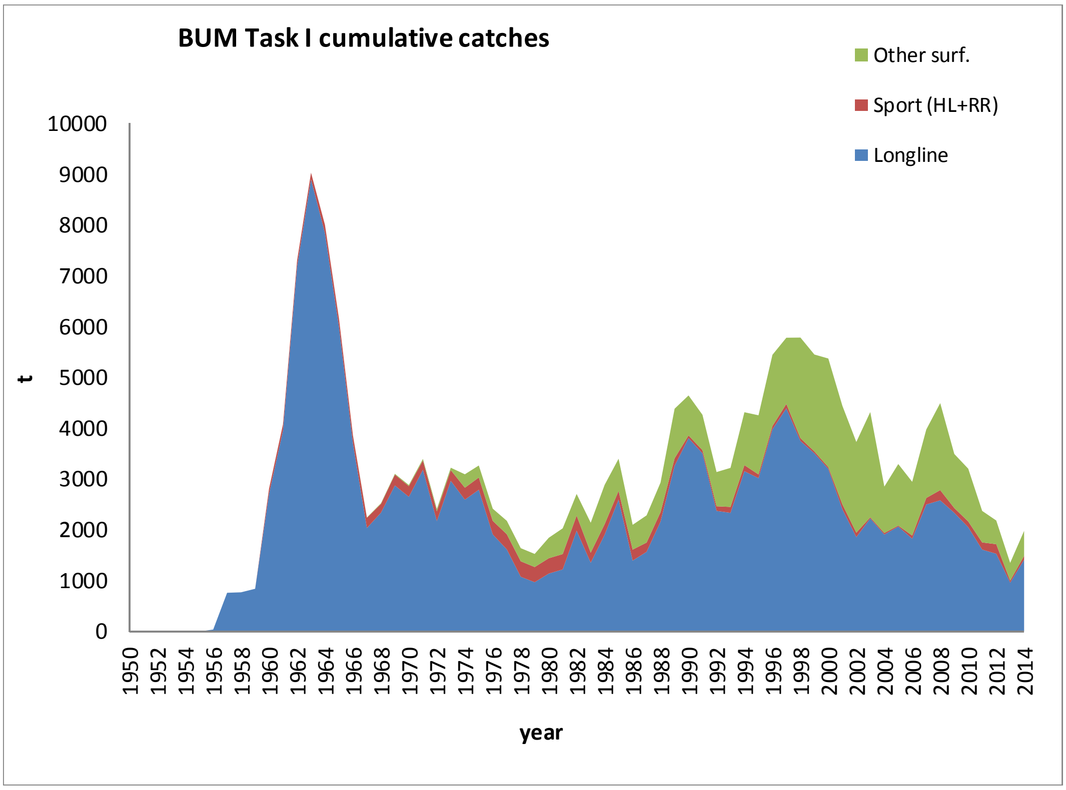


e. BUM (2000-09)

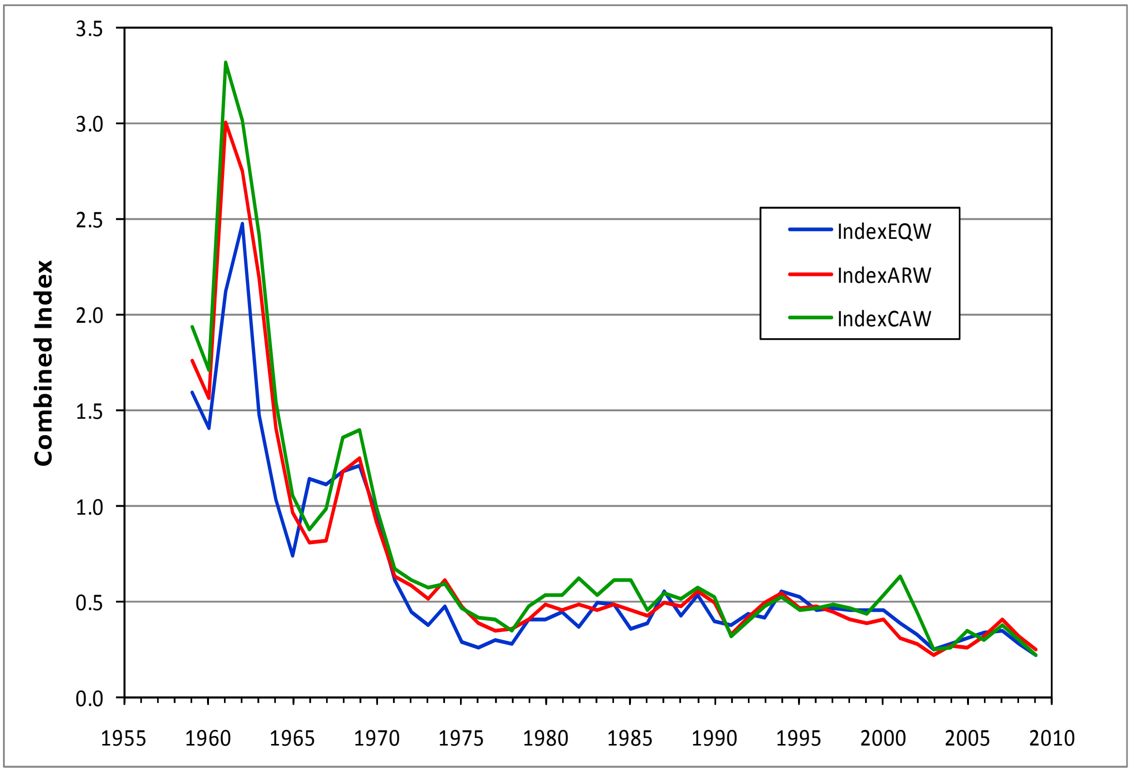


f. BUM(2010-13)

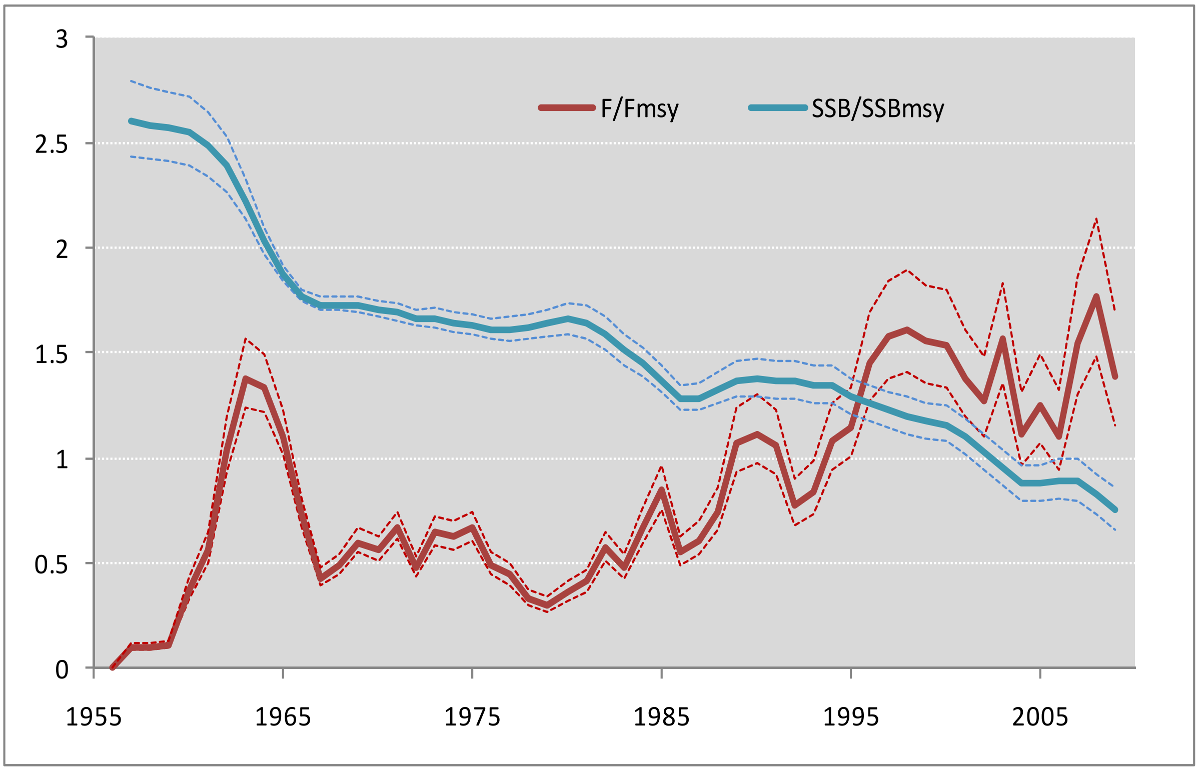
BUM-Figure 1. Geographic distribution of mean blue marlin catch by major gears and decade.



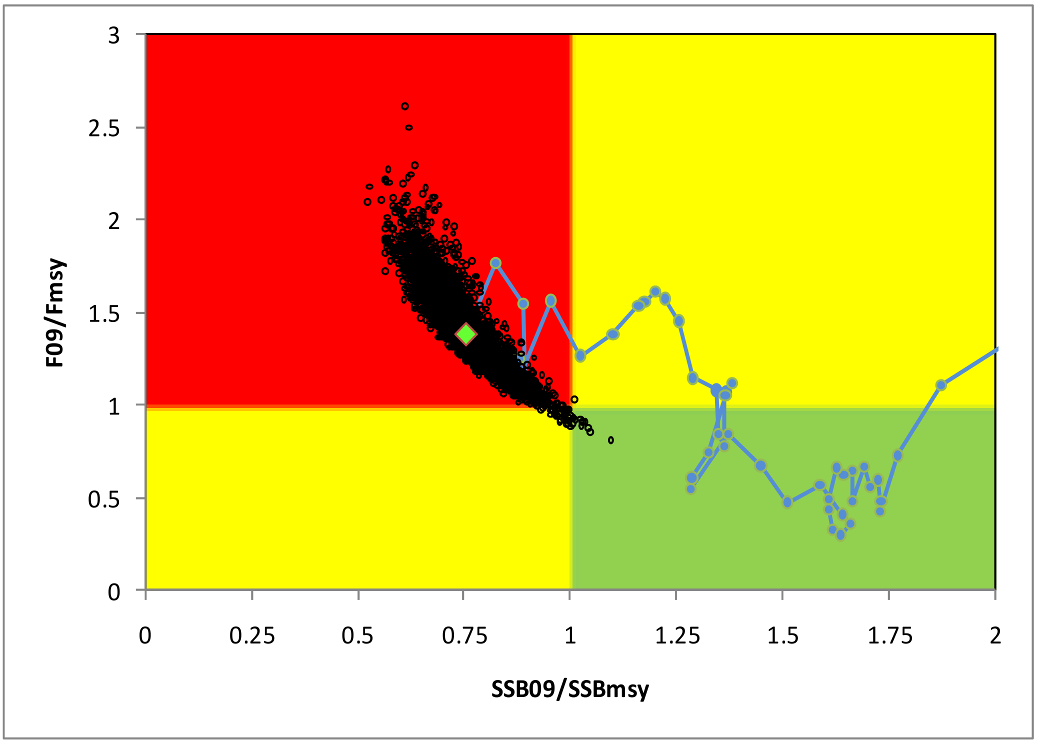
BUM-Figure 2. Total catch of blue marlin reported in Task I.



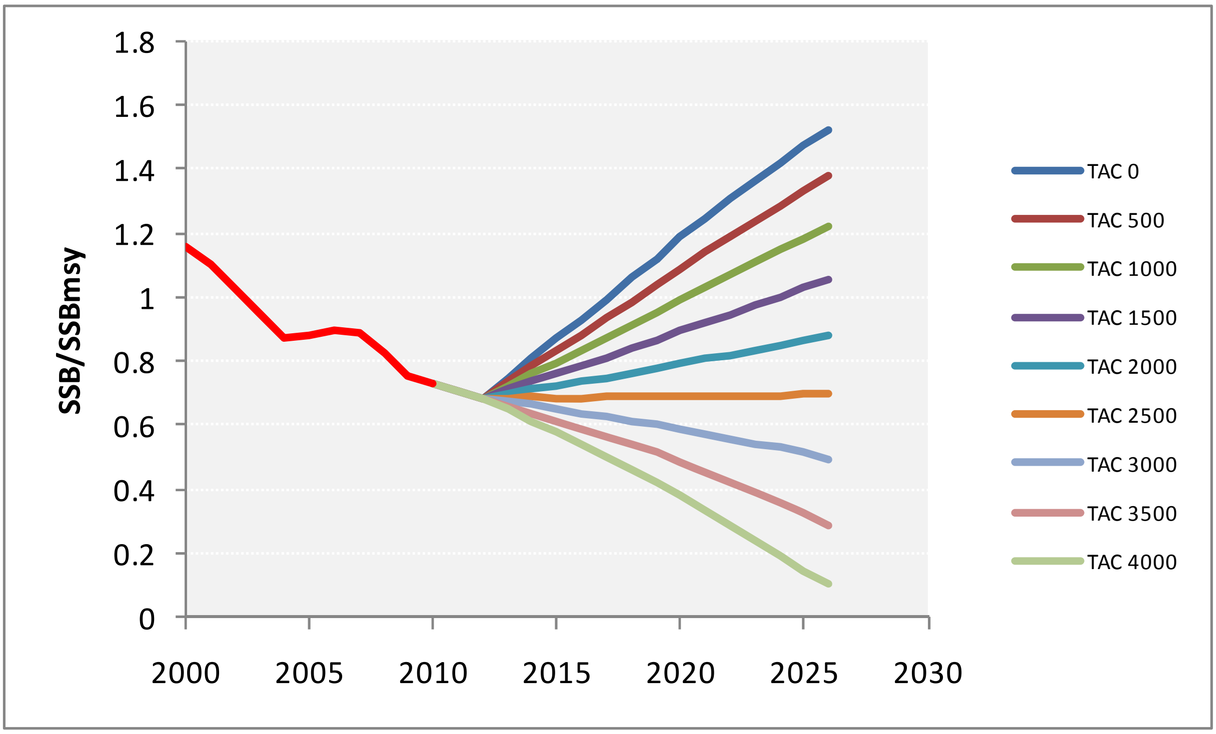
BUM-Figure 3. Blue marlin standardized combined CPUE indices estimated using equal weighting for all CPUE series (EQW), weighting the CPUE series by area (ARW) and by catch (CAW).



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.



B**UM-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. 2013b). The last year of fishery data used in the assessment was 2010.

WHM-1. Biology

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

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

White marlin inhabits the surface mixed layer of the open ocean. Although they spend 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
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	732	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	
	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	
		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	
		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	
		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	
		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	
		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	
		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	0	8	19	19	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	
		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	
		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	
		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	
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Philippines	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	1	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	
		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	
		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	
		Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Venezuela	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
	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	
		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	
		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	
		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	
		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	
		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	
		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	
		Honduras	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Japan	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	24	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	
		NEI (BIL)	0	0	0	0	0	0	0	0	0	0	0	5	0	21	134	16	27	156	186	179	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	
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Philippines	0	0	0	0	0	0	0	0	1	8	0	0	0	0	0	0	0	0	1	0	2	2	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	
		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	

			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	
		U.S.S.R.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Uruguay	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**
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
		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.	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	
	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	
		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
		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	
		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	

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 SSByr >= SSB_{MSY} and Fyr < F_{MSY} for each year (yr) under different constant catch scenarios (TAC tons).

$F<F_{MSY}$

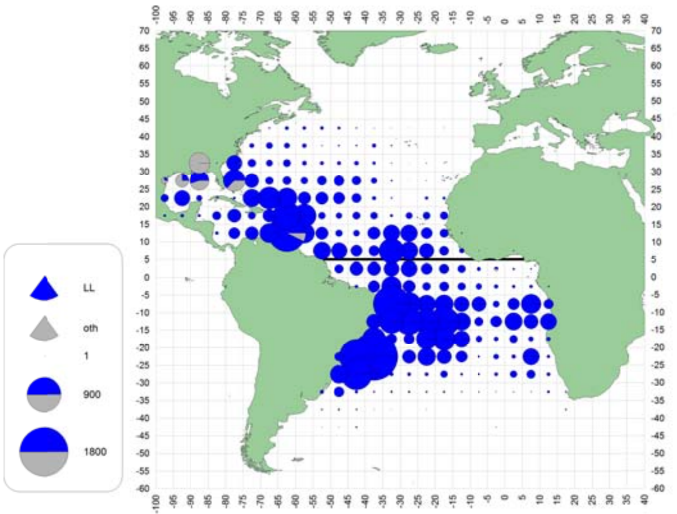
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
0	100	100	100	100	100	100	100	100	100	100
200	100	100	100	100	100	100	100	100	100	100
400	73	74	75	77	79	79	81	82	84	85
600	9	11	12	12	13	14	16	16	17	19
800	0	0	0	0	1	1	1	1	1	1
1000	0	0	0	0	0	0	0	0	0	0
1200	0	0	0	0	0	0	0	0	0	0
1400	0	0	0	0	0	0	0	0	0	0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

$B>B_{MSY}$

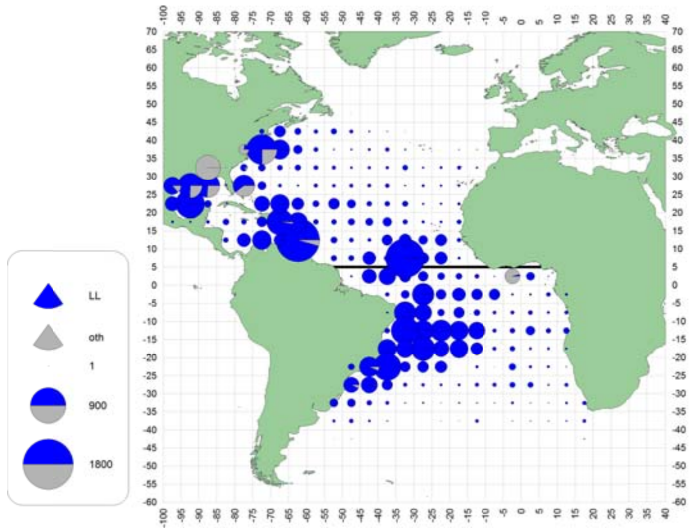
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
0	0	0	0	0	0	0	0	1	1	2
200	0	0	0	0	0	0	0	0	1	1
400	0	0	0	0	0	0	0	0	0	0
600	0	0	0	0	0	0	0	0	0	0
800	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0
1200	0	0	0	0	0	0	0	0	0	0
1400	0	0	0	0	0	0	0	0	0	0
1600	0	0	0	0	0	0	0	0	0	0

$F<F_{MSY}$ and $B>B_{MSY}$

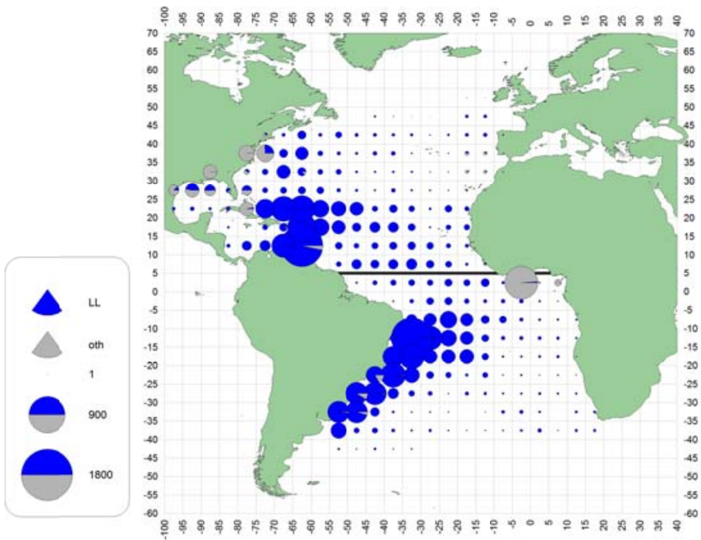
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
0	0	0	0	0	0	0	0	1	1	2
200	0	0	0	0	0	0	0	0	1	1
400	0	0	0	0	0	0	0	0	0	0
600	0	0	0	0	0	0	0	0	0	0
800	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0
1200	0	0	0	0	0	0	0	0	0	0
1400	0	0	0	0	0	0	0	0	0	0
1600	0	0	0	0	0	0	0	0	0	0



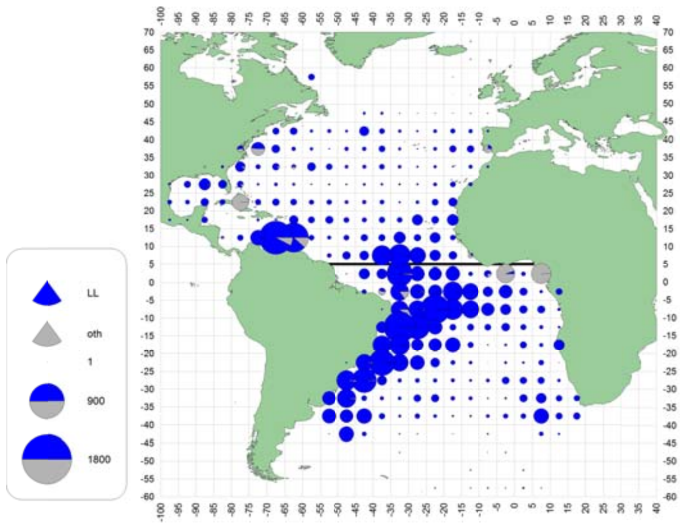
a. WHM (1960-69)



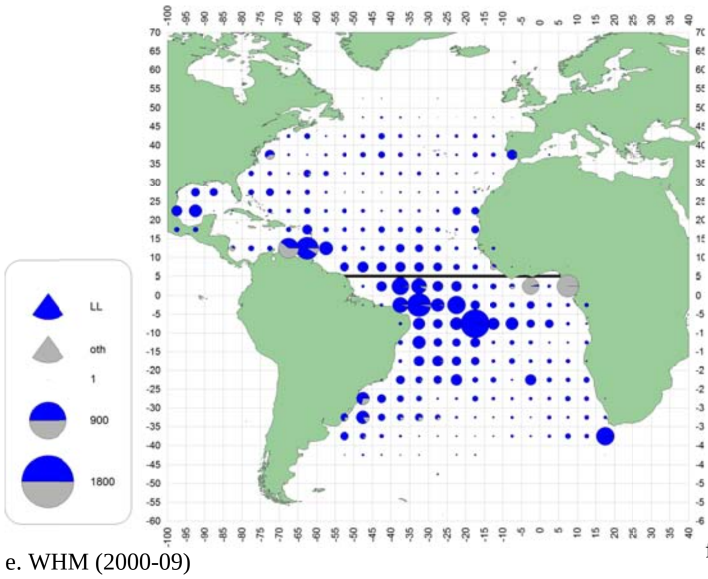
b. WHM (1970-79)



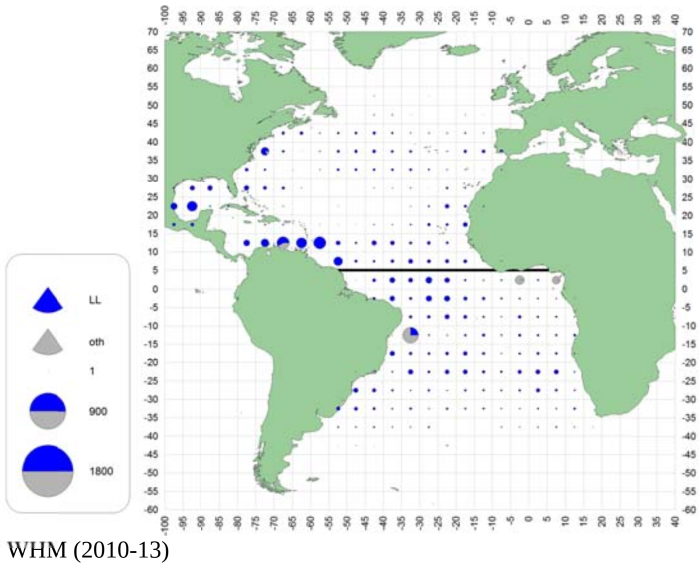
c. WHM (1980-89)



d. WHM (1990-99)

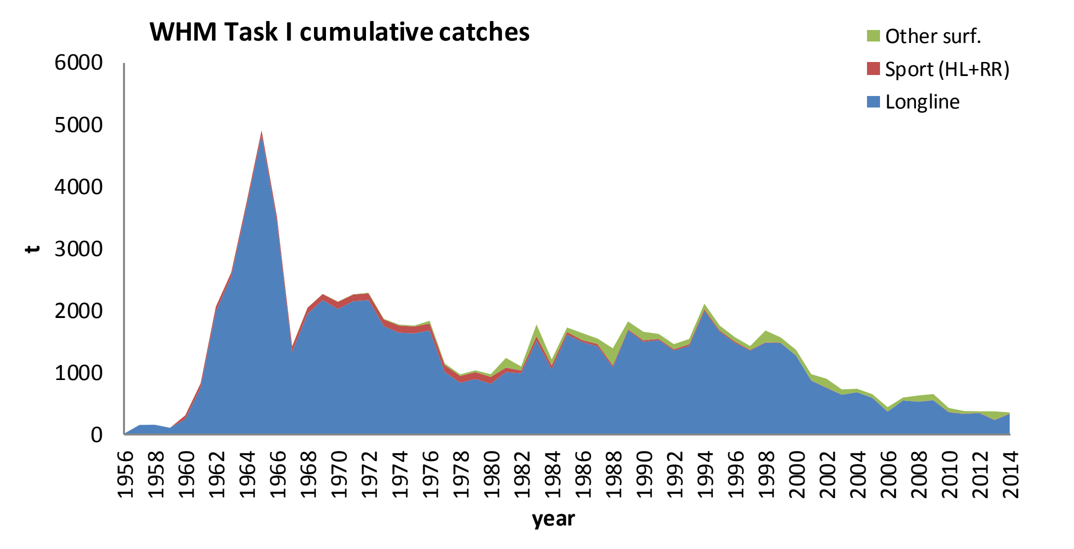


e. WHM (2000-09)

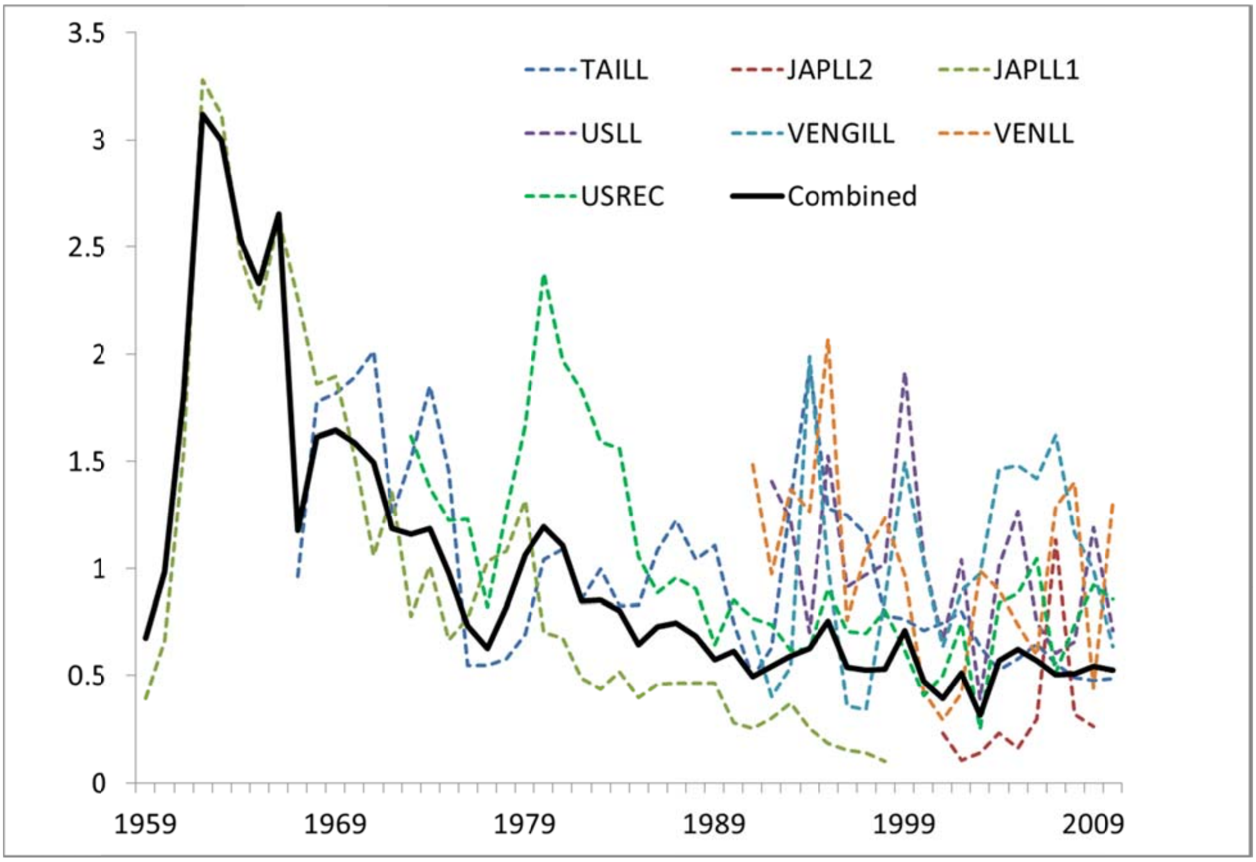


f. WHM (2010-13)

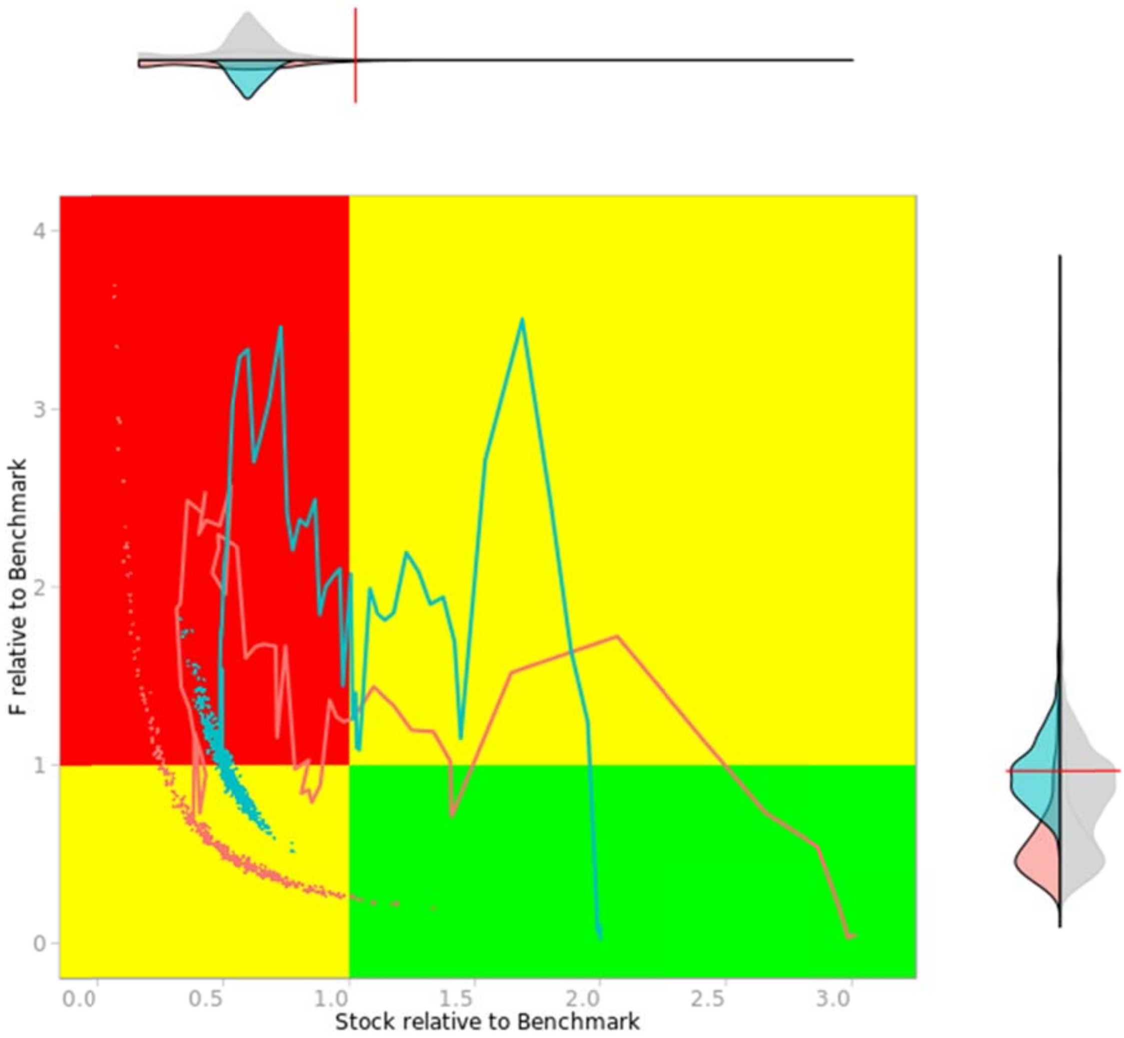
WHM-Figure 1. Geographic distribution of mean white marlin catch by major gears and decade.



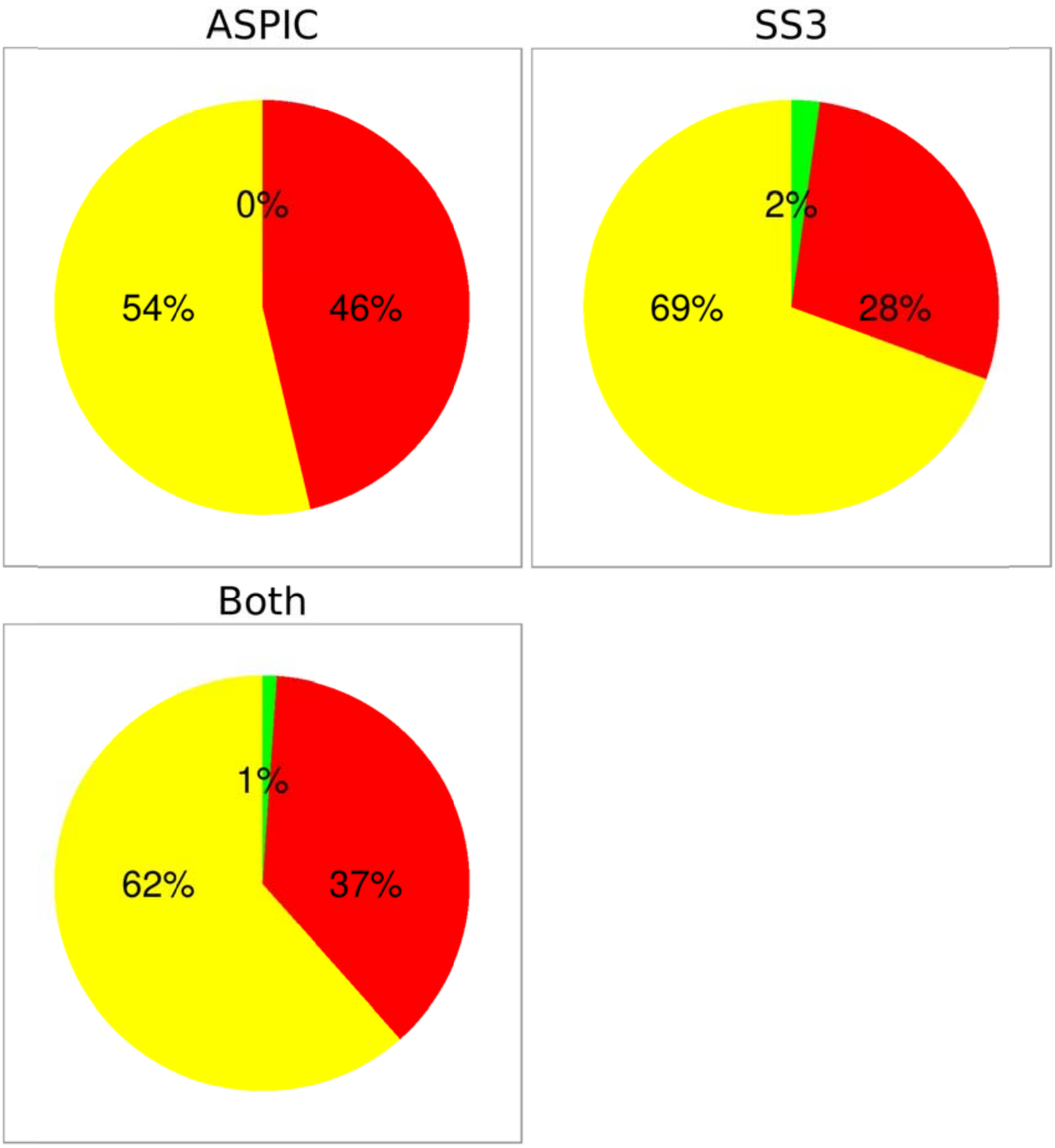
WHM-Figure 2. Total catch of white marlin reported in Task I for the period 1956-2014.



