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for the
CONSERVATION of ATLANTIC TUNAS

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MADRID, SPAIN 2025

INTERNATIONAL COMMISSION FOR THE CONSERVATION OF ATLANTIC TUNAS

CONTRACTING PARTIES
(at 31 December 2024)

Albania, Algeria, Angola, Barbados, Belize, Brazil, Cabo Verde, Canada, China (People's Rep.), Costa Rica, Côte d'Ivoire, Curaçao, Egypt, El Salvador, Equatorial Guinea, European Union, France (St. Pierre & Miquelon), Gabon, Ghana, Grenada, Guatemala, Guinea (Rep.), Guinea Bissau, Honduras, Iceland, Japan, Korea (Rep.), Liberia, Libya, Mauritania, Mexico, Morocco, Namibia, Nicaragua, Nigeria, Norway, Panama, Philippines, Russia, São Tomé e Príncipe, Senegal, Sierra Leone, South Africa, St Vincent and the Grenadines, Syria, The Gambia, Trinidad & Tobago, Tunisia, Türkiye, United Kingdom of Great Britain and Northern Ireland, United States, Uruguay, Venezuela

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Panel No.	***PANEL MEMBERSHIP***	***Chair***
-1- Tropical tunas	Angola, Barbados, Belize, Brazil, Cabo Verde, Canada, China (P.R.), Costa Rica, Côte d'Ivoire, Curaçao, El Salvador, Equatorial Guinea, European Union, France (St Pierre and Miquelon), Gabon, The Gambia, Ghana, Guatemala, Guinea (Rep.), Guinea-Bissau, Honduras, Japan, Korea (Rep.), Liberia, Libya, Mauritania, Mexico, Morocco, Namibia, Nicaragua, Nigeria, Panama, Philippines, Russian Federation, São Tomé e Príncipe, Senegal, Sierra Leone, South Africa, St Vincent and Grenadines, Trinidad and Tobago, United Kingdom of Great Britan and Northern Ireland, United States of America, Uruguay and Venezuela.	Ghana
-2- Temperate tunas, North	Albania, Algeria, Belize, Cabo Verde, Canada, China (P.R), Egypt, European Union, France (St Pierre and Miquelon), Iceland, Japan, Korea (Rep.), Libya, Mauritania, Mexico, Morocco, Namibia, Norway, Panama, Russian Federation, Senegal, St. Vincent and the Grenadines, Syria, Tunisia, Türkiye, United Kingdom of Great Britain and Northern Ireland, United States, and Venezuela.	Japan
-3- Temperate tunas, South	Angola, Belize, Brazil, China (P.R.), Côte d'Ivoire, European Union, Japan, Korea (Rep.), Namibia, Panama, Philippines, South Africa, St Vincent and the Grenadines, United Kingdom of Great Britain and Northern Ireland, United States and Uruguay.	South Africa
-4- Other species	Algeria, Angola, Barbados, Belize, Brazil, Cabo Verde, Canada, China (People's Republic), Costa Rica, Côte d'Ivoire, Egypt, Equatorial Guinea, European Union, France (St Pierre and Miquelon), Gabon, The Gambia Guatemala, Guinea Bissau, Guinea (Rep.), Honduras, Japan, Korea (Rep.), Liberia, Libya, Mauritania, Mexico, Morocco, Namibia, Nigeria, Norway, Panama, São Tomé e Príncipe, Senegal, Sierra Leone, South Africa, St Vincent and the Grenadines, Trinidad and Tobago, Tunisia, Türkiye, United Kingdom of Great Britain and Northern Ireland, United States of America, Uruguay, and Venezuela.	Algeria

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FOREWORD

The Chairman of the International Commission for the Conservation of Atlantic Tunas presents his compliments to the Contracting Parties of the International Convention for the Conservation of Atlantic Tunas (signed in Rio de Janeiro, May 14, 1966), as well as to the Delegates and Advisers that represent said Contracting Parties, and has the honor to transmit to them the ***"Report for the Biennial Period, 2024-2025, Part I (2024)"***, which describes the activities of the Commission during the first half of said biennial period.

This issue of the Biennial Report contains the Report of the 24th Special Meeting of the Commission (Hybrid/Limassol, Cyprus, 11-18 November 2024) and the reports of all the meetings of the Panels, Standing Committees and Sub-Committees, as well as some of the Working Groups. It also includes a summary of the activities of the Secretariat and the Annual Reports of the Contracting Parties of the Commission and Observers, relative to their activities in tuna and tuna-like fisheries in the Convention area.

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

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

ERNESTO PENAS LADO
Commission Chairman

Report of the Standing Committee on Research and Statistics (SCRS)
(Hybrid / Madrid (Spain) – 23-27 September 2024)

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Report of the Standing Committee on Research and Statistics (SCRS)
(Hybrid/ Madrid (Spain) – 23-27 September 2024)

1. General remarks by the SCRS Chair and the Executive Secretary

The 2024 Meeting of the Standing Committee on Research and Statistics (SCRS), held in a hybrid format, was opened on Monday, 23 September 2024 by Dr Craig Brown, Chair of the Committee. Dr Brown welcomed all the participants to the annual meeting, both online and in person.

General remarks by the SCRS Chair, Dr Craig Brown

The SCRS Chair welcomed all participants, both online and in person, and expressed his appreciation for the level of participation. The Chair noted the enormous volume of scientific work carried out during the year and pointed out that this meant that this Committee had in front of it a large task to review this work and to develop the consensus scientific advice to include in its annual report to the Commission. The Chair expressed his confidence in the Committee and wished for all to have a good meeting.

The Chair highlighted some of the accomplishments of the Committee during 2024, noting that three stocks were assessed, work was carried out towards the development of Candidate Management Procedures for several stocks, and research in many areas was advanced. These accomplishments were only possible with the support of the Secretariat. However, this level of effort overly strained the resources of both the Secretariat and the CPC scientists, made more difficult by meetings added during the year to the official calendar (e.g. for SCRS/Panel discussions, Ambassador sessions). Meeting the increasing needs of the Commission for scientific review and advice cannot be sustained at these levels, without additional resources provided to the Secretariat and increased science support from CPCs. Therefore, the Chair urged the Committee to carefully consider the need for the meetings being requested, while taking into account whether additional Ambassador sessions or SCRS/Panel meetings would be needed.

General remarks by the ICCAT Executive Secretary, Mr Camille Jean Pierre Manel

The ICCAT Executive Secretary, Mr Camille Jean Pierre Manel, addressed the meeting, welcomed all the participants and congratulated all the scientists and the Secretariat staff who contributed to the work of the SCRS throughout 2024 with significant progress. A specific reference was made to Prof. Pasquale Arena, Sicilian marine researcher, who passed away in late 2023, for his substantial contributions to the Committee for many years.

He noted in 2024, as in previous years, an increasing demand on the Secretariat, the main factor being the number of meetings of all kinds in which it is involved. Although the SCRS decided to reduce the number of meetings in an effort to lighten the calendar, Mr Manel reiterated an appeal that has been made over the past few years to find a solution to the equation of limiting the number of meetings adequately, so as to continue to improve the Secretariat and SCRS standards. In this respect, he noted that the present proposal for the number of meetings and days of meetings is worrying, given the Secretariat's current resources, and bearing in mind that throughout the year the actual number is always higher than that initially scheduled by the SCRS.

The opening address of the Executive Secretary is contained in **Appendix 1**.

2. Adoption of agenda and arrangements for the meeting

The agenda was approved and is provided in **Appendix 2**. Full assessments were carried out this year on blue marlin (BUM), yellowfin (YFT), and Mediterranean albacore (ALB-M). Additionally, intersessional meetings were held for the Subcommittee on Ecosystems and Bycatch, Working Group on Stock Assessment Methods (WGSAM), the Swordfish Species Group (including Management Strategy Evaluation (MSE)) and the Bluefin Tuna Species Group. Additionally, there was a meeting of the Ad Hoc Working Group on Coordination of Tagging Information, as well as one Intersessional Meeting of Panel 1 on Western Skipjack MSE and another meeting of the Joint Experts Group on Climate Change that involved a high number of SCRS delegates.

The following scientists served as rapporteurs of the various species sections (agenda item 9) of the 2024 SCRS Report.

YFT -	Yellowfin tuna	S. Cass-Calay
BET -	Bigeye tuna	D. Die
SKJ -	Skipjack tuna	A. Davy (East), R. Sant'Ana (West)
ALB -	Albacore	H. Arrizabalaga (Atlantic), J. Ortiz de Urbina (Med.)
BFT -	Bluefin tuna general	C. Brown (Coordinator), J. Walter (West), E. Rodríguez Marín (East)
BIL -	Billfishes	F. Ngom Sow
SWO -	Swordfish	K. Gillespie (Coord. and North), B. Mourato (South), G. Tserpes (Med.)
SMT -	Small tunas	C. N'Guessan
SMA -	Shortfin mako	R. Forselledo
BSH -	Blue shark	R. Forselledo
POR -	Porbeagle	R. Forselledo
SBF -	Southern bluefin	

The Secretariat served as rapporteur for all Agenda items.

3. Introduction of Contracting Party delegations

The Executive Secretary introduced the 39 Contracting Parties present at the 2024 meeting both online and in person: Algeria, Barbados, Belize, Brazil, Canada, China (P.R.), Costa Rica, Côte d'Ivoire, Egypt, El Salvador, European Union (EU), Gabon, Ghana, Guatemala, Guinea (Rep.), Honduras, Japan, Korea (Rep.), Liberia, Mauritania, Mexico, Morocco, Nicaragua, Nigeria, Norway, Panama, Russian Federation, São Tomé e Príncipe, Senegal, Sierra Leone, South Africa, Trinidad and Tobago, Tunisia, Türkiye, United Kingdom, United States, Uruguay, Venezuela and Chinese Taipei. The List of Participants at the Species Groups Meetings and the Plenary Sessions is attached as **Appendix 3**.

4. Introduction and admission of observers

Representatives from one Cooperating non-Contracting Parties, Entities, or Fishing Entities (Chinese Taipei), four inter-governmental organizations (Agreement on the Conservation of Albatrosses and Petrels (ACAP), General Fisheries Commission for the Mediterranean (GFCM), International Council for the Exploration of the Sea (ICES) and Sargasso Sea Commission) and 14 non-governmental organizations (Birdlife International (BI), Defenders of Wildlife, Deutsche Stiftung Meeresschutz/German Foundation for Marine Conservation (DSM), Europêche, Federation of European Aquaculture Producers (FEAP), Federation of Maltese Aquaculture Producers (FMAP), Fishery Improvement Plan (FIP), International Seafood Sustainability Foundation (ISSF), Manta Trust, Marine Stewardship Council (MSC), Pew Charitable Trusts (PEW), Sharkproject International, The Ocean Foundation and The Shark Trust) were admitted as observers and welcomed to the 2024 meeting of the SCRS (see **Appendix 3**).

5. Admission of scientific documents and presentations

As of 21 September 2024, a total of 152 scientific papers and 112 scientific presentations had been submitted at the different SCRS meetings. The List of SCRS Papers and Presentations is attached as **Appendix 4**.

Besides the scientific documents and presentations, there are 10 reports of 6 intersessional meetings, 2 subcommittee meetings and 2 Working Groups meetings, 53 Annual Reports from the Contracting Parties, and non-Contracting Cooperating Parties, Entities and Fishing Entities, as well as various documents by the Secretariat.

6. Report of ICCAT Secretariat activities on statistics and science

The Secretariat summarized its activities, data reported, publications, website updates, and other information contained in the 2024 Secretariat Report on Research and Statistics related to fisheries and biological data submitted for 2024, which included revisions to historical data. The activities and information included in this report refer to the period between 7 September 2023 and 1 September 2024 (the Reporting Period).

Regarding the activities conducted by the Secretariat in the most recent years, in addition to the normal activities on statistics, publications, data funds management and others, the Secretariat dedicated additional work to the preparation and attendance of SCRS meetings, as well as supporting the Commission and SCRS Officers in planning the meetings and managing all related correspondence work and documents. Moreover, it participated in stock assessment activities, and conducted extensive work related to coordination and management of external support for the SCRS data collection and research programmes and activities. The Secretariat's participation in these programmes mainly consisted in both administrative and scientific support, including the coordination and management of research proposals (managed 62 contracts), database management, fund administration, and oversight of auditory and accounting responsibilities, as well as IT support for the programmes. As in the past, during 2024 the Secretariat actively participated in all data collection and research programmes components. Finally, the Secretariat highlighted the effort being made in the development of the ICCAT Integrated Online Management System (IOMS), a system designed to manage online all the information associated with the ICCAT data requirements in the future. This is a long-term project intended to entirely replace the current ICCAT data management system.

A total of 57 ICCAT CPCs [53 Contracting Parties (CP), plus 4 Cooperating non-Contracting Parties/Entities/Fishing Entities (NCC)] have reporting obligations to ICCAT. Costa Rica changed its status from Cooperating to Contracting Party in 2024. For statistical purposes, this corresponds to a total of 75 flag related CPCs (50 CP + 1 CP [15 EU Member States] + 1 CP [5 UK flag States] + 4 NCC) who have reported information to ICCAT in recent years. The term "flag CPC" was adopted here to refer to those 75 flags.

Since the last provision of advice by the SCRS in September 2023, the Secretariat provided support to a total of 35 meetings (SCRS, 19; Commission, 12; Commission/SCRS, 4), in which the staff were deeply engaged. In addition to these, the Secretariat also provided support to 11 additional workshops/webinars.

The Secretariat has continued the series of periodic publications developed throughout the history of ICCAT, which includes: completed publication of volume 80 (completed issues 1 to 10) and has already published issues 1 to 8 of Volume 81 of the ICCAT Collective Volume of Scientific Papers; Part II of the Biennial Period 2022-2023, corresponding to Volume I (Commission meeting report), Volume II (SCRS Plenary meeting report), Volume III (Annual Reports) and Volume IV (Secretariat reports) were already published throughout 2024. Volume 49 of the Statistical Bulletin was published in an electronic version in February 2024, which includes the catches and other statistics series for the period 1950 to 2022. All documents presented to the SCRS are now published within the same year of their presentation in the ICCAT Collective Volume of Scientific Papers.

Following a request regarding the update of Chapter 3 of the ICCAT Manual (Basic types of tuna fisheries), in 2024 the Secretariat hired experts to revise the current sub-chapter 3.1.2 (Longline fishing). The updated sub-chapter shall be presented to the SCRS in 2025.

The ICCAT website, in the three official languages of the Commission, continues to be updated and new tools are being developed on a regular basis to provide better service to users. One of the major tasks associated with the ICCAT website is the automatic and dynamic use of data from the IOMS system using the IOMS public web services.

The former GBYP Assistant Coordinator, Ms. Stasa Tensek, in January 2024, became the new ICCAT Science Officer.

Finally, references were made to international cooperation promoted by the Secretariat with several international organization: FAO Coordinating Working Group on Fishery Statistics (CWP), Fisheries and Resources Monitoring System (FIRMS), Aquatic Sciences and Fisheries Abstracts (ASFA), Global Environment Fund (GEF), General Fisheries Commission for the Mediterranean (GFCM), International

Council for the Exploration of the Sea (ICES), Western Central Atlantic Fishery Commission (WECAFC), Mediterranean Advisory Council (MEDAC), Sargasso Sea Commission (SSC), Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and EU Regional Coordination Group Large Pelagics (RCG LP).

Discussion

The Committee acknowledged and thanked the Secretariat for the extensive, efficient and hard work of the Secretariat to deliver the SCRS requests, and keeping the usual standards under such an increasing heavy workload.

The Committee also welcomed the proposal for collaboration between ICCAT and the GFCM, related to research activities in the Mediterranean under the ecosystem, bycatch, and fisheries commonality and monitoring activities. It was highlighted by Mediterranean CPCs the benefit of this agreement to facilitate the integration of common activities within their national research activities especially for small pelagic species. GFCM participants were welcomed to the upcoming ICCAT workshop on the impact of ICCAT fisheries on sea turtles in the Mediterranean Sea, noting that the meeting's objectives were already set and work was progressing on specific tasks.

The Committee acknowledged and thanked Japan for their financial support to several capacity building projects carried out throughout 2024. The Committee also thanked Japan for the new 5-year ICCAT/Japan Capacity Building Assistance Project (Phase 3) that will start in December 2024.

7. Review of national fisheries and research programmes

The Annual Reports made available electronically included the information as submitted by CPCs which could be reviewed and validated by the Secretariat by 25 September 2024. Further updates may be required for the Commission, as some information may be pending validation or correction.

8. Reports of intersessional SCRS meetings

In 2023, the Committee agreed that the individual intersessional meeting summaries (previously contained within this section 8) should no longer be included in the SCRS annual report. Any specific notes about any particular intersessional meeting made by the Committee, would be included below this section and a footnote added to the table below.

This table shows all Detailed Reports of the intersessional meetings held in 2024 (including links). These Reports have been posted in the ICCAT Collect. Vol. Sci. Pap. Vol. 81 and in the ICCAT meetings webpage.

Item No.	*Detailed Report*	*SCRS No.*
8.1	Blue Marlin Data Preparatory Meeting	SCRS/2024/001
8.2	SCRS Workshop	SCRS/2024/011
8.3	Yellowfin Data Preparatory Meeting	SCRS/2024/002
8.4	Intersessional Meeting of Bluefin Tuna Species Group	SCRS/2024/003
8.5[1]	Intersessional Meeting of Swordfish Species Group (including MSE)	SCRS/2024/004
8.6[2]	Mediterranean Albacore Data Preparatory and Assessment Meeting	SCRS/2024/005
8.7[3]	Meeting of the Working Group on Stock Assessment Methods (WGSAM)	SCRS/2024/007
8.8	Blue Marlin Stock Assessment Meeting	SCRS/2024/008
8.9	Meeting of the Joint Experts Group on Climate Change	*
8.10	Meeting of the Ad Hoc Working Group on Coordination of Tagging Information	SCRS/2024/012
8.11	Yellowfin Tuna Stock Assessment Meeting	SCRS/2024/009

* This report will be published during 2025 in the ICCAT Biennial Report (Period 2024-2025, Part I).

9. 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.

[1] Specific note:
- The Committee agreed that final SWO-N MSE results (item 14.3 and **Appendix 9**) will be presented to Panel 4 in October 2024 and at the Commission meeting in November 2024. It was noted that the scope of SWO-N MSE work in 2025 (described in item 17.1.9) will depend on feedback from the Commission. Following a request for clarification on SWO-N reference points, it was noted that the Commission has adopted $0.4*SB_{MSY}$ as an interim reference point for SWO-N (Rec. 17-02).

[2] Specific notes:
- It was clarified that the assessment considered a single stock for Mediterranean albacore in terms of biology parameters, fishery statistics, and abundance indices.
- The Committed highlighted the uncertainty in particular for the historical catch series, and that any new information from CPCs is important to improve the evaluation.
- It was clarified that the 20% or 10% biomass levels reported are simply indicative of the uncertainty in the projections, but not as defined reference value, nor being proposed as reference limit for Mediterranean albacore. It was further noted that larval indices are considered as proxies of spawning biomass of the stock, thus used in surplus production models.

[3] Specific notes:
- The Committee encouraged all CPCs to apply the Bycatch Estimation Tool (BYET) to estimate and report their discards and methodology for the ICCAT statistic submissions as directed by Rec. 19-05. It was noted that BYET would work with any data, but users need to review the model convergence, and the uncertainty associated with data provided as standard deviation or confidence intervals. It was also noted that the SC-STAT needs to discuss how to include the associated uncertainty in the current ICCAT statistic submission forms.
- The Committee encouraged all Species Groups to apply the revised guideline for CPUE standardization at the data preparatory meetings. It was clarified that this guideline is also applicable to the combined indices, e.g. YFT multi-national joint longline index, that might need additional requirements.

9.1 YFT - Yellowfin

A stock assessment for yellowfin tuna was conducted in 2024 through a process that included a data preparatory meeting in April and an assessment meeting in July. The stock assessment used fishery data from the period 1950-2022. The complete description of the stock assessment process and the development of management advice is found in the Report of the 2024 Yellowfin Tuna Data Preparatory Meeting (ICCAT, 2024c) and the Report of the 2024 Yellowfin Tuna Stock Assessment Meeting (ICCAT, 2024k).

YFT-1. Biology

Yellowfin tuna are distributed mainly in the tropical and subtropical oceanic waters of the three oceans. The exploited sizes typically range from 30 cm to 170 cm fork length (FL). The length at 50% maturity was estimated at 115 cm straight fork length (SFL). 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. A single stock for the entire Atlantic Ocean is currently assumed based on conventional tagging and longline catch data that indicate yellowfin are distributed continuously throughout the tropical Atlantic Ocean. Movement rates and timing, migratory routes, and local residence times remain uncertain, but recent tagging activities (e.g., Atlantic Ocean Tropical tuna Tagging Programme (AOTTP)) offer insights (**YFT-Figure 1**). 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. Younger age classes of yellowfin tuna (40-80 cm) exhibit a strong association with floating objects (FOBs: any type of object that can affect fish aggregation, naturally drifting in the ocean). This association with FOBs increases the vulnerability of these smaller fish to surface fishing gears and may also have an impact on the biology and on the ecology of yellowfin due to changes in feeding and migratory behaviours.

A comprehensive description of the biological information used in the stock assessment can be found in the detailed reports (ICCAT, 2024c, 2024k and ICCAT Manual). New information since the previous assessment (2019) is detailed below.

Ages up to 18 years have been observed in the Gulf of Mexico, the western Atlantic and the Ascension Islands using annual otolith increment counts which were validated using 14C bomb radiocarbon and/or oxytetracycline (OTC). Tagging studies of yellowfin in the Pacific and Indian Oceans suggest that natural mortality is age-specific, and higher for juveniles than for adults. Age-specific M estimates were updated in 2024 based on new research. In the 2024 Yellowfin Tuna Stock Assessment (ICCAT, 2024k), the age-specific vector of M incorporated uncertainty unlike in 2019 when a fixed vector was used for M (**YFT-Figure 2**). The maximum age assumption remains as in the previous assessment, 18 years of age.