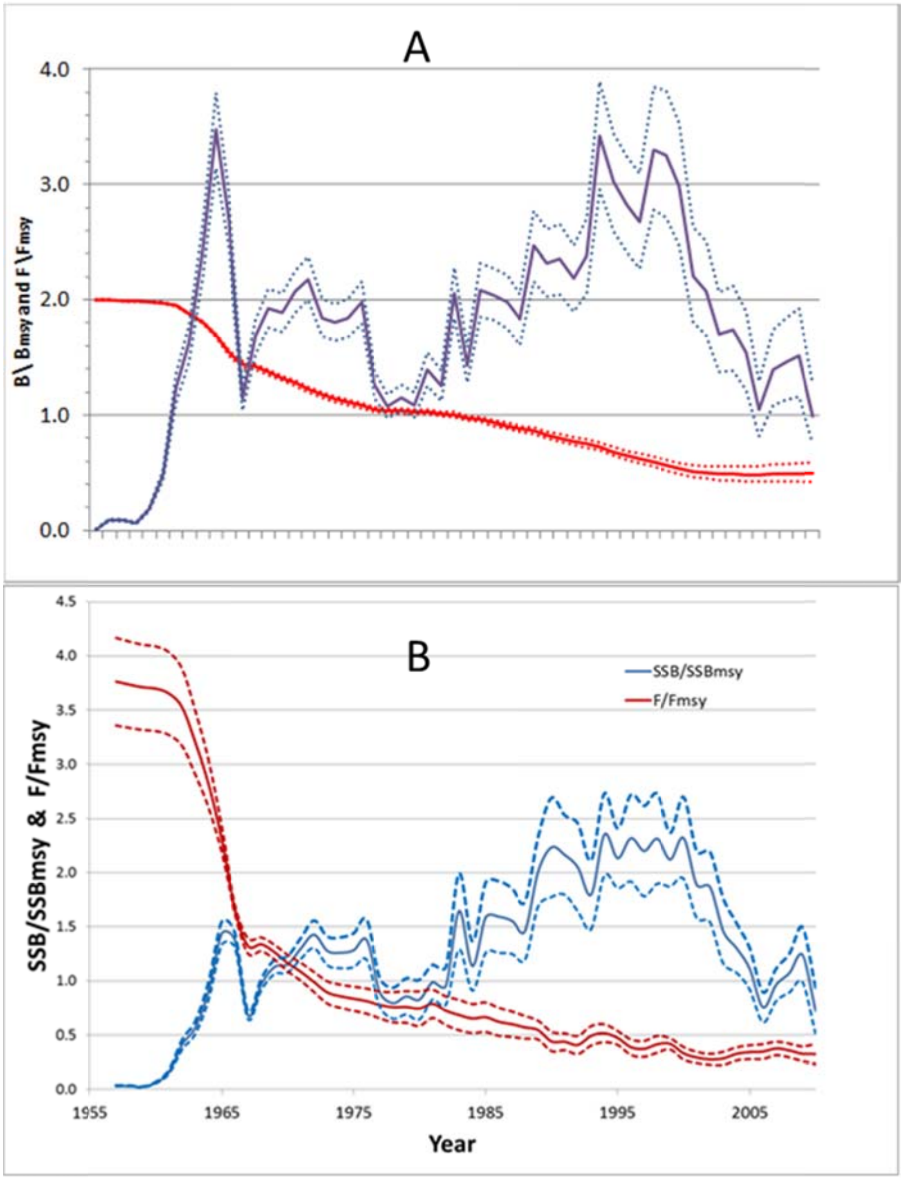
WHM-Figure 3. White marlin indices of abundance presented and selected during the meeting. For graphing purposes the indices were scaled to their respective mean value for the period 1990-2010.



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[1] t	1,250-1,950[1] t
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
Overfished	Possibly	Likely
Overfishing	Possibly	Likely
2008 Replacement Yield	Not estimated	Not estimated
Management Measures in Effect	None[2]	None[2]

[1] Results from Bayesian production model with informative priors. These results represent only the uncertainty in the production model fit. This range underestimates the total uncertainty in the estimates of MSY.
[2] Some countries have domestic regulations.

SAI-Table 1. Estimated catches (t) of Atlantic sailfish (*Istiophorus albicans*) by area, gear and flag. (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	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	
		Benin	21	20	21	20	20	20	19	6	4	5	5	12	2	2	5	3	3	4	0	0	0	0	0	0	
		Cape Verde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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
		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	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	
		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
		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
		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
		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
		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	
		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
		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	1
		Honduras	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Japan	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
		Korea Rep.	12	22	2	2	5	5	11	4	0	0	0	0	0	0	0	0	0	0	0	1	0	5	0	6	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	
		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**
		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	
		NEI (BIL)	0	0	0	0	0	0	0	0	0	0	28	269	408	213	55	1	105	43	20	11	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	
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Russian Federation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	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	
		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
		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	
		South Africa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	1	5	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	
		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	
		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	
	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	
		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
		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	
		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
		China PR	0	0	0	0	3	3	3	3	3	9	4	3	1	0	1	0	0	0	1	2	1	1	1	0	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
		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	
		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	
		Dominica	0	0	0	0	0	0	0	0	0	0	0	5	3	0	1	0	3	3	4	2	0	2	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	
		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
		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	
		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	
		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
		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
		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
		NEI (BIL)	0	0	0	0	0	0	0	0	0	0	297	268	0	0	0	0	68	81	252	17	0	0	0	0	

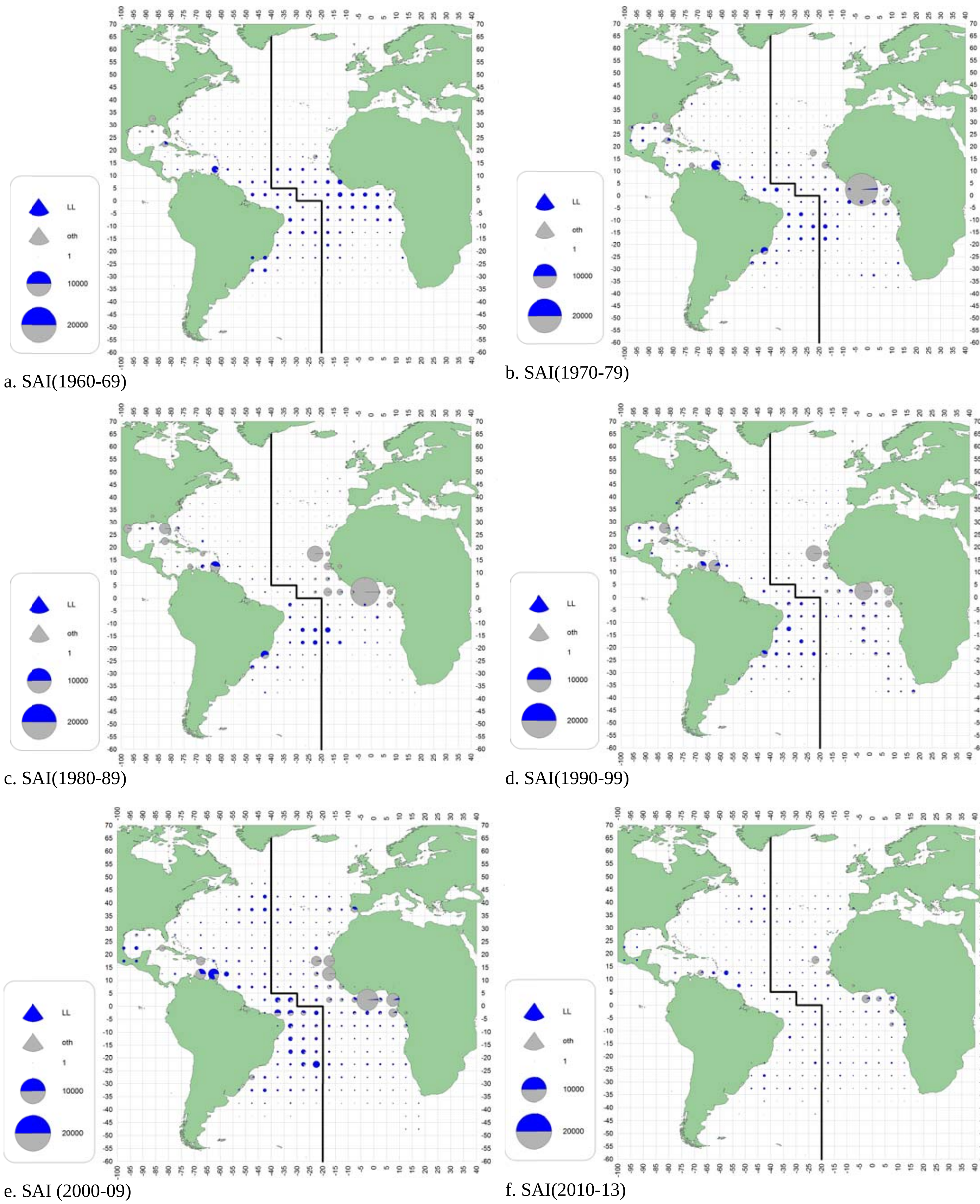
			1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
		NEI (ETRO)	0	0	0	15	27	30	36	46	67	64	41	23	1	1	9	4	4	6	0	0	0	0	0	0	
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Seychelles	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	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	
		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	
	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	
		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	
	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.	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Sport (HL+RR)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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
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	
		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	
		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	
		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	
		Senegal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	
		South Africa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	12	3	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
		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
		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	
		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	
		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	
		St. Vincent and Grenadines	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	
		U.S.A.	0	0	0	0	0	0	2	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
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	

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



a. SAI(1960-69)

b. SAI(1970-79)

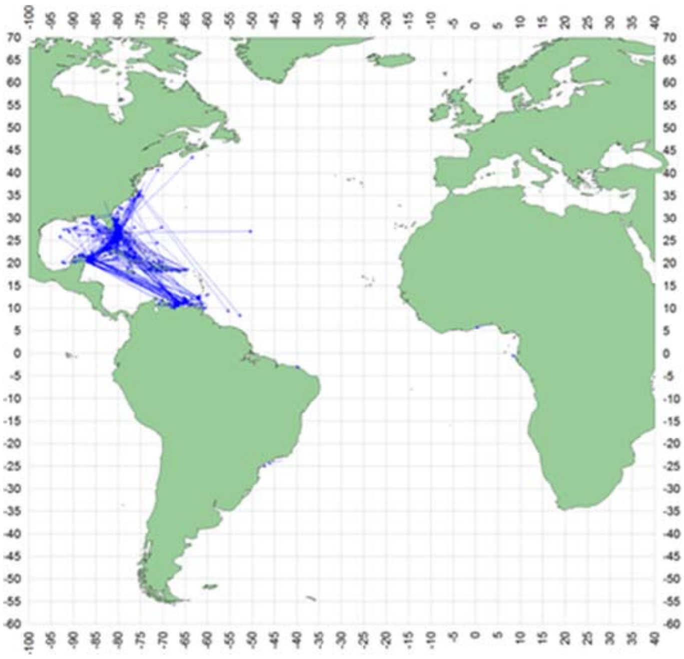
c. SAI(1980-89)

d. SAI(1990-99)

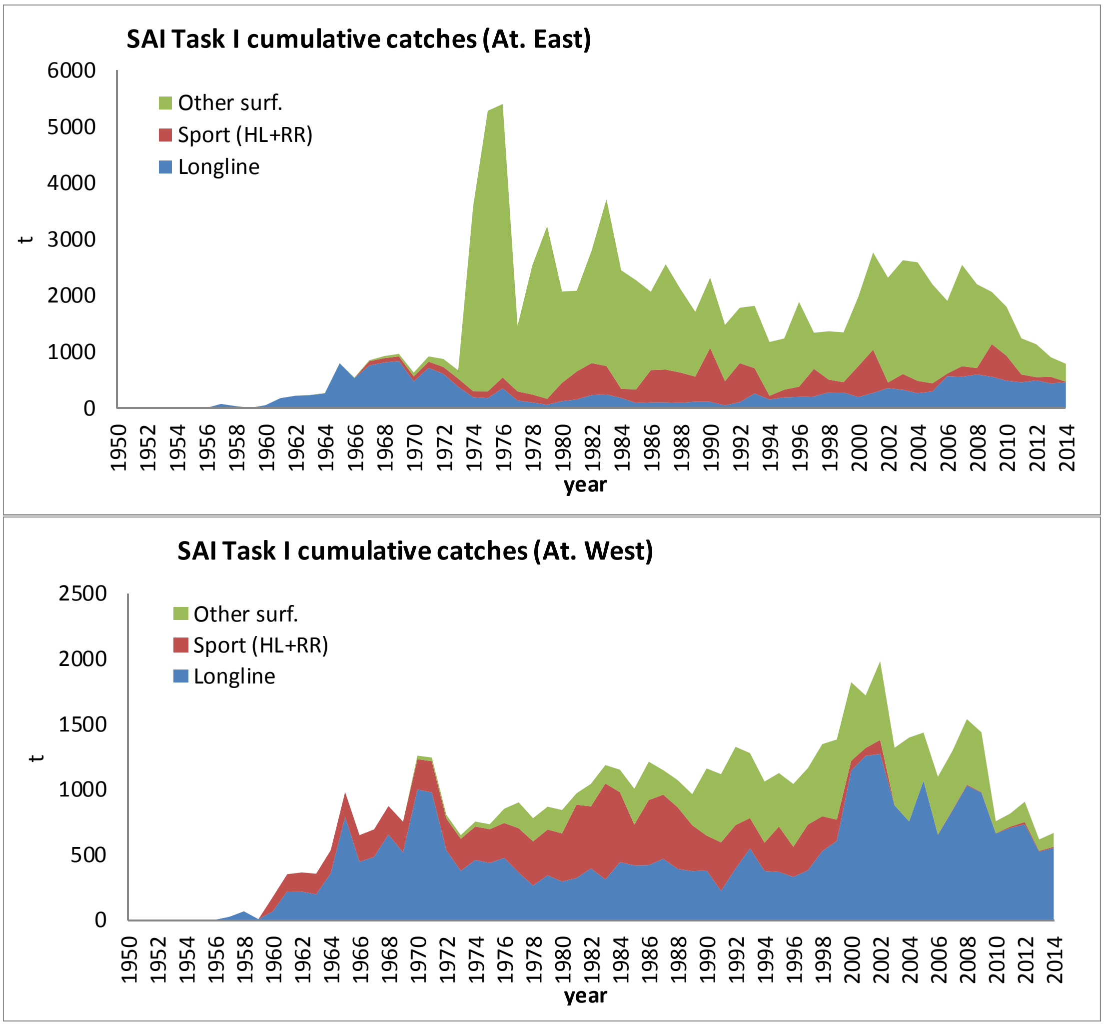
e. SAI (2000-09)

f. SAI(2010-13)

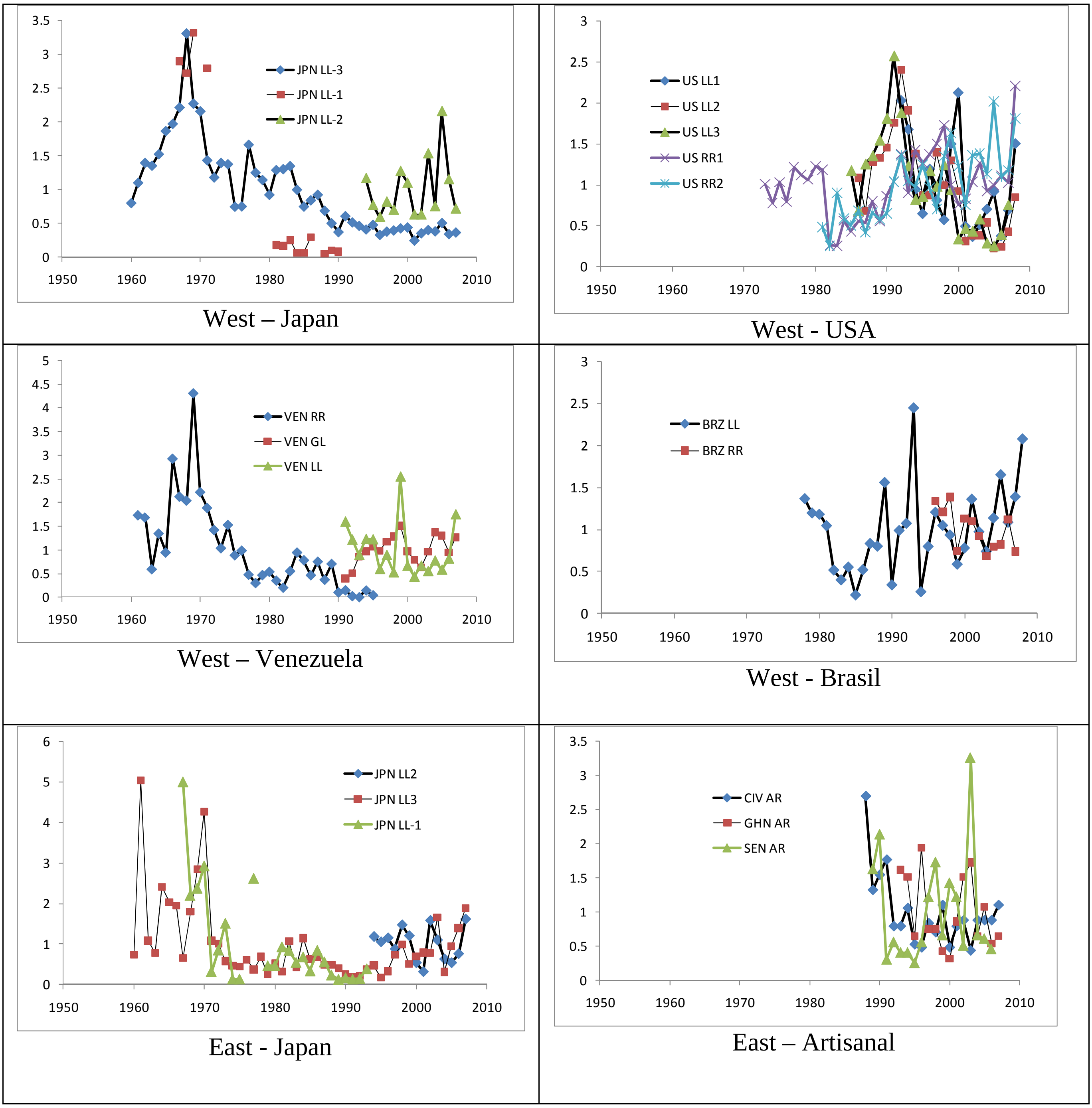
SAI-Figure 1. Geographic distribution of mean catches of sailfish by major gears and by decade. The dark line denotes the separation between stocks.



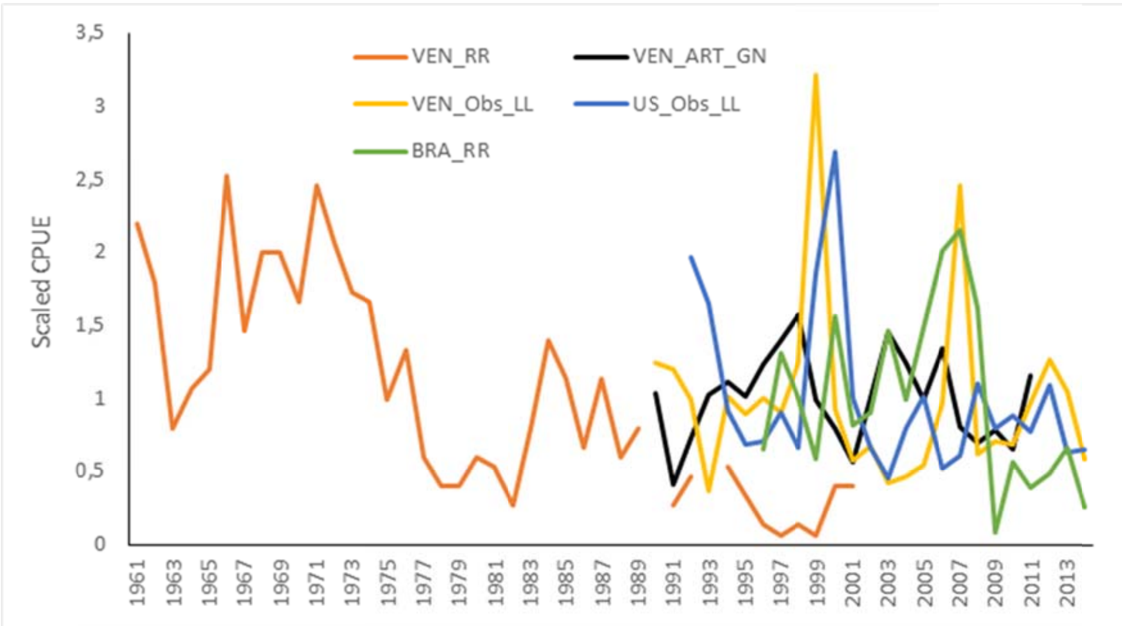
SAI-Figure 2. Conventional tag returns for Atlantic sailfish. Lines join the locations of release and recapture.



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. 2014a). 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 50ºN to 45ºS), this species is available to a large number of fishing countries. **SWO ATL-Figure 2** shows total estimated catches for North and South Atlantic swordfish. Directed longline fisheries from Canada, EU-Spain, and the United States have operated since the late 1950s or early 1960s, and harpoon fisheries have existed at least since the late 1800s. Other directed swordfish fisheries include fleets from Brazil, Morocco, Namibia, EU-Portugal, South Africa, Uruguay, and Venezuela. The primary by-catch or opportunistic fisheries that take swordfish are tuna fleets from Chinese Taipei, Japan, Korea and EU-France. The tuna longline fishery started in 1956 and has operated throughout the Atlantic since then, with substantial catches of swordfish that are produced as a by-catch of tuna fisheries. The largest proportion of the Atlantic catches is made using surface-drifting longline. However, many additional gears are used, including traditional gillnets off the coast of western Africa.

The 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		
	North Atlantic	***South Atlantic***
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)

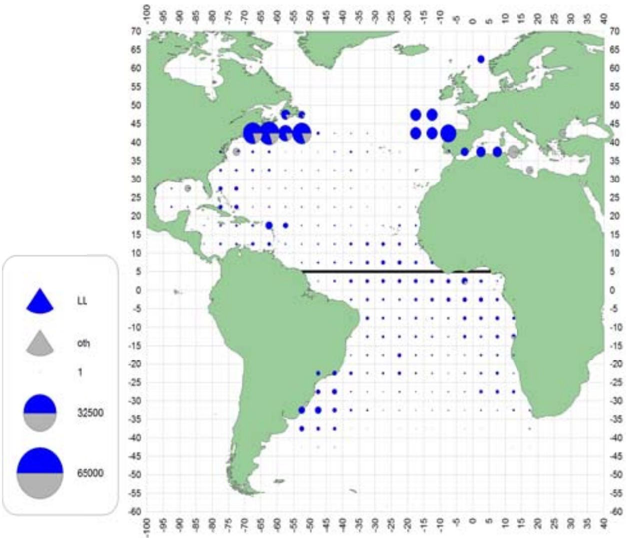
			1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
TOTAL			32976	28826	29207	32868	34459	38803	33511	31567	26251	27123	27180	25139	23758	24075	25252	25643	25718	27932	23596	24761	24209	23918	24470	20127	20686
	ATN		15672	14934	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	Longline	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	Longline	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	Longline	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	
	ATS	Longline	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	
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	
		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	
		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	
		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	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	0	1	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	
		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	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	1	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	49
		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	0	2	2	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	40
		Sta. Lucia	0	0	0	0	1	0	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	26
		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	1812
		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	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	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	13	17
		Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	29	14	0	0	0	10	23	15	2	4
		Venezuela	9	75	103	73	69	54	85	20	37	30	44	21	34	45	53	55	22	30	11	13	24	18	25	24	24
	ATS	Angola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	18
		Argentina	230	88	88	14	24	0	0	0	0	38	0	5	10	8	0	0	0	0	0	0	1	0	0	0	
		Belize	0	0	0	0	0	1	0	0	0	17	8	0	0	0	0	0	0	120	32	111	121	207	197	136	45
		Benin	28	28	26	28	25	24	24	10	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Brazil	1696	1312	2609	2013	1571	1975	1892	4100	3847	4721	4579	4082	2910	2920	2998	3785	4430	4153	3407	3386	2926	3033	2833	1312	2892
		Cambodia	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		China PR	0	0	0	0	0	0	0	0	29	534	344	200	423	353	278	91	300	473	470	291	296	248	316	196	206
		Chinese Taipei	900	1453	1686	846	2829	2876	2873	2562	1147	1168	1303	1149	1164	1254	745	744	377	671	727	612	410	424	379	582	424
		Cuba	448	209	246	192	452	778	60	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Côte D'Ivoire	8	18	13	14	20	19	26	18	25	26	20	19	19	43	29	31	39	17	159	100	114	145	82	110	55
		EU.Bulgaria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.España	6166	5760	5651	6974	7937	11290	9622	8461	5832	5758	6388	5789	5741	4527	5483	5402	5300	5283	4073	5183	5801	4700	4852	4184	4113
		EU.Lithuania	0	0	0	0	794	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Portugal	0	0	1	0	0	380	389	441	384	381	392	393	380	354	345	493	440	428	271	367	232	263	184	125	252
		EU.United Kingdom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	49	0	0	3	0	0	0	0	
		Gabon	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	
		Ghana	146	73	69	121	51	103	140	44	106	121	117	531	372	734	343	55	32	65	177	132	116	60	54	37	26
		Guinea Ecuatorial	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Honduras	0	0	3	0	0	6	4	5	2	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Japan	6708	4459	2870	5256	4699	3619	2197	1494	1186	775	790	685	833	924	686	480	1090	2155	1600	1340	1314	1233	1162	684	984
		Korea Rep.	50	147	147	198	164	164	7	18	7	5	10	0	2	24	70	36	94	176	223	10	0	0	42	47	53
		Mixed flags (FR+ES)	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	
		NEI (ETRO)	439	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Namibia	0	0	0	0	22	0	0	0	0	730	469	751	504	191	549	832	1118	1038	518	25	417	414	85	129	395
		Nigeria	0	0	3	0	0	0	9	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	29	105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Philippines	0	0	0	0	0	0	0	0	0	0	0	6	1	8	1	1	4	58	41	49	14	35	15	35	58
		S. Tomé e Príncipe	181	179	177	202	190	178	166	148	135	129	120	120	120	120	126	147	138	138	183	188	193	0	0	0	
		Senegal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	77	138	195	180	264	162	178	143
		Seychelles	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	
		Sierra Leone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	0	0	
		South Africa	0	5	9	4	1	4	1	1	240	143	328	547	649	293	295	199	186	207	142	170	145	97	50	171	152
		St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	7	16	4	3	2	2	19
		Togo	3	5	5	8	14	14	64	0	0	0	0	0	0	0	9	10	2	0	0	0	0	0	0	0	
		U.S.A.	0	0	0	0	0	0	171	396	160	179	142	43	200	21	15	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	
		UK.Sta Helena	0	0	0	0	0	0	0	0	0	0	0	20	4	0	0	0	0	0	0	0	0	0	0	5	6
		Uruguay	302	156	210	260	165	499	644	760	889	650	713	789	768	850	1105	843	620	464	370	501	222	179	40	103	**0**
		Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	26	6	3	0	3	1	3	0	1
Discards	ATN	Canada	0	0	0	0	0	0	0	5	52	35	50	26	33	79	45	106	38	61	39	9	15	8	111	12	
		Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27	9	6
		Japan	0	0	0	0	0	0	0	0	0	0	598	567	319	263	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	170	46	19	0
		Mexico	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
		U.S.A.	0	215	383	408	708	526	588	446	433	494	490	308	263	282	275	227	185	220	205	148	138	223	217	120	150
		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	
	ATS	Brazil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	91	6	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	117	72	41
		Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	147	70	23	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
		U.S.A.	0	0	0	0	0	0	1	21	10	6	1	0	0	0	1	0	0	0	0	0	0	0	0	0	

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

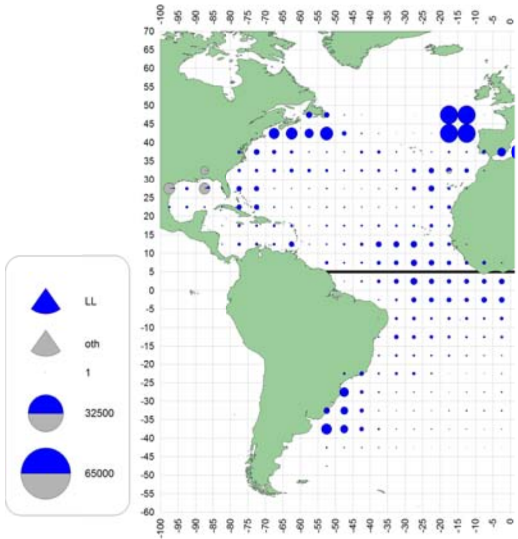
2. Canada estimates of dead discards for 2013 and 2014 were updated to 0 t and 12 t, respectively.

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.

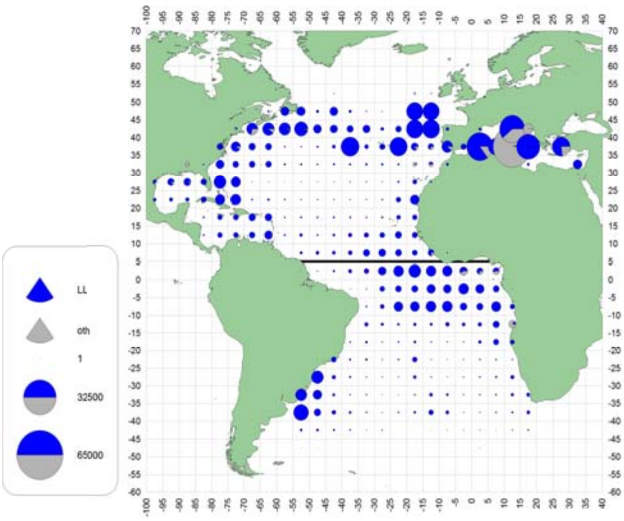
TAC	2014	2015	2016	2017	2018	2019	2020	2021
13000	88	91	92	92	92	92	93	93
13200	88	91	91	92	92	91	91	91
13400	88	90	90	89	89	89	89	89
13600	88	88	88	88	87	87	86	85
13700	88	88	88	87	85	84	84	83
13800	88	87	86	85	83	82	82	81
13900	88	86	84	83	82	80	79	77
14000	88	84	82	80	79	77	75	74
14100	88	82	80	78	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



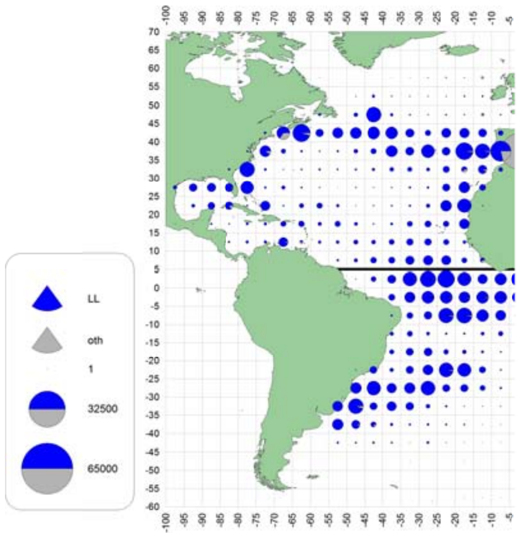
a. SWO(1960-69)



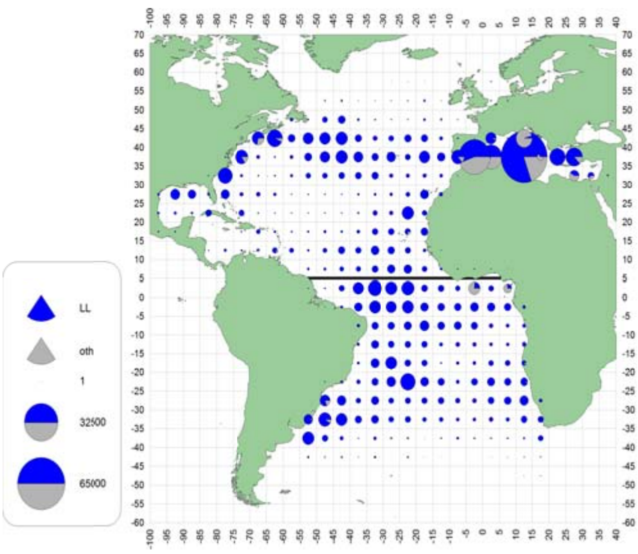
b. SWO(1970-79)



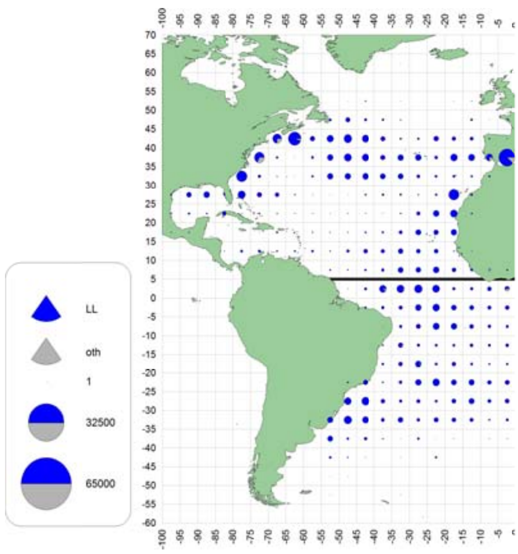
c. SWO(1980-89)



d. SWO(1990-99)

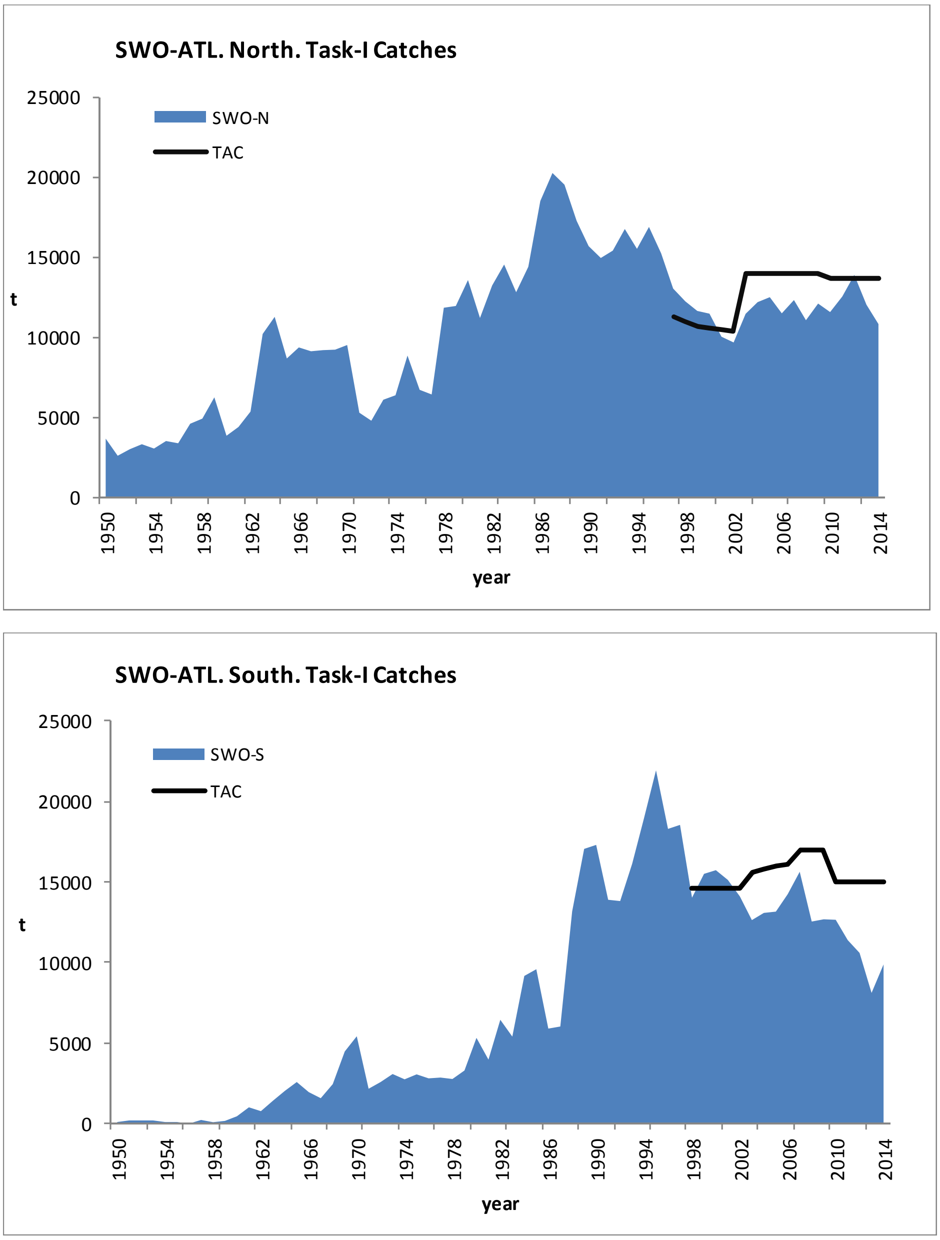


e. SWO (2000-09)

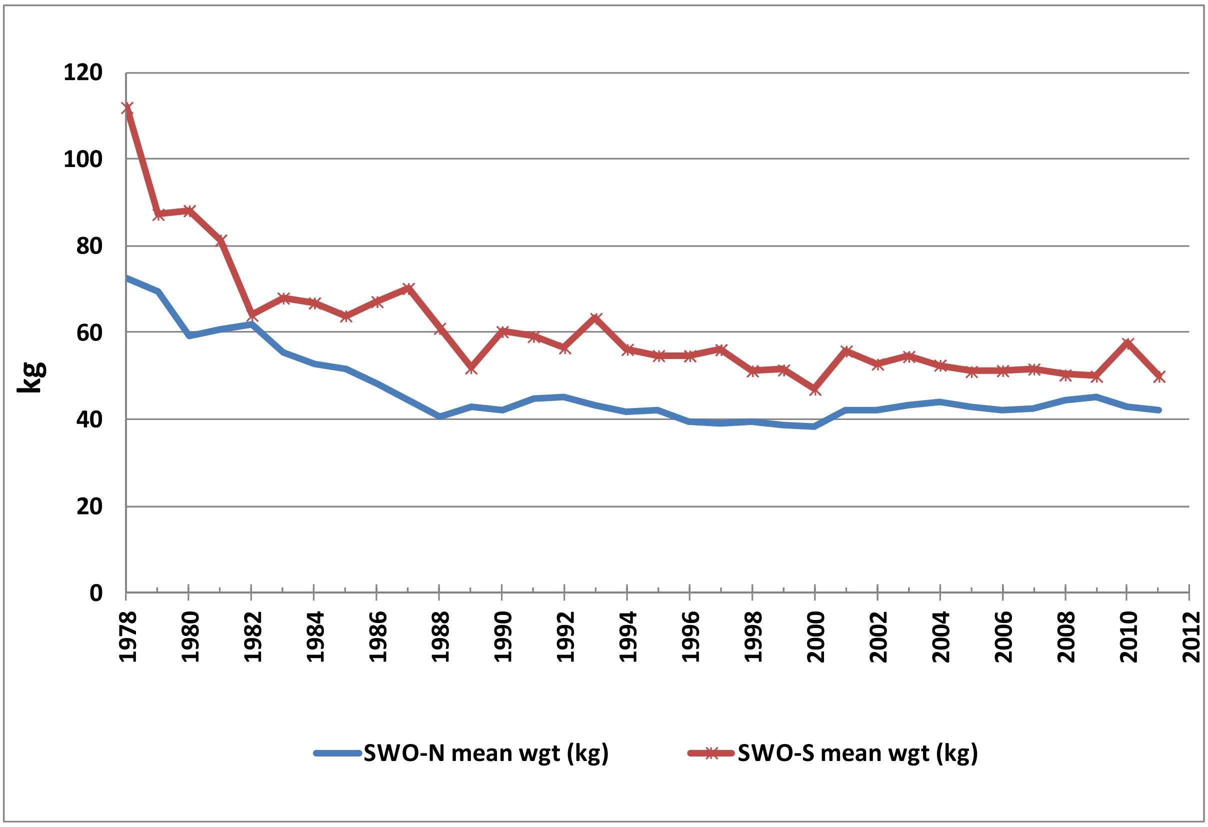


f. SWO(2010-13)

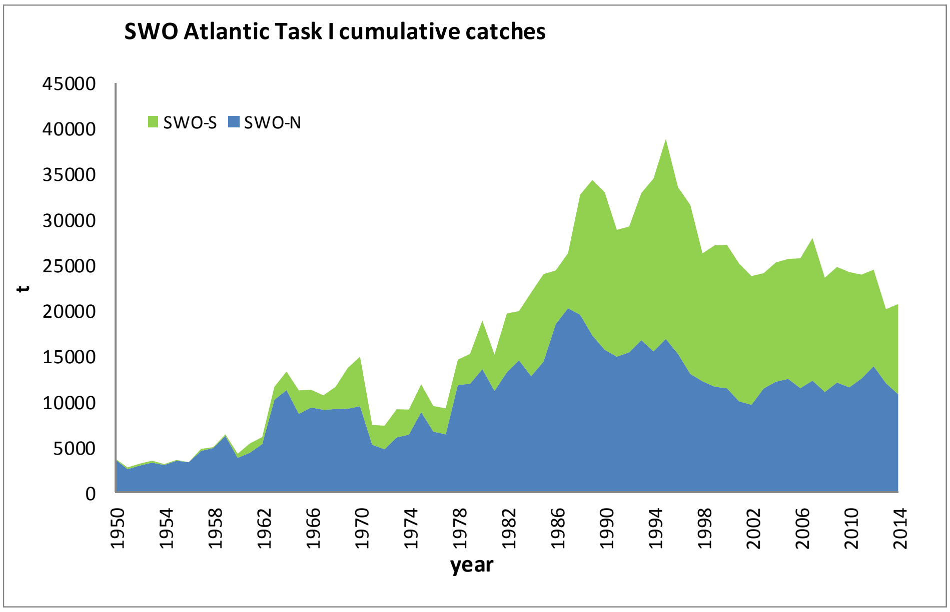
SWO-ATL-Figure 1. Geographic distribution of swordfish cumulative catch (t) by gear, in the Convention area, shown on a decadal scale. The maps are scaled to the maximum catch observed during 1960-2013.



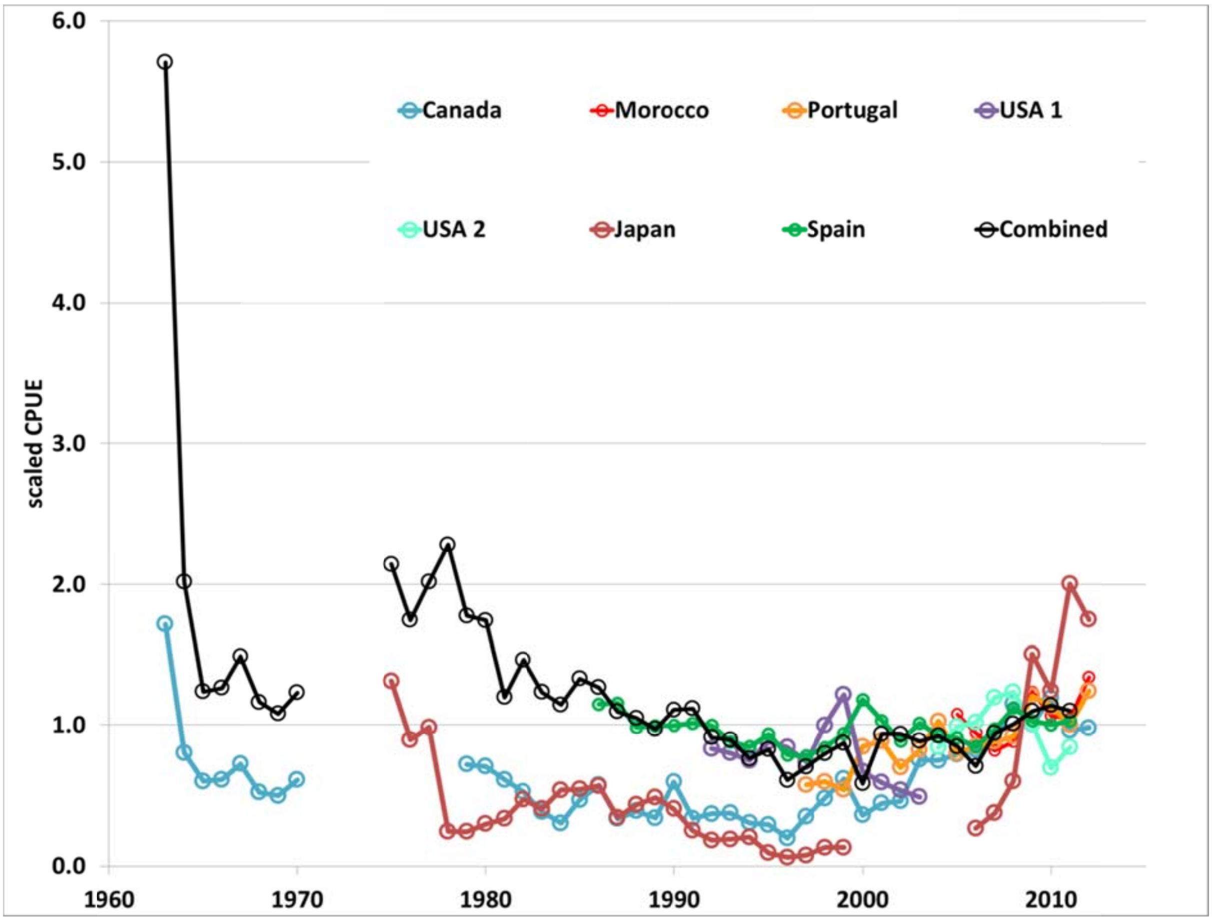
SWO-ATL-Figure 2. North and South Atlantic swordfish catches and TAC (t).



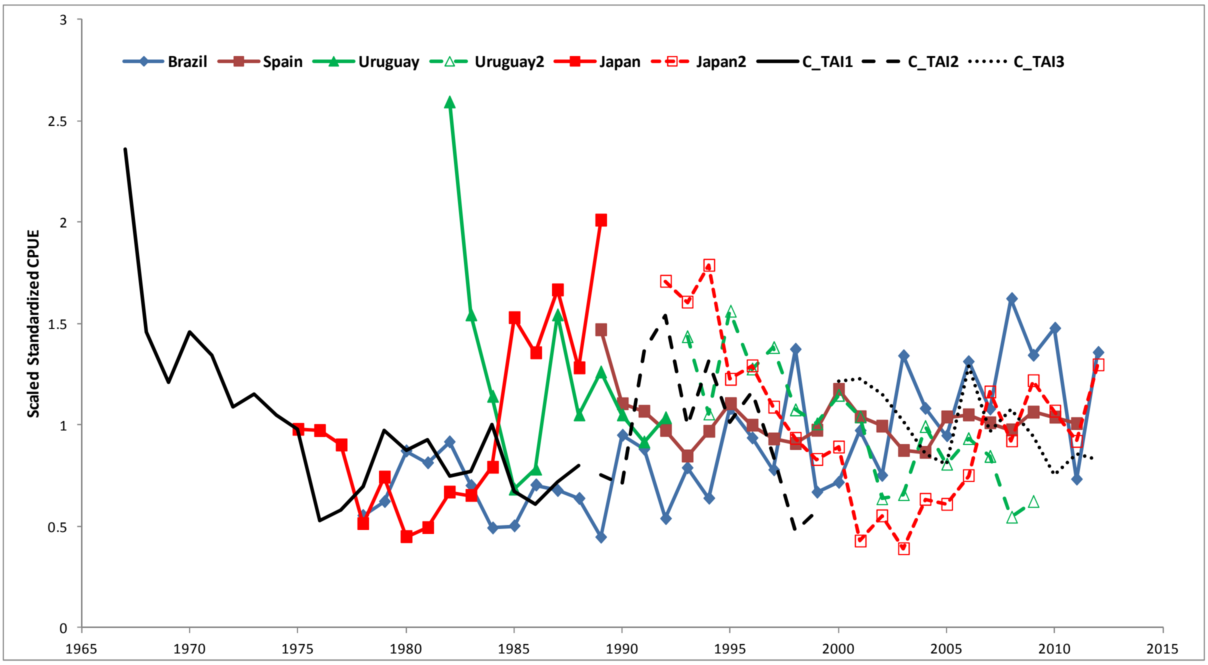
SWO-ATL-Figure 3. Trends in mean weight (kg) for the entire North and South Atlantic swordfish stocks. The information for 2010 is being reviewed and should be considered preliminary.



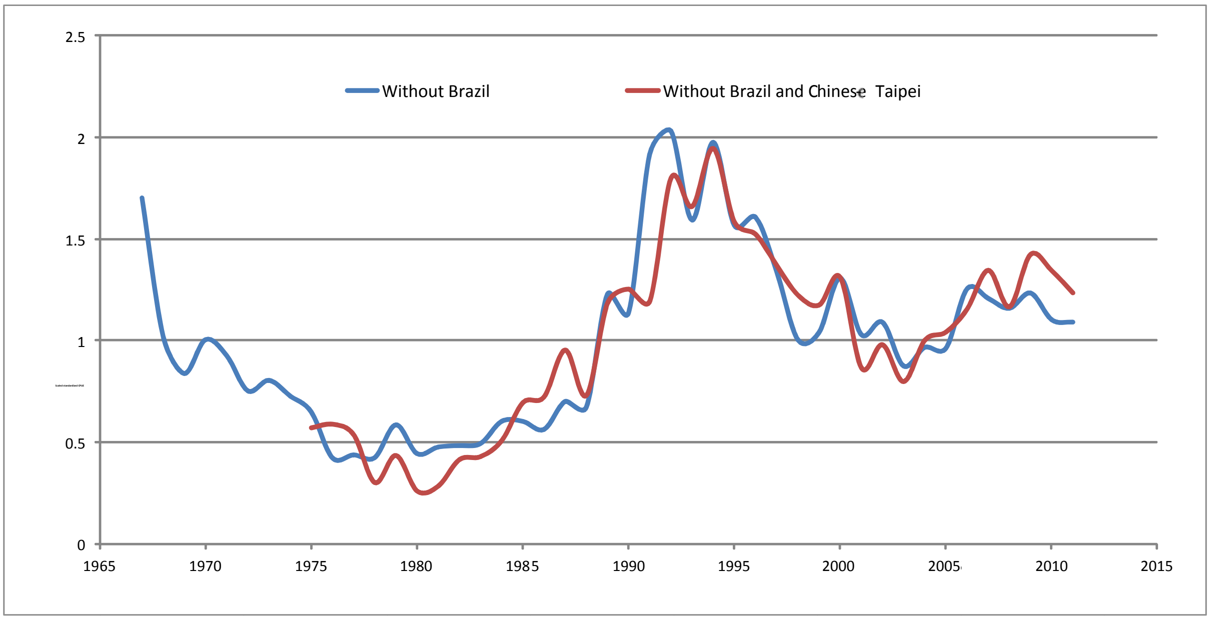
SWO-ATL-Figure 4. Swordfish reported catches (t) for North and South Atlantic, for the period 1950-2014.



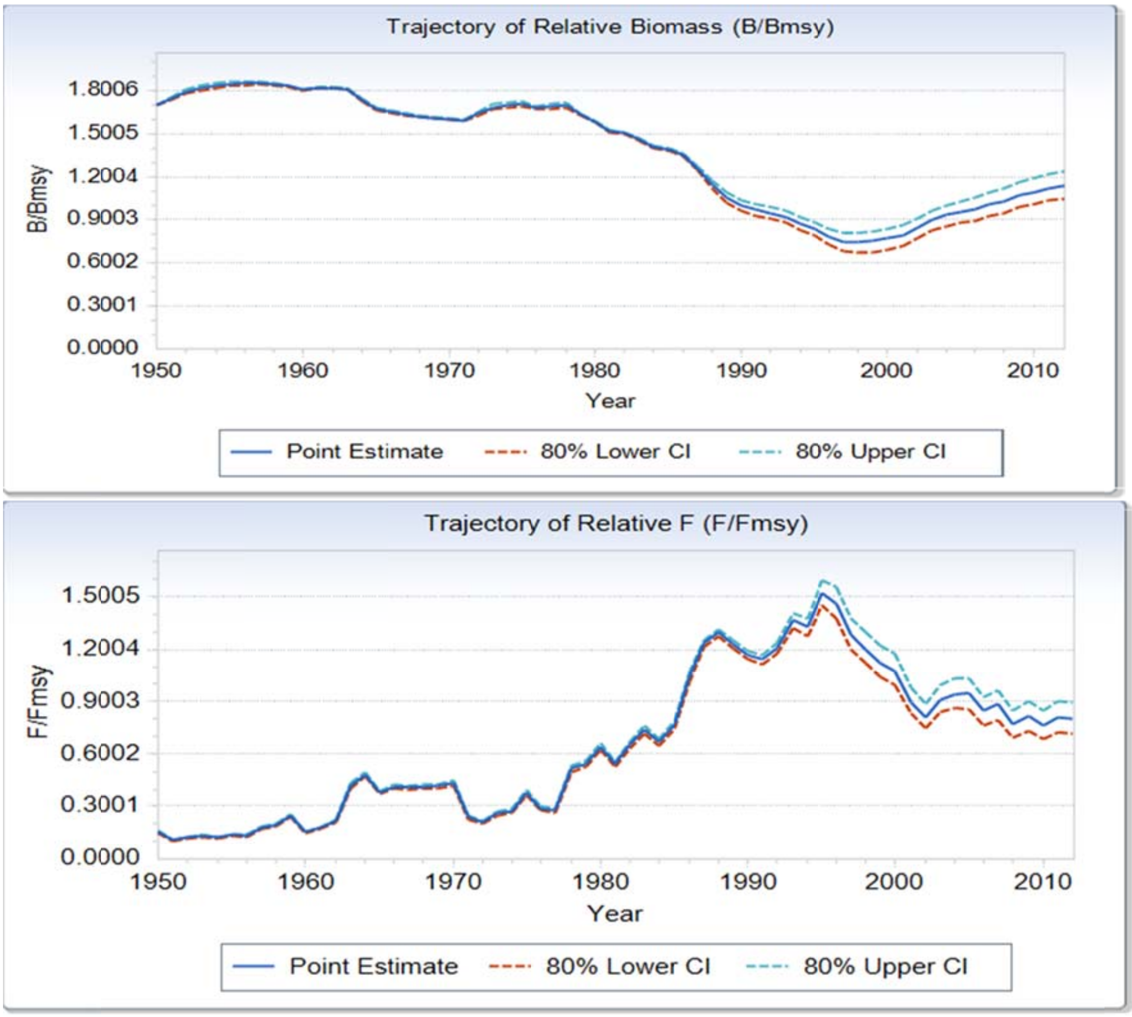
SWO-ATL-Figure 5. Standardized CPUEs series provided by CPCs for the North Atlantic swordfish and the combined index of the base production model. The CPUE series were scaled to their mean for the overlapping years.



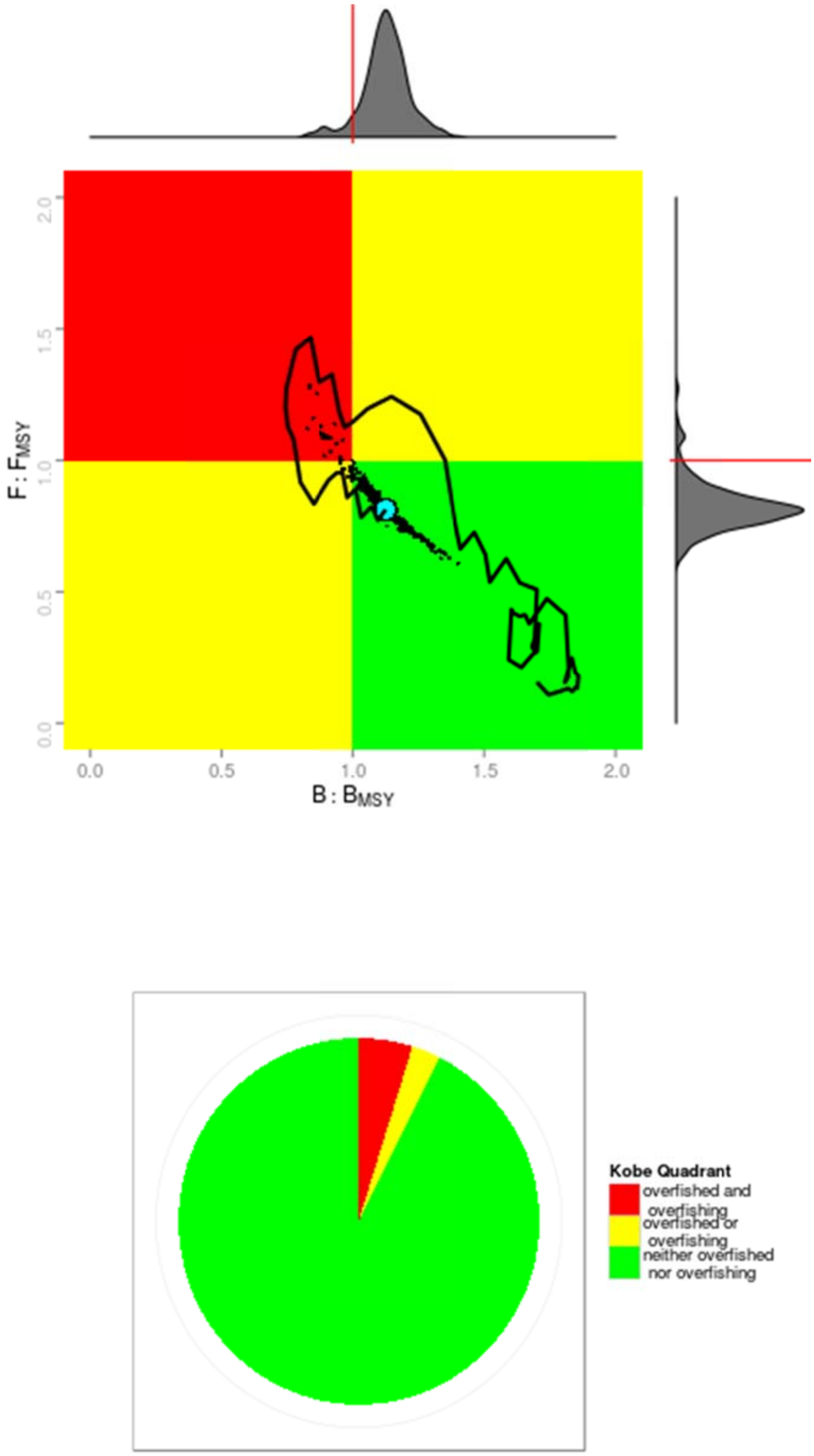
SWO-ATL-Figure 6. Standardized CPUEs series provided by CPCs for the for South Atlantic swordfish, The CPUE series were scaled to their mean for the overlapping years.



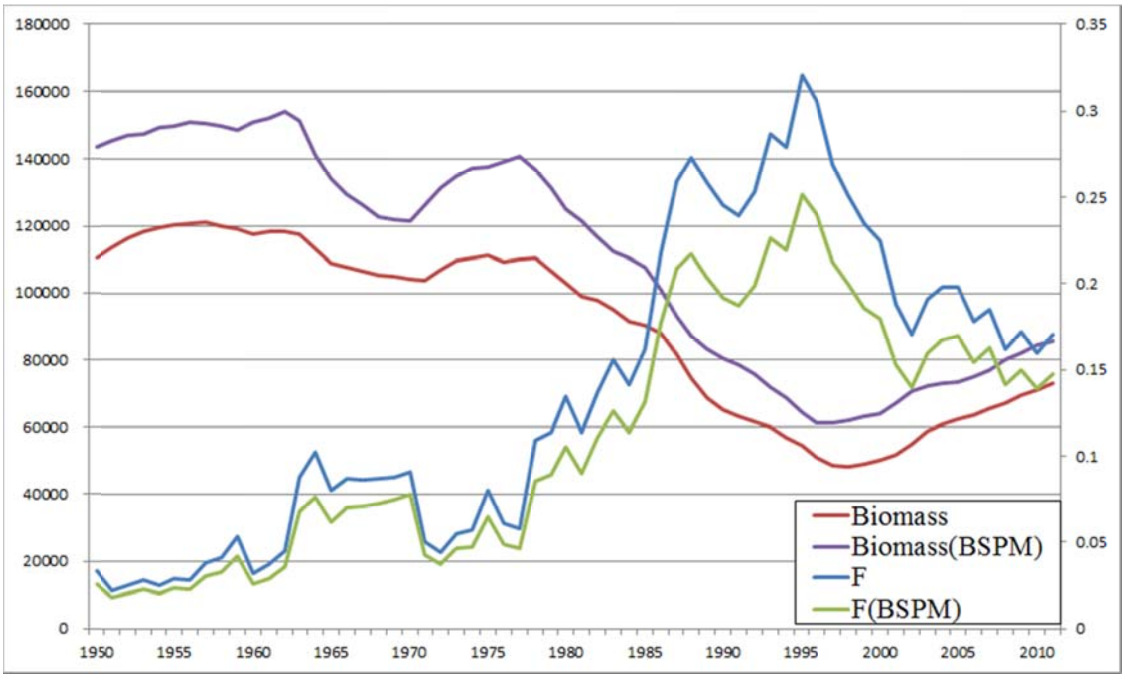
SWO-ATL-Figure 7. South Atlantic swordfish combined standardized CPUE indices.



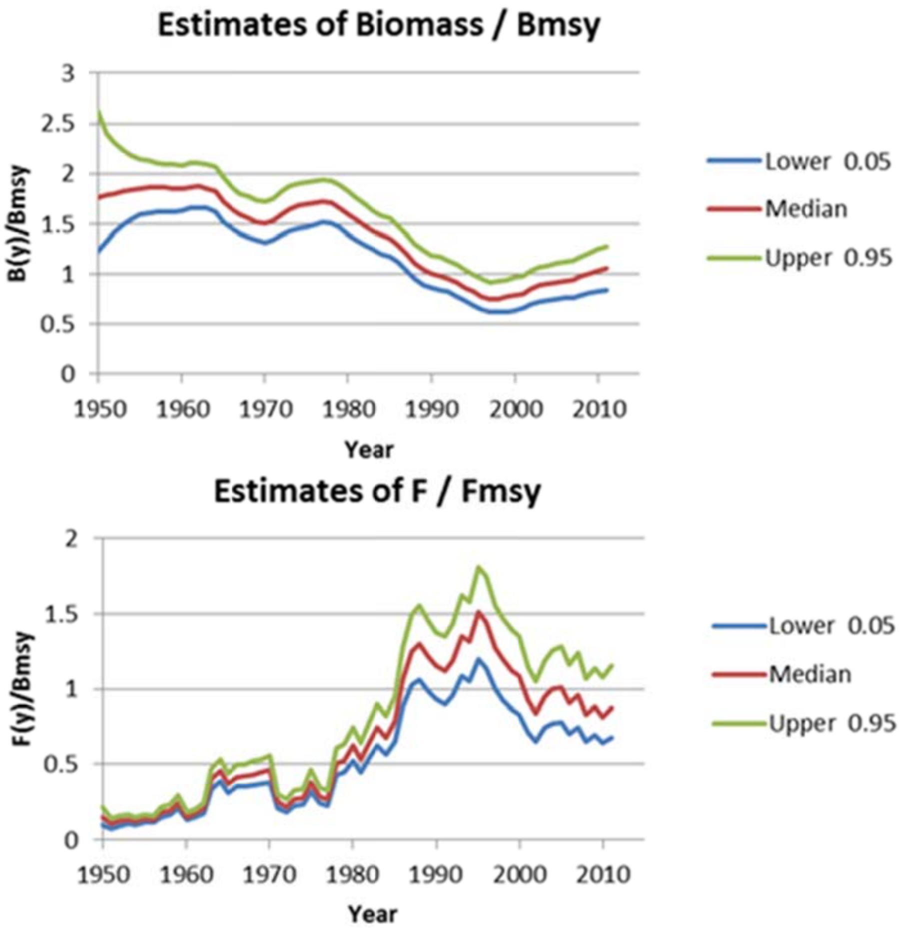
SWO-ATL-Figure 8. Results from the North Atlantic base case ASPIC model: trends in swordfish relative biomass (top) and fishing mortality (bottom) point estimates.



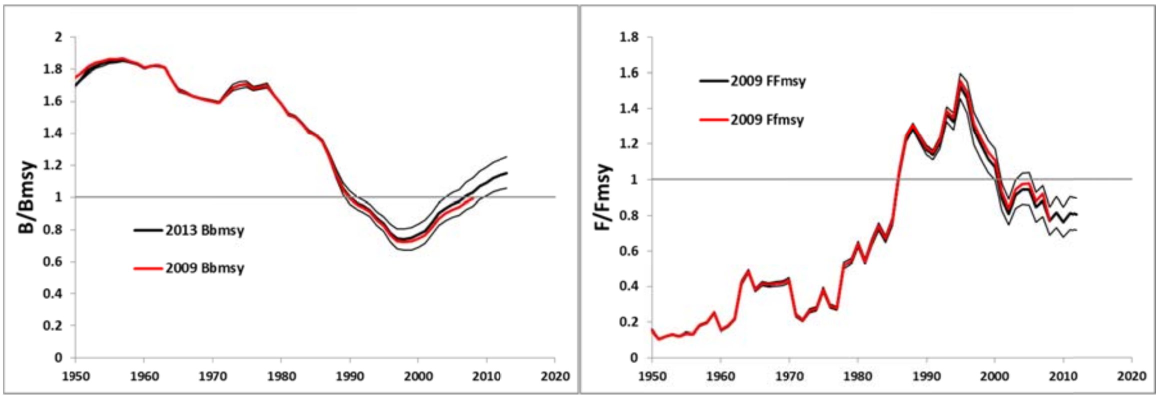
SWO-ATL-Figure 9. North Atlantic swordfish stock status trajectory (solid line) for the period 1950-2011, from the base ASPIC model (solid circle is the estimated median point). The pie chart represents the probabilities of stock being in the different color quadrants (red 3%, yellow 2%, green 95%).



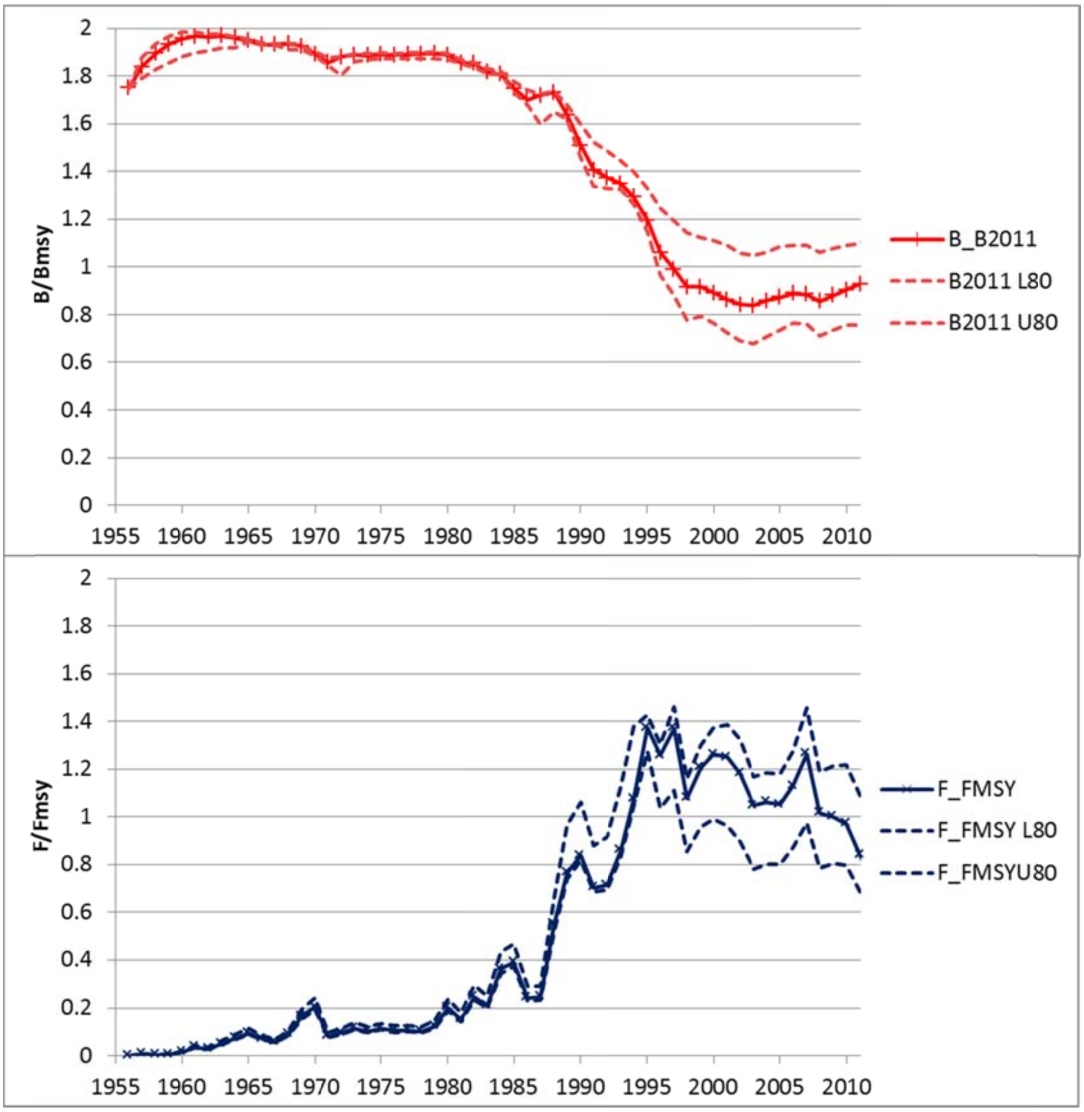
SWO-ATL-Figure 10. Trends in North Atlantic swordfish absolute biomass and fishing mortality estimates from the ASPIC and BSP2 base case models.