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-Figure 3**). Overall Atlantic catches declined by nearly half from the peak in 1990 (193,584 t) to 107,007 t estimated for 2013 but have since increased to an average of about 140,000 t during 2019-2023. Catches have generally exceeded the total allowable catch (TAC) of 110,000 t implemented from 2012 forward (**YFT-Table 1, YFT-Figure 4**).

Rec. 19-02 requires the ICCAT Secretariat to work with the SCRS to prepare an estimate of capacity in the Convention area, to include at least all the fishing units that are large-scale or operate outside the Exclusive Economic Area (EEZ) of the CPC they are registered in. These capacity estimates were updated in 2024, and these estimates in 2023 were 62 large scale purse seine vessels targeted tropical tunas, which is lower than some previous estimates, but slightly larger than the estimate made by SCRS for 2018 (**YFT-Table 2**). Currently, no capacity estimates are available for other large-scale fleets.

Three indices of abundance were used in stock assessment model runs to develop management advice (**YFT-Figure 5**), the joint-CPC tropical Atlantic (region 2) longline index (1979-2022), the acoustic echosounder buoy index associated with FOBs (2010-2022) and the purse seine free school index (1993-2022). Indices that reference adult biomass (the joint-LL and the purse seine free school index) have disparate trends. The joint-LL suggests the biomass of adult yellowfin tuna has remained generally stable or increased since 2019 while the purse seine free school index suggests a decline. The acoustic buoy index references juvenile yellowfin abundance in the eastern Atlantic and suggests a modest increase since 2012.

YFT-3. State of the stock

A full stock assessment was conducted for yellowfin tuna in 2024 using an age-structured model framework (Stock Synthesis) applied to the available data through 2022. The trend in the spawning stock biomass (SSB) and the SSB relative to the level that would produce Maximum Sustainable Yield (MSY) (SSB_{MSY}) shows a general continuous decline over time (**YFT-Figure 6**). However, spawning stock biomass has remained above SSB_{MSY} over the entire time series and in the most recent years showed a slightly increasing trend. Estimates of historical fishing mortality (relative to F_{MSY}) increased steadily to around 0.8 in the early 1980s, then remained at a level below F_{MSY} until the early 2010s (**YFT-Figure 6**). Since the mid-2010s, the fishing mortality increased to F_{MSY}, before dropping below F_{MSY} in 2021 and 2022. Annual estimates of recruitment are also shown in **YFT-Figure 6.** In 2019 and 2020, the recruitment estimates were above the long-term average. In the most recent year 2022, the recruitment estimate was fixed at the value produced by the spawner-recruitment relationship because it was not well estimated by the stock assessment model.

Numerous changes have occurred in the relative impact of fleets/gears fishing on yellowfin, including the decreased impact of the longline fisheries since the 1960s, the concurrent increase of early PS fisheries and the transition from PS-free school toward FOB/fish aggregating device (FAD) associated fishing beginning around 1990 (**YFT-Figure 7**). In addition, catches from the Brazilian "vessel associated-school" handline fishery operating in the western Atlantic have increased nearly nine-fold, from about 1,600 t in 2012 to over 14,000 t in 2023. Lastly, 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 FOB/FADs (**YFT-Figure 3**).

The median estimate of SSB_{2022}/SSB_{MSY} was 1.37 (80% confidence interval: 0.91 - 2.15), indicating the stock was not overfished in 2022 with 81% probability. The median estimate of F_{2022}/F_{MSY} was 0.89 (0.40 - 1.46), indicating that overfishing was not occurring in 2022 with 58% probability. The median MSY estimated was 121,661 t with 80% confidence intervals of 107,485 and 188,456 t. The probability of the stock being in each quadrant of the Kobe plot in 2022 is provided in **YFT-Figure 8**. There was a 58% probability that the stock was in the green quadrant (not overfished nor subject to overfishing) a 23% probability of being in the orange quadrant (subject to overfishing but not being overfished), and a 19% probability in the red quadrant (being both overfished and subject to overfishing).

YFT-4. Outlook

Kobe matrices were constructed using projections of constant catch (i.e. landings plus dead discards) from 100,000 t to 160,000 t, in 5,000 t intervals (**YFT-Figure 9** and **YFT-Table 3**). To inform the potential recovery time in the absence of fishing, a constant catch projection at 0 t was also run. The probability of the biomass falling below 20% of the level that supports MSY was also calculated for each projection year and catch scenario (**YFT-Table 4**). It should be noted that the reference chosen, 20% of biomass that supports MSY, was selected for informational purposes and has not been adopted formally by the SCRS for tropical tunas. The projections assume that recent (2020-2022) fishing operations (i.e. fleet selectivity and the relative catch between fleets) will continue under the recruitment scenario estimated from the spawner-recruitment relationship.

YFT-5. Effect of current regulations

Rec. 11-01 established a TAC of 110,000 t but did not establish limits by CPC. Concern over the catches of small yellowfin and bigeye tunas led to the establishment of spatial closures to surface fishing gear FAD sets in the Gulf of Guinea (Recs. 04-01, 08-01, 11-01, 14-01, 15-01) or entire Atlantic (Recs. 19-02, 21-01, and 22-01). The Committee evaluated the effectiveness of alternative temporal closures (season and duration) using outputs of the most recent stock assessments of bigeye and yellowfin tunas (item 19.38).

YFT-6. Management recommendations

The Committee reiterated concern that current catch levels, averaging nearly 140,000 t over the last 5 years, are expected to result in overfishing and lead to an overfished status if they continue. Furthermore, given that the TAC has been exceeded continuously by substantial amounts, existing conservation and management measures appear to be insufficient to limit harvest. The Committee recommends that the Commission establish a mechanism to ensure that the catches of YFT do not exceed any adopted TAC. The

Commission should also be aware that increased harvests on small yellowfin tuna have been shown to have negative consequences to both long-term sustainable yield and stock status. Should the Commission wish to increase long-term sustainable yield, the Committee continues to recommend that effective measures be found to reduce fishing mortality on small yellowfin tuna (e.g., FOB-related and other fishing mortality of small yellowfin tuna).

ATLANTIC YELLOWFIN TUNA SUMMARY

Estimates	Mean (80% confidence intervals)
Maximum Sustainable Yield (MSY)	121,661 t (107,485 - 188,456 t)[1]
2023 Yield	139,529 t
Relative Biomass[2]: B_{2022}/B_{MSY}	1.37 (0.91 – 2.15)
Relative Fishing Mortality: F_{2022}/F_{MSY}	0.89 (0.40 - 1.46)

2022 Total Spawning Stock Biomass[3]		970,000 t
Stock Status (2022)	Overfished: No[4]	
	Overfishing: No[5]	

(Rec. 17-01, Rec. 22-01)
- No fishing with natural or artificial floating objects from 1 January to 13 March 2023, throughout the Convention area. Prohibition of deployment of drifting FADs during a period of 15 days prior to the start of the closure period
- TAC of 110,000 t (since Rec. 11-01)
- Specific authorization to fish for tropical tunas for vessels 20 meters or greater
- Prohibition of discarding from purse seine
- Specific limits on FADs, non-entangling FADs required

[1] Minimum and maximum values are the 80%LCI and 80%UCI of the 4000 Monte Carlo estimates of the SS model
[2] Spawning Stock Biomass (Stock Synthesis)
[3] Median of the 4000 Monte Carlo estimates of the SS model
[4] 81% probability the stock is not overfished
[5] 58% probability no overfishing is taking place

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

			1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
TOTAL	A+M		172763	154552	148697	136653	144076	134165	131964	152905	136464	123236	119574	105091	105912	102844	111874	117915	117424	113186	114389	107007	115698	129859	150311	136863	135914	136213	153913	122367	149098	139529
Landings		Bait boat	22590	18687	15810	16804	19591	21808	16584	19522	17407	13720	19379	13407	15187	15099	10342	10080	10741	14531	10328	8350	9872	9983	11100	8710	8016	7676	7180	6463	8566	6513
		Longline	27080	25322	26589	21985	25812	26670	27266	23079	17793	19394	29705	25393	22723	29545	22342	22097	20051	18964	19006	16398	14475	14362	17989	16292	16261	17644	16110	13551	16790	26043
		Other surf.	7282	6745	6946	6339	5578	6481	7274	7128	5478	8911	7891	7176	8655	5547	2987	3261	3727	3951	6510	11213	14134	16068	19559	23043	19392	16814	20503	19077	24590	19564
		Purse seine	112752	101289	98539	90030	91607	77257	78789	102789	95465	79905	61064	58061	58595	51812	75189	81045	81886	74131	76665	69711	75813	88138	100133	87885	91203	93061	108958	82225	97637	86070
Landings(FP)		Bait boat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5
		Purse seine	3059	2509	813	1495	1488	1781	2051	387	321	1305	1535	1054	747	836	1008	1423	1012	1601	1872	1332	1401	1168	1528	867	991	992	1116	1005	1459	1298
Discards		Bait boat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Longline	0	0	0	0	0	167	0	0	0	0	0	0	5	6	5	9	8	9	8	3	3	3	3	4	11	9	25	26	26	33
		Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	137	0	63	40	17	20	19	25	2
Landings	CP	Angola	137	216	78	70	115	170	35	34	34	34	34	0	0	23	98	0	0	0	0	0	0	0	0	2	3	0	1	8	16	5
		Barbados	156	255	160	149	150	155	155	142	115	178	211	292	197	154	156	79	129	131	195	188	218	262	324	270	248	121	173	213	202	237
		Belize	0	1	0	3	963	0	326	406	0	0	0	0	143	1164	1160	1346	2058	3214	5902	5246	7069	7132	5660	6170	8743	10107	9341	8197	10118	9647
		Brazil	4169	4021	2767	2705	2514	4127	6145	6239	6172	3503	6985	7223	3790	5468	2749	3313	3677	3615	4639	7277	11645	13643	16682	18362	16381	12907	13183	13664	15716	18894
		Canada	52	174	155	100	57	22	105	125	70	73	304	240	293	276	168	53	166	50	93	74	34	59	19	193	15	108	75	110	198	175
		Cape Verde	1943	1908	1518	1783	1421	1663	1851	1684	1953	1868	3236	6019	5648	4568	7905	4638	5856	6002	4603	7513	4507	7866	6990	2837	5584	3699	6259	2043	974	352
		China PR	156	200	124	84	699	2190	1674	1056	697	1050	1305	1185	1085	1124	649	462	427	346	264	211	92	170	468	578	359	321	461	140	529	2444
		Costa Rica	0	0	0	0	0	6	5	4	0	1	1	0	7	9	7	4	6	14	15	32	120	117	139	183	114	74	117	150	54	52
		Curaçao	155	140	3313	6212	6240	4169	5776	4945	4619	6667	4747	24	1939	1368	7351	6293	5302	4413	6792	3727	5152	6267	8012	6661	7615	7773	9081	7729	3122	1250
		Côte d'Ivoire	0	0	0	2	0	0	673	213	99	302	565	175	482	216	626	573	470	385	1481	2077	324	251	315	952	116	2649	4460	2117	3336	2914
		EU-Denmark	0	0	0	0	0	0	0	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		EU-España	40619	38282	34915	24584	31383	19977	24851	31105	31469	24884	21414	11795	11607	13667	24490	32862	25587	21060	18886	12016	14380	21199	19625	12665	10908	14756	19618	10202	11363	11072
		EU-France	34914	29614	33838	29952	30787	29904	29923	31870	34444	33040	23962	22679	18940	13733	16115	19049	20798	22749	18919	20647	23223	21093	26488	26178	25069	18609	17089	13262	17240	14043
		EU-Ireland	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		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	0	0	0	0	0	0
		EU-Latvia	0	55	151	223	97	25	36	72	334	334	334	334	334	0	0	0	200	143	15	0	0	23	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	1	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	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		EU-Portugal	126	231	288	176	267	177	194	4	6	4	5	167	334	953	479	1250	653	579	447	339	71	76	127	137	638	256	129	22	134	479
		El Salvador	0	0	0	0	0	0	0	933	0	0	0	0	0	0	0	0	0	0	0	0	0	2736	8573	6228	5496	3893	8813	6135	6239	4176
		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	0	0	0	0	0
		Gabon	88	218	225	225	295	225	162	270	245	44	6	2	44	0	1	0	0	0	0	0	0	0	0	1	3	0	0	0	0	
		Gambia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
		Ghana	9984	9268	8182	15087	13850	21450	12673	23845	18546	15839	15444	13019	14037	15570	16521	15858	20252	18501	16470	13921	18939	19659	20218	20398	24346	26243	26435	21264	29550	22159
		Great Britain	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	21	22	1	0	0	0	0	0	0	0	0	0	0
		Grenada	385	410	523	302	484	430	403	759	593	749	460	492	502	633	756	630	673	686	663	674	675	1167	1607	1257	1391	818	784	369	1036	730
		Guatemala	0	0	0	0	0	0	0	0	0	2207	1588	2906	5265	3461	3736	2603	3124	2803	2949	4023	3754	5200	2720	3718	2539	2957	2594	1856	4237	2550
		Guinea Ecuatorial	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	892	892	199	0	2	11	9	6	0	8	10	8	7	4	1
		Guinée Rep	0	208	1956	820	0	0	0	0	0	0	0	0	0	0	0	0	298	293	1559	1484	823	0	0	0	0	0	0	322	1327	913
		Honduras	0	4	3	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Japan	4783	5227	5250	3539	5173	3405	4061	2691	2105	2754	6260	4247	4643	9037	6252	4994	4580	4454	4662	4577	3824	3470	3376	3123	3093	4050	2656	3065	4187	6713
		Korea Rep	436	453	381	257	23	94	142	3	8	209	984	675	283	573	993	433	380	490	498	212	116	47	368	411	455	507	579	373	481	732
		Liberia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	49	71	89	100	88	76	88	1	6	1731	1740	3	5
		Libya	0	0	0	0	0	0	0	208	73	73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Maroc	3017	2290	3430	1947	2276	2307	2441	3000	2111	1675	814	1940	222	102	110	110	44	272	55	137	107	72	115	113	108	228	344	493	640	845
		Mauritania	0	0	0	0	0	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	671	953	262	175	303	631	900	888	1135	1356	1209	1066	958	891	956	1211	917	1177	1416	1004	1044	960	1279	1241	1028	760	817	880	606	590
		Namibia	35	14	72	69	3	147	59	165	89	139	85	135	59	28	11	1	9	90	24	6	15	42	53	53	424	82	327	256	356	156
		Nigeria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	3	1	0	0	0	0	0	0	0	0	0	0	0
		Panama	12066	13442	7713	4293	2111	1320	1322	646	1140	0	1887	6170	11361	9590	6328	6101	7182	5484	6634	5894	5489	4782	6168	6694	6175	8245	10376	9650	11960	8496
		Philippines	0	0	0	0	162	279	164	12	129	154	367	243	264	239	220	152	89	134	34	128	76	0	0	0	0	0	0	0	0	0
		Russian Federation	1503	2936	2696	4275	4931	4359	737	0	0	0	0	4	42	211	42	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		S Tomé e Príncipe	125	135	120	109	124	114	122	122	122	122	134	145	137	144	160	165	169	173	177	182	186	301	301	266	3	17	13	15	24	24
		Senegal	1	94	77	152	248	663	194	279	558	253	589	1106	1347	1071	720	1146	939	1235	1875	1081	603	1883	6850	3988	5060	8195	8177	8228	9407	17027
		South Africa	486	199	157	116	261	320	191	342	152	298	402	1156	1187	1063	351	303	235	673	174	440	1512	925	706	387	389	551	700	398	1018	1746
		St Vincent and Grenadines	2492	2185	3018	3181	3403	2857	4102	5080	1354	625	4265	3430	2781	3198	2630	2348	882	963	590	352	505	153	461	772	373	105	226	86	193	69
		Trinidad and Tobago	120	79	183	223	213	163	112	122	125	186	224	295	459	615	520	629	788	799	931	1128	1141	1179	1057	890	1214	982	973	1244	1080	1169
		UK-Bermuda	44	44	67	55	53	59	31	37	48	47	82	61	31	30	15	41	37	100	66	36	12	10	9	25	32	50	52	74	61	36
		UK-British Virgin Islands	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	3	10	5	0	0	0	0	0	6	5	0
		UK-Sta Helena	150	181	151	109	181	116	136	72	90	158	226	240	344	177	97	104	65	163	149	53	152	178	181	221	199	310	87	79	67	104
		UK-Turks and Caicos	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	6	2	0	0	0	0	0	0	0	0	0
		USA	8298	8131	7745	7674	5621	7567	7051	6703	5710	7695	6516	5568	7091	5529	2473	2788	2679	3315	4777	4177	3184	2798	4104	4444	2720	2625	3648	3948	7739	3084
		Uruguay	59	53	171	53	88	45	45	94	91	95	204	644	218	35	66	76	122	24	6	7	0	0	0	0	0	0	0	0	0	0
		Venezuela	24789	9714	13772	14671	13995	11187	11663	18687	15033	7657	5792	5097	6514	3911	3272	3198	4783	4419	4837	5050	3772	3127	4204	5059	2751	2037	1934	1974	3169	3486
	NCC	Chinese Taipei	6660	4698	6653	4466	5328	4411	5661	4805	4659	6486	5824	3596	1260	1947	1122	1391	824	1768	1070	1259	1041	1220	942	776	945	736	870	468	669	873
		Guyana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	183	181	3	43	116	164	108	0
		Suriname	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	530
	NCO	Argentina	0	0	0	0	0	0	0	0	0	0	327	327	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Benin	1	1	1	3	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Cambodia	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Colombia	3418	7172	238	46	46	46	46	46	46	46	46	46	46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Congo	14	13	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Cuba	252	266	297	309	15	15	0	0	65	65	65	65	65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Dominica	31	9	0	0	0	80	78	120	169	119	81	119	65	103	124	102	110	132	119	120	256	194	179	145	110	179	307	199	228	245
		Dominican Republic	0	0	0	0	89	220	226	226	226	226	226	226	226	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Faroe Islands	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Jamaica	0	0	21	21	0	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)	477	1847	0	148	0	0	0	1510	1345	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		NEI (Flag related)	4404	4202	5962	6100	8339	6760	5269	2784	57	578	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Saint Kitts and Nevis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	29	13	16	6	11	11	9
		Seychelles	0	0	0	0	0	0	38	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Sta Lucia	130	144	110	110	276	123	134	145	94	139	147	172	103	82	106	97	223	114	98	136	93	175	191	232	199	172	190	156	174	156
		Vanuatu	2357	2357	1130	576	0	228	0	0	0	0	681	713	805	1038	1323	1147	743	341	331	146	17	0	0	0	0	0	0	0	0	
Landings(FP)	CP	Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	50	71	27	109	35	0	0	0	0	0	0	0	0	0
		Cape Verde	0	0	0	0	0	0	0	0	0	0	0	78	28	39	40	103	152	58	35	82	256	272	178	55	73	60	70	0	0	0
		Curaçao	0	0	0	0	0	0	0	0	0	0	0	15	25	22	16	176	95	89	114	86	78	0	0	0	0	0	0	67	0	0
		Côte d'Ivoire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	267	116	24	0	0	0	0	0	0	0	0	0
		EU-España	910	559	87	384	494	733	714	0	0	335	368	142	154	67	270	279	352	358	140	146	353	517	571	440	285	366	276	260	312	285
		EU-France	1461	1074	472	658	703	832	914	344	309	672	597	244	128	33	52	203	181	344	347	129	115	333	352	162	296	293	291	388	990	557
		El Salvador	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45	60	90	78	83	0	202	83	401
		Guatemala	0	0	0	0	0	0	0	0	0	0	0	57	35	17	32	9	34	8	12	13	19	0	0	0	0	0	0	27	26	46

			1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
		Guinée Rep	0	0	0	0	0	0	0	0	0	0	0	72	0	66	20	67	95	389	876	487	461	0	0	0	0	0	0	0	0	**0**
		Panama	0	0	0	0	0	0	0	0	0	0	0	155	125	177	114	99	54	101	54	163	59	0	0	0	0	0	0	62	53	14
		St Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
	NCO	Mixed flags (EU tropical)	688	876	254	452	291	216	423	42	13	298	570	292	251	416	464	467	0	181	0	0	0	0	367	121	259	191	480	0	0	
Discards	CP	Canada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	137	0	63	40	17	20	19	25	2
		EU-Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	6	5	7	9	6	15
		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	0	0	0	0	**0**
		Mexico	0	0	0	0	0	0	0	0	0	0	0	0	5	6	5	9	8	9	7	3	3	3	3	3	5	3	4	5	3	4
		South Africa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		UK-Bermuda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		UK-British Virgin Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		UK-Sta Helena	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		USA	0	0	0	0	0	167	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	13	17	14
	NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	**0**

YFT-Table 2. Comparison of the SCRS estimation of large-scale purse seiners operating in the Atlantic Ocean in 2018 and 2020-2023. When a number is uncertain, a range (min.-max.) is given. The table reflects updates made during the SCRS Plenary meeting.