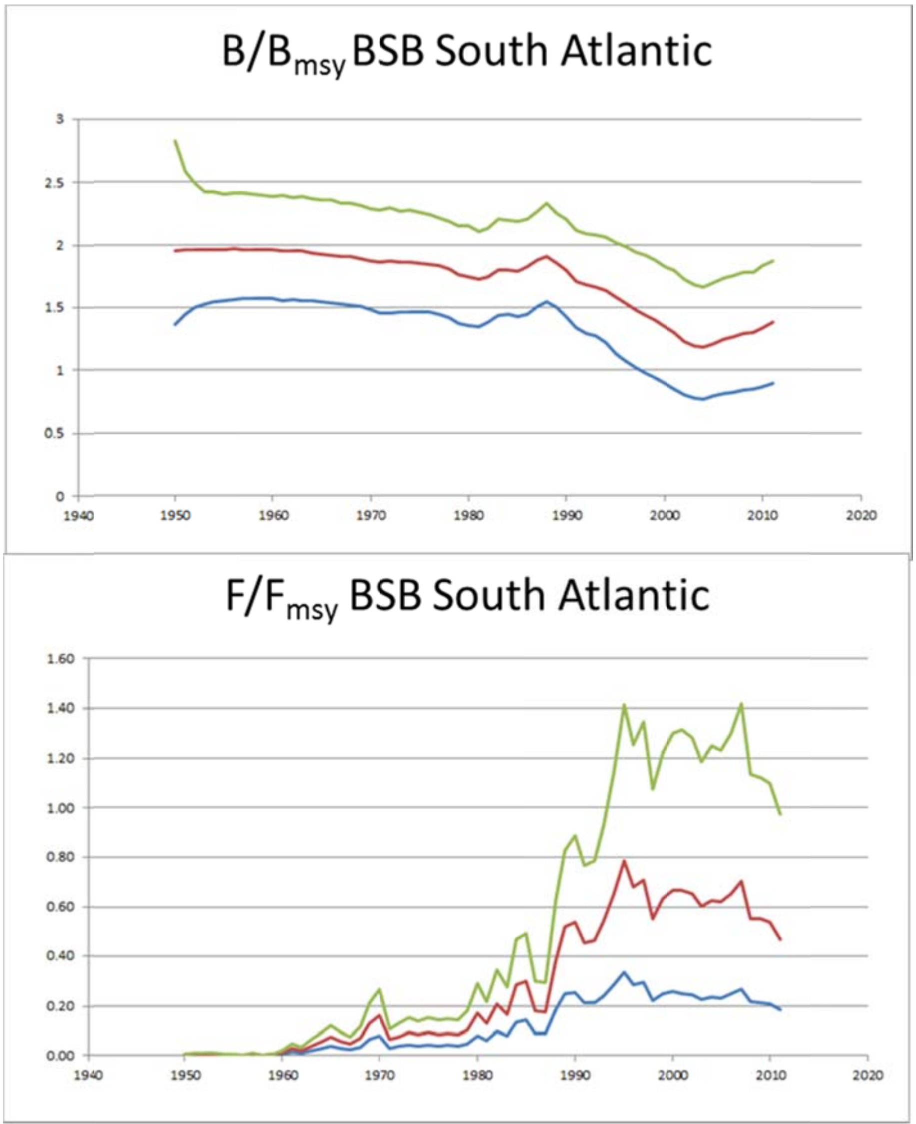
SWO-ATL-Figure 11. Plots of the ratios of i) stock biomass to B_{MSY} and ii) fishing mortality rate to F_{MSY} from the base case BSP2 for North Atlantic swordfish.



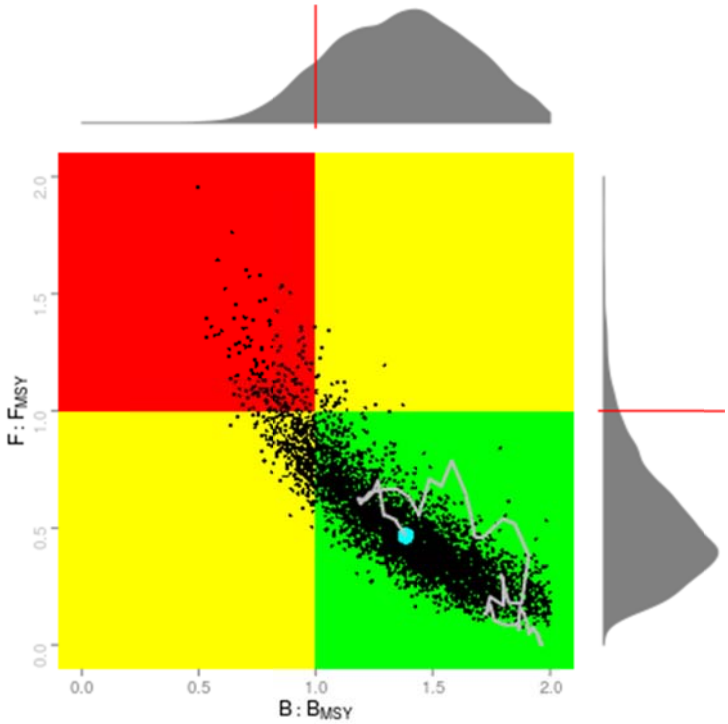
SWO-ATL-Figure 12. Comparison of the relative biomass (left) and fishing mortality (right) estimated by the North Atlantic ASPIC base case models in 2009 and 2013 assessments. Thin lines indicate the 80% confidence bounds for the 2013 estimates.



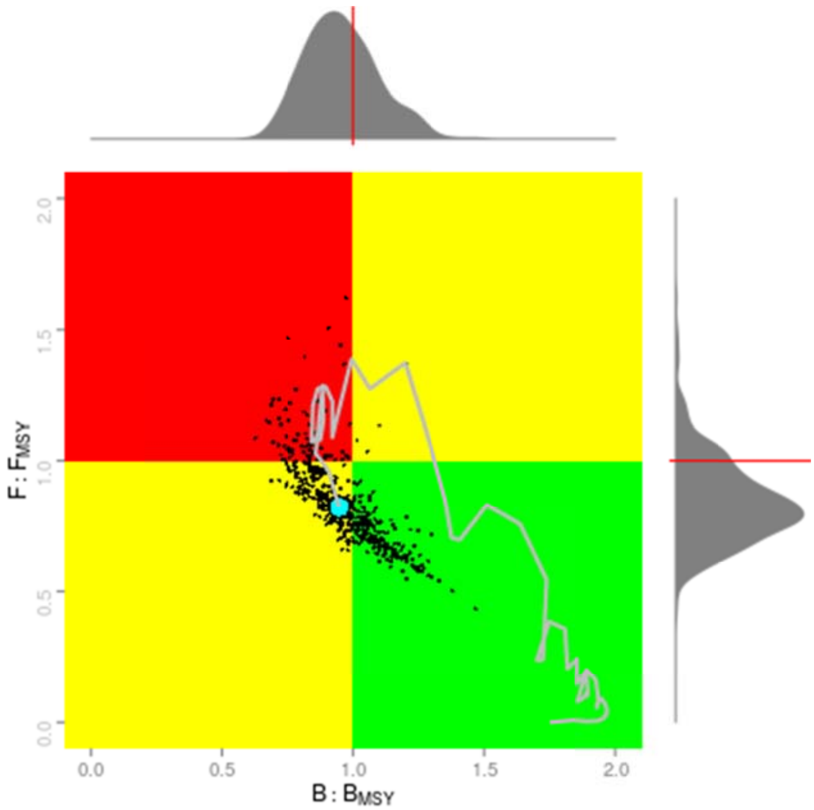
SWO-ATL-Figure 13. South Atlantic swordfish B/B_{MSY} and F/F_{MSY} estimated by ASPIC, dashed lines are the lower and upper 80 percentiles of the bootstrap runs.



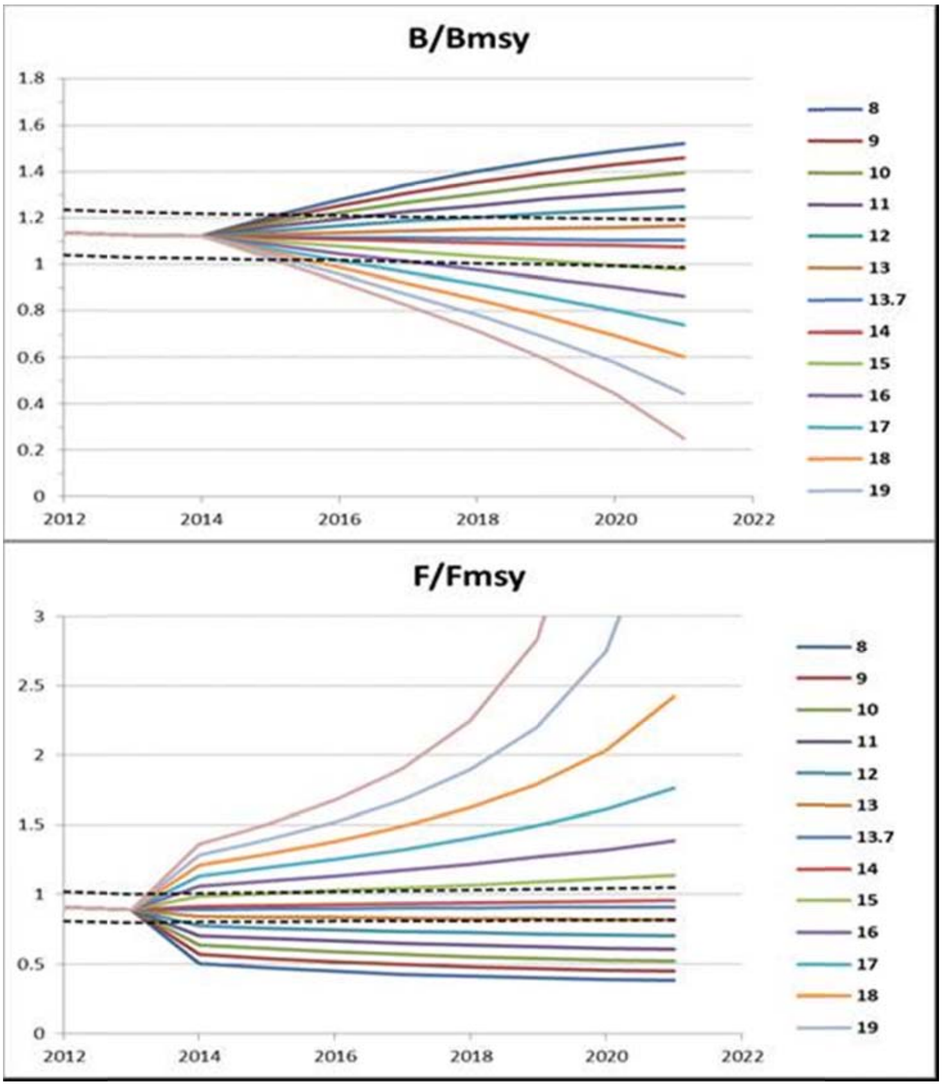
SWO-ATL-Figure 14. South Atlantic swordfish B/B_{MSY} and F/F_{MSY} estimated by BSP2. Posterior median and 90% intervals are plotted.



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 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) long-term 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.

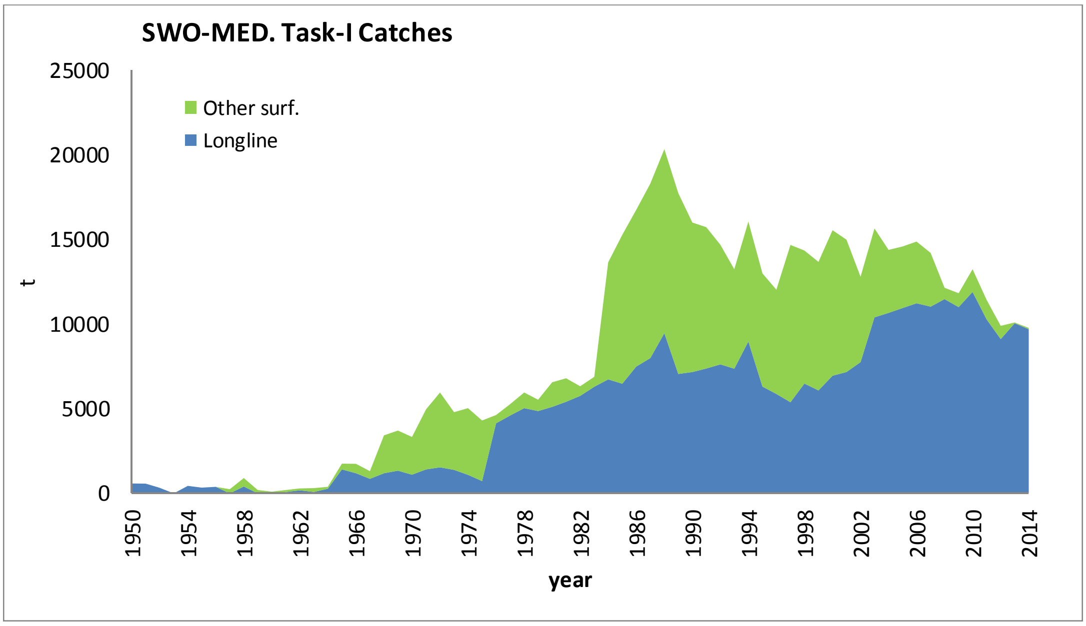
MEDITERRANEAN SWORDFISH SUMMARY

Maximum Sustainable Yield	~15,000 [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]
Overfished 2013 (Yes/No)	Yes[1]
Overfishing 2013 (Yes/No)	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]

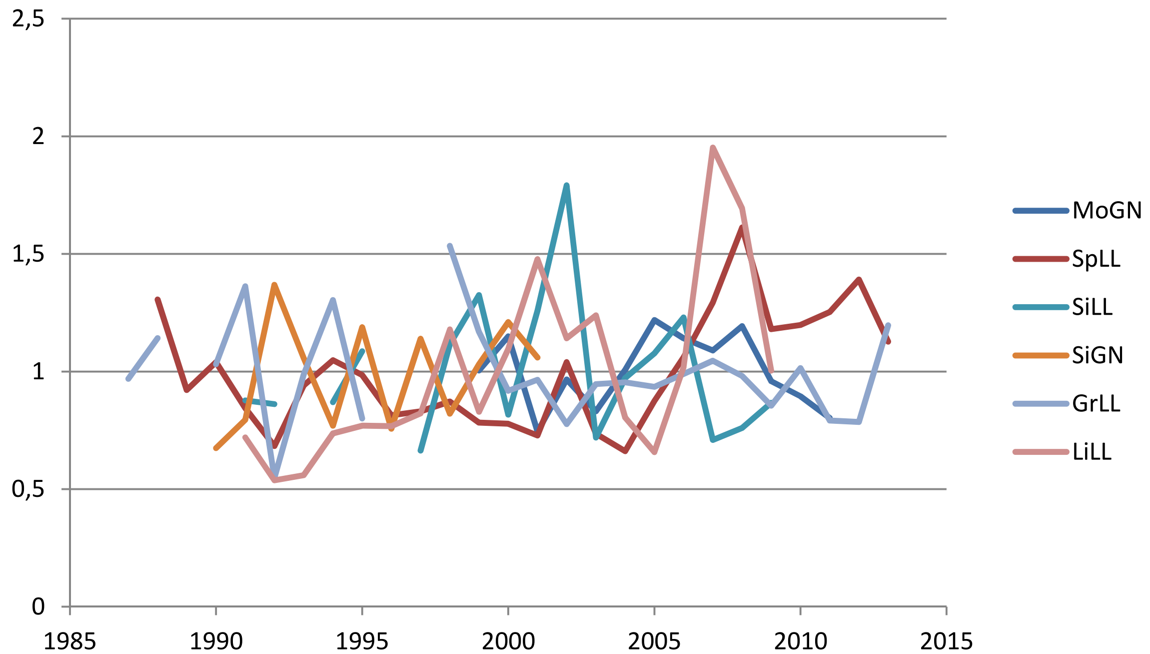
[1] Estimates based on the XSA and equilibrium analyses (see text for details).
[2] As of September 2015.
[3] Certain additional fishery restrictions are implemented at the national level.

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

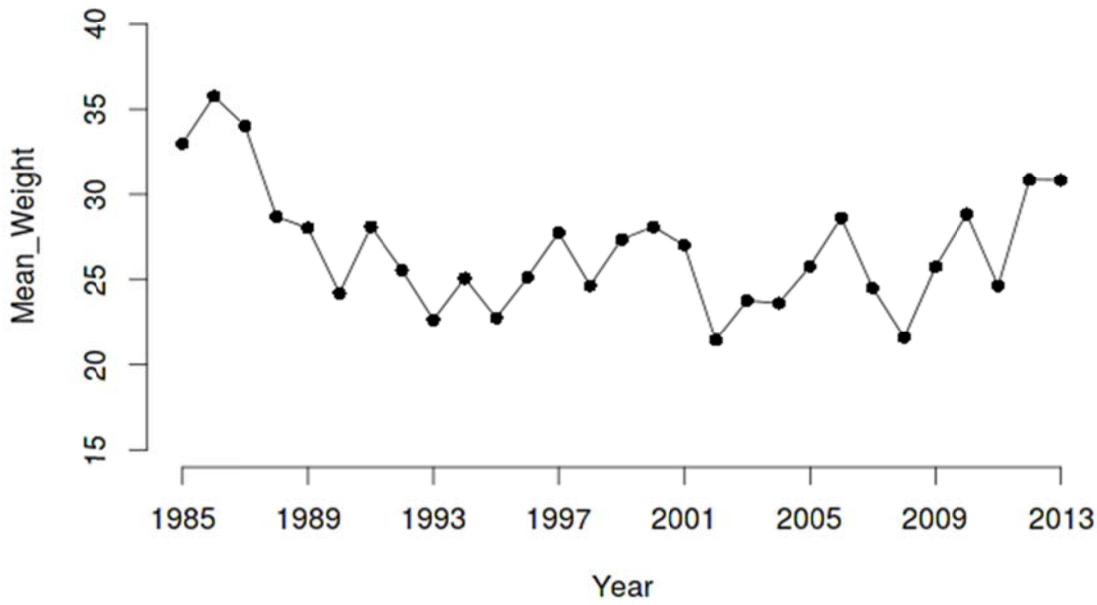
		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
TOTAL	MED	16018	15746	14709	13265	16082	13015	12053	14693	14369	13699	15569	15006	12814	15674	14405	14600	14893	14227	12164	11840	13265	11450	9913	10110	9793
Landings	Longline	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	
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	
	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	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	
	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	
	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	
	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	
	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	



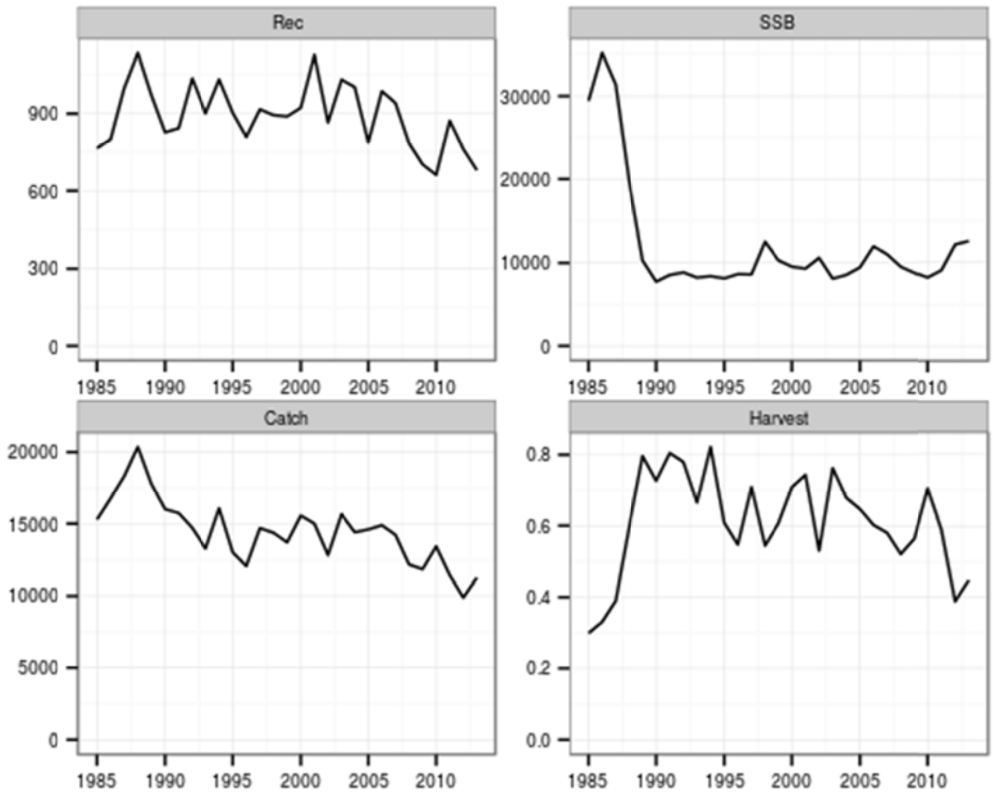
SWO-MED-Figure 1. Cumulative estimates of Task-I swordfish catches (t) in the Mediterranean by major gear types, for the period 1950-2014.



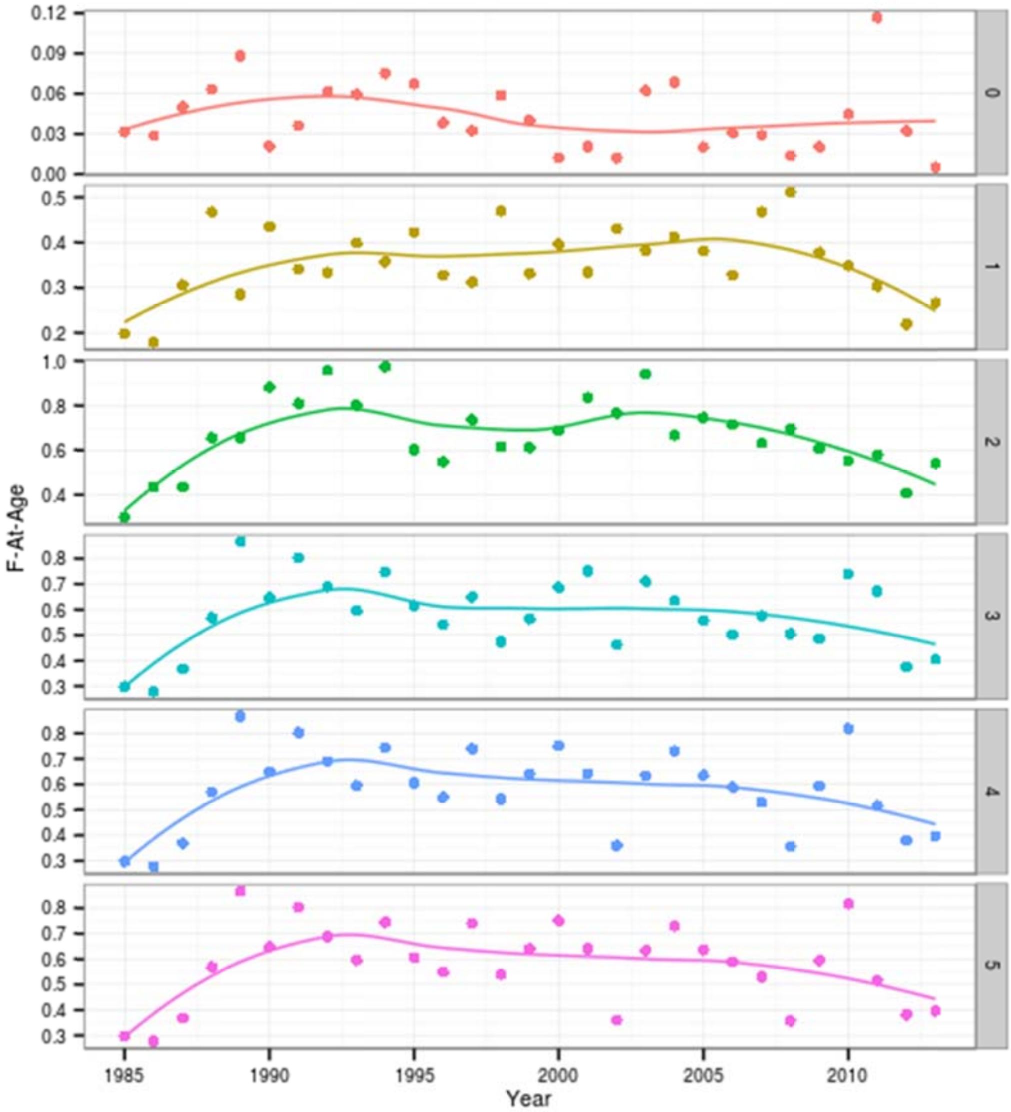
SWO-MED-Figure 2. Time series of standardized CPUE rates scaled to the corresponding mean value for the Spanish longliners (SpLL), Sicilian longliners (SiLL), Greek longliners (GrLL), Moroccan gillnetters (MoGN), Sicilian gillnetters (SiGN) and Ligurian longliners (LiLL).



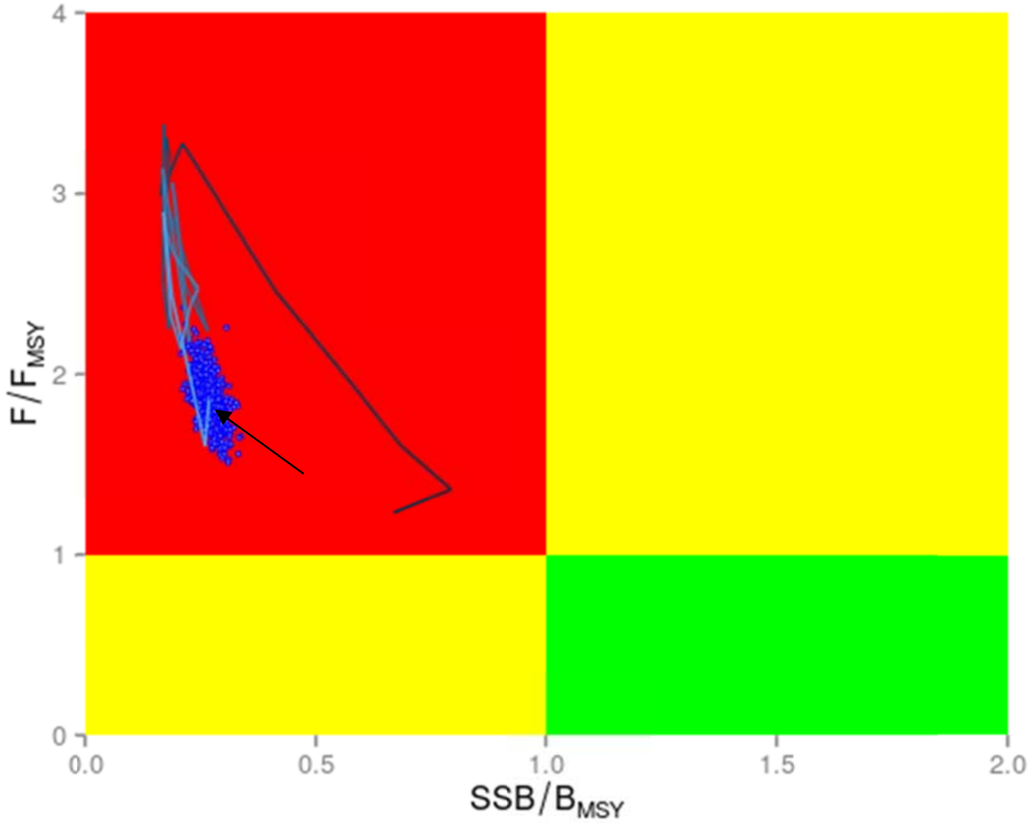
SWO-MED-Figure 3. Time series of mean fish weight (kg) in the catches.



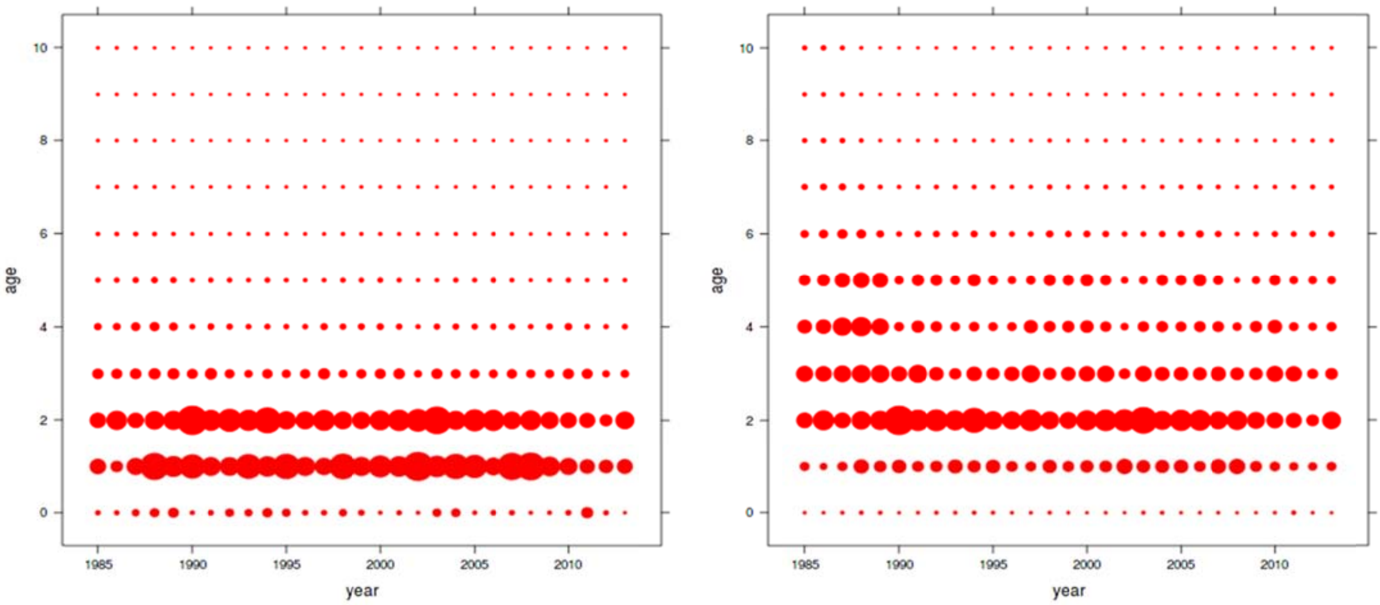
SWO-MED-Figure 4. XSA estimates of historic time series of recruitment (thousands of fish), SSB (t), catch (t) and average fishing mortality (harvest) of ages 2-4.



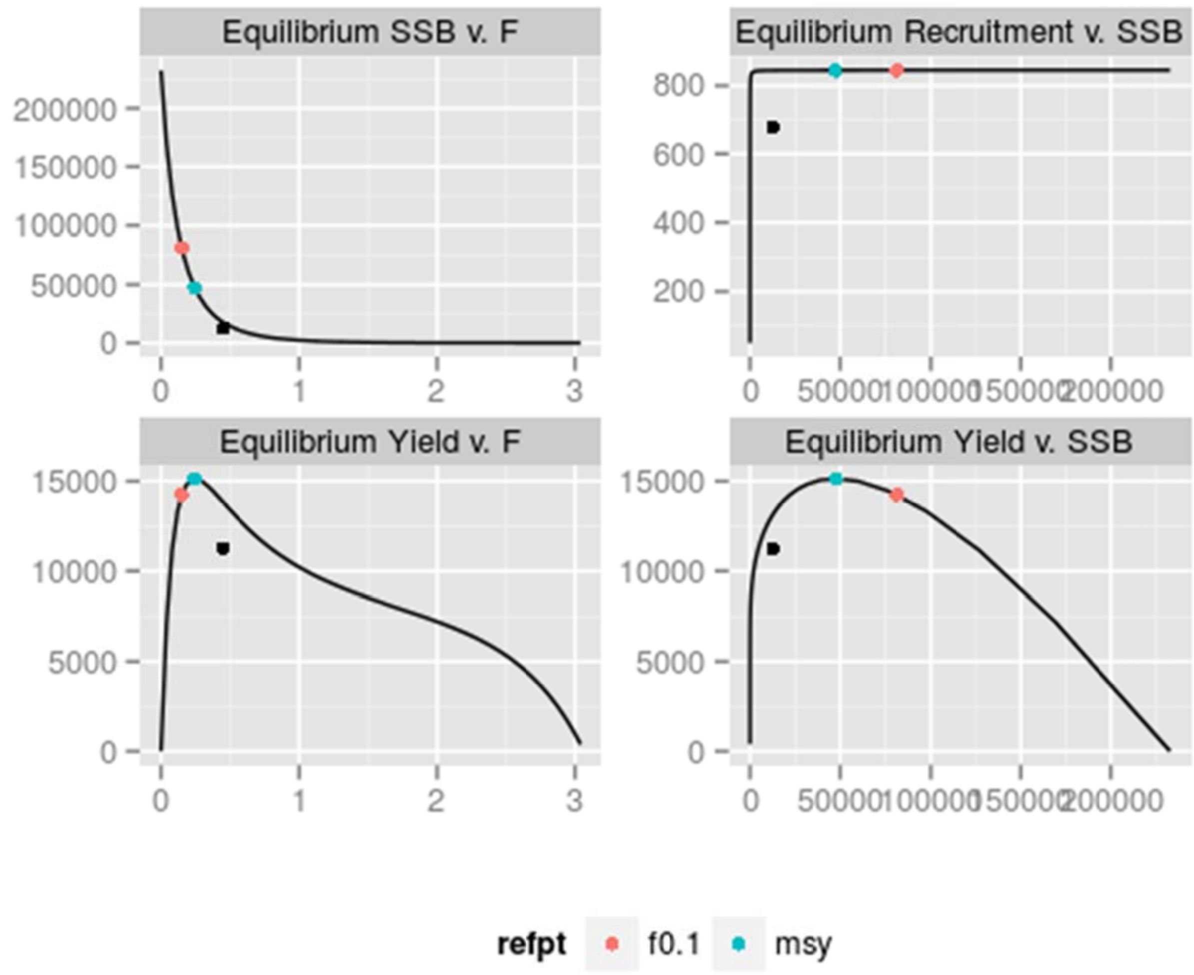
SWO-MED-Figure 5. XSA estimates of F-at-age; lines represent lowest smoothers.



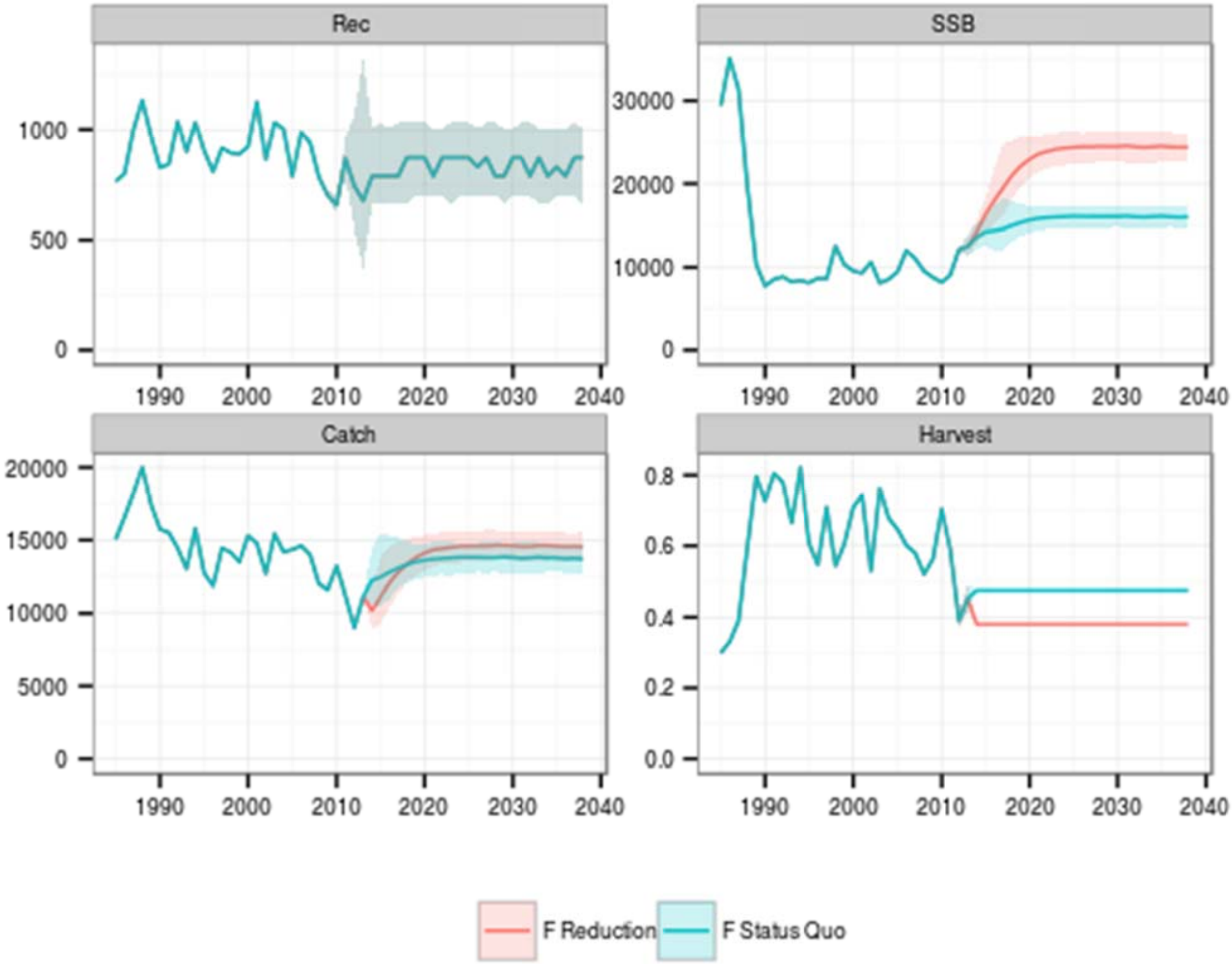
SWO-MED-Figure 6. Time trends for stock status (B/B_{MSY} and F/F_{MSY}) derived from the XSA. The arrow indicates the ratio estimates for the last assessment year (2013).



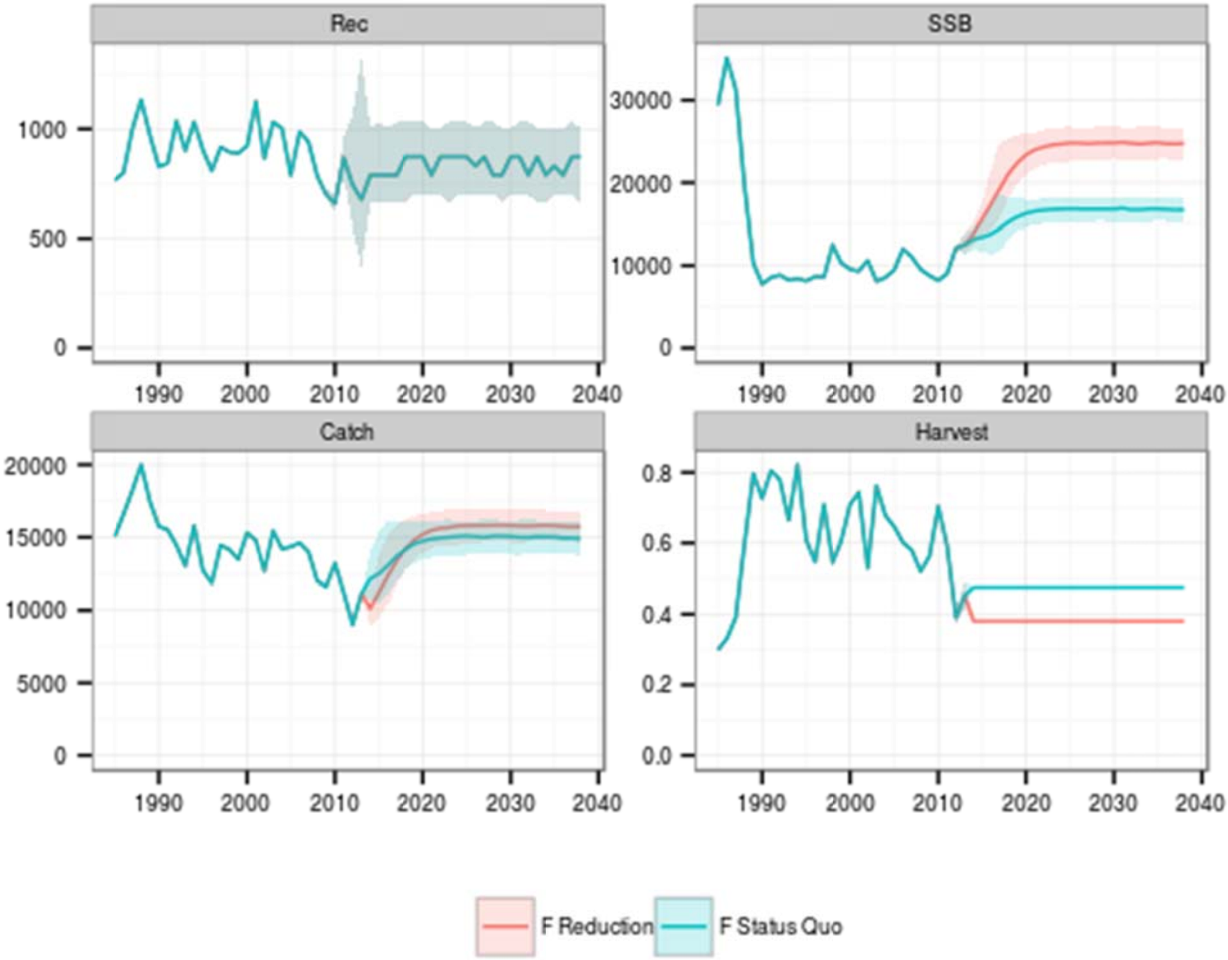
SWO-MED-Figure 7. Proportion of catch numbers (left) and catch weight (right) at age by year.



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

Knowledge on the biology and fishery of small tunas is very fragmented. 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 document 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**. Lopt 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, Lopt 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 Lopt 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 hasn't been able to conduct any quantitative stock assessment for any of 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.

SMT-Table 1. Reported landings (t) of small tuna species, by area 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
BLF	TOTAL	A+M		3888	4202	4353	3535	2719	4051	4488	3027	3238	3185	2465	4034	4756	1303	1926	1031	1937	1927	1669	1442	1548	1533	1529	1218	873
	Landings		All gears	3888	4202	4353	3535	2719	4051	4488	3027	3238	3185	2465	4034	4756	1303	1926	1031	1937	1927	1669	1442	1548	1533	1529	1218	873
	Landings		Angola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Brazil	335	130	49	22	38	153	649	418	55	55	38	149	1669	1	118	91	242	233	266	10	9	46	124	102	299
			Cuba	487	318	196	54	223	156	287	287	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Curaçao	70	60	60	65	60	50	45	45	45	45	45	45	45	0	0	0	0	0	0	0	0	0	0	0	
			Dominica	19	10	14	15	19	30	0	0	0	79	83	54	78	42	20	38	47	29	37	45	41	37	39	37	
			Dominican Republic	520	536	110	133	239	892	892	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			EU.España	0	0	307	46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			EU.France	865	1210	1170	1140	1330	1370	1040	1040	1040	1040	1040	1040	1040	0	0	0	0	0	0	0	32	19	26	0	14
			Grenada	293	195	146	253	189	123	164	126	233	94	164	223	255	335	268	306	371	291	290	291	291	291	291	291	
			Jamaica	0	0	0	0	0	0	148	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Liberia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Mexico	0	0	0	0	0	0	0	0	0	0	0	12	0	10	9	10	10	12	6	7	6	9	5	4	4
			NEI (ETRO)	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	
			St. Vincent and Grenadines	38	11	7	53	19	20	18	22	17	15	23	24	24	0	0	0	0	0	0	0	0	0	0	11	
			Sta. Lucia	17	14	13	16	82	47	35	40	100	41	45	108	96	169	96	126	182	151	179	165	203	229	192	147	104
			Trinidad and Tobago	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	5	5	5	5	5	5	5	5	5	5
			U.S.A.	81	112	127	508	492	582	447	547	707	617	326	474	334	414	675	225	831	422	649	619	622	417	599	418	345
			UK.Bermuda	13	8	6	5	7	4	5	4	6	6	5	4	5	9	4	5	8	7	6	7	9	8	11	11	15
			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	0	0	1	
			UK.Turks and Caicos	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Venezuela	1150	1598	2148	1224	21	624	758	498	1034	1192	696	1902	1210	319	732	225	237	777	231	293	331	473	237	191	88
BLT	TOTAL	A+M		11994	8777	5714	3420	5300	4301	5909	3070	2309	2646	3912	5796	6041	3794	6223	4231	4090	4877	6657	5557	7952	9483	6188	7247	3811
	Landings		All gears	11994	8777	5714	3420	5300	4301	5909	3070	2309	2646	3912	5796	6041	3794	6223	4231	4090	4877	6657	5557	7952	9483	6188	7247	3811
			Algerie	0	174	270	348	306	230	237	179	299	173	225	230	481	0	391	547	586	477	1134	806	970	1119	1236	577	1025
			Brazil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	47	0	
			EU.Croatia	0	24	21	52	22	28	26	26	26	26	0	0	0	0	0	0	0	0	0	0	8	13	9	10	12
			EU.España	2985	2226	1210	648	1124	1472	2296	604	487	669	1024	861	493	495	1009	845	1101	3083	3389	726	3812	3227	1620	2654	749
			EU.France	0	8	4	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
			EU.Greece	1400	1400	1400	1400	1400	1400	1426	1426	0	0	196	125	120	246	226	180	274	157	620	506	169	129	118	155	4
			EU.Italy	494	432	305	379	531	531	229	229	229	462	462	462	2452	1463	1819	866	0	0	342	732	574	653	613	892	
			EU.Lithuania	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	21	20	10	9	1	2	3	6	1	3	1	1	0	2	8	4	11	14	12	7	11	23	3	85	14
			EU.Portugal	0	0	0	0	0	0	0	0	28	263	494	208	166	231	299	580	867	20	143	436	654	387	55	38	
			Maroc	2452	1289	1644	170	1726	621	1673	562	1140	682	763	256	621	246	326	50	199	35	83	336	525	237	194	237	171
			Russian Federation	0	2171	814	70	100	0	0	0	0	0	408	1028	460	122	102	139	22	0	23	48	67	119	366	703	352
			Serbia & Montenegro	0	13	1	0	0	2	6	6	6	7	8	8	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	99	75	87	81	84	83	83	
			Tunisie	985	985	35	20	13	14	13	32	93	45	15	2300	932	989	1760	0	0	0	0	0	0	940	935	938	920
			Turkey	0	35	0	324	77	0	0	0	0	316	316	316	316	0	284	1020	1031	993	836	1873	1081	2552	907	863	562
			U.S.S.R.	3634	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0	0	11	
			Yugoslavia Fed.	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BON	TOTAL			28908	33334	21992	30528	21719	21219	25134	24518	45253	37313	27151	27637	24581	14424	15832	78767	40095	14179	14964	21182	20864	24817	44852	24285	26214
		ATL		6811	8079	6881	4531	6037	6030	7939	10441	15523	9143	5179	5400	8864	3307	4584	4391	8345	5542	4922	11162	8281	10375	5531	5920	3392
		MED		22097	25255	15111	25997	15682	15189	17195	14078	29730	28170	21972	22237	15717	11117	11248	74376	31751	8637	10042	10019	12584	14442	39321	18365	22823
	Landings	ATL	All gears	6811	8079	6881	4531	6037	6030	7939	10441	15523	9143	5179	5400	8864	3307	4584	4391	8345	5542	4922	11162	8281	10375	5531	5920	3392
		MED		22097	25255	15111	25997	15682	15189	17195	14078	29730	28170	21972	22237	15717	11117	11248	74376	31751	8637	10042	10019	12584	14442	39321	18365	22823
	Landings		Angola	128	102	4	49	20	9	39	32	0	2	118	118	118	0	0	138	0	931	0	1962	1997	131	267	1373	2
			Argentina	1207	1794	1559	434	4	138	108	130	12	68	19	235	1	129	269	110	0	0	0	220	59	6	33	0	
			Barbados	0	0	0	0	0	0	0	0	0	0	0	1	2	2	0	0	0	0	0	0	0	0	0	0	
			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	
			Brazil	226	71	86	142	142	137	0	0	0	0	0	0	0	0	0	90	0	0	0	0	0	171	0	3	
			Cuba	28	0	0	0	0	0	0	0	230	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	539	539	539	539	
			Côte D'Ivoire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3	0	3	13	755	3	0	26	3
			Dominica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	16	16	9	4	0	0	0	0	
			EU.Bulgaria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			EU.España	18	8	39	5	3	2	2	1	0	12	12	10	5	23	9	2	15	14	13	36	45	57	7	44	28
			EU.Estonia	187	8	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	430	820	770	1052	990	990	610	610	610	24	32	0	18	0	0	0	0	122	59	25	208	241	102	245	288
			EU.Germany	53	0	0	0	0	0	714	0	0	0	0	0	38	0	0	0	0	0	0	0	0	0	0	0	6
			EU.Greece	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			EU.Ireland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48	0	0	0	0	56	125	91	108	100	
			EU.Latvia	221	7	4	0	3	19	301	887	318	0	416	396	639	0	0	0	0	0	0	0	0	0	0	0	**0**
			EU.Lithuania	162	11	10	0	0	0	0	0	0	0	0	0	793	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	344	539	539	0	2047	104	1075	54
			EU.Poland	0	0	0	0	0	0	225	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			EU.Portugal	202	315	133	145	56	78	83	49	98	98	162	47	61	40	50	38	318	439	212	124	476	461	321	184	22

				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
			EU.United Kingdom	0	0	0	0	0	0	287	0	0	0	0	0	0	0	0	0	35	0	0	30	71	113	4	0	0
			Gabon	0	0	0	0	0	0	0	0	0	0	0	0	58	0	0	0	0	0	0	0	0	0	0	0	
			Georgia	0	0	0	0	0	0	0	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	
			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	
			Grenada	0	0	0	0	0	0	24	6	14	16	7	10	10	0	0	0	0	0	0	0	0	0	0	0	
			Jamaica	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Maroc	492	794	1068	1246	584	699	894	1259	1557	1390	2163	1700	2019	928	989	1411	1655	1053	1419	2523	109	145	235	89	90
			Mexico	215	200	657	779	674	1144	1312	1312	1632	1861	1293	1113	1032	1238	1066	654	1303	1188	1113	1063	1046	1080	1447	1534	1115
			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	2	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Rumania	8	212	84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Russian Federation	0	948	29	0	0	0	0	0	4960	0	0	574	1441	461	16	79	316	259	52	368	1042	2293	848	125	416
			Senegal	525	597	345	171	814	732	1012	1390	2213	2558	286	545	621	195	183	484	2304	1020	1380	4029	1677	2876	1453	514	1217
			Sierra Leone	10	4	6	0	0	0	0	0	0	0	11	245	44	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	
			St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	15	18	0	16	23	27	15	6	20	0	0	
			Sta. Lucia	3	3	3	4	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
			Togo	177	172	107	311	254	145	197	197	197	197	0	0	0	0	1583	1215	2298	0	0	0	0	0	0	0	
			Trinidad and Tobago	0	0	0	17	703	169	266	220	30	117	117	56	452	188	280	81	7	16	38	68	68	14	9	16	16
			U.S.A.	299	469	498	171	128	116	156	182	76	83	142	120	139	44	70	68	40	97	47	50	46	66	46	50	126
			U.S.S.R.	706	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	0	2	0
			UK.Turks and Caicos	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Ukraine	0	0	25	0	0	0	342	2786	1918	1114	399	231	1312	30	0	0	0	0	0	0	0	0	0	0	
			Uruguay	0	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Venezuela	1514	1518	1454	5	1661	1651	1359	1379	1659	1602	2	0	61	13	0	16	18	19	12	38	10	21	7	4	9
		MED	Albania	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Algerie	1307	261	315	471	418	506	277	357	511	475	405	350	597	0	609	575	684	910	1042	976	1009	355	353	614	504
			EU.Bulgaria	17	17	20	8	0	25	33	16	51	20	35	35	35	0	0	0	0	0	0	0	16	8	96	6	5
			EU.Croatia	0	49	128	6	70	0	0	0	25	120	0	0	0	0	0	0	0	0	0	0	59	41	31	56	56
			EU.Cyprus	0	0	0	0	0	0	0	0	0	0	14	0	10	10	6	4	3	0	0	0	0	0	0	0	
			EU.España	712	686	228	200	344	632	690	628	333	433	342	349	461	544	272	215	429	531	458	247	518	574	442	881	585
			EU.France	1	10	5	6	0	0	0	0	0	0	0	0	27	0	0	0	0	15	34	20	23	13	12	30	25
			EU.Greece	2534	2690	2690	2690	1581	2116	1752	1559	945	2135	1914	1550	1420	1538	1321	1390	845	1123	587	476	531	798	733	960	148
			EU.Italy	1244	1087	1288	1238	1828	1512	2233	2233	2233	4159	4159	4159	4579	2091	2009	1356	0	0	1323	1131	964	1197	472	1245	1053
			EU.Malta	0	0	0	0	0	0	2	7	2	2	1	0	1	0	1	1	11	7	7	3	6	1	3	2	0
			Egypt	598	574	518	640	648	697	985	725	724	1442	1442	1128	1128	0	0	0	0	0	0	0	0	0	0	0	
			Libya	0	0	71	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Maroc	69	69	31	25	93	37	67	45	39	120	115	5	61	85	78	38	89	87	142	131	57	12	1	0	8
			NEI (MED)	311	311	311	300	300	300	300	75	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	
			Serbia & Montenegro	0	45	0	3	2	6	10	12	12	14	17	17	0	0	0	0	0	0	0	0	0	0	0	0	
			Tunisie	488	305	643	792	305	413	560	611	855	1350	1528	1183	1112	848	1251	0	0	0	0	0	0	1425	1415	1413	1407
			Turkey	14737	19151	8863	19548	10093	8944	10284	7810	24000	17900	12000	13460	6286	6000	5701	70797	29690	5965	6448	7036	9401	10019	35764	13158	19032
			U.S.S.R.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Yugoslavia Fed.	79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BOP	TOTAL			473	608	641	630	791	703	2196	481	177	868	1207	1012	923	736	581	217	32	1047	533	449	287	377	681	662	952
		ATL		436	507	465	378	615	588	2064	254	47	651	1062	858	786	713	573	215	32	875	426	442	273	335	657	641	939
		MED		37	101	176	252	176	115	132	227	130	217	145	154	137	23	8	2	0	172	107	6	14	42	24	21	13
	Landings	ATL	Benin	1	1	1	1	1	1	1	3	1	1	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	5	3	1	2	11	21	7	1	2	
			Maroc	369	486	423	348	598	524	2003	246	28	626	1048	830	780	706	503	132	0	634	391	273	199	213	642	555	867
			Mauritania	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Senegal	16	20	41	29	16	63	60	5	18	24	14	28	6	7	70	78	29	240	33	158	53	115	14	84	72
		MED	Algerie	0	87	135	198	153	92	119	224	128	216	135	145	128	0	0	0	0	0	0	0	0	9	7	3	3
			EU.France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
			Libya	0	0	40	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Maroc	37	14	1	14	23	23	13	3	2	1	10	9	9	20	7	1	0	172	107	6	14	30	15	16	8
			Tunisie	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	0	2	2	2	2
BRS	TOTAL	A+M		7698	8856	6051	8049	7161	7006	8435	8004	7923	5754	4785	4553	7750	5137	3410	3712	3587	2253	3305	2681	2871	2214	613	1427	697
	Landings		Brazil	2767	1437	1149	842	1149	1308	3047	2125	1516	1516	988	251	3071	2881	814	471	1432	563	1521	1042	1281	1162	0	581	2
			EU.France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Grenada	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Guyana	0	0	0	0	0	0	211	571	625	1143	308	329	441	389	494	521	377	277	312	141	92	116	124	151	
			Trinidad and Tobago	2471	2749	2130	2130	2130	1816	1568	1699	2130	1328	1722	2207	2472	1867	2103	2720	1778	1414	1472	1498	1498	936	489	695	695
			Venezuela	2460	4670	2772	5077	3882	3882	3609	3609	3651	1766	1766	1766	1766	0	0	0	0	0	0	0	0	0	0	0	
CER	TOTAL	A+M		225	375	390	450	490	429	279	250	250	0	3	5	1	2	1	1	1	0	0	0	0	1	0	0	0
	Landings		Dominica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
			Dominican Republic	50	45	79	50	90	29	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			EU.France	175	330	310	400	400	400	250	250	250	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
			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	
			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	
			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	
			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
			Cape 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
			Curaçao	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	
			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	
			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	
			Germany Democratic Rep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Ghana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2577	2134	1496	2786	3604	2295	2469	2382	
			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	
			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	
			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	
			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	
			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	
			Senegal	1084	311	201	342	319	309	0	0	0	7	0	4	0	13	288	151	83	119	383	15	217	201	341	16	22
			Sta. Lucia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Trinidad and Tobago	0	0	0	17	0	56	199	368	127	138	245	0	0	0	414	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	
			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	
			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	
			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	0	100	154	71	86	78	107
			Cape Verde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	144	84	200	189	188	428	130	271	256	268
			Curaçao	0	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	0	3	177	81	236
			EU.España	0	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	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	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	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	0	507	105	161	383	631	764	247	0	0	
			Panama	0	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	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	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	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	395	530	349	181	385	208
			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	
			Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	42	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	250
			St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	155	56	118	72	96	84	86	48
			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	407
			Suriname	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	515	
			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	13	1
			U.S.A.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	479	503	578	366	820
			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	3	4

				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
			Venezuela	0	0	0	0	0	0	0	0	0	0	0	0	0	55	0	14	16	0	0	24	0	38	40	42	29
	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	253	226	181
KGM	TOTAL	A+M		10420	13241	14691	16331	14777	14930	17782	19660	16394	17717	16161	15360	17258	15863	12830	11766	8185	17936	7344	12533	9742	10868	12762	11992	4430
	Landings		Angola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	914
			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	
			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	
			Brazil	2070	962	979	1380	1365	1328	2890	2398	3595	3595	2344	1251	2316	3311	247	202	316	33	0	0	1	1	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	0	0	**0**
			Dominica	0	0	0	0	0	0	0	0	0	36	35	2	0	0	0	0	0	0	0	0	0	0	0	0	
			Dominican Republic	33	34	47	52	0	0	0	589	288	230	226	226	226	0	0	0	0	0	0	0	0	0	0	0	
			Grenada	0	0	0	0	0	0	2	4	28	14	9	4	5	0	0	0	0	0	0	0	0	0	0	0	
			Guyana	0	0	0	0	0	0	0	270	440	398	214	239	267	390	312	245	168	326	174	91	59	75	90	99	
			Jamaica	0	0	0	0	0	0	0	0	0	0	0	0	48	0	0	0	0	0	0	0	0	0	0	0	
			Mexico	2689	2147	3014	3289	3097	3214	4661	4661	3583	4121	3688	4200	4453	4369	4564	3447	4201	3526	3113	3186	3040	3130	3090	3335	3019
			St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	9	0	0	0	
			Sta. Lucia	0	0	0	0	0	0	1	4	0	0	9	1	1	0	1	1	1	2	0	1	3	4	1	1	0
			Trinidad and Tobago	432	657	0	1192	0	471	1029	875	746	447	432	410	1457	802	578	747	661	567	1043	1001	1001	720	393	495	496
			U.S.A.	4127	8213	9344	9616	7831	7360	7058	8720	7373	6453	6780	6603	6061	6991	7129	7123	2837	13482	3013	8247	5630	6939	9187	8062	
			UK.British Virgin Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
			Venezuela	1069	1228	1308	801	2484	2558	2140	2139	340	2424	2424	2424	2424	0	0	0	0	0	0	0	0	0	0	0	
KGX	TOTAL	A+M		131	225	266	301	508	512	824	156	251	1	229	48	0	15	0	1	26	16	0	2	20	16	9	18	25
	Landings		Barbados	51	45	51	55	36	42	49	0	0	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	3	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	4	3	3
			Colombia	25	7	12	21	148	111	539	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	236	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			EU.France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	4	14	19
			EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	26	16	0	2	20	7	2	0	
			Gabon	0	0	0	0	140	145	79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Grenada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Jamaica	0	0	0	0	0	0	0	155	0	0	44	48	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	
			Puerto Rico	0	0	53	84	86	134	106	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	14	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	4
			St. Vincent and Grenadines	0	0	0	0	0	0	1	1	1	1	138	0	0	0	0	0	0	0	0	0	0	1	0	0	
			Sta. Lucia	55	79	150	141	98	80	50	0	0	0	48	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	
			Ukraine	0	94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LTA	TOTAL			15152	13086	24202	16554	14175	12829	14254	16348	17583	15391	18298	18668	19453	16713	15939	11503	9247	16878	13514	15060	18898	18606	18016	19788	10731
		ATL		12535	10771	22447	15296	12978	10934	12138	14746	14668	12515	15003	15804	16810	16029	14500	10461	7642	15191	11256	12961	16728	14938	13830	16004	8000
		MED		2617	2315	1755	1258	1197	1894	2116	1601	2914	2876	3294	2863	2643	684	1439	1042	1605	1687	2259	2100	2170	3668	4186	3784	2731
	Landings	ATL	All gears	12535	10771	22447	15296	12978	10934	12138	14746	14668	12515	15003	15804	16810	16029	14500	10172	6747	13539	9194	10911	13232	11278	10060	12376	5858
		MED		2617	2315	1755	1258	1197	1894	2116	1601	2914	2876	3294	2863	2643	684	1439	1042	1605	1687	2259	2100	2170	3668	4186	3784	2731
	Landings(FP)	ATL		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	290	894	1652	2062	2050	3496	3660	3770	3629	2141
	Landings	ATL	Angola	285	306	14	175	121	117	235	75	406	118	132	132	132	0	0	2	0	4365	0	128	1759	3455	1905	1404	10
			Argentina	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Benin	66	61	49	53	60	58	58	196	83	69	69	69	69	0	0	0	0	0	0	0	0	0	0	0	
			Brazil	685	779	935	985	1225	1059	834	507	920	930	615	615	615	0	320	280	0	0	0	0	0	22	581	301	
			Canada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Cape Verde	65	74	148	17	23	72	63	86	110	776	491	178	262	143	137	81	123	292	250	357	185	102	131	131	131
			Cuba	88	63	33	13	15	27	23	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	38	38	76	57	
			Côte D'Ivoire	2800	100	142	339	251	253	250	155	136	9	123	1	0	0	153	287	427	2159	1791	1446	1631	50	1062	1433	152
			Dominica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			EU.Bulgaria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			EU.España	55	81	1	0	0	10	55	27	110	6	2	22	8	1	489	50	16	0	38	35	136	168	71	52	112
			EU.Estonia	0	66	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	0	74	13	8	54	59	22	215	21	696	631	610	613	0	10	27	12	0	1	50	35	5	30	27	6
			EU.Germany	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			EU.Italy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			EU.Latvia	0	65	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	9	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	14	69	8	0	18	1	9	
			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	2	61	73	45	72	72	218	320	171	14	50	0	2	16	19	21	24	43	10	6	5	14	4	18	
			EU.United Kingdom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	15	23	38	0	
			Gabon	0	0	0	0	0	0	182	0	18	159	301	213	57	173	0	0	0	0	0	0	0	0	0	0	
			Germany Democratic Rep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Ghana	323	201	11608	359	994	513	113	2025	359	306	707	730	4768	8541	7060	5738	783	1335	745	1692	1465	1001	1274	1138	
			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	1
			Israel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Maroc	367	57	370	44	43	230	588	195	189	67	101	87	308	76	91	33	0	40	2	63	5	57	10	11	3

				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	
			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	
			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	
			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	
			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	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	33	178	182	179	0	183	188	193	191	384	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	
			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	
			Sta. Lucia	0	0	0	0	0	0	0	2	2	2	0	1	10	1	0	0	1	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	
			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	
			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	
			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	
			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	
			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	
			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	
			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	
			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	0	810	800	803	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	
	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
			Cape Verde	0	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	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	0	3	162	56	12
			EU.España	0	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	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	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	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	0	18	139	306	364	262	516	530	0	0	
			Panama	0	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	A+M		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	
			Côte D'Ivoire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	66	0	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	
			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	
			Gabon	0	0	0	0	0	0	0	0	85	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	
			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	
			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	
			S. Tomé e Príncipe	6	5	3	5	6	6	8	7	8	5	6	6	6	6	21	12	13	0	91	94	96	95	191	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	
			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	
SSM	TOTAL	A+M		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	
			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	
			Dominica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Dominican Republic	1290	728	735	739	1330	2042	2042	231	191	125	158	158	158	0	0	0	0	0	0	0	0	0	0	0	
			EU.France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	
			EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Gabon	0	0	0	0	0	0	0	0	0	0	0	0	265	0	0	0	0	0	0	0	0	0	0	0	
			Grenada	3	0	0	1	2	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	
			Mexico	8194	8360	9181	10066	8300	7673	11050	11050	5483	6431	4168	3701	4350	5242	3641	5723	3856	3955	4155	4251	4128	4026	3321	3581	3857
			Sta. Lucia	0	0	0	0	0	0	0	0	0	0	0	1	27	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
		Trinidad and Tobago	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		U.S.A.	2554	5655	5663	5143	4380	3363	2866	3509	2968	3282	3893	4524	4613	4552	4477	4747	2425	2147	1746	1946	1846	1896	1864	1877	
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	
	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	
		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	
		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	
		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
		Cape 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
		Curaçao	280	250	260	270	250	230	230	230	230	230	230	230	230	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	
		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	
		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	0	1	0	4	0	0	46
		EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	0	4	3	9	8	10	2	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	
		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	
		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	
		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	
		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	
		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	0	148	155
		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	
		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	
		Cape 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	
		Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	7	31	57	23	78	9	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	3	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	
		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	
		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	
		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	
	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	104	108	86

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

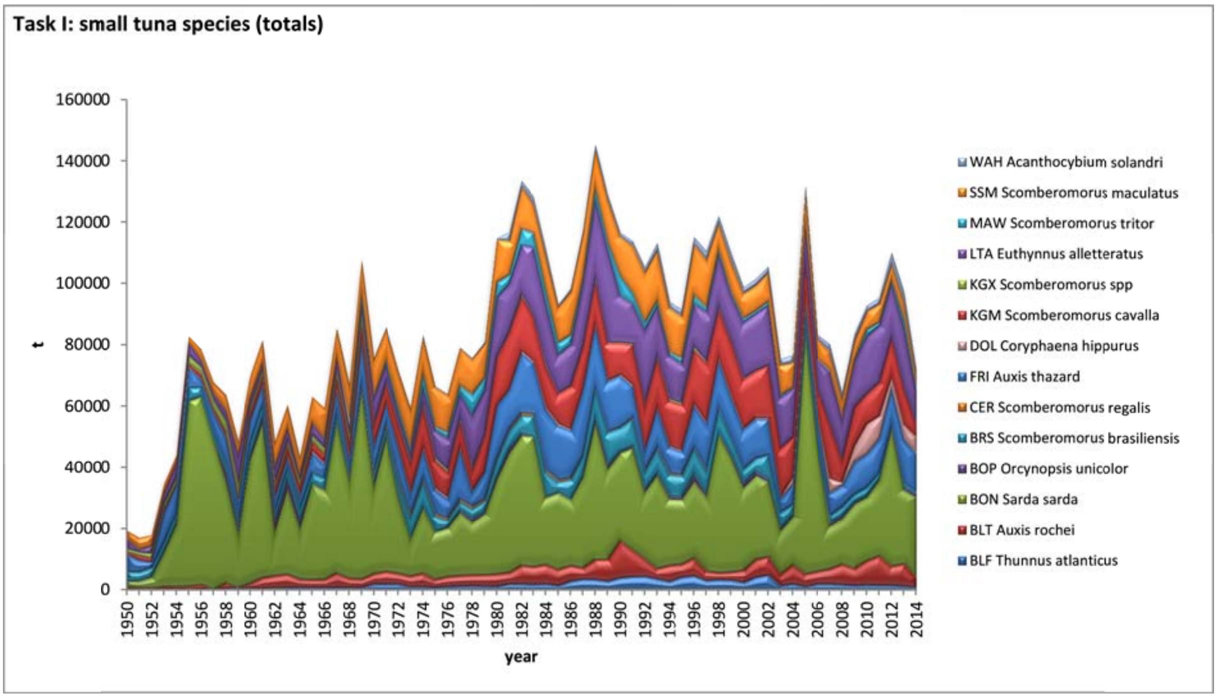
SMT-Table 2. Risk of the small tunas species caught by tuna longline fisheries in the Atlantic Ocean.

Species	**Risk**
Scomberomorus cavalla	High
Acanthocybium solandri	High
Scomberomorus brasiliensis	High
Euthynnus alletteratus	Moderate
Auxis thazard	Moderate
Auxis rochei	Moderate
Sarda sarda	Moderate
Thunnus atlanticus	Low
Scomberomorus regalis	Low

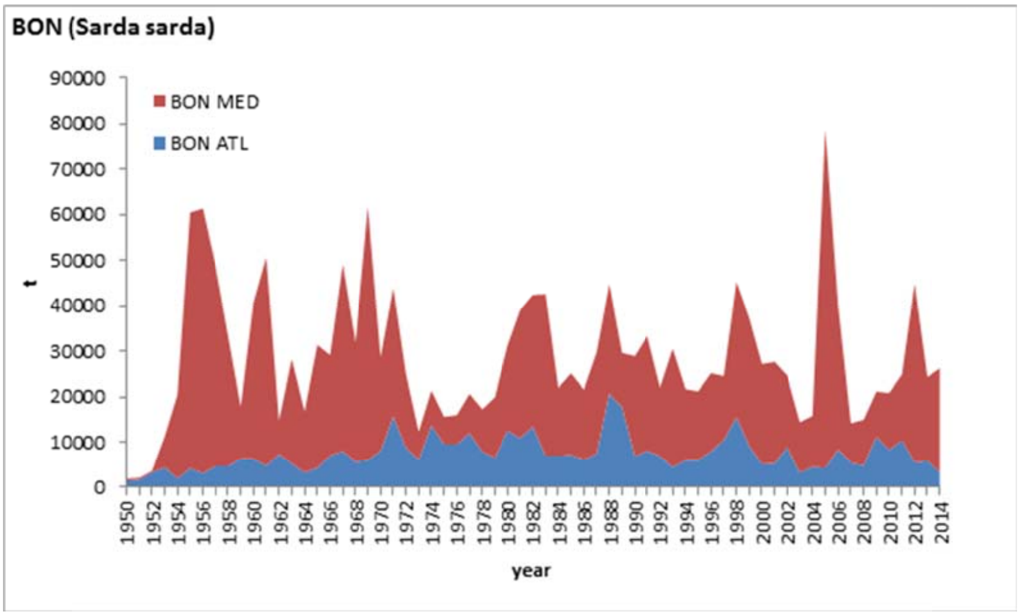
SMT-Table 3. Summary of life-history parameters currently available for the small tunas for the 5 major areas: North and South Atlantic Ocean (both Eastern and Western) and the Mediterranean Sea.