Flag/Year	***2018***	***2020***	***2021***	***2022***	***2023***
BLZ	2	8	8	8	10
CPV	1	1	1	0	0
CUW	5	4	4	2	0
EU.ESP	10	10	11	10	8
EU.FRA	10	9	10	10	9
GHA	15	16	16-17	16-17	16
GIN	0	0	1	1	1
GTM	2	2	2	2	2
LBR	0	2	2	0	0
MAR	0	1	3-4	3-4	1
PAN	2	4	4	4	4
SEN	7	7	7	7	6
SLV	4	4	3	3	3
VEN	0	1	2-4	2-3	2
Total	**58**	**69**	**74-78**	**68-71**	**62**

YFT-Table 3. Estimated probabilities of the Atlantic YFT stock a) being below F_{MSY} (overfishing not occurring), b) above SSB_{MSY} (not overfished) and c) above SSB_{MSY} and below F_{MSY} (green zone) in a given year for a given catch level (0, 100,000 t - 160,000 t), based upon 4,000 Monte Carlo iterations of the Stock Synthesis base case. This result was used to develop the management advice of Atlantic YFT stock.

a) Probability that $F \leq F_{MSY}$

Catch	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
0kt	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
100kt	92%	91%	90%	89%	89%	89%	88%	88%	88%	88%
105kt	90%	89%	87%	86%	85%	85%	84%	83%	83%	82%
110kt	88%	86%	84%	82%	81%	80%	79%	77%	76%	75%
115kt	86%	83%	81%	79%	76%	74%	72%	70%	68%	67%
120kt	83%	80%	77%	74%	71%	67%	65%	63%	62%	61%
125kt	81%	77%	73%	69%	65%	62%	60%	58%	56%	55%
130kt	78%	74%	68%	64%	60%	57%	55%	53%	51%	49%
135kt	75%	70%	64%	60%	56%	53%	50%	48%	46%	44%
140kt	71%	66%	61%	56%	51%	48%	45%	44%	42%	41%
145kt	68%	63%	57%	52%	48%	44%	42%	41%	39%	38%
150kt	65%	60%	54%	48%	44%	42%	39%	38%	36%	35%
155kt	62%	56%	51%	45%	42%	39%	37%	35%	34%	33%
160kt	60%	54%	47%	43%	39%	36%	34%	33%	31%	30%

b) Probability that $SSB \geq SSB_{MSY}$

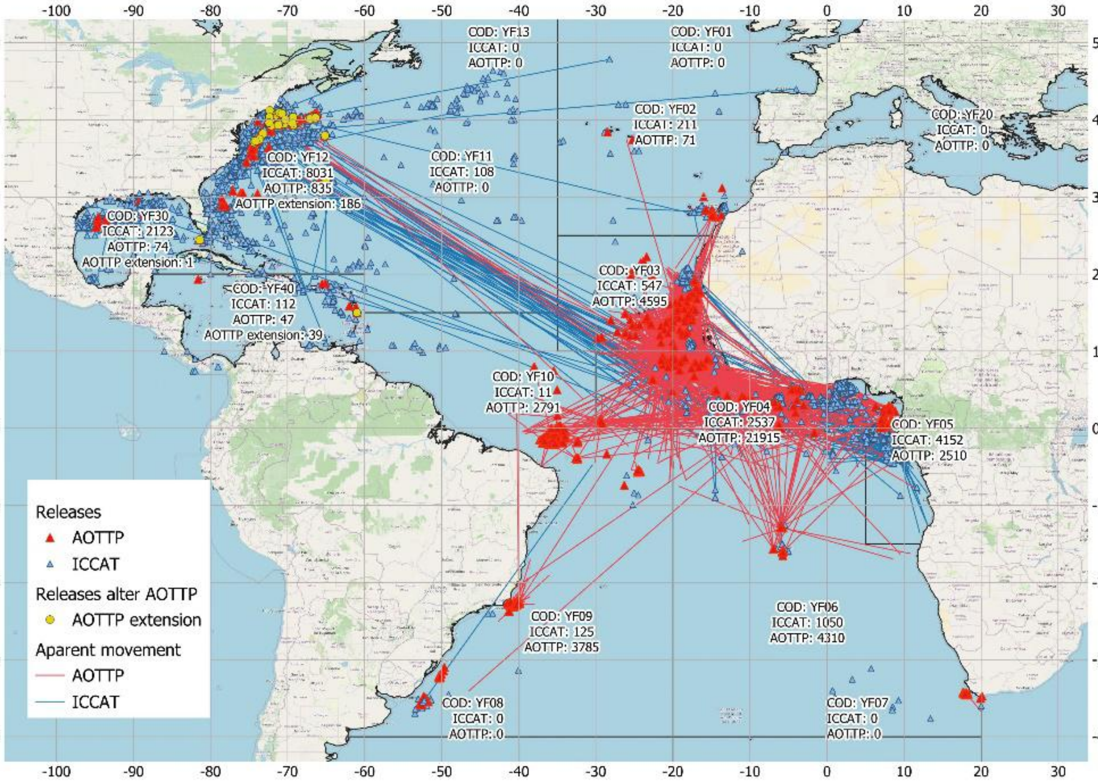
Catch	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
0kt	93%	94%	97%	99%	100%	100%	100%	100%	100%	100%
100kt	90%	87%	86%	85%	85%	85%	85%	85%	84%	84%
105kt	89%	87%	85%	84%	83%	82%	81%	81%	80%	80%
110kt	89%	86%	84%	82%	81%	79%	78%	76%	75%	74%
115kt	89%	86%	83%	81%	78%	76%	74%	72%	69%	67%
120kt	89%	85%	82%	78%	75%	72%	69%	66%	64%	62%
125kt	89%	85%	81%	76%	72%	68%	64%	61%	59%	57%
130kt	89%	84%	80%	74%	70%	64%	60%	57%	54%	52%
135kt	88%	84%	78%	72%	66%	60%	56%	53%	50%	48%
140kt	88%	84%	77%	70%	63%	57%	53%	49%	46%	44%
145kt	88%	83%	76%	68%	59%	54%	49%	45%	43%	41%
150kt	88%	82%	74%	66%	56%	50%	46%	43%	40%	38%
155kt	87%	82%	73%	63%	54%	47%	43%	40%	38%	36%
160kt	87%	81%	72%	61%	51%	44%	41%	37%	35%	34%

c) Probability that $F \leq F_{MSY}$ and $SSB \geq SSB_{MSY}$

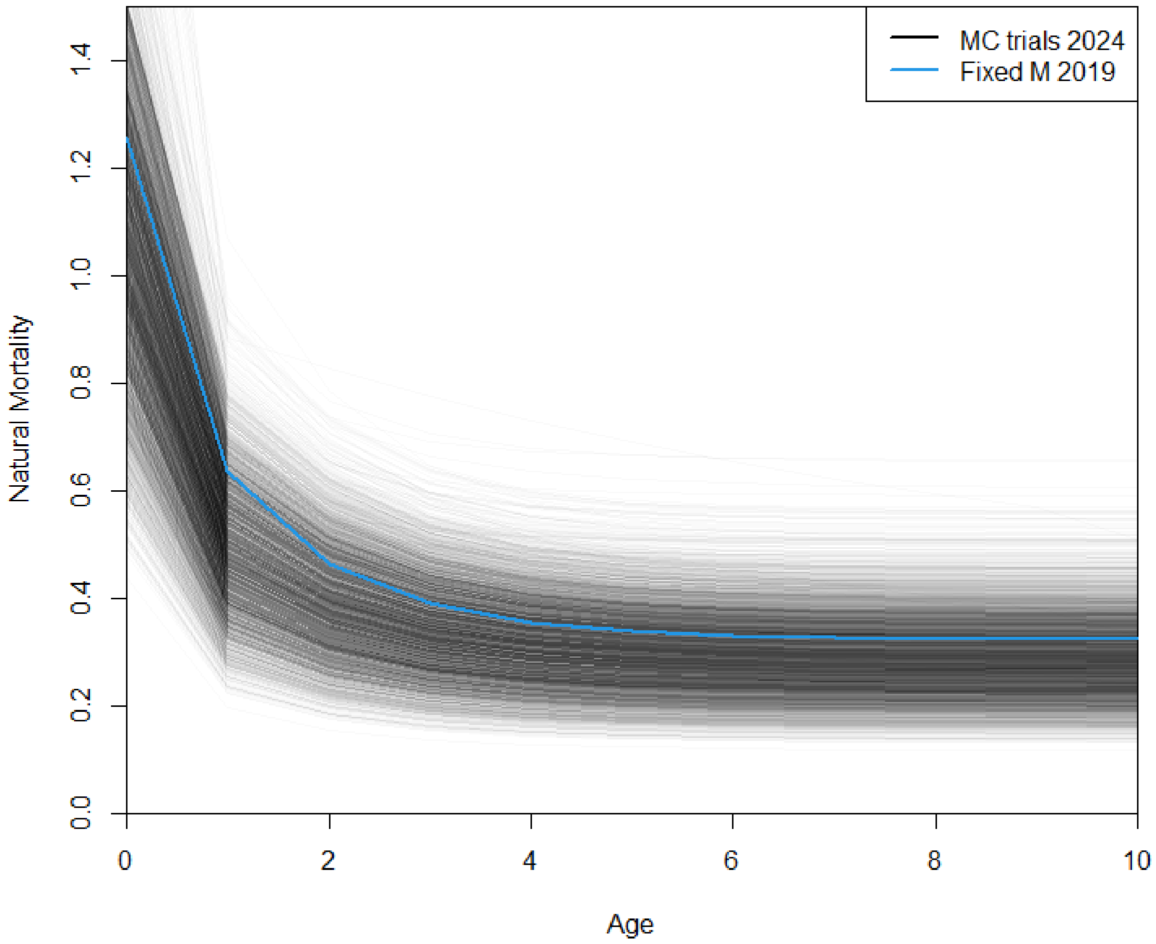
Catch	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
0kt	93%	94%	97%	99%	100%	100%	100%	100%	100%	100%
100kt	90%	87%	86%	85%	85%	85%	85%	85%	84%	84%
105kt	89%	87%	85%	84%	83%	82%	81%	81%	80%	80%
110kt	88%	86%	84%	82%	80%	79%	78%	76%	75%	74%
115kt	86%	83%	81%	79%	76%	74%	72%	70%	68%	66%
120kt	83%	80%	77%	74%	71%	67%	65%	63%	62%	61%
125kt	81%	77%	73%	69%	65%	62%	60%	58%	56%	55%
130kt	78%	74%	68%	64%	60%	57%	55%	53%	51%	49%
135kt	75%	70%	64%	60%	56%	53%	50%	48%	46%	44%
140kt	71%	66%	61%	56%	51%	48%	45%	44%	42%	41%
145kt	68%	63%	57%	52%	48%	44%	42%	41%	39%	38%
150kt	65%	60%	54%	48%	44%	42%	39%	38%	36%	35%
155kt	62%	56%	51%	45%	42%	39%	37%	35%	34%	33%
160kt	60%	54%	47%	43%	39%	36%	34%	33%	31%	30%

YFT-Table 4. Estimated probability of the spawning stock biomass of Atlantic YFT will be below the 20% of SSB_{MSY}.

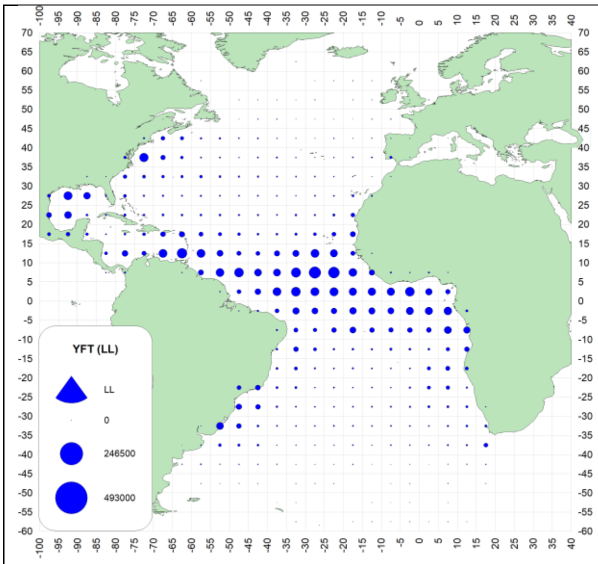
Catch	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
0kt	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
100kt	0%	0%	0%	0%	0%	0%	1%	1%	1%	1%
105kt	0%	0%	0%	0%	0%	1%	1%	1%	1%	1%
110kt	0%	0%	0%	0%	0%	1%	1%	1%	1%	2%
115kt	0%	0%	0%	0%	1%	1%	1%	1%	2%	3%
120kt	0%	0%	0%	0%	1%	1%	1%	2%	3%	4%
125kt	0%	0%	0%	0%	1%	1%	2%	3%	4%	5%
130kt	0%	0%	0%	0%	1%	1%	2%	4%	5%	7%
135kt	0%	0%	0%	1%	1%	2%	3%	5%	7%	10%
140kt	0%	0%	0%	1%	1%	2%	4%	6%	9%	13%
145kt	0%	0%	0%	1%	2%	3%	5%	8%	12%	17%
150kt	0%	0%	0%	1%	2%	4%	7%	10%	15%	21%
155kt	0%	0%	0%	1%	2%	5%	8%	13%	20%	26%
160kt	0%	0%	0%	1%	3%	6%	10%	16%	24%	32%



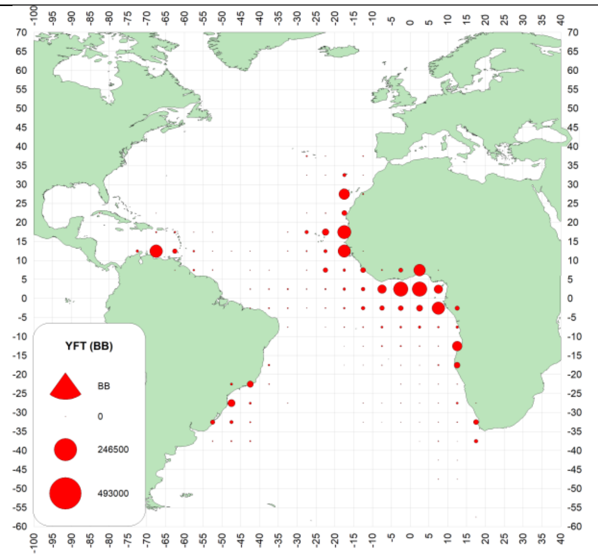
YFT-Figure 1. YFT releases and the apparent movement of the update database (red colour those of the Atlantic Ocean Tropical Tuna Tagging Programme (AOTTP) project and in blue the rest; dots (in yellow) represent fish tagged during the extension of the AOTTP project in the Northwest Atlantic.



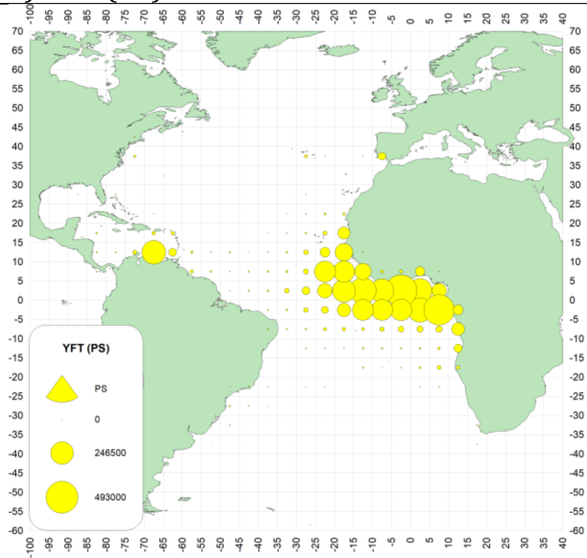
YFT-Figure 2. Age-specific natural mortality vectors used in the 2024 stock assessment (black line). With the values used in the previous assessment (2019, blue line). Both were computed assuming a maximum age of 18.



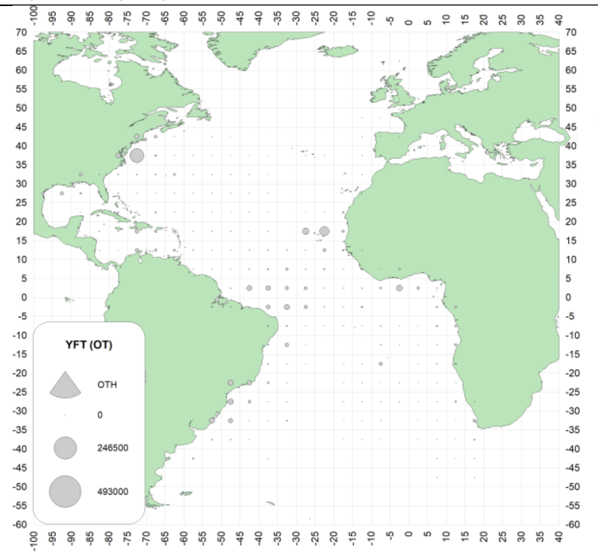
a) YFT (LL)



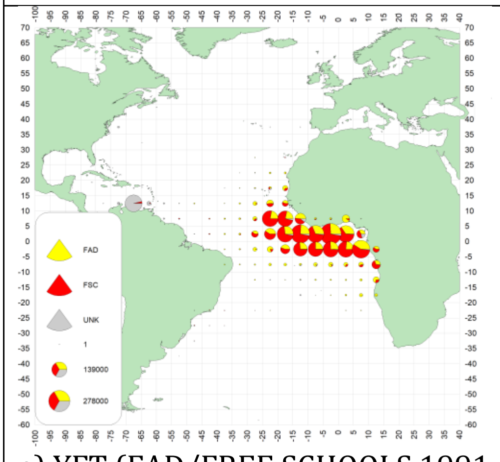
b) YFT (BB)



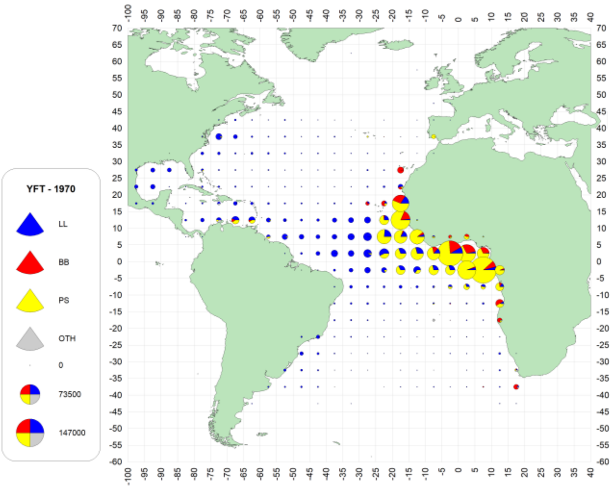
c) YFT (PS)



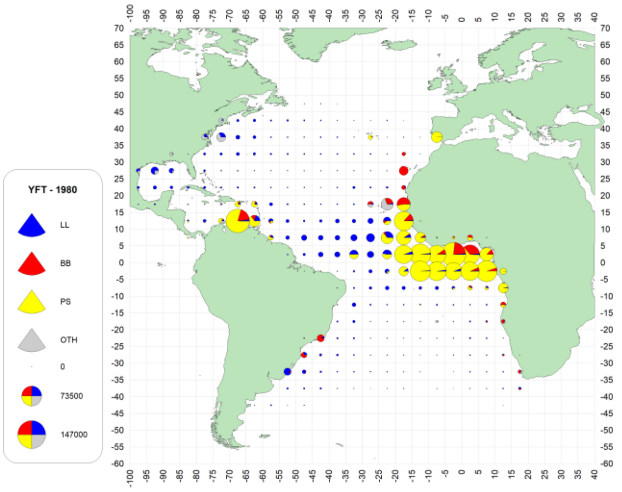
d) YFT (oth)



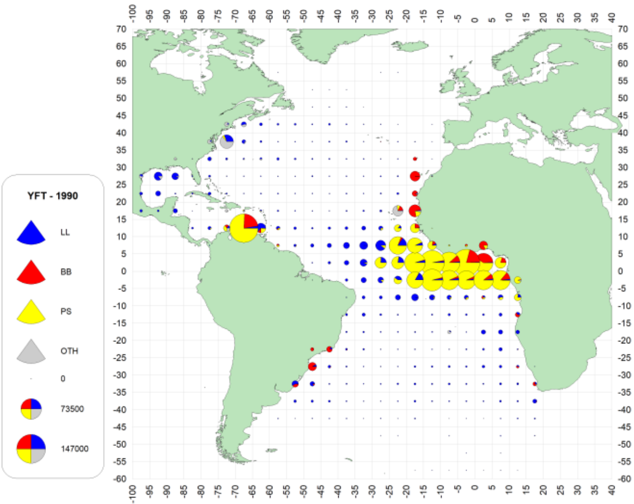
e) YFT (FAD/FREE SCHOOLS 1991-2022)



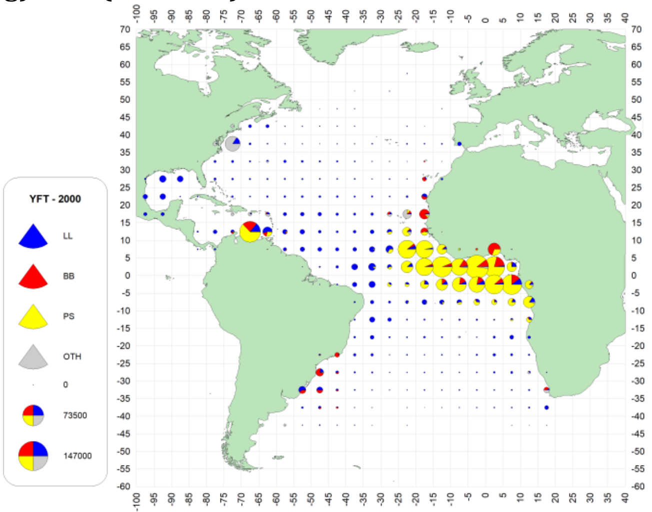
f) YFT (1970-79)



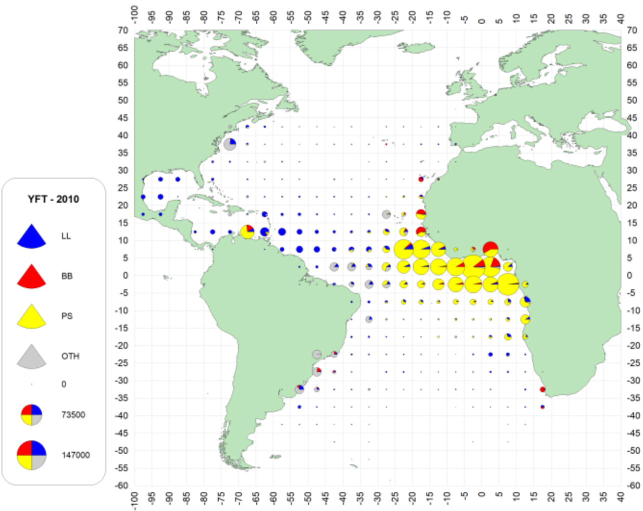
g) YFT (1980-89)



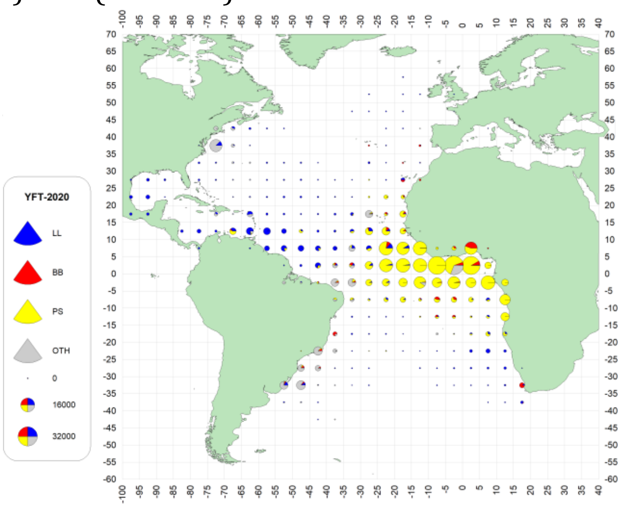
h) YFT (1990-99)



i) YFT (2000-09)

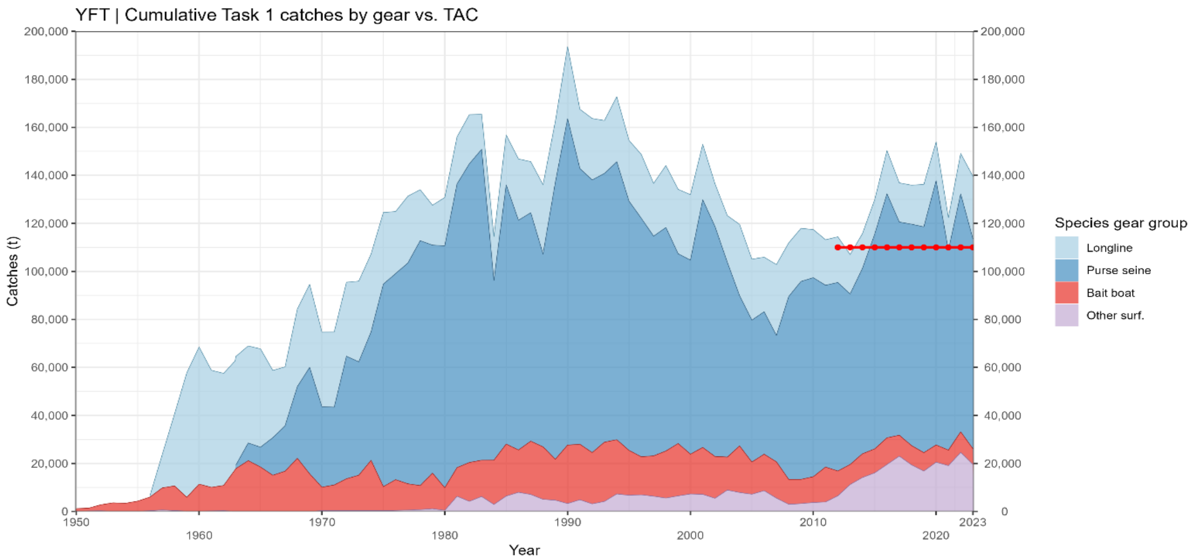


j) YFT (2010-19)

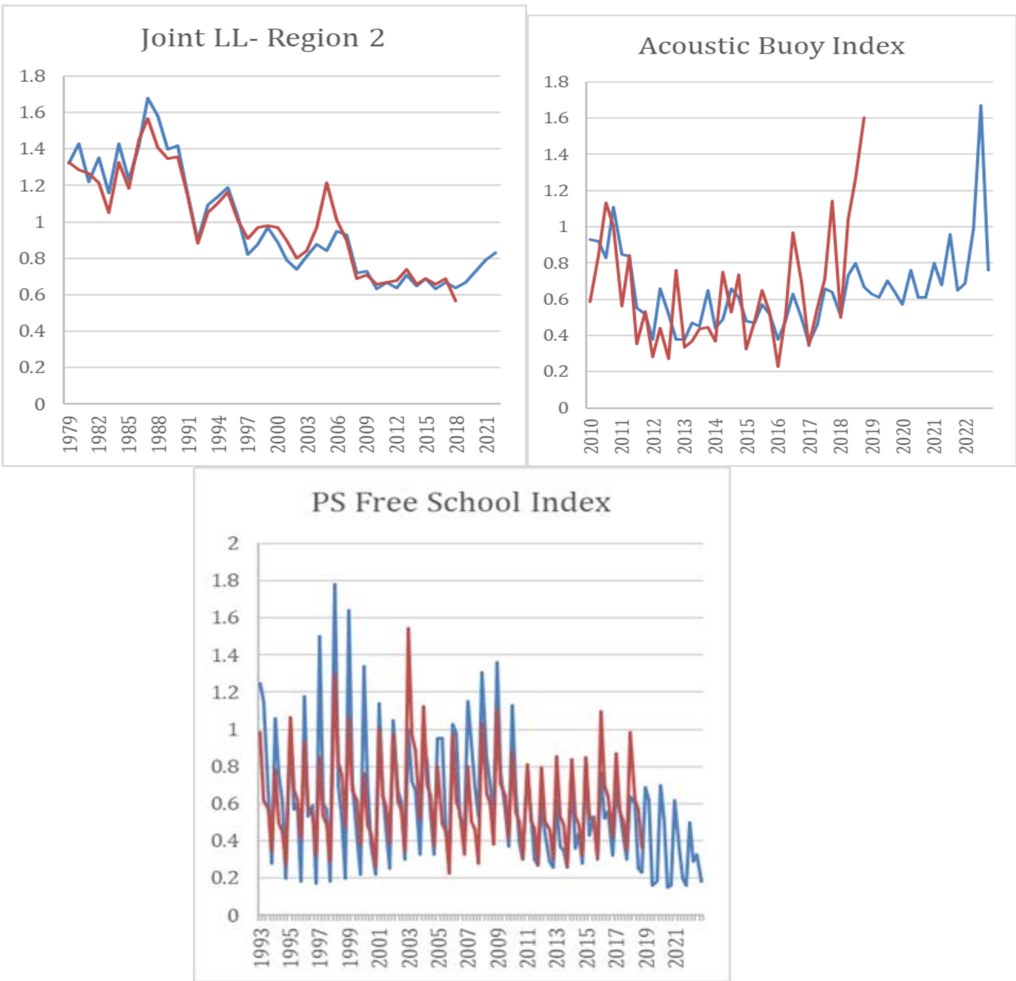


k) YFT (2020-22)

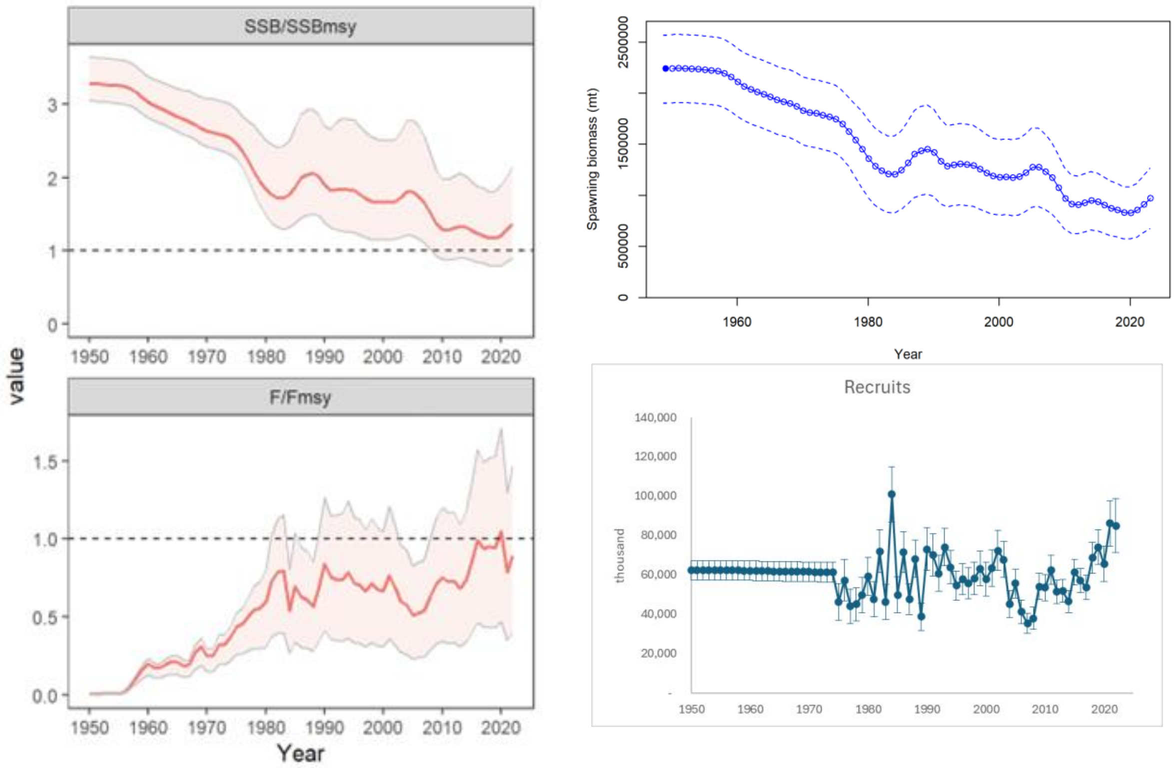
YFT-Figure 3. Geographical distribution of yellowfin tuna total catches by major gears [a-e] and by decade [f-k]. The maps are scaled to the maximum catch observed during 1970-2022. Note: the last panel k) shows only 3 years of information. Thus, apparent changes in the size of the pie charts (in k) should not be interpreted as a reduction in catch during 2020-2022.



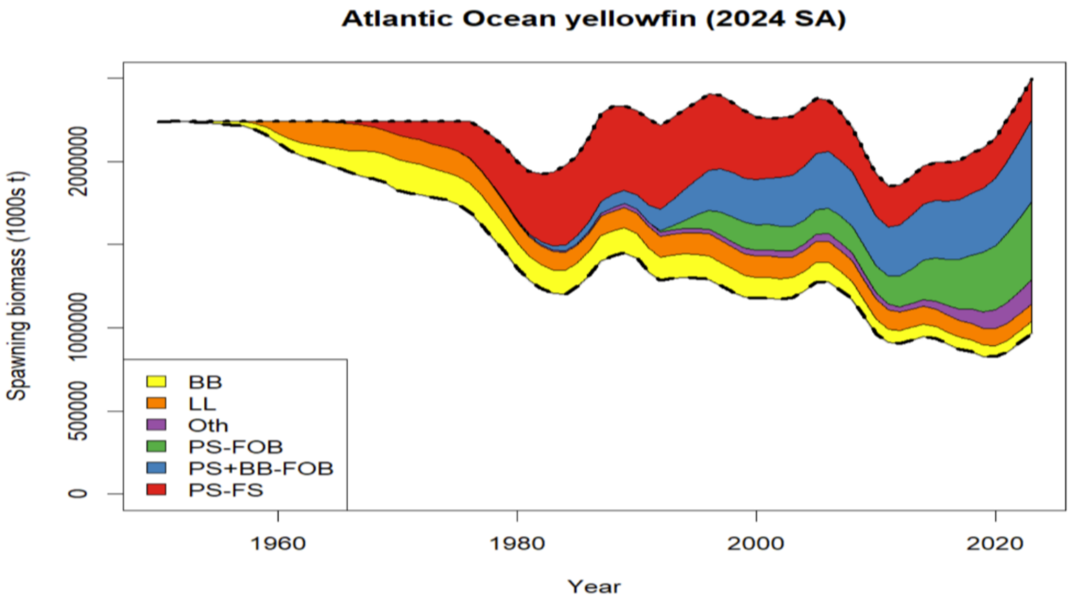
YFT-Figure 4. Yellowfin tuna total catch 1950-2023 by main fishing gear group. The red dotted line represents the TAC.



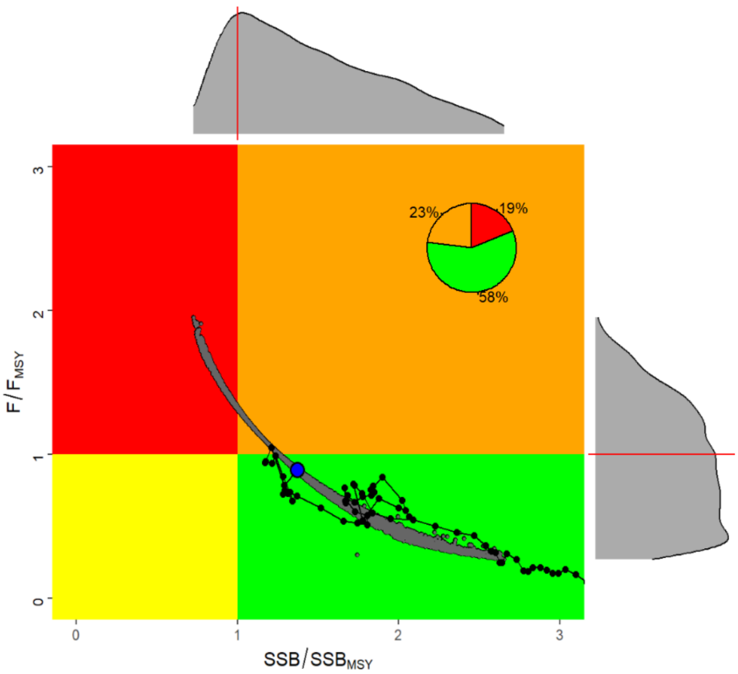
YFT-Figure 5. Standardized indices of Atlantic yellowfin tuna relative abundance fit within Stock Synthesis; the joint-CPC tropical Atlantic (region 2) longline index (1979-2022), the acoustic echosounder buoy index associated with FOBs (2010-2022) and the purse seine free school index (1993-2022). The red lines show the index used in the 2019 assessment, and the blue line shows the updated index provided for the 2024 assessment. Note: PS Free School index was estimated on a quarterly basis while the others are annual.



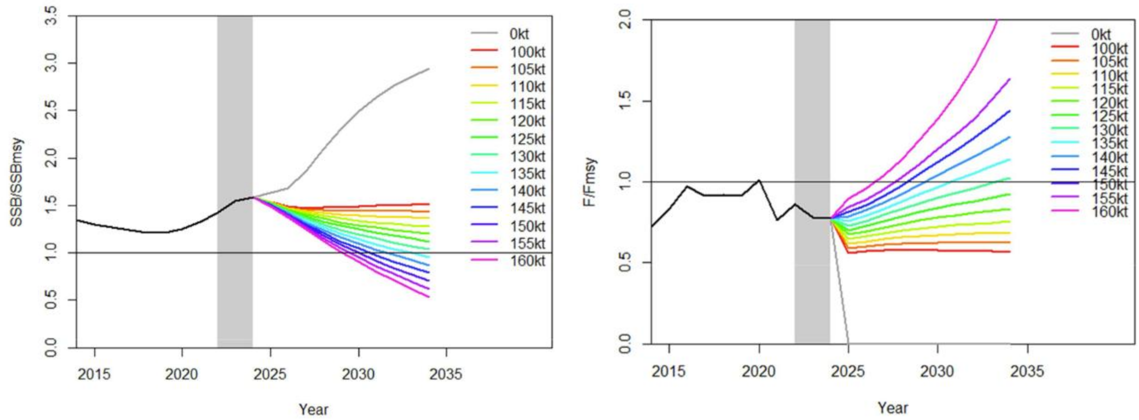
YFT-Figure 6. Annual trends of relative biomass (SSB/SSB$_{MSY}$, top left), fishing mortality (F/F$_{MSY}$, bottom left), absolute spawning biomass (SSB, top right), and annual recruits (number of Age 0, top left) from the Stock Synthesis reference case for Atlantic yellowfin tuna. The dark line indicates the median of 4000 iterations and the shaded area is the overall 80% confidence bounds of the results for the relative plots, for the SSB and recruit series the confidence intervals indicate the 95% CIs.



YFT-Figure 7. Impact plots represent the relative impact of each gear on the spawning biomass of the stock. Coloured areas represent model predicted increases in spawning biomass when catches of each gear are eliminated from the historical catches. The estimated unfished spawning biomass (dotted line) varies with recruitment deviations. The historical SSB trajectory, estimated by the stock assessment model, is indicated with a dashed line. The codes PS FOB and PS+BB-FOB represent the purse seine fisheries operating on FOB/FADs. The code PS+BB-FOB reflects that these purse seine fleets have operated in association with bait boats (BB) in the past. The free school refers to the purse seine operations on free school banks.



YFT-Figure 8. Kobe plot of the stock status of Atlantic yellowfin tuna in 2022. Gray dots are the 4,000 Stock Synthesis model runs; the blue circle is the median of these runs and marginal histograms represent the distribution of either SSB/SSB$_{MSY}$ or F/F$_{MSY}$. The black line indicates the stock status trajectory starting in 1958. The inserted pie chart indicates the proportion of model iterations within each Kobe colour quadrant, 58% in the green quadrant, 23% in the orange quadrant, and 19% in the red quadrant.



YFT-Figure 9. Trends of projected relative spawning stock biomass (left panel, SSB/SSB$_{MSY}$) and fishing mortality (right panel, F/F$_{MSY}$) for Atlantic yellowfin tuna under different fixed catch scenarios of 0–160,000 t, based upon projections of Stock Synthesis. Each line represents the median of the 4,000 Monte Carlo iterations by projected year.

9.2 BET - Bigeye

A stock assessment for bigeye tuna was conducted in 2021 through a process that included a data preparatory meeting in April and an assessment meeting in July. The stock assessment used fishery data from the period 1950-2019 and indices of relative abundance used in the assessment were calculated through 2019. The complete description of the stock assessment process and the development of management advice is found in the Report of the 2021 Bigeye Tuna Data Preparatory Meeting (ICCAT, 2021a) and the Report of the 2021 Bigeye Tuna Stock Assessment Meeting (ICCAT, 2021b).

BET-1. Biology

Bigeye tunas 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 archival acoustic 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 favourable. 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, molluscs, and crustaceans are found in their stomach contents. Bigeye tuna exhibit relatively fast growth: about 110 cm fork length at age three, 145 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. Based on Indian Ocean tagging data, growth rates of bigeye tuna differ between sexes, males reaching around 10 cm larger L_{INF} than females. Bigeye tuna become mature around 100 cm at around 3 years old. Young fish form schools mixed with other tunas such as skipjack and young yellowfin tuna. These schools are often associated with drifting objects, whale sharks and sea mounts. This association weakens as bigeye tuna grow.

Extensive growth information obtained during the Atlantic Ocean Tropical Tuna Tagging Programme (AOTTP) has confirmed previous assumptions about growth rates and the Richards curve published by Hallier *et al*. (2005) continues to be used in the bigeye stock assessment. It is assumed that natural mortality (M) is larger for young fish than for old fish. Age-specific M assumptions were modified significantly from the 2018 stock assessment (ICCAT, 2019). Modifications were based on new information recently obtained by ageing otoliths of Atlantic BET showing that fish reach 17 years of age (in contrast to previous estimates of 15 years) and by the decision to use a better procedure to derive natural mortality from maximum age. Various pieces of evidence, such as a lack of identified genetic heterogeneity, the time-area distribution of fish and movements of tagged fish, as confirmed by the recent data obtained from the AOTTP programme (**BET-Figure 1**), suggest an Atlantic-wide single stock for this species. However, the possibility of other more complex scenarios of stock structure should not be disregarded. Knowledge about the relationship between recruitment and spawning stock remains limited, so assumptions about the steepness of this relationship for small spawning stock sizes and the interannual variation in recruitment remain the same as the assumptions of the 2018 stock assessment. These uncertainties in stock structure, natural mortality, and the relationship between spawning stock and recruitment have important implications for the stock assessment as described in the Report of the 2021 Bigeye Tuna Stock Assessment Meeting (ICCAT, 2021b).

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. 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 other fleets has been conducted since 1980 to estimate bigeye tuna catches (**BET-Figure 2, BET-Table 1**). The size of fish caught varies among fisheries: medium to large fish for the longline fishery and purse seine free school sets, small to large for subtropical baitboat fishery, and small for tropical baitboat, western handline and purse seine floating object (FOB) / fish aggregating device (FAD) fisheries.

The major historical baitboat fisheries are located in Ghana, Senegal, the Canary Islands, Madeira and the Azores. Since 2012, a "vessel associated-school" fishing method using handline, where the vessels acts as a fish aggregating device developed in the western equatorial area, with bigeye catches increasing from 555 t in 2012 to an average of 4,670 t in 2015-2019. The tropical purse seine fleets operate in the Gulf of Guinea in the eastern Atlantic and across the tropical equatorial area. The longline fleets operate across a broader geographic range, covering tropical and temperate regions (**BET-Figure 2**). While bigeye tuna is 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 tunas are mostly caught while fishing on floating objects such as logs or manmade fish aggregating devices (FOB/FADs). The estimated total numbers of FADs released yearly has increased since the beginning of the FAD fishery, especially in recent years. During 2018-2023, bigeye landings in weight caught by longline fleets represent 49%, purse seine fleets 32%, baitboat 11% and other surface fleets 8% of the total landings (**BET-Table 1**).