ZONES	NORTHEAST ATLANTIC		SOUTHEAST ATLANTIC		NORTHWEST ATLANTIC		SOUTHWEST ATLANTIC		MEDITERRANEAN	
Species/Paramenter	Growth Parameters	Reproduction parameter	Growth Parameters	Reproduction parameter	Growth Parameters	Reproduction parameter	Growth Parameters	Reproduction parameter	Growth Parameters	Reproduction parameter
LTA	Yellow	Yellow	Yellow	Yellow	Red	Red	Red	Red	Yellow	Yellow
FRI	Yellow	Red	Yellow	Red	Red	Red	Red	Red	Yellow	Red
BLT	Yellow	Red	Red	Red	Red	Red	Red	Red	Yellow	Red
SSM	Red	Red	Red	Red	Yellow	Yellow	Red	Red	Red	Red
MAW	Red	Yellow	Yellow	Red	Red	Red	Red	Red	Red	Yellow
BON	Yellow	Red	Yellow	Red	Red	Red	Yellow	Red	Yellow	Yellow
WAH	Yellow	Red	Red	Red	Yellow	Yellow	Red	Yellow	Red	Yellow
BRS	Red	Red	Red	Red	Red	Red	Yellow	Yellow	Red	Red
BLF	Red	Red	Red	Red	Yellow	Yellow	Yellow	Yellow	Red	Red
KGM	Red	Red	Red	Red	Yellow	Yellow	Yellow	Yellow	Red	Red

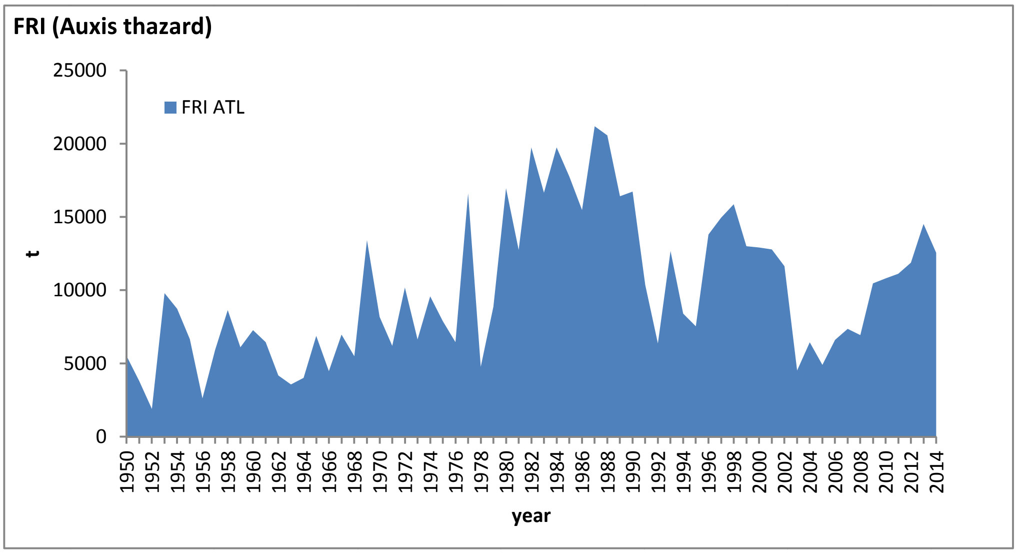
Yellow: Data available but needed to be update
Red: No existing data



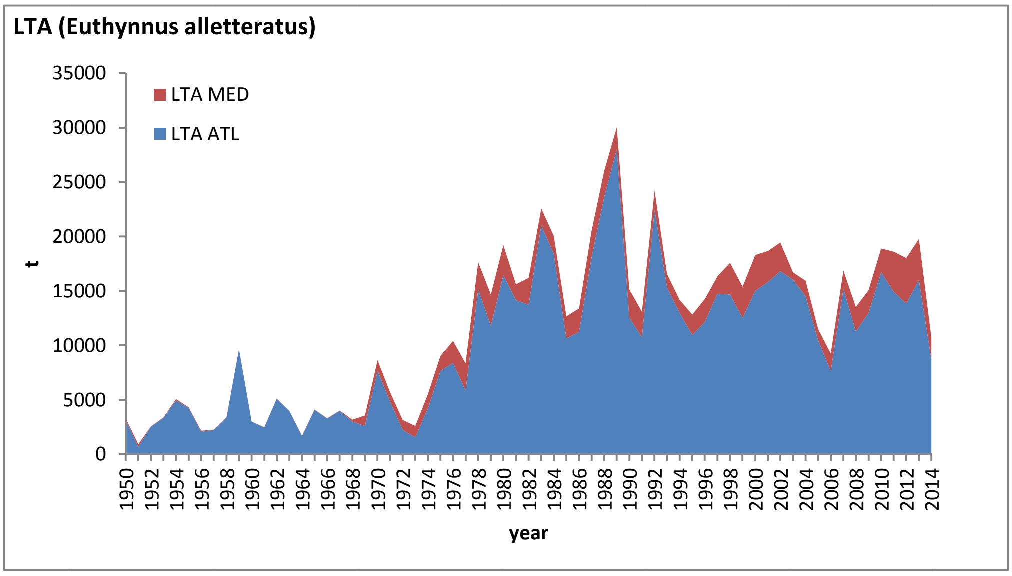
SMT-Figure 1. Estimated landings (t) of small tunas (combined) in the Atlantic and Mediterranean, 1950-2014. The data for the last three years are incomplete.



a)

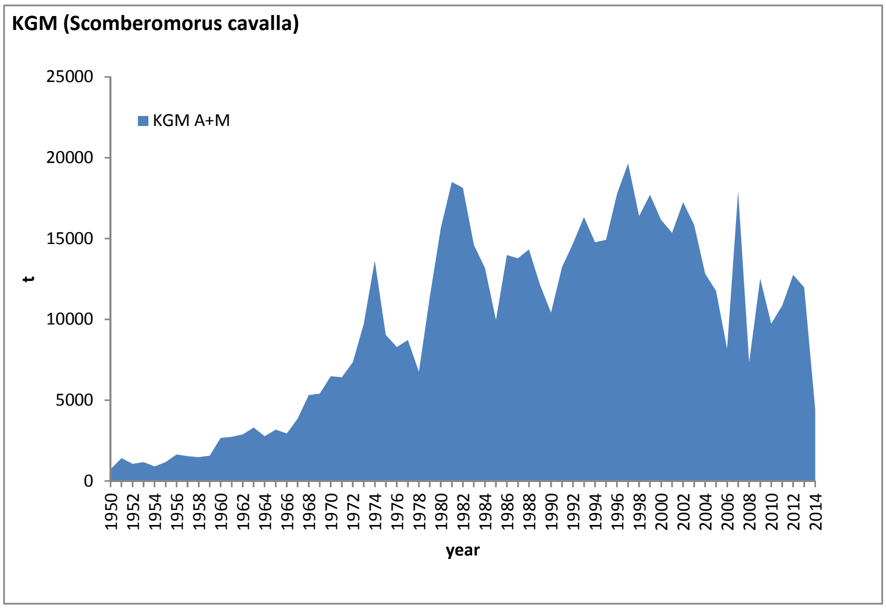


b)



c)

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.



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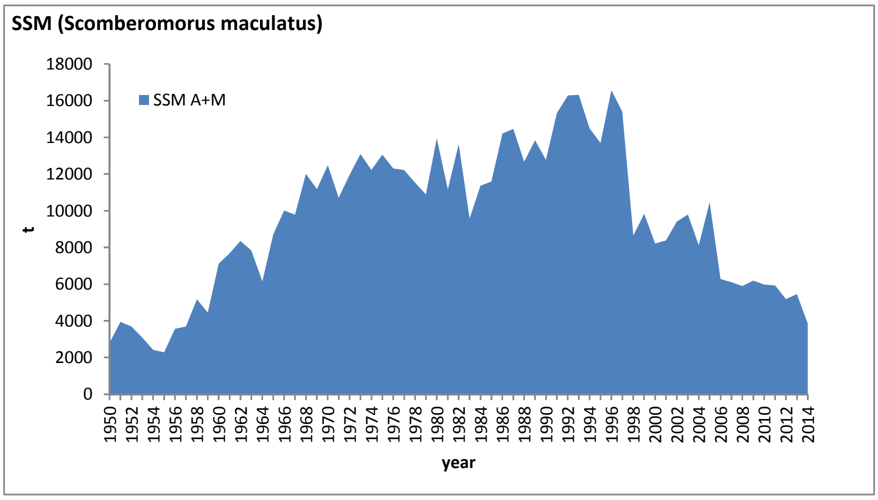
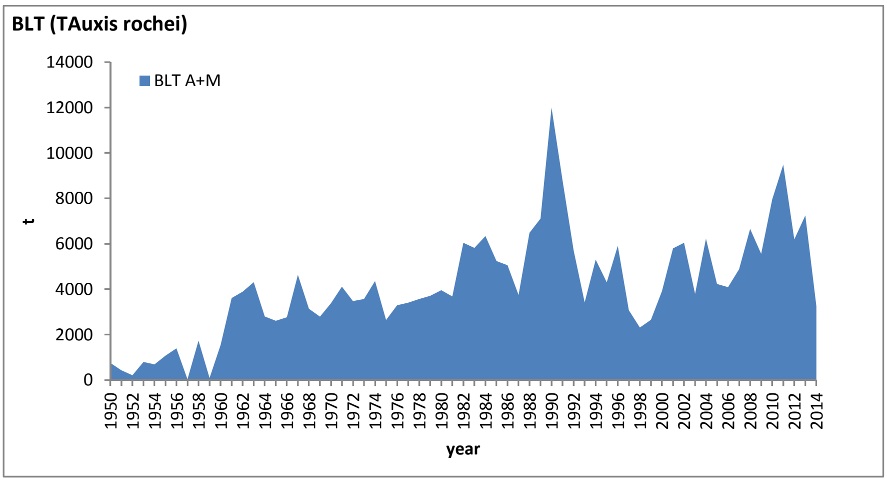
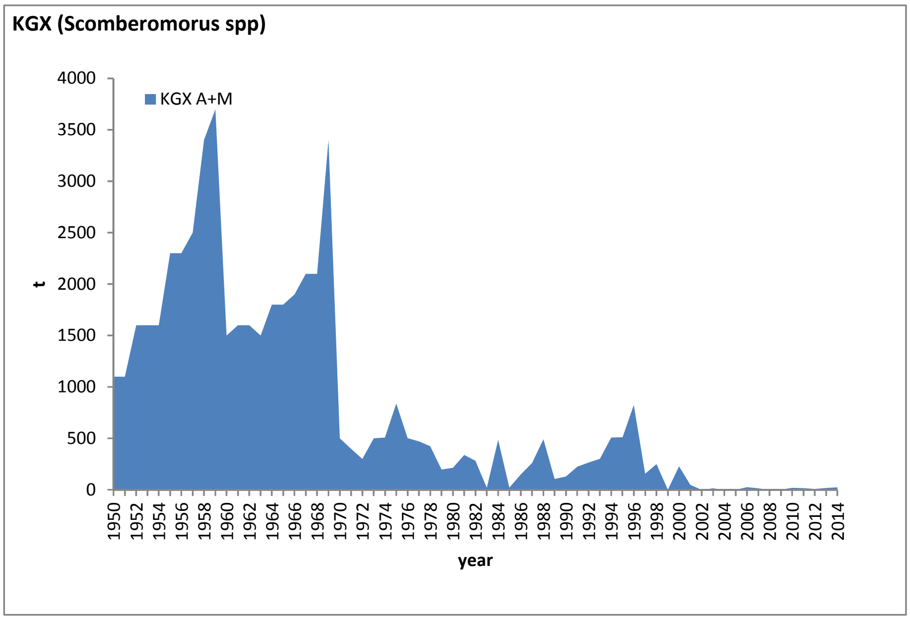


e)

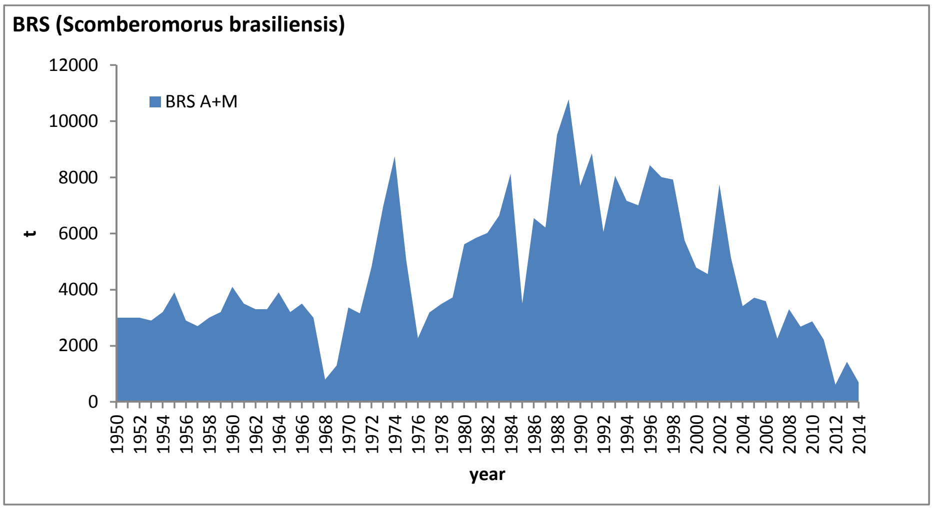


f)

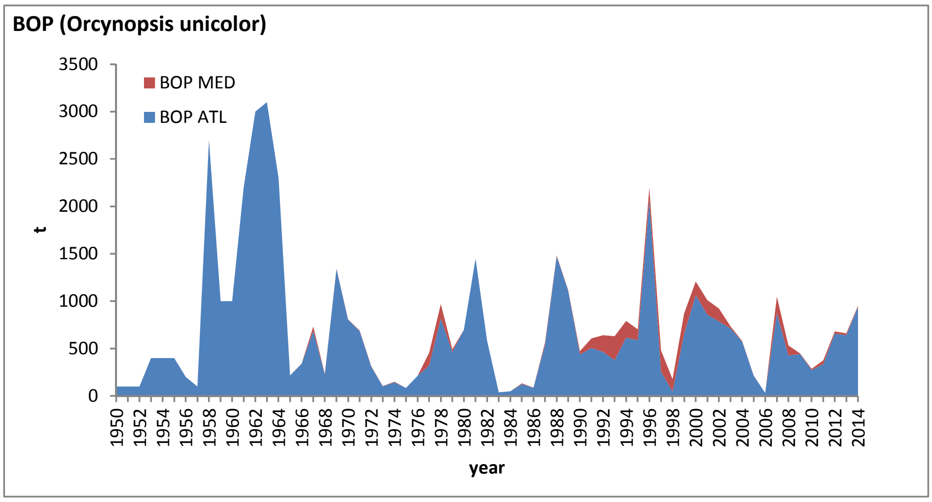
SMT-Figure 2. Estimated landings (t) of the major species of small tunas in the Atlantic and Mediterranean, 1950-2014. The data for the last years are incomplete.



g)

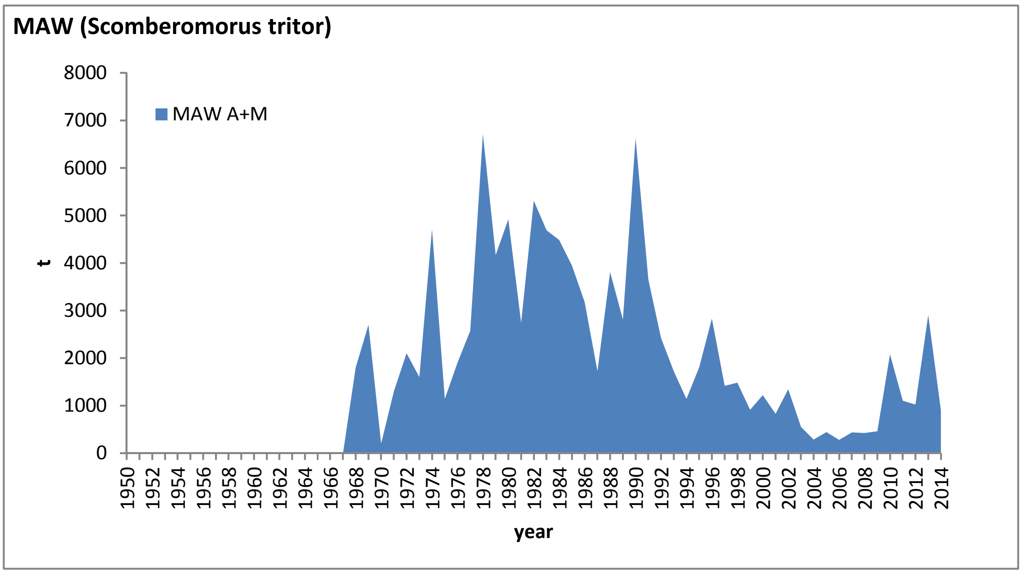


h)

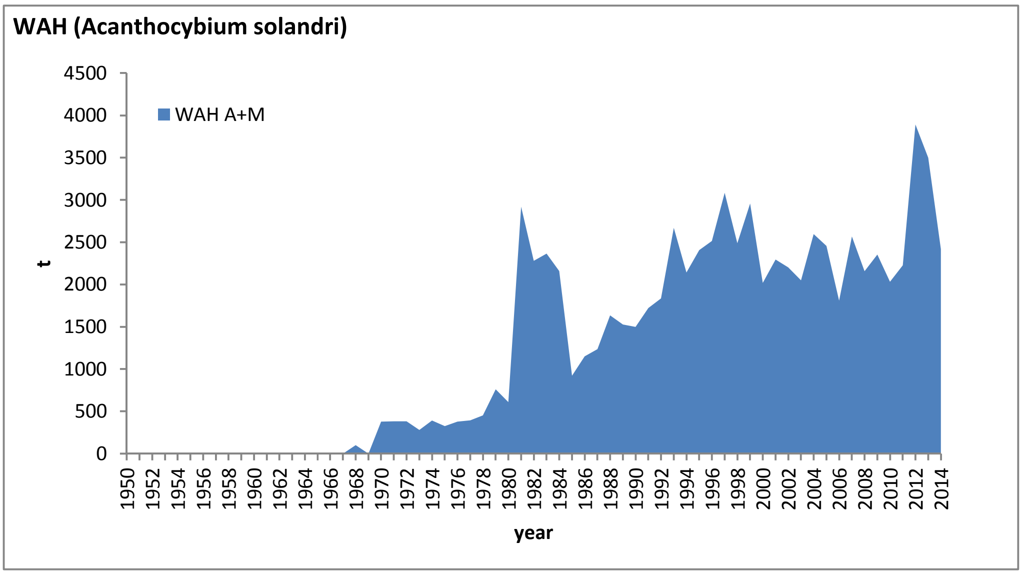


i)

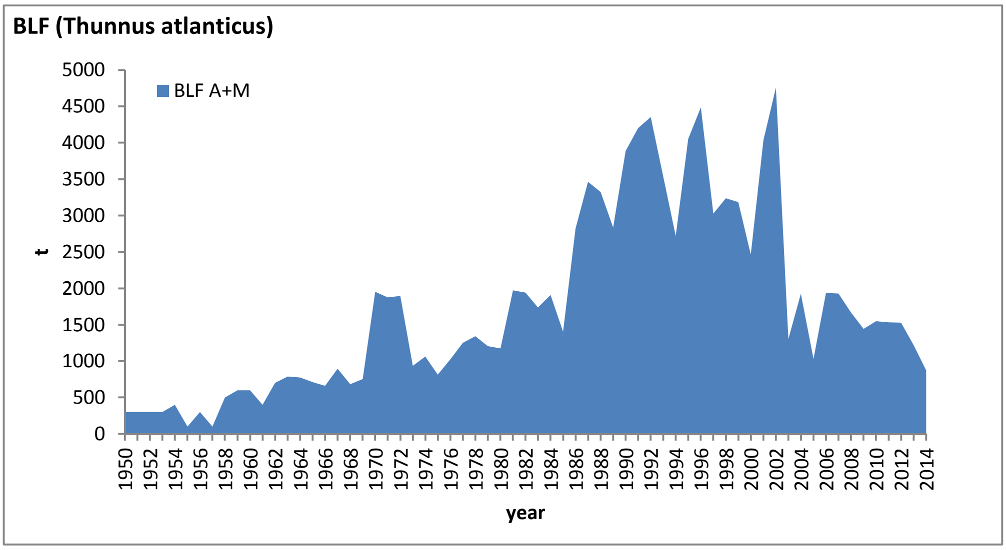
SMT-Figure 2. Estimated landings (t) of the major species of small tunas in the Atlantic and Mediterranean, 1950-2014. The data for the last years are incomplete.



j)



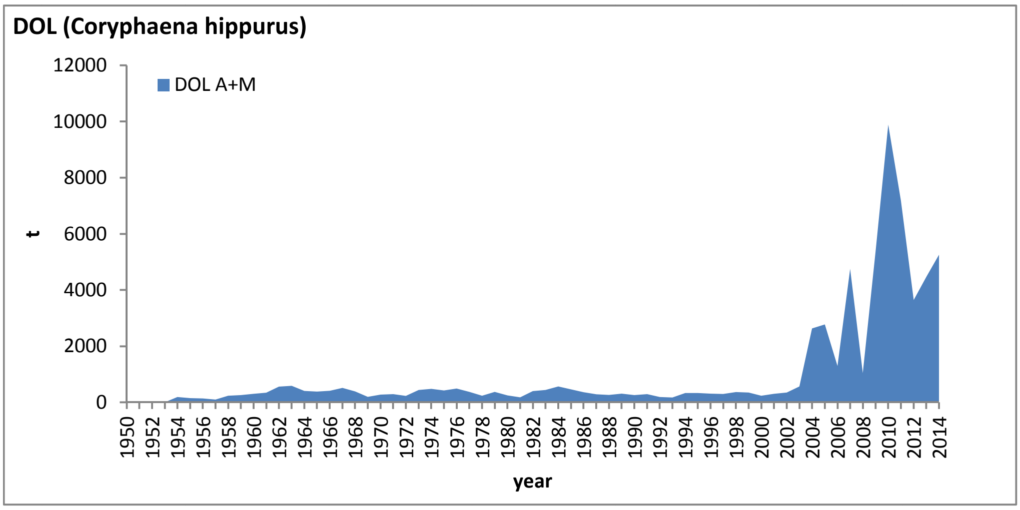
k)



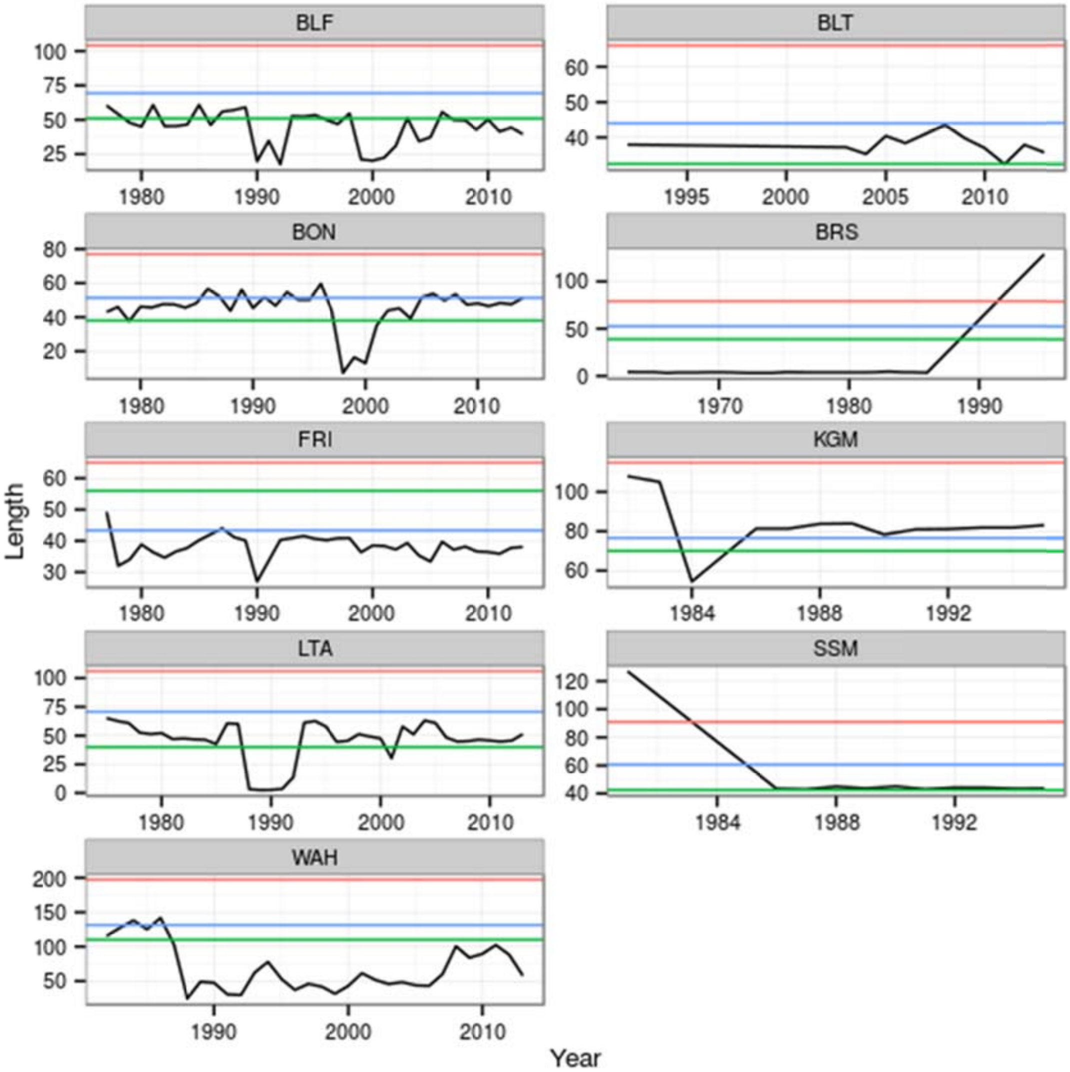
l)

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.

m)



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. 2013c), 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. 2009c). An Ecological Risk Assessment had also been conducted for 16 shark species (20 stocks), which is detailed in the 2012 report of the Sharks Working Group.

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), US 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 finals years of each series (since the 2008 stock assessment) for both North and South stocks, hence the indications of potential overfishing shown in the previous stock assessment have diminished and the 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[2]
2013 Yield		36,748 t[1]
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]
Overfished 2013 (Yes/No)		Not likely [6]
Overfishing 2013 (Yes/No)		Not likely [6]

1 Estimated catch used in the 2015 assessments.
2 Task I catch.
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[2]
2013 Yield		20,799 t[1]
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]
Overfished 2013 (Yes/No)		Undetermined[4]
Overfishing 2013 (Yes/No)		Undetermined[4]

1 Estimated catch used in the 2015 assessments.
2 Task I catch.
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 SHORTFIN 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]
Overfished 2010 (Yes/No)		No[3]
Overfishing 2010 (Yes/No)		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]
Overfished 2010 (Yes/No)		No[3]
Overfishing 2010 (Yes/No)		No[3]
Management Measures in Effect		[Rec. 04-10], [Rec. 07-06], [Rec. 10-06]

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

NORTHWEST ATLANTIC PORBEAGLE SUMMARY

Current Yield (2008)		144.3 t[1]
Relative Biomass	B_{2008}/B_{MSY}	0.43-0.65[2]
Relative Fishing Mortality	F_{MSY}	0.025-0.075[3]
	F_{2008}/F_{MSY}	0.03-0.36[4]
Domestic Management Measures in Effect		TACs of 185 t and 11.3 t[5]
Overfished (Yes/No)		Yes
Overfishing (Yes/No)		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]
Overfished (Yes/No)		Yes
Overfishing (Yes/No)		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]
Overfished (Yes/No)		Yes
Overfishing (Yes/No)		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	
	ATS	Longline	0	0	0	0	0	0	7	5	4	1	0	0	0	0	0	0	0	60	14	0	0	4	132	132	114
		Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Landings	ATN	Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	
		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
		Cape Verde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		China 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	0	66	31	66	11	2	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	
		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	0	12	0	0	1	0	12	9	6	4	6	5	3	6	6	96	8	10	8	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	0	1	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	
		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	
		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	0	239	0	0	14	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	0	0	0	0	0	0	0	0	0	0	2213	2316	1906	6616	3536	3419	1829	207	2352	2957	1439	1147	2471
		Panama	0	0	0	0	0	0	0	0	0	168	22	0	0	0	0	0	0	0	521	0	0	0	0	0	
		Russian Federation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	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	203	51	60	
		South Africa	0	0	0	0	0	0	0	0	23	21	0	83	63	232	128	154	90	82	126	119	125	318	158	179	524

			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	
		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	
		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	0	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	
		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	
		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	
		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	

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	
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	
	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	
		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	0	15	2	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	0	2	3	2	1	1	1	0	0	0	1	15	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	
		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	
		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	
		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	0	5	0	0	11	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	0	10	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	
		Russian Federation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Senegal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	34	23	
		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	
		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	
		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	0	0	0	0	0	0	0	0	0	0	52	12	13	1	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
	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	
		EU.Portugal	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**
		Maroc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Discards	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	
		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	
	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	
		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.

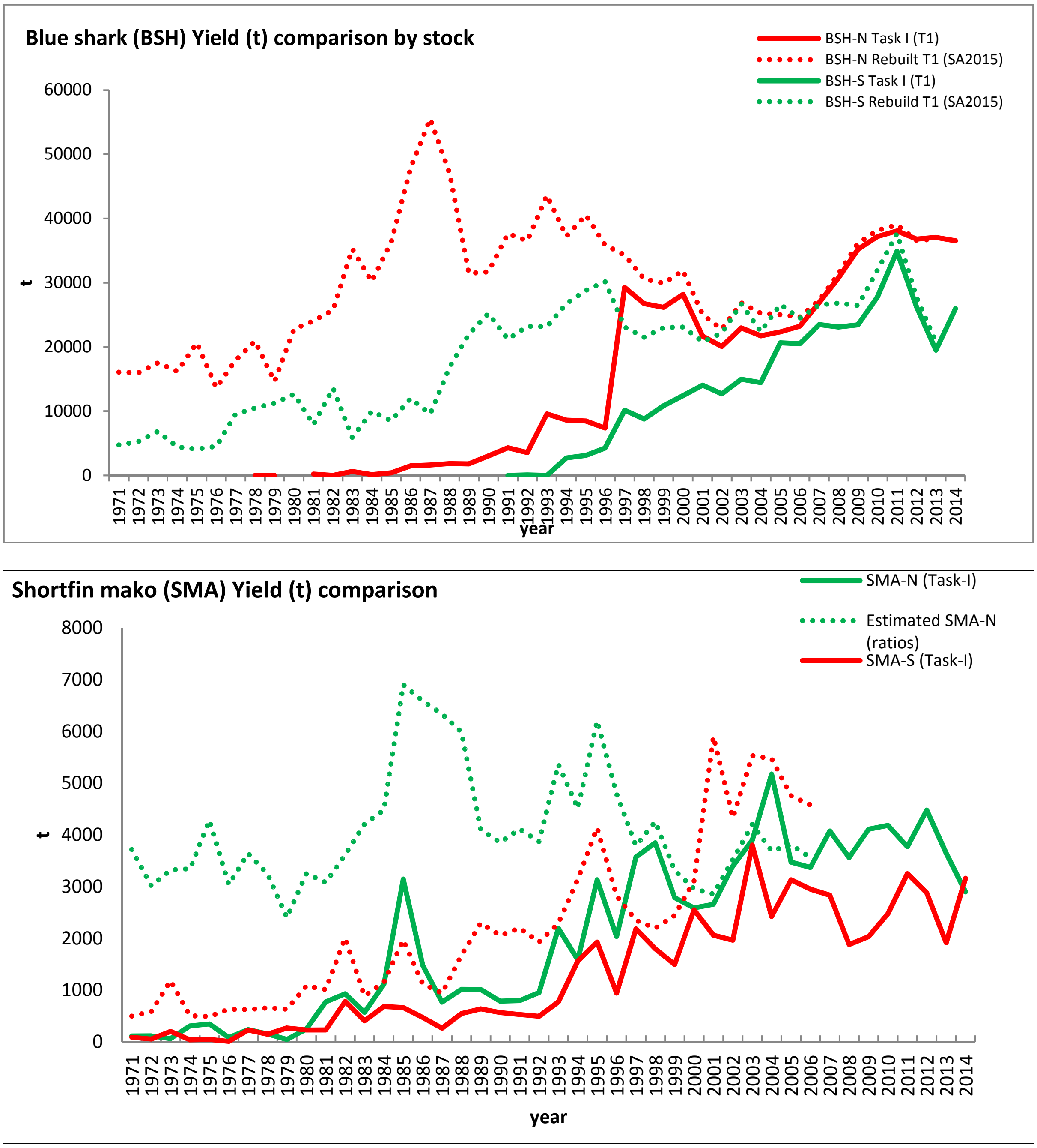
POR-Table 1. Estimated catches (t) of porbeagle (*Lamna nasus*) by area, gear and flag. (v2, 2015-09-25)

			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	
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	
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	
		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	
		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	
		EU.Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		EU.Portugal	2	1	0	0	0	0	0	0	0	0	7	4	10	101	50	14	6	0	3	17	7	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	
		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	
		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	
		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	
		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	
		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	
		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	
		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	
		EU.España	0	0	0	0	0	0	0	2	2	2	7	1	2	9	4	0	3	5	4	13	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	
		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	
		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	
		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	
		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	25
		Guinea Ecuatorial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Japan	0	0	0	1	0	0	3	14	0	1	0	0	0	0	0	0	0	5	41	34	8	7	25	15	13
		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	
		Seychelles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Uruguay	0	0	0	0	0	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	0	2	1	1	0	2	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	
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	
		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**

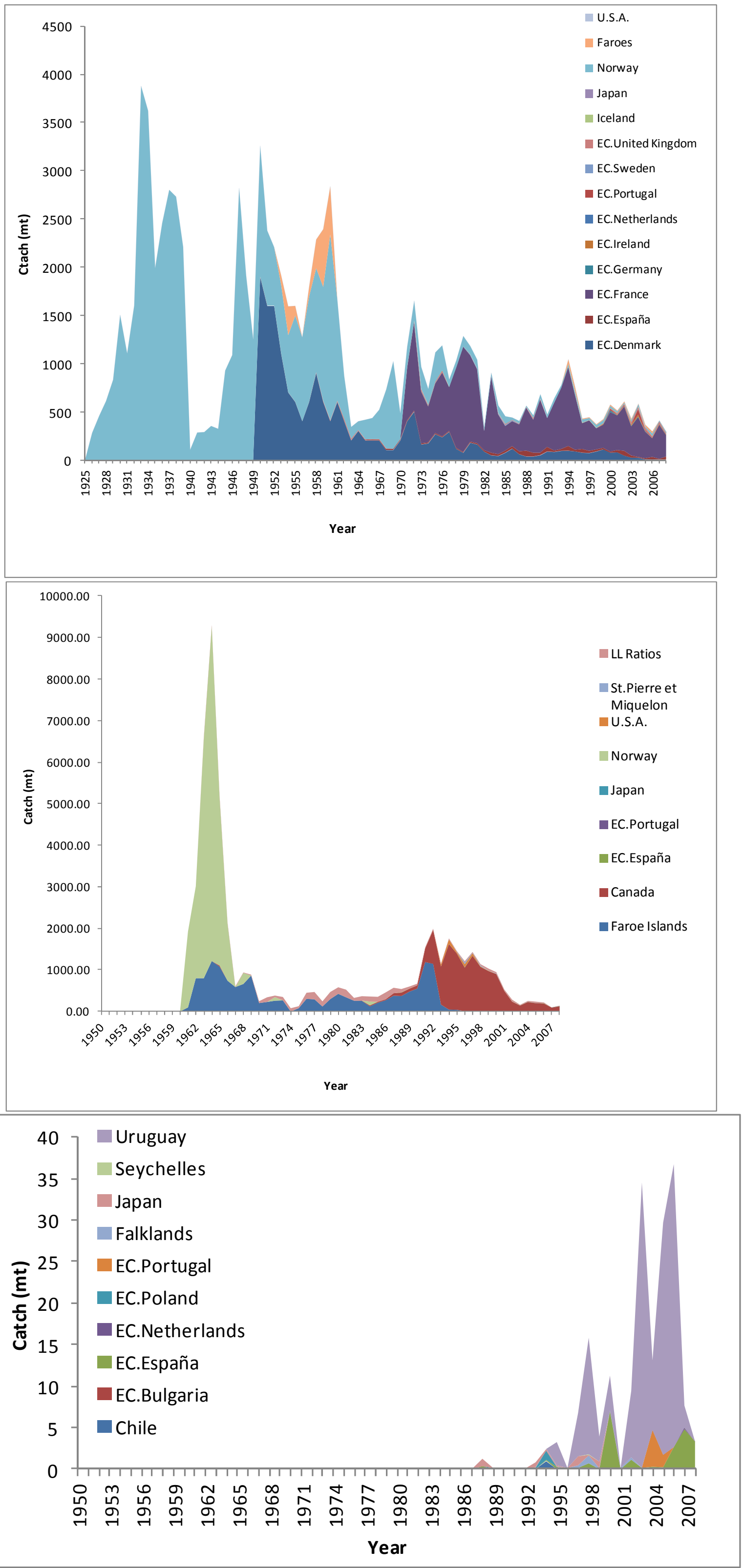
1. Brazilian Task I catches from 2012 to 2014 are preliminary and under revision.