The total annual Task 1 catch (**BET-Table 1**, **BET-Figure 3**) increased continuously up to the mid-1970s reaching 60,000 t and fluctuated over the next 15 years. In 1992, catch reached about 100,000 t and continued to increase, reaching a historic high of about 135,000 t in 1994. Since then, reported and estimated catch continuously declined and fell to 59,192 t by 2006. From the low level of 2006, catches increased again and reached 80,000 t in 2015. Catches averaged close to 73,000 t in the period 2016-2020. Catches of all tropical tunas declined considerably in 2021, and the reported catch of bigeye tuna was only 47,209 t. The preliminary catch reported for 2023 was 61,320 t.

After the historic high catch in 1994, all major fisheries exhibited a decline in catch while the relative share of 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 catch per unit effort (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 purse seine in the total catches for the period 2010-2019. Other surface fisheries, from CPCs with no specific catch limits under Rec. 16-01, also increased the catches from around 900 t in 2011 to around 5,700 t in 2016-2020, mainly due to the development of a handline vessel associated-school fishery in the equatorial western Atlantic.

Rec. 19-02 requires the ICCAT Secretariat to work with the SCRS to prepare an estimate of capacity in the Convention area, to include at least all the fishing units that are large-scale or operate outside the Exclusive Economic Area (EEZ) of the CPC they are registered in. These capacity estimates were updated in 2024, and these estimates in 2023 were 62 large scale purse seine vessels targeted tropical tunas, which is lower than some previous estimates, but slightly larger than the estimate made by SCRS for 2018 (**YFT-Table 2**). Currently, no capacity estimates are available for other large-scale fleets.

Small bigeye tuna continues to be diverted to local West African markets, predominantly in Abidjan, and sold as *faux poissons* in ways that make their monitoring and official reporting challenging. Monitoring of such catches has 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 with those from the main purse seine fleet in the ICCAT Task 1 data used for the assessments. The 2020-2022 catch for *faux poissons* was estimated by the Tropical Tunas Species Group to be 4% of the total purse seine BET catch.

In the 2018 stock assessment mean average weight of bigeye tuna was reviewed. It showed mean weight decreased prior to 2004 but has remained relatively stable at around 10 kg for the last decade. Average weight, however, is quite different for the different fishing gears. In 2017 it was around 55 kg for longliners, 10 kg for baitboats, and 6 kg for purse seiners. Since 2000, 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 2000 and 2008. The average weight of bigeye tuna caught in free schools is more than double the average weight of those caught around FOB/FADs. Since 1991, when tuna catches were identified separately for FADs for EU and other CPCs purse seine fleets, the majority of bigeye tuna are caught in sets associated with FADs; particularly since the mid-2000s (60%-80%). Similarly, baitboat-caught bigeye tuna weighed between 6 and 10 kg up to 2011, but with greater inter-annual variability in average weight compared to longline or purse seine caught fish.

During the 2018 stock assessment a Joint Longline standardized abundance index (Hoyle *et al*., 2019) was used instead of each individual CPC's standardized CPUE indices used in the 2015 assessment. The joint longline standardized index for 1959-2017 was constructed using detailed operational data (including set by set and vessel identifiers) from major longline fleets, (Japan, Korea (Rep.), United States and Chinese Taipei). The index was broken down into two periods, 1959-1978 ("early") and 1979-2017 ("late") because of changes in the level of information available on fishing operations.

The development of this joint standardized CPUE index was motivated to reduce data conflicts that arise when CPUE trends differ for different fleets in the same period. This can occur when available data are sparse, when the fishery occurs at the extremes of the spatial distribution of the stock and/or does not represent a meaningful proportion of the stock biomass, or when the index references only a small portion of the age or size distribution. This can also occur when there are important changes in fisheries operations (e.g., targeting, regulations, spatial distribution) that cannot be addressed in the standardization process.

The 2018 joint longline indices were an improvement over fleet-specific indices and, for the "late" period, was able to account for differences in fishing efficiency of longline vessels. The "early" joint longline index developed in 2018 for the period 1959-1978 was included in the assessment of 2021 (**BET-Figure 4**).

A new joint longline index was produced in 2021 for the "late" period 1979-2019 (**BET-Figure 4**). Unfortunately, it was not possible to update this index by using the same level of detailed data and same set of fleet-specific longline data sets as it was done during the 2018 stock assessment due to restrictions on analyses caused by the COVID-19 pandemic. The 2021 "late" joint longline index used data aggregated to monthly catches by fleet and 1x1 latitude longitude. This index was developed without set-by-set data.

A new quarterly acoustic echosounder buoy index associated with FADs covering the period 2010-2019 is now available for all three species of tropical tunas and helped the assessment account for changes in abundance of juvenile BET (**BET-Figure 5**). This new index is a significant improvement in the available information set for the stock assessment given the challenges faced up until now to develop an index from the purse seine fisheries of tropical tunas. The index is developed from tuna biomass estimates obtained from the acoustic buoys placed in FADs. Observations of tropical tuna species composition from purse seine FAD catch sets conducted in similar places and times to the acoustic observations are used to develop a buoy index for each species of tropical tuna.

In the assessment, the joint longline index was assumed to have a selectivity for older fish, equivalent to the Japan longline fleet in the tropical Atlantic. As the acoustic buoy index represents BET abundance associated with FADs it was assumed that it represents the same range of sizes and ages of BET as those caught in the purse seine FAD fishery.

BET-3. State of the stock

The 2021 stock assessment was conducted using similar assessment models to those used in 2018, updating the data until 2019, but with some significant changes in natural mortality assumptions, derived from new information and new assumptions on maximum age, the relative abundance indices used and the fleet structure of the model used for providing management advice. As in 2018, stock status evaluations for Atlantic bigeye tuna used in 2021 several modelling approaches, ranging from non-equilibrium (MPB) and Bayesian state-space (JABBA) production models to integrated statistical assessment models (Stock Synthesis). Different model formulations considered to be plausible representations of the stock dynamics were used to characterize stock status and the uncertainties in stock status evaluations.

The Stock Synthesis integrated statistical assessment model allows the incorporation of more detailed information, both for the biology of the species as well as fishery data, including the size data and selectivity by different fleet and gear components. As Stock Synthesis allows modelling of the changes in selectivity of different fleets as well as to investigate the effect of the length/age structure of the catches of different fisheries in the population dynamic, productivity and fishing mortality, it was the agreed model to be used for the management advice. The Stock Synthesis uncertainty grid includes 27 model configurations, all of which were given equal weight, that were investigated to ensure that major sources of structural uncertainty were incorporated and represented in the assessment results (**BET-Table 2**). Although the results of two production models, non-equilibrium and Bayesian state-space, are not used for management advice they provide comparative perception of stock status. The median relative biomass (B/B_{MSY}) and relative fishing mortality (F/F_{MSY}) trajectories from production models and the Stock Synthesis models depicted similar patterns. The set of 27 Stock Synthesis models has wide uncertainty bounds for these trajectories, and the biomass trajectories from all the production models are within these bounds.

Results of the uncertainty grid of Stock Synthesis runs show a long-term decline in spawning stock biomass (SSB) from the beginning of the fishery, accelerating from 1970 to 2000 and a relative stable SSB in the last 20 years. Relative fishing mortality increased from the beginning of the fishery until 1999, rapidly declined from 1999 to 2008 and has been relatively stable since. Recruitment estimates for the recent period of 2015-2019 show an increasing trend (**BET-Figure 6**), in spite of the relative stability of recent SSB (**BET-Figure 7**).

The Stock Synthesis uncertainty grid shows 1950-2019 trajectories of increasing F and decreasing biomass (B) towards the red area of the Kobe plot ($F > F_{MSY}$ and $SSB < SSB_{MSY}$) (**BET-Figure 7 and 8**). Overfishing starts in around 1993, and the stock becomes overfished around 1997, therefore reaching the red quadrant of the Kobe plot and mostly remained in the red quadrant until 2019 when overfishing ceased (**BET-Figure 8**). The results of the assessment, based on the median of the entire uncertainty grid shows that in 2019 the Atlantic bigeye tuna stock was overfished (median SSB_{2019}/SSB_{MSY} = 0.94 and 80% confidence interval (CI) of 0.71 and 1.37) and was not undergoing overfishing (median F_{2019}/F_{MSY}=1.00 and 80% CI of 0.63 and 1.35). The average of MSY was estimated as 86,833 t with (80% CI of 72,210 t and 106,440 t) from the uncertainty grid deterministic runs.

Calculations of the time-varying benchmarks from the stock synthesis uncertainty grid show a long-term increase in SSB_{MSY} and a general long-term decrease in MSY. This change in benchmarks is the result of the change in overall selectivity caused by the shift to catch greater proportions of smaller fish. The current estimate of MSY is below what was achieved in past decades because of this shift. Other potential sources of changes in stock productivity have not been accounted in the assessment as no evidence for such changes has been presented to the Committee (**BET-Figure 9**).

Current estimates of stock status in 2019 are more optimistic than the 2017 stock status estimated at the 2018 stock assessment. Sensitivity analyses demonstrated that such changes in stock status partially result from replacing the 2018 "late" joint longline index with the new "late" joint longline index and incorporating new mortality at age vectors (**BET-Figure 10**).

The effect of natural mortality, steepness, and Sigma R (variability on the log of recruitment) on the uncertainty around current stock status are shown in **BET-Figure 11**. Of the three axes of uncertainty, natural mortality contributes the most to changing the perception of stock status. Assumptions about natural mortality are the greatest contributors to this uncertainty (**BET-Figure 11a**).

Uncertainty regarding the change in the longline index methodology was not incorporated into the uncertainty grid because it was not clear to the Committee on an appropriate way to do so. The scale of the impact of such change in methodology can be seen in **BET-Figure 10**. Therefore, the current stock status (**BET-Figure 8**) is more uncertain than the SCRS has been able to quantify with the uncertainty grid.

BET-4. Outlook

During the 2021 assessment projections were conducted for the uncertainty grid Stock Synthesis for a range of fixed catches from 35,000 to 90,000 t for 15 years (which corresponds to 2 generation times of bigeye) from 2020-2034. Projections results are driven by all the assumptions made for the projection period: by the catch estimate for 2020, by the assumption that removals equal the TAC from 2021 onwards, by the assumption that the relative contribution of different fleets to catches from 2020 onwards are the same as the contributions for 2017-2019 and that future recruitment is determined by spawning stock. The 2020 catch in the projections is 22% lower than the average catches of the period 2015-2019, and, for the first time since 2015, this catch did not exceed the TAC.

Under the projections of 2021 the assumed catch for 2020, and 2021 were 59,919 t and 61,500 t, respectively. As of September 2023, the reported catch of 2020 was 57,971 t, smaller than the catch used in the projections made in 2021. The 2021 catches reported of 47,568 t were lower in comparison, but the 2022 preliminary catches of 62,513 t were slightly higher than the TAC of 62,000 t. Therefore, projections conducted in 2021 have to be interpreted with caution as none of the projection tables were calculated with catches for 2020-2022 that match the current reported catches for such period.

For some of the projections, the modelled stock could not sustain some of the constant high TACs in the long term, as SSB was predicted to decline below a safe threshold (**BET-Table 3**). This safe threshold is an indicator of very low SSBs that may compromise the rebuilding ability of a stock when such low levels of biomass are reached. The value of 20% SSB at MSY is used by the Committee for both YFT and BET. The results of projections of the Stock Synthesis are provided in the form of Kobe II Strategic Matrices (K2SMs) including with probabilities that overfishing is not occurring ($F<=F_{MSY}$), stock is not overfished ($SSB>=SSB_{MSY}$) and the joint probability of being in the green quadrant of the Kobe plot (i.e., $F<=F_{MSY}$ and $SSB>=SSB_{MSY}$) (**BET-Table 4**).

The rapid change in probabilities of overfishing and overfished during 2020 and 2021 (**BET-Figure 12**). are the result of the fact that estimated stock status in 2019 is close to the centre point of the Kobe plot. When a stock is at such centre point decreases in fishing mortality initially lead to large changes in these probabilities as can be seen from the marginal histograms (**BET-Figure 8**).

The more optimistic outlook presented in the 2021 assessment compared to the one obtained in 2018, is the result of a combination of factors: updates to the data and biological parameters, changes in the methodology and data used for the joint longline index, use of the buoy index, changes to the fleet structure in the stock synthesis models, and the assumed catches of BET for 2020 and 2021 which were low in comparison to catches for 2015-2019. There was some disagreement among Committee members on whether all these changes represent improvements to the information used to provide the determination of stock status and the outlook for the stock. Therefore, the Kobe II matrix should be interpreted with caution.

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 2009-2015 (**BET-Table 1**) have been always lower than 85,000 t. The TAC was again reduced to 65,000 t in Rec. 15-01 which entered into force in 2016 and Rec. 18-01, and in Rec. 19-02 to 62,500 t and 61,500 t for 2020 and 2021, respectively. TACs for 2022-2024 were set to 62,000 t (Rec. 21-01, Rec. 22-01, and Rec. 23-01, respectively). Catches exceeded the TAC by more than 20% every year from 2016-2019 except 2018 when catches were 12% higher than the TAC. Note that because TACs do not limit catches of all countries and fleets that can catch bigeye tuna, the total catch removed from the stock can exceed the TAC. Rec. 19-02 included new catch limits for CPCs not previously under catch limits that took effect in 2020. Such limits were somewhat modified in subsequent recommendations. Current limits are described in Rec. 22-01 and Rec. 23-01. Such limits may have contributed to the declines in reported catch for 2020 and 2021 which were lower than the TAC, although such decline may have also been partly due to the effects of COVID-19 in fishing operations. Preliminary reported catches for 2023 were 61,320 t, lower than the TAC of 62,000 t.

Concern over the catches of small yellowfin and bigeye tunas led to the establishment of spatial closures to surface fishing gear FAD sets in the Gulf of Guinea (Recs. 04-01, 08-01, 11-01, 14-01, 15-01) or entire Atlantic (Recs. 19-02, 21-01, and 22-01). The Committee evaluated the effectiveness of alternative temporal closures (season and duration) using outputs of the most recent stock assessments of bigeye and yellowfin tunas (item 19.38).

BET-6. Management recommendations

The Atlantic bigeye tuna stock in 2019 was estimated to be overfished but not undergoing overfishing. According to the Kobe II Strategy Matrix (K2SM), a future constant catch of 61,500 t, which is the TAC established in Rec. 19-02, will have a high probability (97%) of maintaining the stock in the green quadrant of the Kobe plot by 2034. This would leave the stock in a state consistent with the Convention objectives and the recovery plan in Rec. 19-02 (**BET-Table 4**). The K2SM incorporates some of the known main sources of uncertainty, however, some other sources of relevant uncertainties were not being included in the development of the K2SM, including the appropriateness of the range of natural mortalities used in the uncertainty grid and the change in methodology used to develop the Joint Longline index. Therefore, current stock status and the outlook for the stock are more uncertain than portrayed in the summary table and the K2SM. Projection probabilities should be interpreted with caution. Until such additional sources of uncertainty can be properly incorporated in the estimation of stock status and the K2SM, the Commission should consider adopting a TAC that would shift the stock status of BET towards the green zone of the Kobe plot with a high probability.

The Commission should be aware that increased harvests on small fishes 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) (**BET-Figure 9**). Rec. 19-02 contains measures adopted by the Commission aimed at increasing long-term sustainable yield by reducing the catch of juveniles of tropical tunas. It is too early to know the extent by which these measures have reduced mortality of juvenile BET.

ATLANTIC BIGEYE TUNA SUMMARY	
Maximum Sustainable Yield	86,833 t with (72,210 -106,440 t)[1]
Current (2023) Yield	61,320 t[2]
Relative Spawning Biomass (SSB_{2019}/SSB_{MSY})	0.94 (0.71-1.37)[1]
Relative Fishing Mortality (F_{2019}/F_{MSY})	1.00 (0.63-1.35)[1]
Stock Status (2019)	Overfished: Yes[3] Overfishing: No[3]
Conservation & management measures in effect:	Rec. 16-02, Rec. 17-01 and Rec. 23-01 – TAC for 2022-2024 was set to 62,000 t for Contracting Parties and Cooperating non-Contracting Parties, Entities or Fishing Entities. – No fishing with natural or artificial floating objects from 1 January to 12 March in 2024, throughout the Convention area. – No more than 300 FADs active at any time by vessel. – Use of non-entangling FADs. – Prohibition of discarding from purse seine.

1 Combined result of stock synthesis 27 uncertainty grid runs. Median and 10 and 90% percentile in brackets.
2 Reports for 2023 reflect the most recent data but should be considered provisional.
3 Probability of overfished 58%, probability of overfishing 50%.

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

			1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
TOTAL	A+M		134932	128057	120767	110249	107948	121422	103434	91636	75801	87596	90043	67954	59192	69895	63172	76427	76074	76749	71317	66977	75308	80000	79897	78665	73077	75384	57971	47209	62313	61320
Landings		Bait boat	20352	25687	18342	21277	19173	22197	12141	14430	8460	11233	20238	13104	10605	10561	6307	11548	7842	12659	10459	9195	8715	7970	6710	8366	7932	7341	6811	6141	6855	4668
		Longline	78908	74882	74930	68306	71851	77224	72010	56123	47350	55356	49400	37961	34183	46231	41063	43533	42516	37899	34930	32245	36770	40379	36345	35190	32065	33890	27288	20996	32429	36999
		Other surf.	973	561	363	546	445	678	459	723	226	451	293	733	552	449	220	258	487	1146	1012	2783	4960	6002	6472	7217	4616	6054	5461	5339	5167	5682
		Purse seine	32667	25260	26592	19127	15490	20139	17460	20103	19552	19689	19094	15129	13310	11962	14810	20007	24235	23767	24080	22122	24253	24418	28624	26838	27284	26930	17026	14058	16793	13092
Landings(FP)		Bait boat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	6
		Purse seine	2032	1667	540	993	989	1184	1363	257	214	867	1019	1026	542	692	772	1081	994	1277	823	632	609	1193	1744	1015	1151	1145	1355	646	1028	850
Discards		Bait boat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	14	0	0	2	0	0	26	15	27	26	33	22
		Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	36	0	38	2	10	3	1	2	1
Landings	CP	Angola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	100
		Barbados	0	0	0	24	17	18	18	6	11	16	19	27	18	14	14	7	12	7	15	11	26	30	19	16	29	14	20	25	24	28
		Belize	0	10	0	5	195	0	134	96	0	0	0	0	4	60	70	234	249	1218	1242	1336	1502	1877	1764	1961	2135	2307	991	600	1002	1190
		Brazil	601	1935	1707	1237	776	2024	2768	2659	2582	2455	1496	1081	1479	1593	958	1189	1173	1841	2120	3623	6456	7750	7660	7258	5096	6249	6284	6499	7341	6364
		Canada	111	148	144	166	120	263	327	241	279	182	143	187	196	144	130	111	103	137	166	197	218	257	171	214	237	193	104	253	330	379
		Cape Verde	385	271	299	228	140	9	2	0	1	1	1	1077	1406	1247	444	545	554	1037	713	1333	2271	2764	1680	1107	1418	880	576	171	2	3
		China PR	428	476	520	427	1503	7347	6564	7210	5840	7890	6555	6200	7200	7399	5686	4973	5489	3720	3231	2371	2232	4942	5852	5514	4823	5718	3614	1638	3249	5415
		Costa Rica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	4	4	1	1	6	1	1
		Curaçao	0	0	1893	2890	2919	4016	3098	3757	2221	3203	3526	27	416	252	1721	2348	2688	3441	2890	1964	2315	2573	3598	2844	3530	2787	1519	1701	824	143
		Côte d'Ivoire	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	790	576	47	507	635	441	12	544	1239	384	2334	141	59	386	64
		EU-España	22096	17849	15393	12513	7110	13739	11250	10133	10572	11120	8365	7618	7454	6675	7494	11966	11272	13100	10914	10082	10736	10058	11469	11544	8400	9117	5997	6598	6424	5892
		EU-France	12262	8262	9135	5955	5583	5413	5873	5533	4437	4048	2989	2814	2984	1525	1130	2313	3355	3507	3756	3222	3837	2801	4772	4039	4055	5118	2104	1809	3678	2103
		EU-Ireland	0	0	0	4	0	0	0	10	0	0	0	33	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	7	0	7	0	0	0
		EU-Portugal	3099	9662	5810	5437	6334	3314	1498	1605	2590	1655	3204	4146	5071	5505	3422	5605	3682	6920	6128	5345	3869	3135	2187	3146	4405	3146	3069	3106	3123	2787
		El Salvador	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	992	1450	1826	2634	2464	1518	1492	1479	1196
		FR-St Pierre et Miquelon	0	0	0	0	0	0	0	90	21	0	28	6	0	2	3	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
		Gabon	87	10	0	0	0	184	150	121	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Gambia	0	0	0	0	0	0	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	4738	5517	4751	10174	10647	11704	5632	9864	6480	9061	17888	8860	2307	2559	3372	4515	6253	3541	4468	2963	4175	5918	5194	3838	3636	2917	3160	2221	3672	2371
		Great Britain	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	32	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Grenada	10	10	0	1	0	0	0	0	0	0	0	0	0	10	31	0	0	0	0	0	0	18	23	33	27	19	11	0	1	4
		Guatemala	0	0	0	0	0	0	0	0	0	736	831	998	949	836	998	913	1011	282	262	163	993	340	1103	1602	1488	1623	906	768	855	596
		Guinea Ecuatorial	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	50	0	58	0	3	10	17	4	11	7	8	6	6	5	1
		Guinée Rep	0	334	2394	885	0	0	0	0	0	0	0	0	0	0	0	0	328	322	1516	1429	902	0	0	0	0	0	0	0	5	101
		Honduras	0	61	28	59	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Iceland	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Japan	38503	35477	33171	26490	24330	21833	24605	18087	15306	19572	18509	14026	15735	17993	16684	16395	15205	12306	15390	13397	13603	12390	10365	10994	9854	9327	8973	8679	11943	13948
		Korea Rep	386	423	1250	796	163	124	43	1	87	143	629	770	2067	2136	2599	2134	2646	2762	1908	1151	1039	675	562	432	623	540	587	674	763	724
		Liberia	53	57	57	57	57	57	57	57	57	57	0	0	0	0	0	0	0	0	0	0	0	0	27	98	1	3	222	29	0	3
		Libya	500	400	400	400	400	400	400	31	593	593	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Maroc	977	553	654	255	336	1444	1160	1182	1154	1399	1145	786	929	700	802	795	276	300	300	308	300	309	350	410	500	850	1033	1239	1363	1441
		Mauritania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	
		Mexico	4	10	2	1	3	3	2	2	6	4	5	4	3	3	1	1	3	1	1	2	1	2	2	3	3	3	3	3	4	3
		Namibia	715	29	7	46	16	423	589	640	274	215	177	307	283	41	146	108	181	289	376	135	240	465	359	141	109	79	568	1185	2070	664
		Nigeria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0
		Panama	13234	9927	4777	2098	1252	580	952	562	211	0	1521	2310	2415	2922	2263	2405	3047	3462	1694	2774	2315	1289	2337	1664	2067	3052	1648	1107	1328	1322
		Philippines	0	0	0	0	1154	2113	975	377	837	855	1854	1743	1816	2368	1874	1880	1399	1267	532	1323	1964	0	0	0	0	0	0	0	0	0
		Russian Federation	0	0	13	38	4	8	91	0	0	0	0	1	1	26	73	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		S Tomé e Príncipe	3	6	4	5	6	5	4	4	4	4	11	6	4	0	92	94	97	100	103	107	110	633	421	393	2	81	46	90	149	150
		Senegal	123	357	190	272	789	1372	915	1159	497	322	490	770	1318	1293	734	1144	969	479	436	606	369	1031	1500	2978	2870	2272	2772	856	746	1174
		Sierra Leone	0	0	0	0	0	0	6	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		South Africa	79	27	7	10	53	55	249	239	341	113	270	221	84	171	226	159	145	153	47	435	332	193	121	257	282	432	357	380	464	619
		St Vincent and Grenadines	812	519	596	545	1937	2940	1921	1143	130	103	18	0	114	567	171	293	396	38	25	16	30	496	622	889	428	504	220	136	568	309
		Trinidad and Tobago	29	27	37	36	24	19	5	11	30	6	5	9	12	27	69	56	40	33	33	37	59	77	37	25	17	13	10	9	10	14
		UK-Bermuda	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	1
		UK-Sta Helena	6	10	10	12	17	6	8	5	5	4	6	18	25	18	28	17	11	190	51	19	17	44	77	70	45	4	0	0	1	1
		UK-Turks and Caicos	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	2	0	0	0	0	0	0	0	0	0
		USA	1402	1209	882	1138	929	1263	574	1085	601	482	416	484	991	527	508	515	578	866	727	903	892	1082	568	836	921	829	801	968	1210	933
		Uruguay	37	80	124	69	59	28	25	51	67	59	40	62	83	22	27	201	23	15	2	30	0	0	0	0	0	0	0	0	0	0
		Venezuela	457	457	189	274	222	140	221	708	1241	847	1060	243	261	318	122	229	85	264	98	94	169	132	156	318	165	28	79	129	39	39
	NCC	Chinese Taipei	19680	18023	21850	19242	16314	16837	16795	16429	18483	21563	17717	11984	2965	12116	10418	13252	13189	13732	10805	10316	13272	16453	13115	11845	11630	11288	9226	4093	8181	10274
		Guyana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	25	34	53	2	4	1	0	0
		Suriname	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	83
	NCO	Benin	9	9	9	30	13	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Cambodia	0	0	0	0	0	32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Congo	9	9	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Cuba	7	7	5	0	0	0	0	0	16	16	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	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Faroe Islands	0	0	0	0	0	11	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		NEI (ETRO)	356	915	0	7	0	0	0	362	68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		NEI (Flag related)	8964	10697	11862	16565	23484	22190	15092	7907	383	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Saint Kitts and Nevis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	0	0	1	0	0	
		Seychelles	0	0	0	0	0	0	58	0	162	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	1	2	2	0	2	0	0	0	0	0	0	0	0	0	6	10	25	13	13	9	3	3	2
		Togo	23	6	33	33	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Vanuatu	2713	2610	2016	828	0	314	0	0	0	0	104	109	52	132	91	34	42	39	23	9	4	0	0	0	0	0	0	0	0	
Landings(FP)	CP	Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	46	42	16	41	23	0	0	0	0	0	0	0	0	0
		Cape Verde	0	0	0	0	0	0	0	0	0	0	0	75	28	37	38	61	102	40	22	45	97	165	121	39	53	42	54	0	0	0
		Curaçao	0	0	0	0	0	0	0	0	0	0	0	13	25	20	13	117	59	46	60	34	42	0	0	0	0	0	0	57	0	0
		Côte d'Ivoire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	95	45	0	0	0	0	0	0	0	0	0	0
		EU-España	605	371	58	255	328	487	474	0	0	223	244	143	88	49	190	250	211	216	98	80	143	334	398	323	216	265	200	224	299	243
		EU-France	970	713	314	437	467	553	607	229	205	446	397	222	79	26	51	150	122	394	192	56	54	191	233	108	213	201	233	289	689	405
		El Salvador	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	201
		Guatemala	0	0	0	0	0	0	0	0	0	0	0	56	28	15	26	9	18	6	11	5	15	0	0	0	0	0	0	23	13	5
		Guinée Rep	0	0	0	0	0	0	0	0	0	0	0	72	0	60	20	22	74	203	288	245	209	0	0	0	0	0	0	0	0	0
		Panama	0	0	0	0	0	0	0	0	0	0	0	151	106	135	97	85	38	70	41	80	27	0	0	0	0	0	0	53	12	1
	NCO	Mixed flags (EU tropical)	457	582	169	301	193	143	281	28	8	198	378	294	189	348	337	375	324	257	0	0	0	503	993	546	669	637	868	0	0	0
Discards	CP	Canada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0
		EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	36	0	38	2	10	3	1	2	1
		EU-Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

		1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
	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	26	15	18	17	27	16
	Korea Rep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	**0**
	Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
	South Africa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
	UK-Bermuda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
	USA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	6	5	6
NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	14	0	0	0	0	0	0	0	0	0	0	**0**

BET-Table 2. Details of the specifications for the 27 Stock Synthesis models of the uncertainty grid for the Atlantic bigeye tuna. The 27 models are constructed as a fully crossed design of the 3 uncertainty parameters below (3x3x3=27). Max age represents the assumption of lifespan used to estimate age specific natural mortality. Sigma R represents the variability of recruitment not explained by the spawning stock recruitment relationship and steepness represents the shape of the SSB vs recruitment relationship. The bold values represent the model combination that the Committee defined as "reference" case. This reference case model was defined solely for the purpose of constructing the initial runs of the assessment and for comparison with sensitivity runs. The reference case model was given the same weight than any of the other models of the uncertainty grid in the estimation of stock status and development of forecasts.

Parameter	***Value 1***	***Value 2***	***Value 3***
Max_Age	17	20	25
Steepness	0.7	0.8	0.9
Sigma R	0.2	0.4	0.6

BET-Table 3. Percent of the model runs that resulted in SSB levels <= 20% of SSB_{MSY} during the projection period for a given catch level (in 1000 t) for Atlantic bigeye tuna.

TAC (1000s mt)	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
35	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
37.5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
40	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
42.5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
45	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
47.5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
50	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
52.5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
55	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
57.5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
60	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
61.5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
62.5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
65	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
67.5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
70	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
72.5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
75	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
77.5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
80	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
82.5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%
85	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	2%	8%
87.5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	3%	13%	27%
90	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	3%	14%	28%	32%

BET-Table 4. 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 a given catch level ('000 t), based upon Stock Synthesis 2021 assessment outcomes.

a) Probability of Overfishing Not Occurring (F <= F_{MSY}).

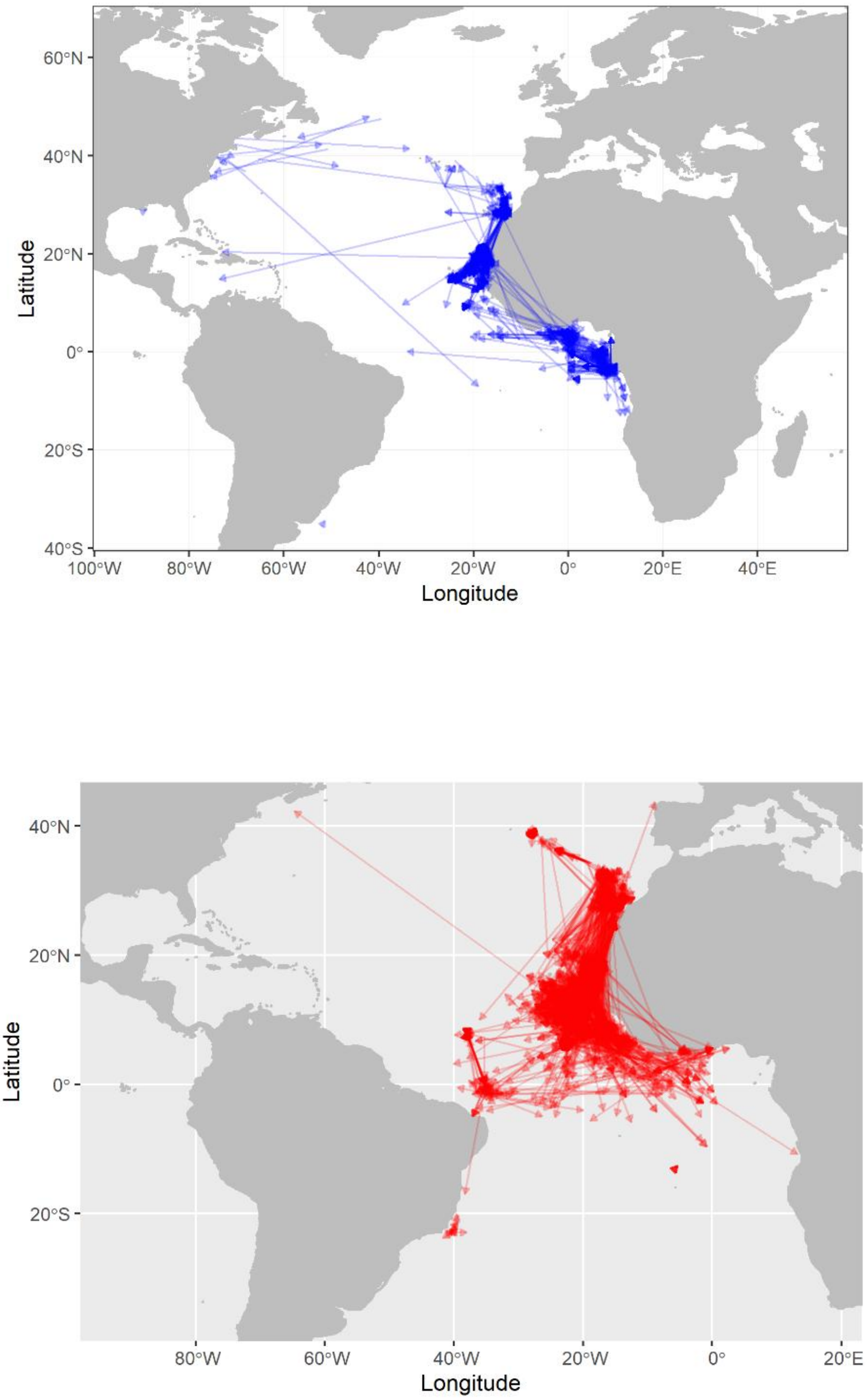
TAC (1000s mt)	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
35	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
37.5	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
40	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
42.5	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
45	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
47.5	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
50	99%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
52.5	98%	99%	99%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%
55	97%	98%	98%	99%	99%	100%	100%	100%	100%	100%	100%	100%	100%
57.5	96%	97%	98%	98%	99%	99%	99%	99%	100%	100%	100%	100%	100%
60	94%	96%	96%	97%	98%	98%	99%	99%	99%	99%	99%	99%	99%
61.5	93%	95%	95%	96%	97%	97%	98%	98%	98%	98%	98%	98%	99%
62.5	92%	94%	95%	96%	96%	97%	97%	98%	98%	98%	98%	98%	98%
65	90%	92%	92%	93%	94%	95%	95%	95%	96%	95%	95%	95%	95%
67.5	88%	89%	90%	91%	92%	92%	93%	93%	92%	92%	92%	92%	91%
70	85%	86%	87%	87%	88%	88%	89%	89%	88%	87%	87%	86%	85%
72.5	82%	83%	83%	83%	84%	84%	83%	83%	82%	81%	80%	79%	78%
75	78%	80%	79%	79%	79%	78%	77%	76%	75%	74%	73%	71%	69%
77.5	75%	76%	75%	74%	73%	72%	70%	69%	67%	66%	65%	63%	61%
80	71%	72%	70%	69%	67%	65%	62%	60%	58%	56%	55%	53%	52%
82.5	67%	67%	65%	64%	60%	57%	55%	52%	50%	47%	46%	44%	43%
85	63%	63%	60%	58%	53%	50%	47%	44%	41%	39%	38%	37%	36%
87.5	59%	59%	55%	53%	47%	43%	40%	36%	34%	32%	31%	31%	31%
90	55%	54%	50%	48%	41%	37%	33%	30%	28%	27%	26%	27%	26%

b) Probability of Not Overfished (SSB >= SSB_{MSY}).

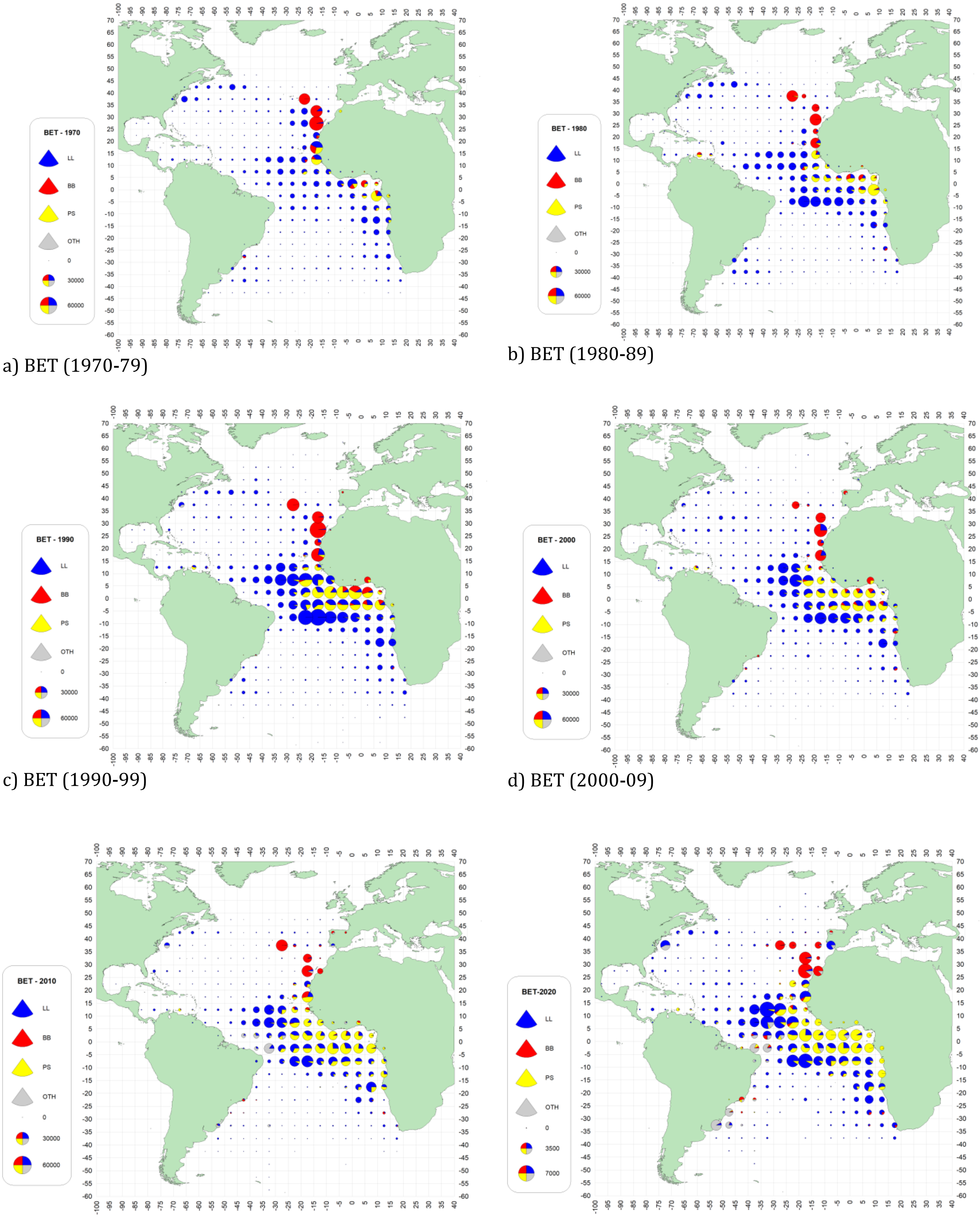
	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
35	85%	91%	96%	98%	99%	100%	100%	100%	100%	100%	100%	100%	100%
37.5	85%	91%	96%	98%	99%	100%	100%	100%	100%	100%	100%	100%	100%
40	84%	90%	95%	98%	99%	100%	100%	100%	100%	100%	100%	100%	100%
42.5	84%	90%	94%	97%	99%	99%	100%	100%	100%	100%	100%	100%	100%
45	84%	89%	94%	96%	98%	99%	100%	100%	100%	100%	100%	100%	100%
47.5	83%	89%	93%	96%	97%	99%	99%	100%	100%	100%	100%	100%	100%
50	83%	88%	92%	95%	97%	98%	99%	99%	100%	100%	100%	100%	100%
52.5	83%	87%	91%	94%	96%	97%	98%	99%	99%	100%	100%	100%	100%
55	82%	87%	91%	93%	95%	96%	97%	98%	99%	99%	100%	100%	100%
57.5	82%	86%	90%	92%	93%	95%	96%	97%	98%	98%	99%	99%	99%
60	82%	86%	89%	90%	92%	93%	94%	95%	96%	97%	98%	98%	98%
61.5	81%	85%	88%	89%	91%	92%	93%	94%	95%	96%	97%	97%	98%
62.5	81%	85%	87%	89%	90%	91%	91%	93%	94%	95%	96%	96%	97%
65	81%	84%	86%	87%	88%	88%	89%	90%	91%	91%	92%	93%	93%
67.5	80%	84%	85%	85%	85%	85%	85%	85%	86%	87%	88%	87%	88%
70	80%	83%	83%	83%	82%	82%	81%	80%	81%	81%	81%	81%	82%
72.5	80%	82%	82%	81%	79%	77%	75%	74%	74%	74%	74%	73%	73%
75	79%	81%	80%	78%	76%	73%	70%	68%	68%	66%	66%	65%	64%
77.5	79%	81%	79%	75%	72%	68%	64%	62%	60%	58%	57%	55%	54%
80	78%	80%	77%	72%	68%	63%	58%	56%	52%	50%	48%	47%	46%
82.5	78%	79%	75%	69%	64%	58%	53%	47%	45%	42%	41%	40%	39%
85	77%	78%	73%	66%	59%	52%	47%	41%	38%	36%	35%	34%	35%
87.5	77%	77%	71%	63%	55%	47%	40%	35%	32%	31%	30%	31%	31%
90	76%	76%	69%	60%	50%	43%	35%	30%	27%	26%	28%	28%	27%

c) Probability of Not Overfished (SSB >= SSB_{MSY}) and Overfishing not occurring (F <= F_{MSY}).