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

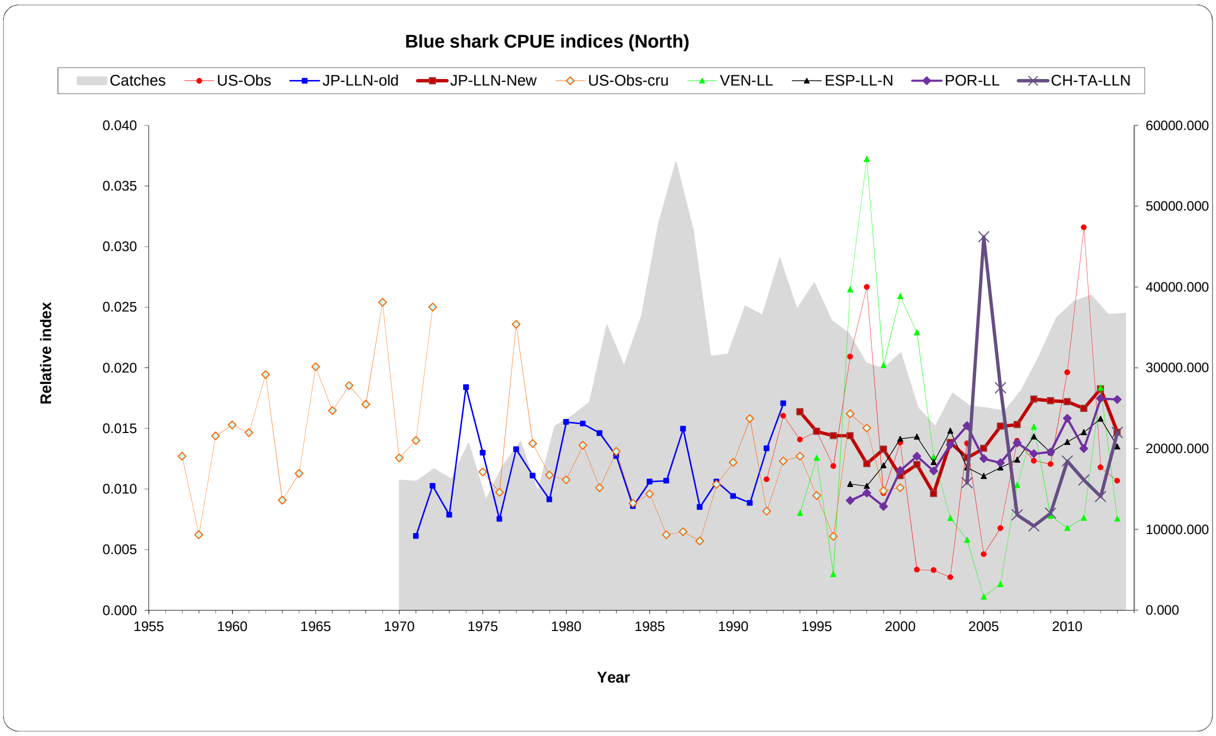
Stock	v_1	v_2	v_3
BTH	3	1	1
LMA	5	3	2
SMA	1	8	2
POR	2	7	4
CCS	11	4	5
FAL SA	12	5	6
CCP	15	2	6
OCS	4	13	8
FAL NA	8	11	8
ALV	9	14	11
BSH NA	6	19	10
DUS	17	6	12
SPK	14	10	13
BSH SA	7	20	14
TIG	10	16	15
PLS SA	18	9	16
SPL NA	16	12	16
SPZ	13	17	18
SPL SA	19	15	19
PLS NA	20	18	20

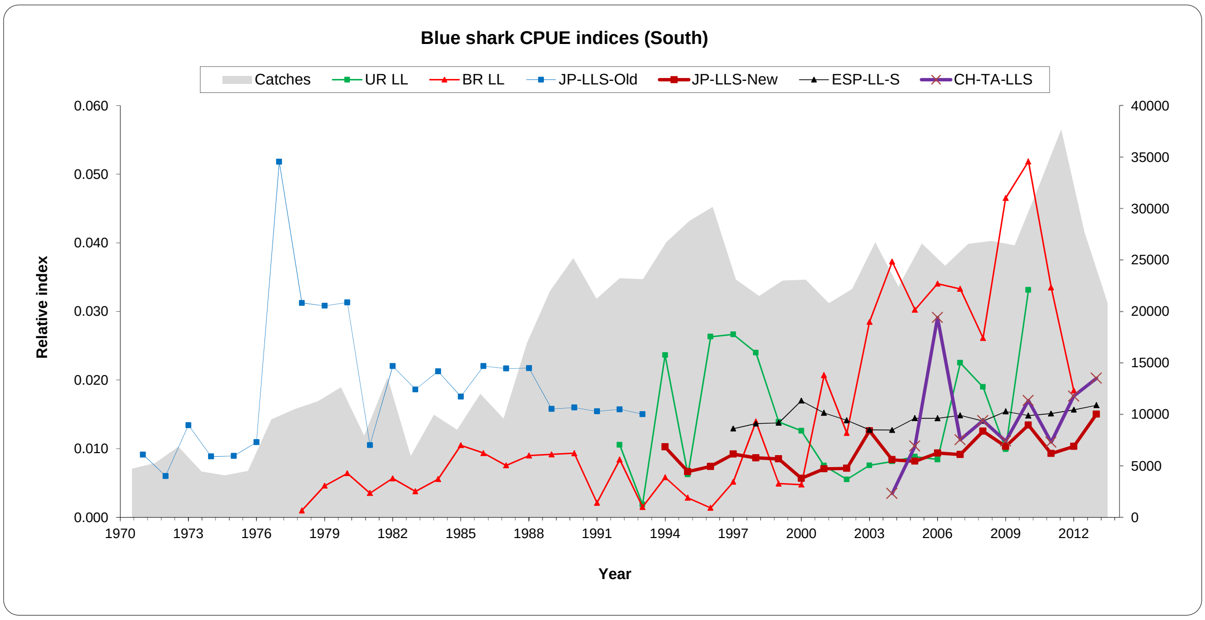


SHK-Figure 1. Blue shark (BSH) and shortfin mako (SMA) catches reported to ICCAT (Task I) and estimated by the Committee (2014 landings are considered provisional).

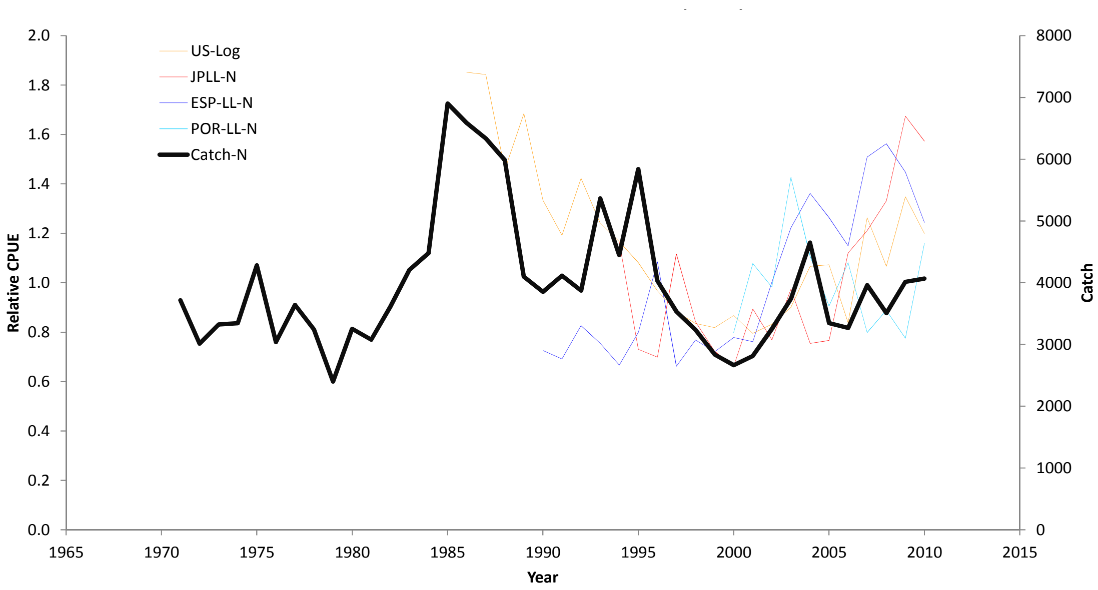


SHK Figure 2. Catch by flag of porbeagle sharks from the northeast Atlantic (top), northwest Atlantic (middle), and southwest Atlantic (bottom) used in the assessment. While these catches are considered the best available, NE catches are believed to underestimate the pelagic longline catches for this 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.

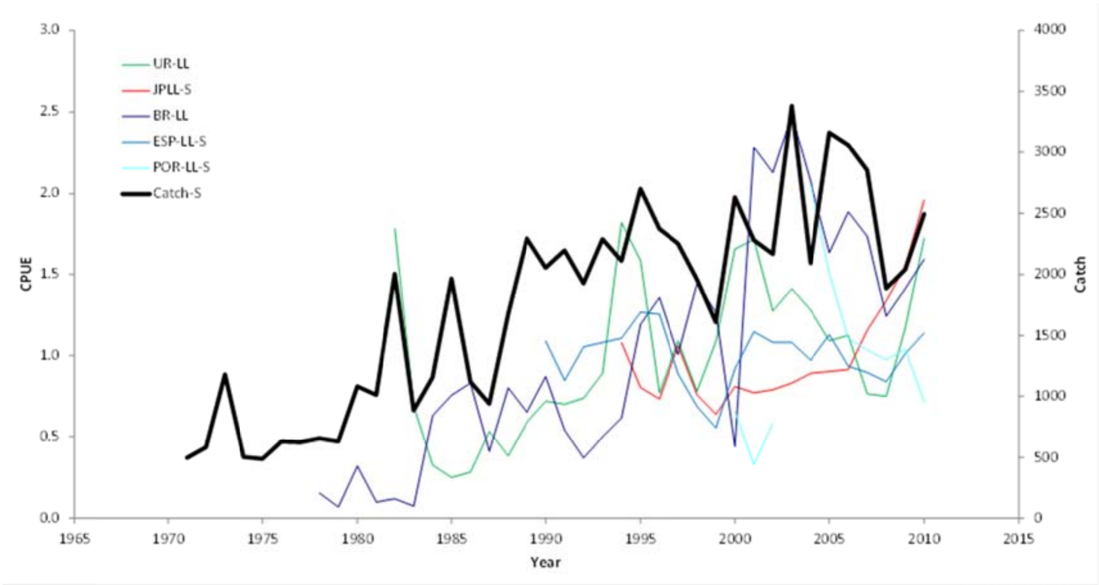




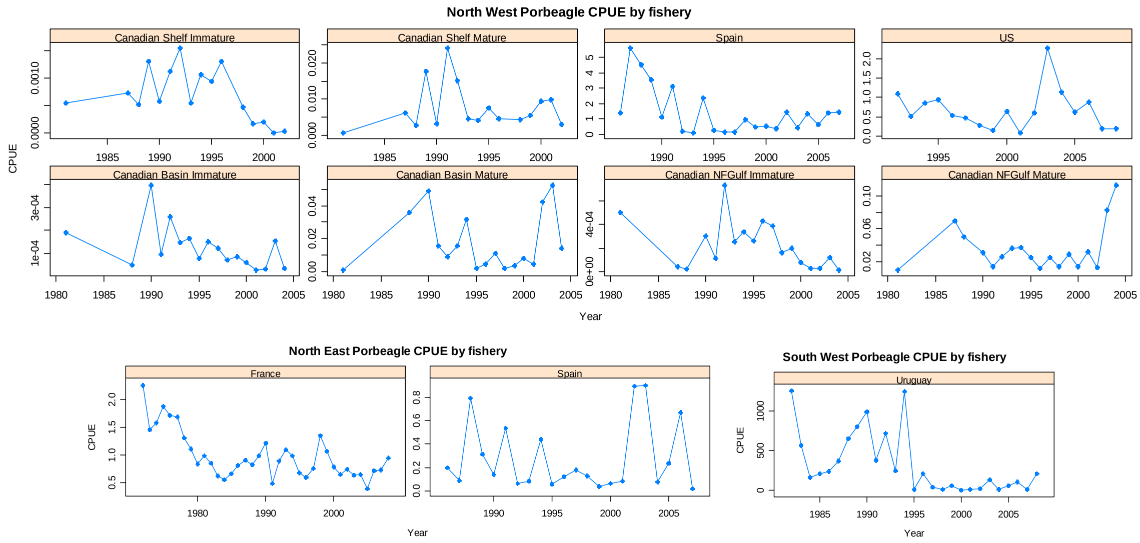
SHK-Figure 3. CPUE series used in the assessments of North and South Atlantic blue shark (BSH) stocks. Total catches used in the assessments are also shown.



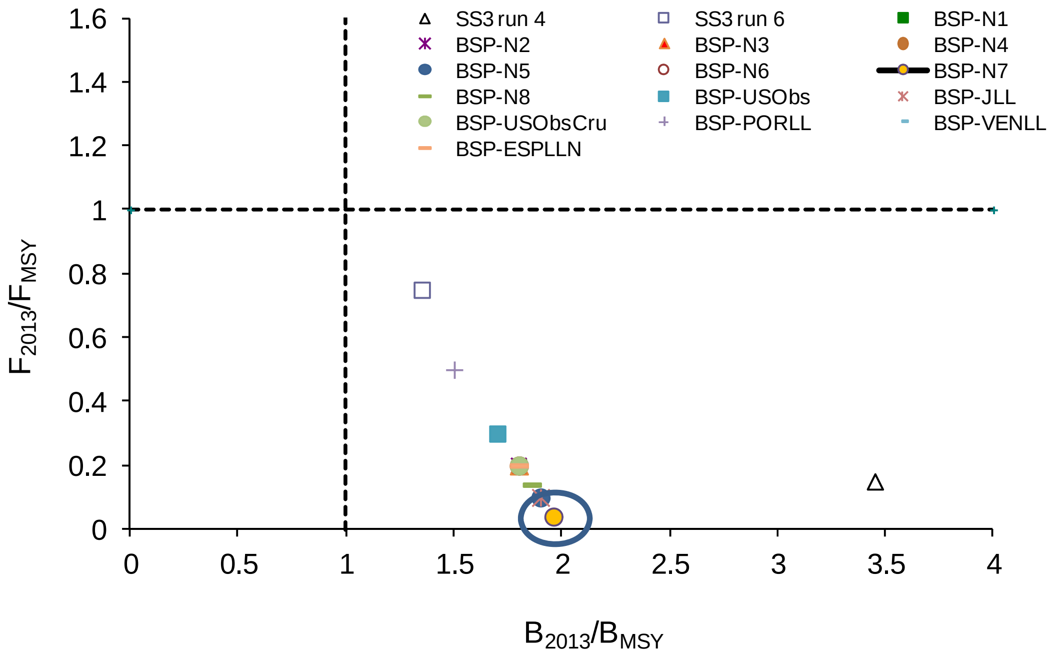
SHK-Figure 4. Indices of abundance for North Atlantic shortfin mako shark, along with total catches input into the BSP model.



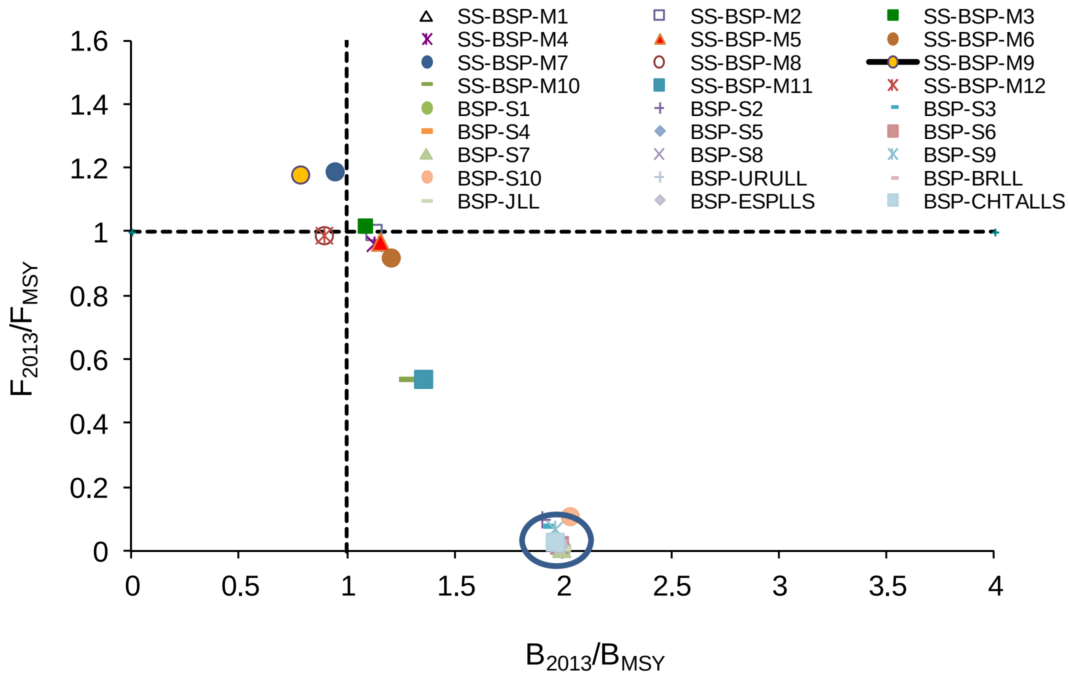
SHK-Figure 5. South Atlantic shortfin mako catches and indices of abundance input to the BSP model.



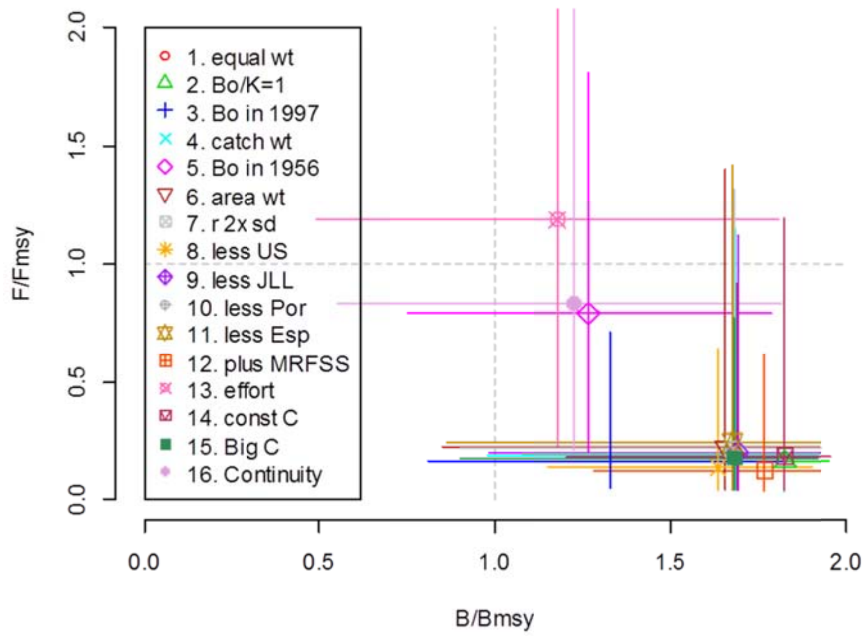
SHK-Figure 6. CPUE series for the porbeagle used in the last assessment NW stock (upper figures), NE stock (lower left figures) and SW stock (lower right figure).



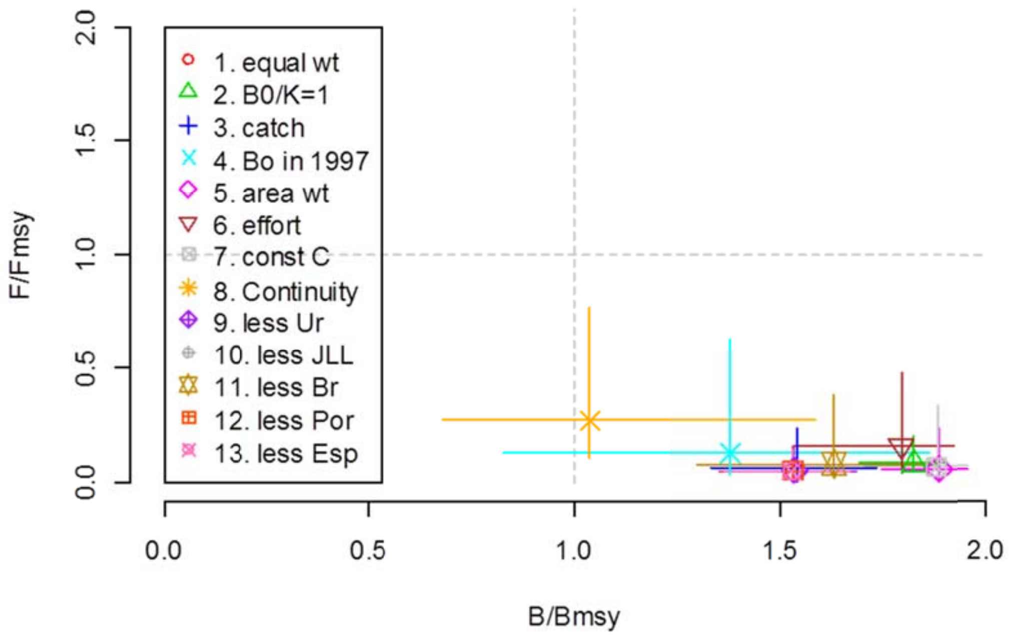
SHK-Figure 7. Phase plots summarizing scenario outputs for the current (for 2013) stock status of North Atlantic blue shark (BSH). BSP=Bayesian surplus production model; SS3=Stock synthesis model. The circle denotes common status for several BSP runs. Note that the x-axis values for SS3 are SSF_{2013}/SSF_{MSY}.



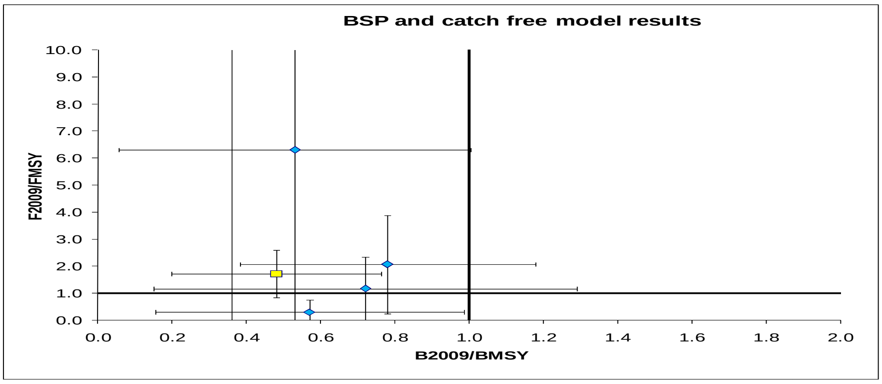
SHK-Figure 8. Phase plots summarizing scenario outputs for the current (for 2013) stock status of South Atlantic blue shark (BSH). BSP=Bayesian surplus production model; SS-BSP=State-space Bayesian surplus production model. The circle denotes common status for several BSP runs.



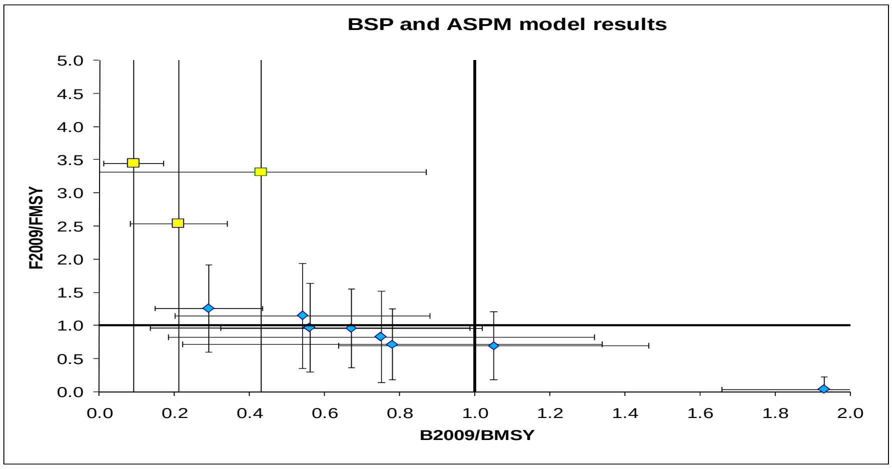
SHK-Figure 9. For North Atlantic shortfin mako sharks, median biomass relative to B_{MSY} and median fishing mortality rate relative to F_{MSY}, with 80% credibility intervals, from BSP model.



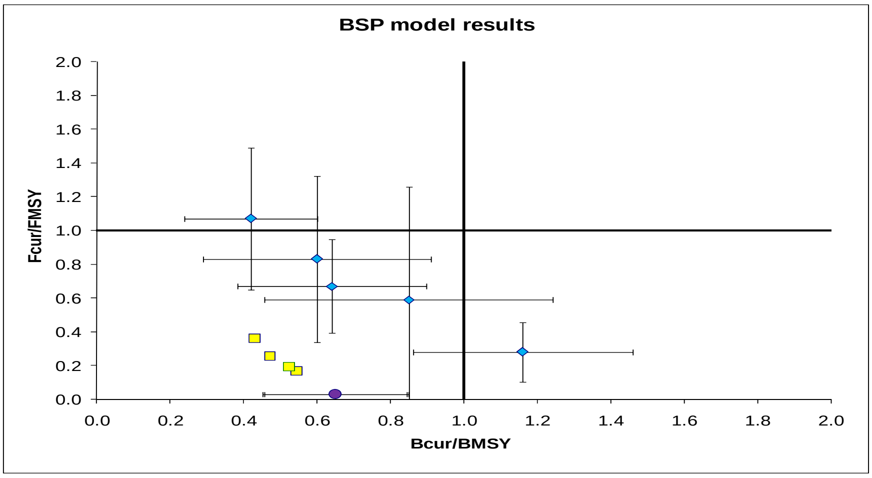
SHK-Figure 10. For South Atlantic shortfin mako sharks, median biomass relative to B_{MSY} and fishing mortality rate relative to F_{MSY}, with 80% credibility intervals.



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 N2009/N1961 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 1512 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 SCRS in 2013 and 2014; additional recovered data will be presented to 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 participations 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 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 be 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 compliment 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 securement 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 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 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	*Effectiveness of existent Recommendations and Resolutions for improving data bases*					
1.1.2	*Collaborating with other tuna RFMOs and research institutes*	(a), (b)				
1.1.3	*Refining protocols for data collection and species identification for target species and bycatch*					
1.1.4	*Designing and conduct data evaluation meetings on a regular basis,*					
1.1.5	*Investing in capacity building and cooperation*	(c), (d), (e)				
1.2	Improve resolution and precision of total catch composition					
1.2.1	*Demonstrating through simulation modelling, improvement in precision of estimates of exploitation*					
1.2.2	*Pursuing broad-based application of electronic monitoring systems*					
1.2.3	*Utilising VMS data for all tuna fisheries for which VMS is required*					
1.2.4	*Compiling comprehensive data on FADs and on fishing operations*	(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	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						
																	WGSAM																				
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			
										YFT DATA PREP							FADs																				
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	
										SC-ECOSYSTEMS + SMT																					SHARKS						
																																		ALBACORE			
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					
			ALBACORE																												SAILFISH						
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			
					SAILFISH ASS																										YFT ASSESSMENT						
Jul							1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
																															BFT DATA PREP						
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		
																															SPECIES GROUPS						
Oct	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31						
			SCRS PLENARY																																		
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 long term 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 SCRS/2014/043. 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 popup 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.

Proponent Working Group / Sub-committee	*Description of project*	*Budget[1]*		*Priority[2]*		*Source of funds[3]*
		2016	*2017*	*2016*	*2017*	
			Statistics and Secretariat			
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
Subtotal Statistics and Secretariat		114,507.14				
			Stock assessment and data preparatory meetings			
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
Subtotal assessments		46,000.00	10,000.00			
			Research in support of assessments			
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 popup 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
Subtotal research		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 data base.

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 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. 1º 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 hyppurus*) 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^ox1^o) 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^ox5^o 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.

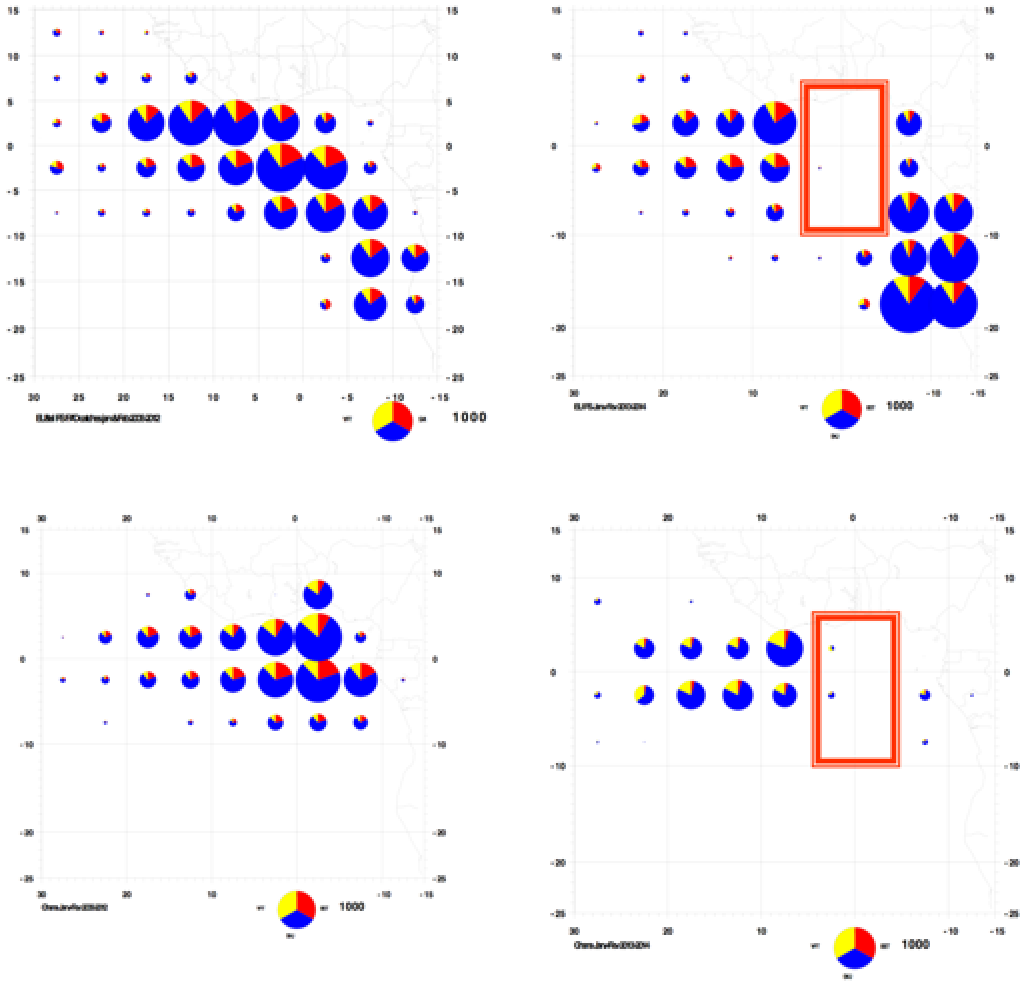


Figure 19.1.1. Spatial distribution of catches by species made by European and Associated purse seine fleet fishing on FADs (upper row panels) and Ghanaian purse seine and baitboat fleets (lower row panels) during January and February for the seven years prior to the time-area closure in Rec. 14-01 (left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

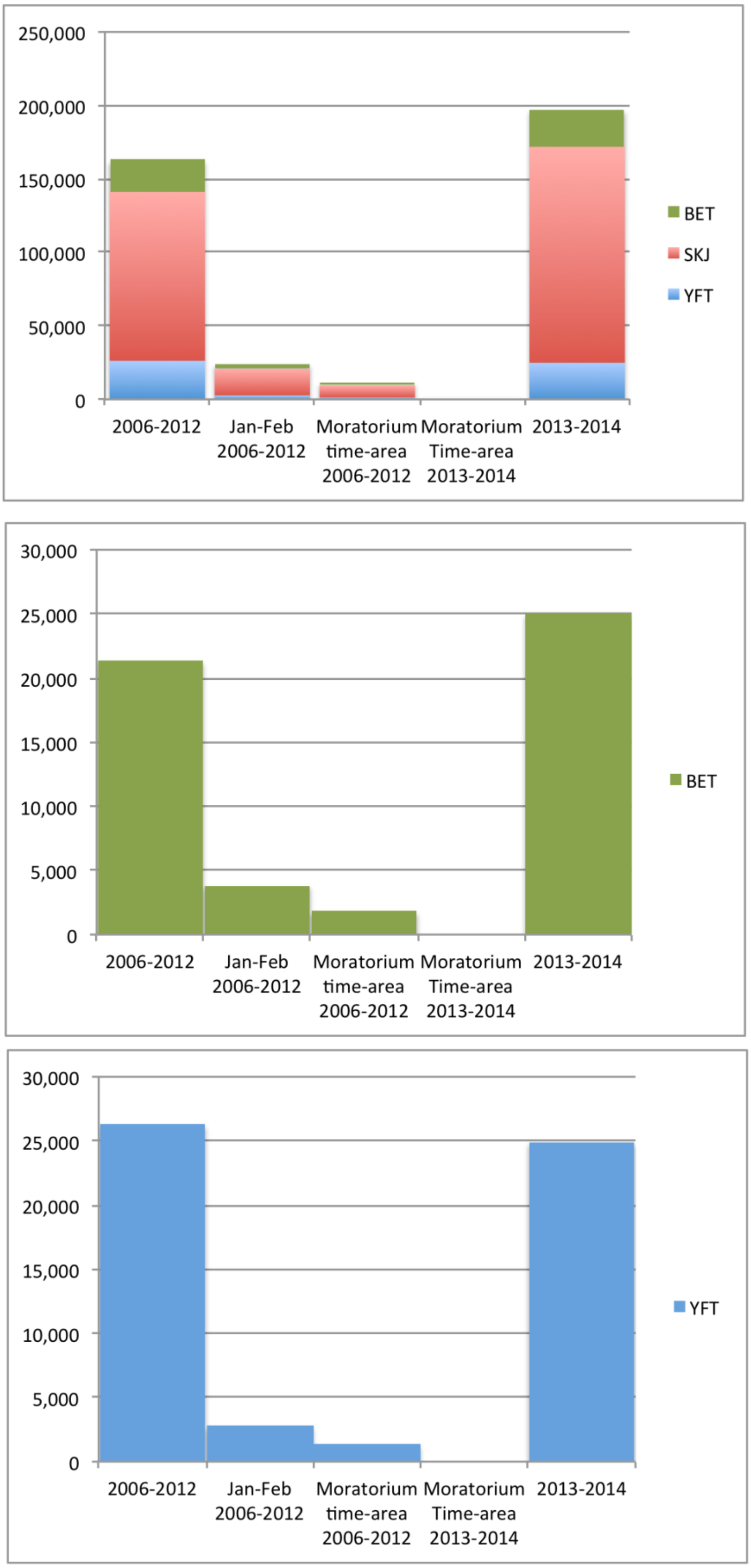


Figure 19.1.2. Average annual catches of yellowfin, bigeye and skipjack made in the times and areas indicated by the EU and Associated purse seine FAD and Ghana purse seine and baitboat fisheries.