TAC (1000s mt)	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
35	85%	91%	96%	98%	99%	100%	100%	100%	100%	100%	100%	100%	100%
37.5	85%	91%	96%	98%	99%	100%	100%	100%	100%	100%	100%	100%	100%
40	85%	90%	95%	98%	99%	100%	100%	100%	100%	100%	100%	100%	100%
42.5	84%	90%	94%	97%	99%	99%	100%	100%	100%	100%	100%	100%	100%
45	84%	89%	94%	96%	98%	99%	100%	100%	100%	100%	100%	100%	100%
47.5	83%	89%	93%	96%	97%	99%	99%	100%	100%	100%	100%	100%	100%
50	83%	88%	92%	95%	97%	98%	99%	99%	100%	100%	100%	100%	100%
52.5	83%	88%	92%	94%	96%	97%	98%	99%	99%	100%	100%	100%	100%
55	82%	87%	91%	93%	95%	96%	97%	98%	99%	99%	100%	100%	100%
57.5	82%	86%	90%	92%	93%	95%	96%	97%	98%	98%	99%	99%	99%
60	81%	86%	89%	90%	92%	93%	94%	95%	96%	97%	98%	98%	98%
61.5	81%	85%	88%	89%	91%	92%	93%	94%	95%	96%	97%	97%	97%
62.5	81%	85%	87%	89%	90%	91%	92%	93%	94%	95%	96%	96%	97%
65	81%	84%	86%	87%	87%	88%	89%	90%	90%	92%	92%	93%	93%
67.5	80%	83%	84%	85%	85%	85%	85%	85%	86%	87%	87%	87%	88%
70	79%	82%	83%	82%	82%	81%	81%	80%	81%	81%	80%	81%	82%
72.5	78%	80%	80%	79%	79%	77%	75%	74%	74%	74%	74%	73%	73%
75	76%	78%	77%	76%	74%	72%	70%	68%	68%	66%	65%	65%	64%
77.5	73%	74%	74%	72%	70%	67%	64%	62%	59%	58%	57%	56%	54%
80	70%	71%	70%	68%	64%	61%	57%	55%	52%	50%	48%	47%	46%
82.5	67%	67%	65%	63%	59%	55%	52%	47%	44%	42%	41%	40%	39%
85	63%	63%	60%	58%	53%	48%	45%	40%	37%	36%	34%	34%	34%
87.5	59%	58%	55%	53%	47%	42%	38%	34%	31%	30%	29%	29%	30%
90	55%	54%	50%	48%	41%	37%	32%	28%	26%	25%	25%	26%	25%



BET-Figure 1. Apparent movements (straight line distance between the tagging location and that of recovery) calculated from conventional tagging of Atlantic bigeye tuna from the historical ICCAT tagging database (top panel) and the current AOTTP activities (bottom panel).



a) BET (1970-79)

b) BET (1980-89)

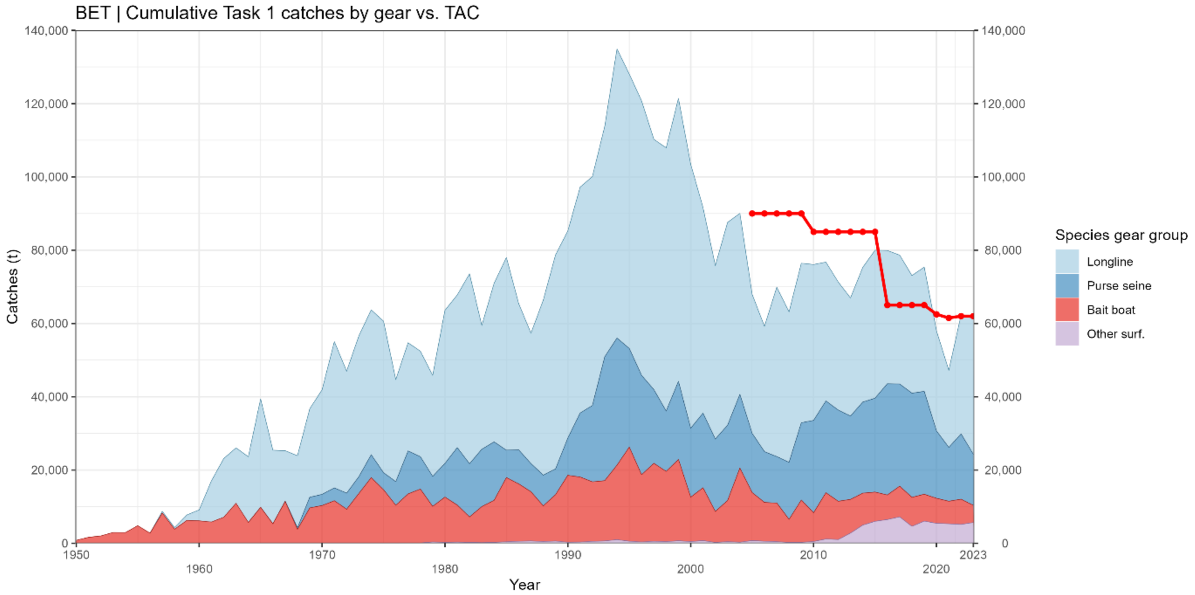
c) BET (1990-99)

d) BET (2000-09)

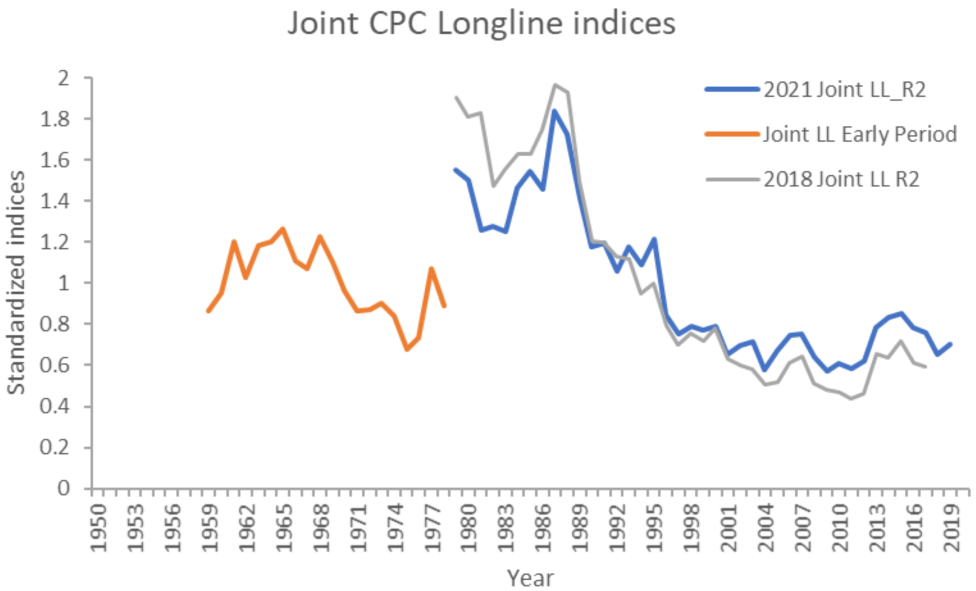
e) BET (2010-19)

f) BET (2020-22)

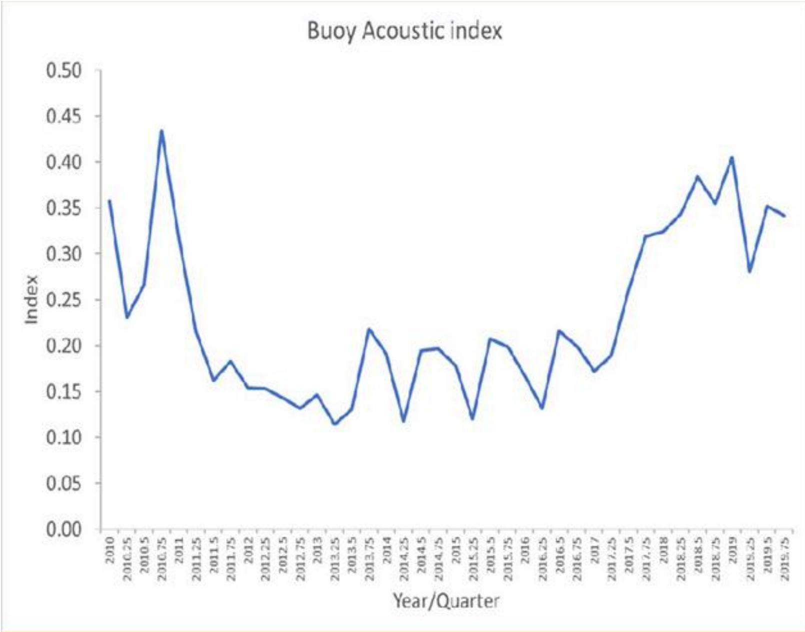
BET-Figure 2 [a-f]. Geographical distribution of the bigeye tuna catch by major gears and decade. The maps are scaled to the maximum catch observed during 1970-2022 (the last decade only covers 3 years).



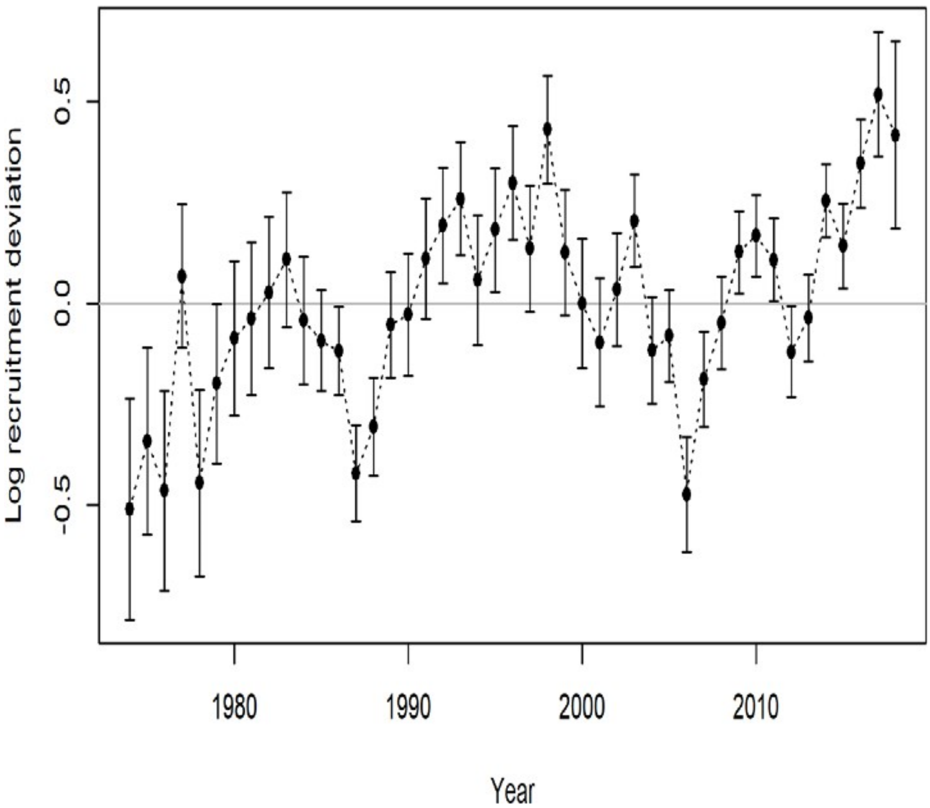
BET-Figure 3. Bigeye tuna estimated and reported catches for all the Atlantic stock (t). The red dotted line indicates the TAC.



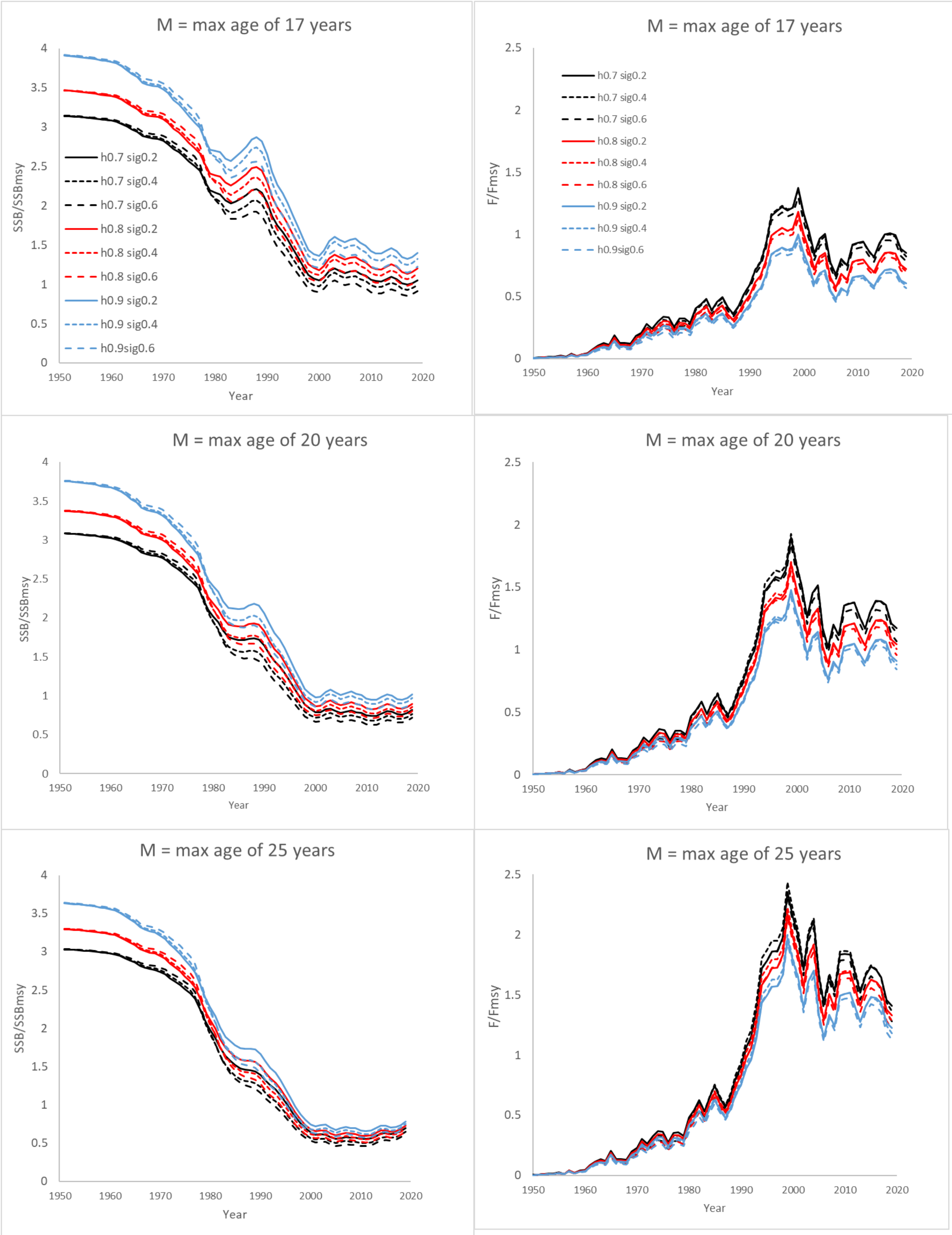
BET-Figure 4. Annual joint longline index for 1959 to 2019 that include two series early period (1959-1978, Joint LL Early Period) and the late period (1979-2019, 2021 joint LL_R2) used in the 2021 stock assessment. For comparison the 2018 joint index late period (1979-2017) is presented (2018 Joint LL R2) which was used for sensitivity runs. Indices are split in 1979 because of the lack of vessel ID data prior to that year. 2018 index for the late period was developed with set by set and vessel data, but 2021 index for the late period was not.



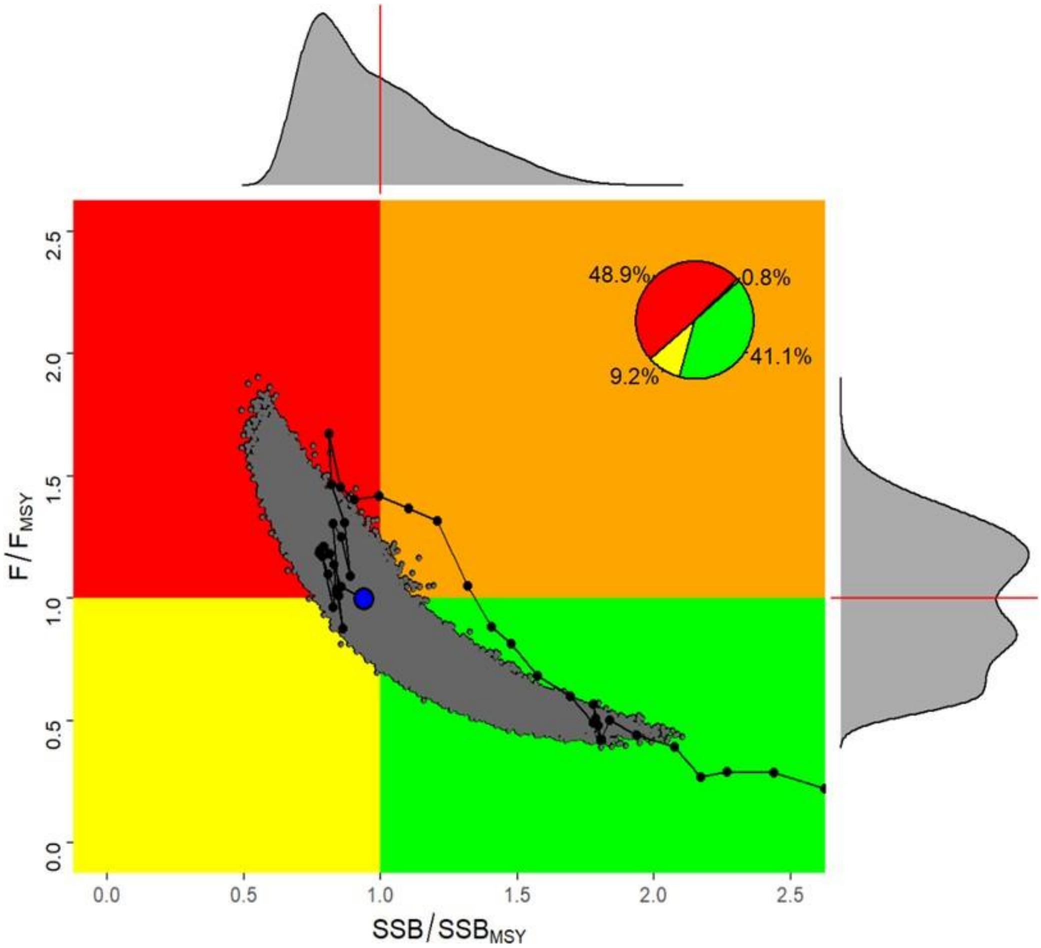
BET-Figure 5. Quarterly abundance index from acoustic buoys used in the FAD fishery for 2010 to 2019.



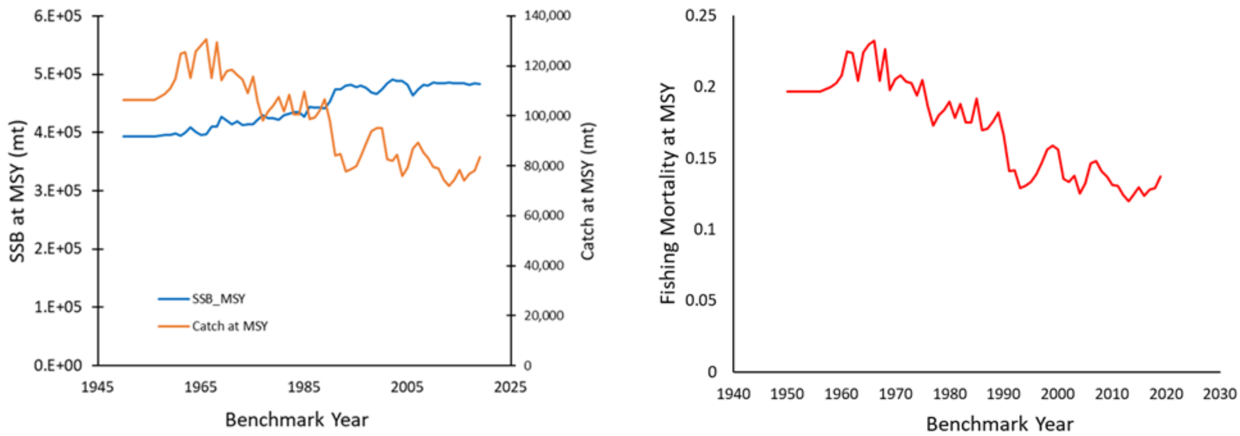
BET-Figure 6. Estimated recruitment deviations for the period 1974-2018 for Stock Synthesis reference case (see **BET-Table 2** for definition). The zero line represents the expected recruitment resulting from the previous year spawning stock biomass. Positive values represent better than expected recruitments, negative values, worse than expected recruitment.



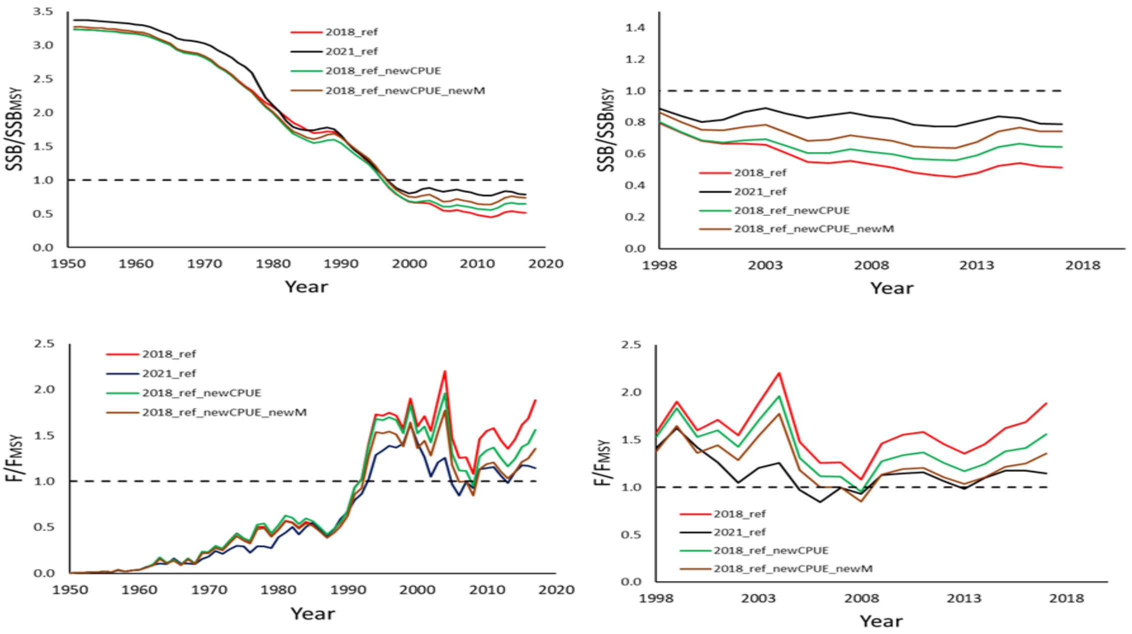
BET-Figure 7. Time series of stock status trends across the 27 Stock Synthesis models of the uncertainty grid. Panels in each row represent the different assumptions of maximum age and thus natural mortality. Left panels represent SSB/SSB_{MSY} trends and right panels F/F_{MSY} trends. Individual lines represent different combinations of steepness and Sigma R.