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:

CPC	*Longliners*	*Purse seiners*
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 bait oats 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 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 stereoscopical 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 stereoscopical 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 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. 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 gill net 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:

Area	*General Criteria*	*Detailed Criteria*	*Changes compared to 2007 criteria*
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 Xiphioidei 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:

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

Appendix 1

AGENDA

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

   YFT-Yellowfin, BET-Bigeye, SKJ-Skipjack, ALB-Albacore, BFT-Bluefin, 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 stereoscopical 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

Appendix 2

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Appendix 3

LIST OF 2015 SCRS DOCUMENTS

Number	*Title*	*Author(s)*
SCRS/2015/010	Report of the 2014 Meeting of the ICCAT Working Group on Stock Assessment Methods	Anon.
SCRS/2015/011	Report of the bigeye data preparatory meeting	Anon.
SCRS/2015/012	Report of the blue shark data preparatory	Anon.
SCRS/2015/013	Report of the bluefin data revision	Anon.
SCRS/2015/014	Report of the FADs Working Group meeting	Anon.
SCRS/2015/015	Report of the bigeye assessment meeting	Anon.
SCRS/2015/017	Report of the 2014 intersessional meeting of the Sub-committee on Ecosystems	Anon.
SCRS/2015/018	Report of the 2015 blue shark stock assessment	Anon.
SCRS/2015/019	Report of the small tuna data revision meeting	Anon.
SCRS/2015/020	Reframing Stock Assessment As Risk Management	Kell L., Ortiz de Urbina J., Merino G., De Bruyn P., Arrizabalaga H. and Tserpes G.
SCRS/2015/021	Update on the Venezuelan catch and spatial-temporal distribution of blue shark (*Prionace glauca*) in the Caribbean Sea and adjacent waters of the North Atlantic Ocean	Arocha F., Narvaez M., Gutierrez X., Laurent C. and Marcano L.
SCRS/2015/022	Standardized catch rates for blue shark (*Prionace glauca*) from the Venezuelan pelagic longline fishery in the Caribbean Sea and adjacent waters of the North Atlantic Ocean: Period 1994-2013	Arocha F., Ortiz M. and Marcano J.
SCRS/2015/023	An Evaluation of the Impact on Uncertainty in Data Processing on Stock Assessment and Management Advice	Carruthers T.R., Kell L. and Palma C.
SCRS/2015/024	New observations on the bluefin tuna trap fishery off southern Portugal (NE Atlantic) between 1998-2014: trends on catches, catch-at-size and sex ratios	Santos M.N., Rosa D., Coelho R. and Lino P.G.
SCRS/2015/025	Evolution of spatial distribution of fishing ground for the Spanish albacore (*Thunnus alalunga*) troll fleet in the North eastern Atlantic, years: 2000 to 2013	Ortiz de Zárate V. and Perez B.

SCRS/2015/026	On the variability of the length-weight relationship for Atlantic bluefin tuna, *Thunnus thynnus* (L.)	Cort J.L., Estruch V.D., Santos M.N., Di Natale A., Abid N. and de la Serna J.M.
SCRS/2015/027	A method for estimating stock mixing rates based on length or age composition data	Karnauskas M., Lauretta M.V., Walter III J.F. and Maunder M.N.
SCRS/2015/028	NZ50 a new metric for maximum size in the catch: an example with blue marlin	Goodyear C.P.
SCRS/2015/029	Some considerations for CPUE standardization; variance estimation and distributional considerations	Walter J.F., Lauretta M.V. and Christman M.C.
SCRS/2015/030	Building a Management Strategy Evaluation for northern swordfish: Part 1	Schirripa M.J.
SCRS/2015/031	Proposed study design for best practices when including environmental information into ICCAT indices of abundance	Schirripa M.J. and Goodyear C.P.
SCRS/2015/032	A method for combining indices of abundance across fleets that allow for precision in the assignment of environmental covariates while maintaining confidentiality of spatial and temporal information provided by CPCs	Lauretta M., Walter J.F., Hanke A., Brown C., Andrushchenko I. and Kimoto A.
SCRS/2015/033	Species richness intercepted by pelagic longliners, southwest Atlantic Ocean	Domingo A., Forselledo R., Jiménez S. and Mas F.
SCRS/2015/034	First results of the double tagging study conducted by Uruguay	Domingo A., Forselledo R., Jiménez S., Mas F. and Miller P.
SCRS/2015/035	Indices of larval bluefin tuna (*Thunnus thynnus*) in the western Mediterranean Sea (2001-2013)	Ingram G-W. Jr., Alvarez-Berastegui D., Reglero P., García A. and Alemany F.
SCRS/2015/036	Annual indices of bluefin tuna (*Thunnus thynnus*) spawning biomass in the Gulf of Mexico (1977-2013): evaluating updates in the age-length key used in the standardization	Ingram Jr. G-W.
SCRS/2015/037	Standardized CPUE of blue shark in the Portuguese pelagic longline fleet operating in the North Atlantic	Coelho R., Santos M.N., Lino P.G. and Rosa D.

SCRS/2015/038	Age and growth of the smooth hammerhead, *Sphyrna zygaena*, in the Atlantic Ocean	Rosa D., Coelho R., Fernandez-Carvalho J., Ferreira A. and Santos M.N.
SCRS/2015/039	Distribution patterns of the blue shark, *Prionace glauca*, in the Atlantic Ocean from fishery observer programmes of the major fishing fleets	Coelho R., *et al.*
SCRS/2015/040	Standardized age-length key for East Atlantic and Mediterranean bluefin tuna based on otoliths readings	Rodriguez-Marin E., Quelle P., Ruiz M. and Luque P.L.
SCRS/2015/041	Estimates of stock origin for bluefin tuna caught in western Atlantic fisheries from 1975 to 2013	Hanke A., Busawon D. and Lastname A.
SCRS/2015/042	Linking larval ecology and operational oceanography to provide information for the assessment of the eastern Atlantic bluefin tuna stock	Álvarez-Berastegui D. and Alemany F.
SCRS/2015/043	Evolution of CPUE of Tunisian purse seiners caught bluefin tuna *Thunnus thynnus* (L. 1758) in the central Mediterranean	Rafik Z. and Missaoui H.
SCRS/2015/044	Movements and geographic distribution of juvenile bluefin tunas in the North Atlantic, described through electronic tags	Arregui I., Galuardi B., Goñi N., Arrizabalaga H., Lam C.H., Fraile I., Santiago J. and Lutcavage M.
SCRS/2015/045	Data and associated clarifications necessary for the length-based assessment work for Atlantic bluefin tuna	Rademeyer R. A. and Butterworth D.S.
SCRS/2015/046	Characterization of Canadian bluefin tuna catch using cohort slicing and age-length keys	Hanke, A., Melvin, G., Lauretta, M., Golet W., Andrushchenko, A. and Graham, L.
SCRS/2015/047	Updated nominal CPUE indices and a preliminary combined index of abundance for the Canadian bluefin tuna fisheries: 1981-2014	Andrushchenko I. and Hanke A.
SCRS/2015/048	Population structure and genetic management unit delineation in the bluefin tuna using a genotyping-by-sequencing approach	Puncher G.N., *et al.*
SCRS/2015/049	Unlocking the evolutionary history of the mighty bluefin tuna using novel paleogenetic techniques and ancient tuna remains	Puncher G.N., *et al.*
SCRS/2015/050	Update review of bluefin tuna (*Thunnus thynnus*) size and weight measures taken with stereo video cameras at caging operations in the Mediterranean Sea 2014	Ortiz M.

SCRS/2015/051	Standardized catch rates of blue sharks in the western North Atlantic Ocean from the US pelagic longline logbook and observer programmes	Cortes E.
SCRS/2015/052	Catch characteristics of Atlantic bluefin tuna (*Thunnus thynnus*) caught by Korean tuna fisheries in the Atlantic Ocean	Yoon S.C., Kim Z.G., Lee S.I., Park H. and Lee D.W.
SCRS/2015/053	Review of the ICCAT GBYP tagging activities up to phase 4	Di Natale A.
SCRS/2015/054	A note on the selection of stock-recruitment relationships for the western Atlantic bluefin tuna stock, with reference to temporal variation in the relationship	Cooke J.G.
SCRS/2015/055	Tracking bluefin tuna reproductive migration into the Mediterranean sea with Psat tags using two tagging procedures	Abascal F.J., Medina A., de la Serna J.M., Godoy M.D. and Aranda G.
SCRS/2015/056	An acoustic telemetry curtain across the Strait of Gibraltar?	Canals M., Balguerías E., Stokesbury M., Whoriskey F., Sánchez A., Medina A., Abascal F.J. and Aranda G.
SCRS/2015/057	Standardized catch rates in biomass for North Atlantic stock of blue shark (*Prionace glauca*) from the Spanish surface longline fleet for the period 1997-2013	García-Cortés B., Ramos-Cartelle A., Fernández-Costa J. and Mejuto J.
SCRS/2015/058	Standardized catch rates in biomass for the blue shark (*Prionace glauca*) caught by the Spanish longline fleet in the South Atlantic during the period 1997-2013	Ramos-Cartelle A., García-Cortés B., Fernández-Costa J. and Mejuto J.
SCRS/2015/059	Estimation of capture-at-size data of live bluefin tuna using underwater stereoscopic camera	Tičina V., Katavić I., Šegvić B. T. and Grubišić L.
SCRS/2015/060	Bigeye (*Thunnus obesus*) by-catch estimates from the albacore Spanish surface fishery in the North East Atlantic, 2014	Ortiz de Zárate V. and Perez B.
SCRS/2015/061	System of verification of the code of good practices on board ANABAC and OPAGAC tuna purse seiners and preliminary results for the Atlantic Ocean	Goñi N., Ruiz J., Murua H., Santiago J., Krug I., Sotillo de Olano B., Gonzalez de Zarate A., Moreno G. and Murua H.
SCRS/2015/062	An update of the Azores baitboat fishery catch per unit effort standardization for 1963 - 2014	Sculley M., Pereira, J.G. and Schirripa M.

SCRS/2015/063	Update on task ii size sampling based on Japanese tuna fleet operating in Uruguayan EEZ (2009-2011)	Forselledo R., Domingo A. and Mas F.
SCRS/2015/064	Results of the double tagging study conducted in sharks	Domingo A., Cortes E., Forselledo R., Jiménez S., Mas F. and Miller P.
SCRS/2015/065	Catch disposition of blue sharks (*Prionace glauca*) caught by longliners in the southwestern Atlantic	Mas F., Forselledo R. and Domingo A.
SCRS/2015/066	Sclerochronology of the blue shark (*Prionace glauca*) in the southwest Atlantic	Mas F., Lorenzo I., Cortés E. and Domingo A.
SCRS/2015/067	Update of standardized CPUE of blue shark, *Prionace glauca*, caught by the Uruguayan longliners in the southwestern Atlantic Ocean (1992-2012)	Forselledo R., Mas F., Pons M. and Domingo A.
SCRS/2015/068	Update of standardized CPUE for blue shark caught by the Japanese tuna longline fishery in the Atlantic Ocean	Kai M., Senba Y., Ohshimo S., Shiozahi K. and Yokawa K.
SCRS/2015/069	Historical Catch Estimate Reconstruction for the Atlantic Ocean based on shark fin trade data	Clarke S.
SCRS/2015/070	Review of bigeye tuna catch including fish size by Japanese longline fishery in the Atlantic Ocean	Matsumoto T.
SCRS/2015/071	Standardized CPUE for bigeye tuna caught by the Japanese tuna longline fisheries operated in the Atlantic Ocean up to 2014	Ashida H., Matsumoto T. and Satoh K.
SCRS/2015/072	Tuna fisheries catch landed in Abidjan (Côte d'Ivoire) and sold on local fish market for the period 1982-2014	Chavance P., Dewals P., Amandè M. J., Delgado de Molina A., Cauquil P. and Irié D.
SCRS/2015/073	Diagnostics for a biomass dynamic stock assessment of Atlantic bigeye tuna (*Thunnus obesus*)	Merino G. and Kell L.
SCRS/2015/074	A post-assessment examination of model diagnostics for the 2010 Stock Synthesis model for bigeye tuna	Schirripa M.
SCRS/2015/075	Updated standardized catch rate of the bigeye tuna (*Thunnus obesus*) from the Moroccan longline fishery operating in the Atlantic	Abid N., Baibbat S. and M'hamed A.

SCRS/2015/076	Life history traits and fishery patterns of teleosts caught by the tuna longline fishery in the South Atlantic and Indian Oceans	Frédou F.L., Gaertner D., Kell L., Potier M., Bach P., Travassos P., Hazin F., Frédou T. and Ménar F.
SCRS/2015/077	Le Listao (*Katsuwonus pelamis*) ou l'explosion des captures d'une espèce de thons hauturiers dans la ZEE mauritanienne sous DCP	Taleb Ould Sidi M.
SCRS/2015/078	Indicateurs des pêcheries Tunisiennes des thonidés mineurs	Zarrad R. and Missaoui H.
SCRS/2015/079	Biologie des thonidés mineurs des côtes tunisiennes	Zarrad R. and Missaoui H.
SCRS/2015/080	Larval habitat of bullet tuna (*Auxis rochei*) in the Gulf of Gabès (Ionian Sea-Mediterranean)	Zarrad R.
SCRS/2015/081	Options for managing FAD impacts	Restrepo V., Scott G. and Koehler H.
SCRS/2015/082	Standardized catch rates for bigeye tuna (*Thunnus obesus*) from the United States pelagic longline fishery	Walter J. and Lauretta M.
SCRS/2015/083	Statistiques de la pêche et les activités de recherche menées au Cap-Vert sur le thon, les requins et les poissons à rostre	Monteiro V. and Monteiro C.
SCRS/2015/084	Standardized catch rates for sailfish (*Istiophorus albicans*) from the Venezuelan pelagic longline fishery off the Caribbean Sea and adjacent areas of the western Central Atlantic	Arocha,F. Ortiz M. and Marcano J. H.
SCRS/2015/085	Spatial and temporal distribution patterns of sailfish (*Istiophorus albicans*) in the Caribbean Sea and adjacent waters of the western Central Atlantic, from observer data of the Venezuelan fisheries	Arocha, F., M. Narvaez, C. Laurent, J. Silva and L.A. Marcano
SCRS/2015/086	Drifting Fish Aggregating Devices (dFADs) of the Atlantic Ocean: how many?	Maufroy A., Kaplan D.M., Bez N., Delgado de MolinaA., Murua H., Floch L. and Chassot E.
SCRS/2015/087	Towards acoustic discrimination of tuna species at FADs	Moreno G., *et al.*
SCRS/2015/088	Evaluating potential biodegradable twines for use in FADs	Moreno G., Ferarios J.M., Sancristobal I., Murua J., Goñi N., Murua H., Ruiz J. and Santiago J.

SCRS/2015/089	ISSF skippers workshops: understanding FADs from a fisher's perspective	Murua J., Moreno G. and Restrepo V.
SCRS/2015/090	Towards a Tropical Tuna Buoy-derived Abundance Index (TT-BAI)	Santiago J., Murua H., Moreno G., Soto M. and Quincoces I.
SCRS/2015/091	Standardized CPUE of bigeye tuna (*Thunnus obesus*) of the Taiwanese longline fisheries operated in the Atlantic Ocean (1967-2014)	Huang H. and Chang F.
SCRS/2015/092	Historical review: 50 years of tropical tuna fishing by Senegalese fisheries	Ngom F. and Fonteneau A.
SCRS/2015/093	Identifying priorities for bigeye tuna electronic tagging in the western Atlantic Ocean	Lam C., Galuardi B. and Lutcavage M.E.
SCRS/2015/094	Inferring seasonal movements of tropical tunas between regions in the eastern Atlantic Ocean from catch per unit effort	Sculley M. and Die D.
SCRS/2015/095	Bigeye tuna: update on Task II size sampling based on Japanese tuna fleet operating in Uruguayan EEZ (2009-2011)	Mas F., Domingo A. and Forselledo R.
SCRS/2015/096	Length-length and length-weight relationships for bigeye tuna (*Thunnus obesus*) in the southwestern Atlantic Ocean	Forselledo R., Mas F. and Domingo A.
SCRS/2015/097	Historical data recovery based on port sampling for bigeye tuna (*Thunnus obesus*) caught by Uruguayan longline fleet (1984)	Domingo A. and Forselledo R.
SCRS/2015/098	Update of standardized CPUE of bigeye tuna, *Thunnus obesus*, caught by Uruguayan longliners in the southwestern Atlantic Ocean (1981-2010)	Forselledo R., Mas F., Pons M. and Domingo A.
SCRS/2015/099	Industry initiatives for FAD management	Morón J. and Herrera M.
SCRS/2015/100	Summary of Information available on FADs submitted to the ICCAT Secretariat	De Bruyn P.
SCRS/2015/101	Tendance des captures des thonidés mineurs en Algérie et éléments de biologie	Krim A.
SCRS/2015/102	Bigeye catches estimated for EU purse seiners : a need to apply a new post stratification in the Task II data processing of recent years	Fonteneau A.
SCRS/2015/103	Estimating vulnerability of teleosts caught by the tuna longline fleet in South Atlantic and Indian Oceans	Frédou F.L., Gaertner D., Kell L., Potier M., Bach P., Travassos P., Hazin F., Frédou T. and Ménar F.

SCRS/2015/104	Objectives and first results of the CECOFAD project	Gaertner D., Ariz J., Bez N., Clermidy S., Moreno G., Murua H. and Soto M.
SCRS/2015/105	Standardized CPUE for juvenile bigeye caught by the European and associated purse seine fishery on FADs	Soto M.
SCRS/2015/106	Standardization of catch rates in a FAD fishery: Application to the French purse seine tropical Atlantic bigeye tuna	Katara I, Gaertner D. and Maufroy A.
SCRS/2015/107	Modelling sea turtle by-catch and mortality rates in the Portuguese pelagic longline fishery targeting swordfish: preliminary results using statistical models	Coelho R., Rosa D., Lino P.G. and Santos M.N.
SCRS/2015/108	Observations on small tunas caught in the tuna trap fishery off southern Portugal (NE Atlantic) between 1996 and 2014	Lino P.G., Coelho R. and Santos M.N.
SCRS/2015/109	An elimination of the unnecessary to allow the necessary to speak. An evaluation of the ability of stock assessment to provide advice	Kell L.T., Kimoto A. and Kitakado T.
SCRS/2015/110	A general approach to estimate the number of sea turtle interactions with pelagic longline gear in the ICCAT Convention area	Gray C.M. and Diaz G.A.
SCRS/2015/111	Evidence of spawning in the southern Sargasso Sea of fish species managed by ICCAT - albacore tuna, swordfish and white marlin	Luckhurst B.E. and Arocha F.
SCRS/2015/112	A Length Based Assessment for Atlantic bonito (*Sarda sarda*)	Sid'Ahmed B., Abid N. and Kell L.
SCRS/2015/113	Results of preliminary runs of the CMSY-method against data limited ICCAT stocks	Froese R.
SCRS/2015/114	ACAP summary advice for reducing impact of pelagic longlines on seabirds	ACAP Secretariat
SCRS/2015/115	Data collection requirements for observer programmes to improve knowledge of fishery impacts on seabirds	Wolfaardt A.
SCRS/2015/116	Estimation of seabird by-catch rates and numbers	Wolfaardt A. and Debski I.
SCRS/2015/117	Seabird by-catch mitigation factsheets	Crawford R.
SCRS/2015/118	New opportunities to improve reporting and develop approaches for better understanding seabird by-catch in tuna longline fisheries	Wanless R.M. and Small C.
SCRS/2015/119	ICCAT process for national reporting on by-catch: an assessment of need from a seabird by-catch perspective	Angel A., Wanless R. and Small C.
SCRS/2015/120	Preliminary model examining the effects of the tuna purse-seine fishery on the ecosystem of the Gulf of Guinea	Forrestal F. and Menard F.

SCRS/2015/121	Review and preliminary analyses of size frequency samples of Atlantic bigeye tuna (*Thunnus obesus*)	Ortiz M. and Palma C.
SCRS/2015/122	The use of multivariate state-space modelling for understanding the influences of environmental factors on stock dynamics	Karnauskas M. and Schirripa M.J.
SCRS/2015/123	Preliminary review of ICCAT and WCPFC progress in applying Ecosystem Based Fisheries Management	Juan-Jordá M.J., Arrizabalaga H., Restrepo V., Dulvy N.K., Cooper A.B. and Murua H.
SCRS/2015/124	Variación interanual de la condición física de la Melva (*Auxis rochei*) en migración pre-reproductora y su relación con la oscilación del Atlántico Norte	Muñoz P., Macias D. and Báez J.C.
SCRS/2015/125	Length-weight relationship of bullet tuna from western Mediterranean Sea	Muñoz P., Macias D. and Báez J.C.
SCRS/2015/126	An assessment of Atlantic bigeye tuna for 2015	Schirripa M.J.
SCRS/2015/127	Análisis de la captura incidental del atún aleta negra (*Thunnus atlanticus*) y peto (*Acanthocybium solandri*) en el Golfo de México	Ramírez-López K.
SCRS/2015/128	Evolutions des captures d'*Acanthocybium solandri*dans les debarquements des unités de peches artisanales maritimes Ivoirienne	N'Guessan Constance D., Monin J. A. and Kouadio J.K.
SCRS/2015/129	Description des pêcheries artisanales de thonidés mineurs au Sénégal	Ngom Sow F.
SCRS/2015/130	Preliminary analyses; evaluation of the effects of the newly employed seabird by-catch regulation for longline fisheries in ICCAT Convention area with using current observer data	Inoue Y., Yokawa K. and Minami H.
SCRS/2015/131	Estadísticas españolas de la pesquería atunera tropical, en el Océano Atlántico, hasta 2014	Delgado de Molina A., Delgado de Molina R., Santana J.C. and Ariz J.
SCRS/2015/132	Updated and revised standardized catch rates of blue sharks caught by the Taiwanese longline fishery in the Atlantic Ocean	Tsai W.-P. and Liu K.-M.
SCRS/2015/133	Standardized catch rates of blue shark (*Prionace glauca*) caught by the Brazilian tuna longline fleet (1978-2012) using generalized linear mixed models (GLMM)	Hazin H., Hazin F.H.V. and Mourato B.
SCRS/2015/134	Occurrence of Istiophoridae larvae and Xiphiidae eggs off the southeastern coast of Brazil	Rodrigues T., Esteves K.E., Hilsdorf A.W.S. and Amorim A.F.

SCRS/2015/135	Molecular identification (DNA Barcoding) and taxonomic composition of fish larvae caught off Espírito Santo State, southeastern coast of Brazil	Rodrigues T., Esteves K.E., Hilsdorf A.W.S. and Amorim A.F.
SCRS/2015/136	Datos estadísticos de la pesquería de túnidos de las Islas Canarias durante el periodo 1975 a 2014	Delgado de Molina A., Delgado de Molina R., Santana J.C. and Ariz J.
SCRS/2015/137	Recent data (2007-2013) from the Irish blue shark recreational fishery	Wögerbauer C., O'Reilly S., Doody C., Green P. and Roche W.
SCRS/2015/138	Size-weight relationship of the bigeye tuna (*Thunnus obesus*) from North Atlantic areas using linear and non-linear fits	Carroceda A., and Colmenero C.
SCRS/2015/139	Estimating Ghanaian purse seine and baitboat catch during 2006-2013: input data for 2015 bigeye stock assessment	Chassot E., Ayivi S., Floch L., Damiano A. and Dewals P.
SCRS/2015/140	Catch-at-size and age analyses for Atlantic bigeye	Kell L., Palma C. and Merino G.
SCRS/2015/141	Combined indices of abundance of blue sharks in the north and south Atlantic Ocean	Cortés E.
SCRS/2015/142	Estimates of Maximum Population Growth Rate and Steepness for blue sharks in the North and South Atlantic Ocean	Cortés E.
SCRS/2015/143	Tentative SWOT analysis for the calibration of ICCAT GBYP aerial survey	Di Natale A.
SCRS/2015/144	ICCAT Atlantic-wide Research Programme for Bluefin Tuna (GBYP). Activity report for the last part of Phase 4 and the first part of Phase 5 (2014-2015)	Di Natale A. and Tensek S.
SCRS/2015/145	Report on the use of Research Mortality Allowance by ICCAT GBYP up to September 2015	Di Natale A., Tensek S. and Pagá García A.
SCRS/2015/146	An estimate of additional variance for the ICCAT GBYP aerial survey using mini-PATs data	Quilez Badía G., Tensek S., Di Natale A. and Pagá García A.
SCRS/2015/147	ICCAT GBYP aerial survey for spawning aggregations in 2015. Preliminary report	Di Natale A., Cañadas A., Tensek S., Vázquez Bonales J.A., and Pagá García A.

SCRS/2015/148	ICCAT GBYP report on additional ancient trap data recovered in Phase 4 and 5	Pagá García A., Palma C., Di Natale A. and De Bruyn P.
SCRS/2015/149	Preliminary information about the ICCAT GBYP tagging activities in Phase 5	Di Natale A., Tensek S. and Pagá García A.
SCRS/2015/150	Bayesian surplus production model applied to blue shark catch, CPUE and effort data	Babcock E.A. and Cortés E.
SCRS/2015/151	Preliminary stock synthesis (SS3) model runs conducted for north Atlantic blue shark	Courtney D.
SCRS/2015/152	Report of Japan's scientific observer programme for tuna longline fishery in the Atlantic Ocean in the fishing years 2013 and 2014	Japan
SCRS/2015/153	Stock assessment of south Atlantic blue shark (*Prionace glauca*) through 2013	Carvalho F. and Winker H.
SCRS/2015/154	2015: is the bluefin tuna facing another 2003?	Di Natale A., Tensek S. and Pagá García A.
SCRS/2015/155	Statistics from the Spanish albacore (*Thunnus alalunga*) surface fishery in the north eastern Atlantic in 2014	Ortiz de Zárate V., Perez B. and Ruiz M.
SCRS/2015/156	Analysis of the length weight relationships for the western Atlantic bluefin tuna, *Thunnus thynnus* (L.)	Cort, J. L. and Estruch V.D.
SCRS/2015/157	The fall of the tuna traps and the collapse of the Atlantic bluefin tuna, *Thunnus thynnus* (L.), fisheries of northern Europe from the 1960s	Cort, J.L. and Abuanza P.
SCRS/2015/158	Observaciones sobre el comportamiento reproductivo y post reproductivo del atún rojo, *Thunnus thynnus* (L.), en el Mediterráneo occidental	Balfegó, M., and Cort J.L.
SCRS/2015/159	Estimation of Mediterranean albacore fisheries' productivity using a catch based method	Merino G., Arrizabalaga H., Restrepo V., Murua H., Santiago J., Ortiz de Urbina J. and Scott G-P.
SCRS/2015/160	Updated standardized bluefin CPUE from the Japanese longline fishery in the Atlantic to 2015 fishing year	Kimoto A., Takeuchi Y. and Itoh T.
SCRS/2015/161	Alternate improved estimates of the bigeye FAD catches by the EU *et al.* purse seiners and by the Ghanaian fleet in the Atlantic	Fonteneau A.

SCRS/2015/162	Effects of the ICCAT FAD moratorium on the FAD tuna fisheries and on tuna stocks	Fonteneau A.
SCRS/2015/163	Annual monitoring of reproductive traits of female yellowfin tuna (*Thunnus albacares*) in the eastern Atlantic Ocean	Diaha N.C., *et al.*
SCRS/2015/164	Example of ISSF data analysis and comparison with ICCAT databases	Ortiz M. and Justel-Rubio A.
SCRS/2015/165	Review of ICCAT bigeye assessment in 2015	Sharma R.
SCRS/2015/166	EU Malta methodology for the use of stereoscopic camera systems at time of caging	Gatt M.
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.
SCRS/2015/174	Preliminary reproductive pattern of swordfish (*Xiphias gladius*) 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 (*Thunnus thynnus*) 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 (*Thunnus thynnus*) 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 pêcherie 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 (*Istiophorus platypterus*) 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 (*Katsuwonus Pelamis*) in the Gulf of Mexico	Zygas A., Malca E., Gerard T. and Lamkin J.
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 (*Thunnus thynnus*) 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 (*Thunnus thynnus*) 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 (*Thunnus thynnus*) 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., Chanavce P. and Chassot E.
SCRS/2015/197	Endocarditis in bluefin tuna (*Thunnus thynnus*) 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 Talijančić 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 (*Istiophorus albicans*) 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 Euro 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 (documents SCRS/2013/144 and SCRS/2014/051) 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 has 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 documents SCRS/2013/073, SCRS/2013/169, SCRS/2014/042, SCRS/2014/049 and SCRS/2015/148). Most of the market and auction data provided to the ICCAT GBYP as a donation in kind were initially validated

(SCRS/2014/042) 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 (SCRS/2014/147) 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, 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 (SCRS/2014/048 and SCRS/2014/184).

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 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 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, 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 documents SCRS/2014/048, SCRS/2014/051, 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 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 on documents SCRS/2013/074, SCRS/2013/080, SCRS/2013/089, SCRS/2013/94, 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 the submission to 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 Chair. 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 the 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 SCI-039/2015 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 logistically 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 at 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 long term 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.

Appendix 5

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 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 fewer 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 Principe 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 €69,747.44 **(Table 1)**. Expenditures to-date in 2015 have been €8,069.00, 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 reason 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 €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 €31,500.00 for 2016. The requested contribution from ICCAT is necessary to fully implement the EPRB 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.

Appendix 6

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 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.

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, Cape 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.

Table 1. Estimated costs related to activities planned for 2016 under the ICCAT SMTYP.

Planned activities	*Species*	*Estimated costs (€)*
1. Recovery Task I and Task II data:		
- Eastern Mediterranean: EU-Greece, Turkey	Atlantic bonito (BON)	€15,000
- Central Mediterranean: EU-Italy, Tunisia	Little tunny (LTA)	€15,000
- Western Mediterranean: EU-Spain	King mackerel (KGM)	€7,500
- South West Atlantic & Caribbean Sea: Brazil, Venezuela	Frigate tuna (FRI)	€15,000
- East Atlantic: Mauritania	Bullet tuna (BLT)	€7,500
2. Supporting biological sampling in the Atlantic and the Mediterranean: size and biological data:		
- Senegal	Atlantic bonito (BON)	€7,500
- Côte d'Ivoire	Little tunny (LTA)	€7,500
- Morocco	King mackerel (KGM)	€7,500
- Mauritania	Frigate tuna (FRI)	€7,500
- Tunisia	Bullet tuna (BLT)	€7,500
- Algeria		€7,500
- Venezuela		€7,500
- Mexico		€7,500
- Cape Verde		€7,500
- EU (Spain and Portugal)		€15,000
Total		**€142,500**

Appendix 7

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 before 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 Popup 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.

Project	*Participating CPCs*	*Project leader*	*Budget (€) 1st year*	*Budget (€) 2nd year*	*In-kind contributions from CPCs (€)**
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:

Section	*Rapporteur*
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 2015 Secretariat Report on Statistics and Coordination of Research (SCI-008) 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 CP's and four NCC's: 47 CP's + 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 (SCI-008, 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 T1FC reporting deadlines (*i.e.* BFTE, SWOM, ETRO, SCRS) and that 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 SCI-008 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 (SCI-008, 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 (SCI-008, Table 3 and 4). The reporting status of Task II, after applying the filtering criteria agreed by 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 (SCI-008, Table 5a). However, the large number of tags associated to the ICCAT GBYP has yet to be included in the tagging data base. 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 (SCI-008, 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 data bases for this project for various data sets in an agreed format so they can be made available to all interested scientists.

The new data bases 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 this new data bases 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 website; 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 SCI-008 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 data sets. 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 website, 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 SCI-008.

3.1 Application of Filters 1 and 2 on data submission

The Secretariat used two filtering protocols (SCI-008) 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 SCI-008 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 SCI-008 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 (SCI-008) 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 estimated 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 data base 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 OT.

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 OT.

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 data bases, 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 (SCI-008, 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 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 document SCI-008.

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 respository (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 USA scientists and ICCAT. Presently there is a data exchange protocol to update data between the USA tagging programme and ICCAT, which is important considering that most of the ICCAT conventional tagging database comes from USA 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 e-BCD 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 current awaiting a revised proposal. The Sub-committee acknowledged the importance of the system and fully supported the Secretariats 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 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 T1NC for tuna and tuna-like species, sharks and other by-catch species. Those revisions are summarised in SCI-008, Table 8a (T1NC updates having an SCRS document and provisionally integrated into the ICCAT-DB system). The *faux poissons* T1NC 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 T1NC data (covering both, historical revisions and recent years) in SCI-008, 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 T1NC 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 (SCI-008, 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 SCI-008, 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 an 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 (SCRS/2014/132 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 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 Cote 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 data sets 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 Angola scientists and the CPCs involved with tropical tuna catches within the Angola 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 poisons* by species and country and integrated the revision of *faux poisons* 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 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 tuna. 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

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 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 document SCI-054, 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 SCI-072 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 SCI-072 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 on 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 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 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.

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 over 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 TENTATIVE AGENDA OF THE SUB-COMMITTEE ON STATISTICS

(ICCAT Secretariat, 21-22 September 2015)

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

Addendum 2 to Appendix 8

SCRS PROTOCOL TO REPORT ZERO CATCHES FOR THE MAIN ICCAT SPECIES IN TASK I

Guillermo A. Diaz[1], *Carlos Palma*[2], *Paul de Bruyn*[2]

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.

[1] Sub-committee on Statistics Convener.
[2] ICCAT Secretariat.

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 don't 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 for 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).

	Gear Groups								
	LL	*PS*	*BB*	*HAND*	*GILL*	*TRAW*	*TROL*	*TRAP*	*HARP*
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									

Appendix 9

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. The meeting was held in conjunction with the Small Tuna Working Group in order to address issues that both groups had in common. An invited 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 log-book. 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 EFFIDIS 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 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 on 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. 2014, Page 9) 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 measureable 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 the 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 gleaning 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.

Appendix 10

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Appendix 11

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. *A**ction 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-CPS 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 CPUE's for the artisanal fleets (Senegal, Ghana, Côte d'Ivoire) needs to be undertaken 2015 or early 2016. A support workshop 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;

    a) 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.

    b) U.S. scientists will update standardized CPUE series of sailfish from recreational fisheries.

e) Standardized CPUE's 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 USA for sailfish west, and from 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 others 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 long term 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 including 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, 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.

Planned activities	*Species*	*Estimated costs (€)*
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 – Cape 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**

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 days 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 will 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.

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 25ºS 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
Seabird by-catch indicator 1 (by-catch rate) CPCs with current and historic longline fishing effort south of 25ºS to report the following to the SC-ECO meeting 2016: 1. Using a revised version of the ST09 forms, number of seabirds observed caught, number of hooks observed hauled, amount of effort by log-book in the area south of 25ºS 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 25ºS (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 25ºS.	CPCs
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 25ºS, 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).	CPCs
Use EFFDIS data to: (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)	90%	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 tecnologies	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 techonologies)	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.

Appendix 12

SPEECH 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.