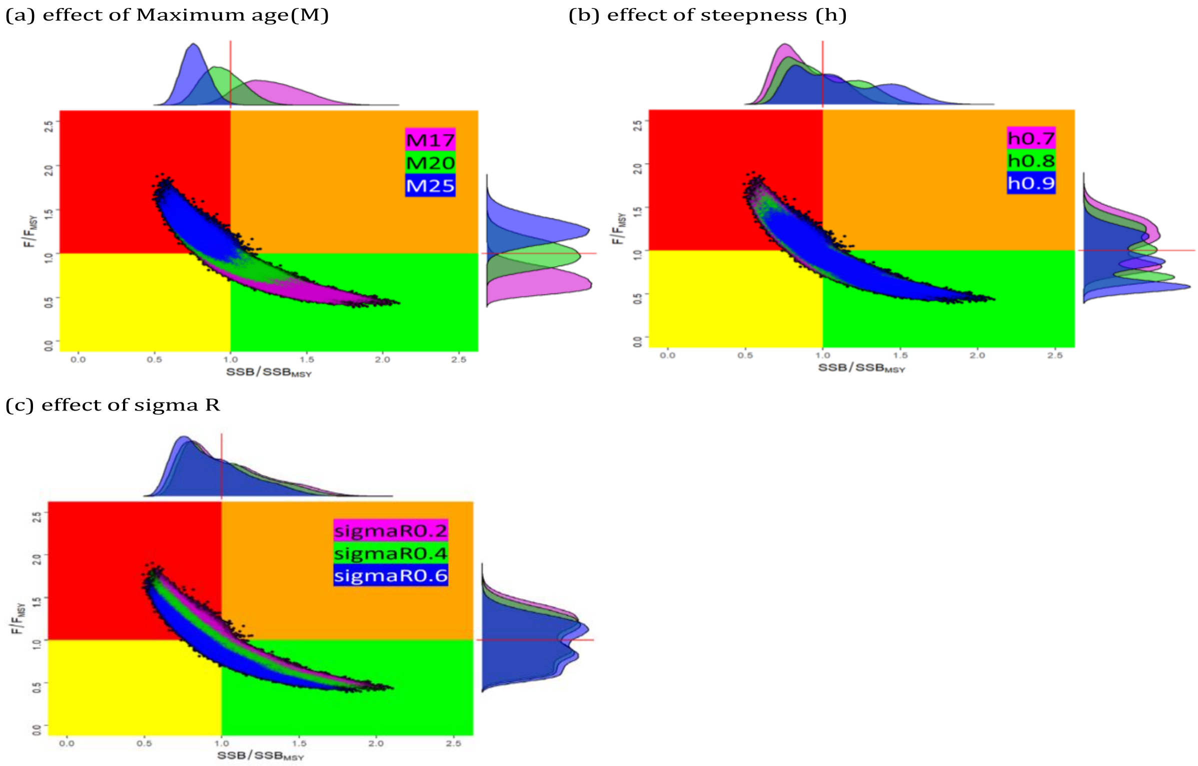
BET-Figure 8. Stock Synthesis: Kobe plot of SSB/SSB_{MSY} and F/F_{MSY} for stock status of Atlantic bigeye tuna in 2019 based on the log multivariate normal approximation across the 27 uncertainty grid model runs of Stock Synthesis with an insert pie chart showing the probability of being in the red quadrant (48.9%), green quadrant (41.1 %), orange (0.8%) and in yellow (9.2 %). Blue circle is the median and marginal histograms represent distribution of either SSB/SSB_{MSY} or F/F_{MSY}.



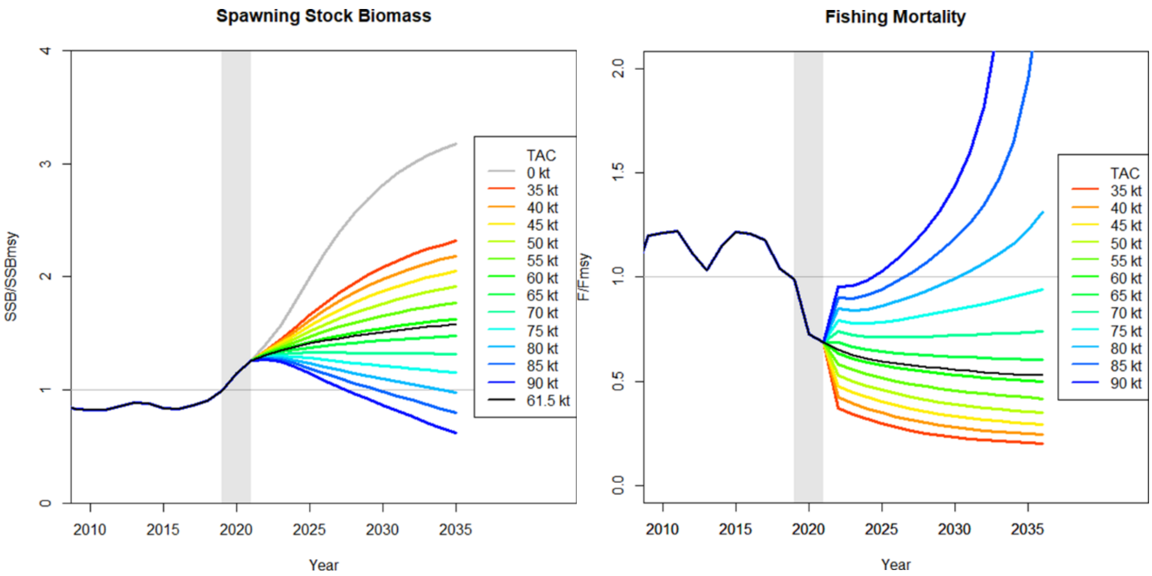
BET-Figure 9. Dynamic estimated SSB at MSY (mt) and Catch at MSY (left panel) and estimated of fishing mortality at MSY (right panel) benchmarks by year, demonstrating the effects of changes in selectivity for bigeye tuna using the Stock Synthesis 2021 reference case.



BET-Figure 10. Sensitivity runs showing time series of stock status trends (left panels 1950-2017, right panels 1998-2017, upper panels SSB/SSB_{MSY} and lower panels F/F_{MSY}) demonstrating the effects of changes in stock status resulting from the incorporation of the 2021 joint longline index and the new assumptions about natural mortality. Lines represent the 2018 (2018_ref) and 2021 (2021_ref) reference cases, the 2018 reference case replacing the 2018 joint longline index with the 2021 joint longline index (2018_ref_new_CPUE) and this last case with the replacement of the 2018 natural mortality with the 2021 natural mortality (2018_ref_new_CPUE_new_M). The natural mortality of the 2021 reference case corresponds to the maximum age of 20.



BET-Figure 11. Effects of the main axes of uncertainty parameters (a: Natural mortality associated with maximum age assumption, b: Steepness, c: Sigma R) on Kobe phase plot for the 27 Stock Synthesis uncertainty grid for Atlantic bigeye tuna. In each plot the cloud of points and the marginal histograms colors match the level in each uncertainty parameter.



BET-Figure 12. Deterministic projections of SSB/SSB_{MSY} (left panel) and fishing mortality (right panel) for the 27 Stock Synthesis uncertainty grid runs at 35,000-90,000 t constant catch for Atlantic bigeye tuna. The lines are the mean of 27 deterministic runs and the black line is for the current TAC (61,500 t). The grey bar represents the period when catches for 2020 and 2021 are fixed to 59,919 t and 61,500 t respectively.

9.3 SKJ - Skipjack

The last stock assessment for eastern and western Atlantic skipjack were conducted in 2022 through a process that included a data preparatory meeting, held online from 21-25 February 2022 (ICCAT, 2022a), and a stock assessment meeting, held online from 23-27 May 2022 (ICCAT, 2022b). Additionally, informal intersessional meetings of the Group were held in April and July (ICCAT, 2022c) to prepare and finalize the stock assessment results. This report covers the most recent information on the status of the eastern and western skipjack stocks. The 2022 assessment was able to provide quantitative estimates of management reference points and projections of stock status for both skipjack stocks, something that was never achieved before by the Committee.

These new assessments for the eastern and western Atlantic skipjack stocks used fishery data from 1950-2020 and 1952-2020, respectively, and indices of relative abundance used in the assessments were calculated through 2020. In both cases, Surplus Production models and Statistically Integrated models were used.

For a complete and detailed description of the assessment and the state of knowledge and status of the eastern and western Atlantic skipjack tuna stocks, readers should consult the Report of the 2022 Skipjack Tuna Data Preparatory Meeting (ICCAT, 2022a) and the Report of the 2022 Skipjack Stock Assessment Meeting (ICCAT, 2022b).

SKJ-1. Biology

Skipjack tuna is a cosmopolitan species found in schools distributed mainly in tropical and subtropical waters of the three oceans. This tropical tuna is the predominant species aggregated around floating objects (FOBs) (including fish aggregating devices (FADs)) where it is caught, commonly associated with juveniles of yellowfin tuna, bigeye tuna and with other species of epipelagic fauna. This species exploited sizes range from 30 cm to 62 cm fork length (FL) for SKJ-W (**SKJ-Table 2**) and 30 cm to 80 cm FL for SKJ-W (**SKJ-Table 3**).

Skipjack tuna breed opportunistically throughout the year over broad areas of the Atlantic Ocean. Both stocks show synchronized spawning behaviour when in a school. Moreover, the skipjack's reproductive potential is considered high because it reaches sexual maturity around one year of age and spawns in warm waters above 25ºC which represents a large ocean area. More specifically, the eastern skipjack stock, spawns over a wide area on either side of the equator, from the Gulf of Guinea to 20º-30º W. There are two known spawning areas for the western skipjack stock, one off the Brazil margin delimited by the parallel of 20º S and the southern limit of the Brazil current, and another area in the North of the Atlantic Ocean, located in the Gulf of Mexico and Caribbean.

Movement patterns based on Atlantic Ocean Tropical tuna Tagging Programme (AOTTP) tagging data demonstrated some connectivity between the Azores and Gulf of Guinea areas for the eastern stock, which had not been observed in the ICCAT historical tagging data. Although in general, the AOTTP tagging data shows minimal exchange between the eastern and western skipjack stocks, the separation between the two stocks is less clear for those tags released by the AOTTP close to the boundaries of the stock (5º S; 35º W) (**SKJ-Figure 2**). This pattern sparked concerns in the current way catches are assigned to a stock when fleets are fishing near and/or across this boundary area. More studies on the potential migration across stock boundaries are needed. These include analysis of returned AOTTP skipjack tags, or potential future releases of conventional tagged fish in places where movement details remain unknown (e.g. Venezuela to the Equator and northern migrations of the western stock). Such studies could improve our understanding of these movements and of potential levels of mixing across the current stock boundaries.

Length at 50% maturity remains estimated at 42 cm, approximately 9.5 months old, and the size of full maturity at 55 cm. Both reproduction parameters remain the same as those used in the last stock assessment.

Considerable uncertainty remains around the growth parameters for the skipjack tuna. To deal with this uncertainty, a distribution of potential growth curves was developed considering available estimated growth parameters compiled from scientific literature, and the resulting growth parameters are shown in the Report of the 2022 Skipjack Stock Assessment Meeting (ICCAT, 2022b). Natural mortality at age was estimated assuming the Lorenzen function and maximum age of 6 years.

All these uncertainties reported on growth, natural mortality, and stock structure could have important implications for the stock assessment of the eastern and western skipjack stocks. Research should aim to continue to reduce these uncertainties.

SKJ-2. Fishery indicators

Skipjack tuna stocks have been historically exploited by two major gears (purse seine on the eastern stock and baitboat on the western stock) and by many countries throughout their range. Longline fisheries remove a comparatively small portion of the total removals (**SKJ-Figures 1, 5 and 6**).

The numerous changes that have occurred in the skipjack fisheries, mainly since the early 1990s (e.g. the progressive use of FOBs and the geographical expansion of the fishing areas by surface fleets), have brought about an increase in skipjack catchability and the proportion of biomass exploited. The nominal catches for the eastern stock had shown a generally increasing trend since the 1960s (**SKJ-Figure 4**). The total catches increase from 1,171 metric tons in 1960 to about 283,000 metric tons in 2018. Since 2018 the total catches decreased to 211,941 t in 2021 and increased to 267,812 t in 2022. The preliminary catch reported for 2023 has decreased by 18% (219,874 t) (**SKJ-Table 1**). This recent decrease is observed for most gears.

Rec. 19-02 requires the ICCAT Secretariat to work with the SCRS to prepare an estimate of capacity in the Convention area, to include at least all the fishing units that are large-scale or operate outside the Exclusive Economic Area (EEZ) of the CPC they are registered in. These capacity estimates were updated in 2024, and these estimates in 2023 were 62 large scale purse seine vessels targeted tropical tunas, which is lower than some previous estimates, but slightly larger than the estimate made by SCRS for 2018 (**YFT-Table 2**). Currently, no capacity estimates are available for other large-scale fleets. The Committee was informed by national scientists of the reductions in the operations of the baitboat fleet in recent years (since 2020), in part due to the implementation of a Marine Protected Area (Decree No. 2020-1133 on the creation of the Marine Protected Areas of Kaalolaal Blouffogny and Gorée (Senegal)) limiting access to live bait for the fishery.

The western skipjack landings have shown a slight decrease since 1982, and this has intensified in the most recent period of the time series (2013-2020) (**SKJ-W Figure 6**). The maximum total catch for this stock was observed in 1985 (40,272 t), and the lowest catch since 1985 was reached in 2020 (18,938 t). This trend can be explained by the reductions in the baitboat catches, which decreased from 26,941 t on average for the period 2011-2015 to less than 15,203 t (on average) in the recent period of the time series (2016-2023). On the contrary, handline catches have increased in recent years, reaching more than an annual average of 3,867 t in the period between 2019-2023, a significant increase over the 301 t average for the period 2011-2015 (**SKJ-Table 1**). Data provided in Task 1 Fleet showed a reduction in the number of vessels operating within the Brazilian baitboat fleet (from 54 baitboat vessels operating in 2015 to 30 vessels in 2020). These reductions in the number of baitboat vessels may be driving much of the decrease in catches of this stock observed in the recent period, as the Brazilian fleet catches the majority of skipjack in the West side of the Atlantic. Finally, catches reported for the recent period (2021-2023) show an increase in trend, reaching 29,555 t in 2023. This increase concerns catch of the others surface gears, with the exception of PS and BB (**SKJ-Figure 6**).

Estimates of "faux poisson" catches for the purse seine fleets targeting tropical tunas in the eastern Atlantic were provided by the majority of the CPCs as indicated in **SKJ-Table 1**. For the 2022 stock assessment, the Tropical Tunas Species Group estimated "faux poisson" catches based on a methodology presented and adopted by the Group at the data preparatory meeting and these estimates were included under the "NEI_mixed flags" code for the stock assessment.

As indicated before, another important fishery indicator was the westward expansion of the eastern purse seine FOB fisheries with an increase in catches in the equatorial area. In the last decade surface fleet fisheries have reported catches on both sides of the skipjack stock boundary of the equatorial area (**SKJ-Figures 1 and 3**). Recent research has shown some similarities between the skipjack size ranges among the catches reported by the EU and Ghana PS-FOB when they are operating on either side of the boundary (40-50 cm straight fork length (SFL), **SKJ-Figure 7** and **SKJ-Figure 8**). Such fish caught by these two fleets tend to be smaller than those caught by purse seiners in the West stock area, mainly by Venezuela PS non-FOB fisheries (45-60 cm). It is possible that the stock boundary area is a mixed area including individuals of both stocks. Any increases in effort of purse seine vessels fishing on FOBs in this area could increase removals from the western skipjack stock.

Mean weight time-series by major fishery for both eastern and western skipjack stocks were estimated using the most recent information available on T1NC, T2SZ and T2CS (Task 2 catch-at-size estimated/reported by ICCAT CPCs). For the eastern and western skipjack stocks, the estimated mean weights have oscillated throughout the time series (1969-2020), **SKJ-Figure 9, SKJ-Figure 10**. The estimated mean weight of eastern skipjack is about 2.1 kg for 1969-2020. The western skipjack average weight is 3.4 kg, indicating that fish caught on eastern stock are smaller than the ones in the western stock.

Three relative indices of abundance were included in the stock assessment of the eastern skipjack, the Canary historical baitboat index (1980-2013), the EU PS FAD index (2010-2020), and the EU Echosounder buoy (2010-2020) index. The EU PS FAD index is new for this stock, derived from sets made by vessels fishing on FADs with operational buoys not owned by the vessel making the set. The Canary baitboat index showed a generally stable trend. For the recent period, the EU PS FAD index showed a slight decreasing trend over the time series, while the EU Echosounder buoy index showed a sharp decline at the beginning of the series and a sharp increase at the end of the series (**SKJ-Figure 11**). For the western skipjack, five relative abundance indices were included in the stock assessment model: Brazilian baitboat historical (1981-1999) and recent (2000-2020), Brazilian handline (2010-2016), US-longline (1993-2020), and Venezuelan purse seiner (1987-2020) indices. The indices for recent years showed a slight decrease trend since the mid-2010s (**SKJ-Figure 12**).

SKJ-3. State of the stocks

The 2022 Skipjack Stock Assessment Meeting (ICCAT, 2022b) was conducted using similar assessment models/methods to those used in the assessments of other tropical tuna species, including yellowfin and bigeye tuna. Stock status evaluations for both stocks of Atlantic skipjack tuna used in 2022 included several modelling approaches, ranging from non-equilibrium (MPB) and Bayesian state-space (JABBA) production models to integrated statistical assessment models (Stock Synthesis). Different model formulations considering plausible representations of the dynamics of the skipjack stocks were used to characterize the stock status and the uncertainties in stock status evaluations.

Eastern skipjack stock

A full stock assessment was conducted for the eastern skipjack tuna stock in 2022, applying production models (JABBA) and one integrated statistical assessment model (Stock Synthesis) to the available catch data through 2020. The Group decided to combine the results of JABBA and Stock Synthesis, with equal weighting, to estimate stock status and develop management advice to capture all major uncertainties in the population dynamics. The uncertainty grids were comprised of combinations of CPUE selection ((i) Canary BB index + EU PS FADs index, and; ii) Canary BB index + Echosounder buoy index), steepness *h* (0.7, 0.8, or 0.9), and growth (25, 50 or 75th regression quantiles) for both Stock Synthesis and JABBA.

SKJ-Figure 13 shows the historic trends of the relative fishing mortality (F/F_{MSY}) and relative biomass (B/B_{MSY}) from the different assessment model runs for eastern skipjack. The combined results of the assessment, based on the median of the entire uncertainty grid, show that in 2020 the East Atlantic skipjack tuna stock was not overfished (median B_{2020}/B_{MSY} = 1.60) and was not undergoing overfishing (median F_{2020}/F_{MSY} = 0.63). The median MSY was estimated as 216,617 t from the uncertainty grid of the deterministic runs. Probabilities of the stock being in each quadrant of the Kobe plot (**SKJ-Figure 14**) are 78% in the green (not overfished, not subject to overfishing), 4% in the orange (subject to overfishing but not overfished), 1% in the yellow (overfished but not subject to overfishing) and 16% in the red (overfished and subject to overfishing). In summary, the results indicated a stock status of not overfished (83% probability), with no overfishing (80% probability).

Noteworthy, the estimated stock biomass of the combined results as shown in the Kobe plot (**SKJ-Figure 14**) and summary table, there is large uncertainty in biomass estimates reflected in the long tails of the biomass distribution relative to B_{MSY} (95% confidence interval of 0.5 to 5.79 B/B_{MSY}). This large range of uncertainty in stock status estimates has implications on the estimated probabilities for each constant catch scenario in the projections that have been used to develop management advice (**SKJ-Tables 4 and 5**).

In the projection results from the Stock Synthesis and JABBA models, some iterations of high catches were predicted with exceptionally small biomass, which results in extremely high fishing mortality. Especially Stock Synthesis and JABBA runs with the Acoustic Buoy index removed projected low biomass within 3-4 years once the stock is harvested at high constant catches. **SKJ-Table 5** and **SKJ-Figure 15** show the joint stochastic projections for both quantities (B/B_{MSY} and F/F_{MSY}). The probability of biomass being less than 10% or 20% of the biomass that supports MSY was calculated for each projection year and catch scenario (**SKJ-Table 4**). Assuming a constant catch at MSY level, the probability of the stock being below 20% of the B_{MSY} at 2028 was about 17% and the probability of being below 10% of the B_{MSY} was about 14%.

Western skipjack stock

The assessment of the western skipjack stock was conducted using a Bayesian state-space production model (JABBA) and an integrated statistical assessment model (Stock Synthesis). Given that the stock status estimated from the JABBA model agreed with the estimated stock status using Stock Synthesis, the Tropical Tunas Species Group decided to use the results of the surplus production model as a comparative perception of the western skipjack stock status, but not for the development of management advice. Therefore, the final stock status and management advice presented in this Executive Summary are based on the combined results from the 9 distinct Stock Synthesis runs derived from the uncertainty grid proposed for the western skipjack stock. A more detailed description of the assessment can be seen in the Report of the 2022 Skipjack Stock Assessment Meeting (ICCAT, 2022b).

SKJ-Figure 16 shows the historical trends of the relative fishing mortality (F/F_{MSY}) and relative biomass (B/B_{MSY}) from the different assessment model platforms for the western skipjack. Based on the combined results used to develop management advice (9 Stock Synthesis deterministic runs), the median estimate of SSB_{2020}/SSB_{MSY} is 1.60, and the median estimated for F_{2020}/F_{MSY} is 0.41. The combined results of all runs indicate that the western skipjack stock is estimated to be in healthy condition with 91% probability of being in the green quadrant, and that the stock is not overfished nor undergoing overfishing (**SKJ-Figure 17**). There was a relatively low estimated probability that the stock is either overfished (yellow quadrant; 6.2%) or both overfished and undergoing overfishing (red quadrant; 2.9%).

The catch advice is provided in the form of Kobe II Strategy Matrices (K2SM) (K including probabilities that overfishing is not occurring ($F <= F_{MSY}$), stock is not overfished ($SSB >= SSB_{MSY}$) and the joint probability of being in the green quadrant of the Kobe plot (i.e., $F <= F_{MSY}$ and $SSB >= SSB_{MSY}$) (**SKJ-Table 7**). Future constant catches of 20,000 t, close to the current catch (19,951 t in 2021) are expected to maintain the stock in the green quadrant. The median MSY across the 9 grid runs was 35,277 t. Future constant catches of this level are expected to maintain the stock in the green quadrant ($F \leq F_{MSY}$ and $SSB \geq SSB_{MSY}$) with about 70% probability by 2028. Probabilities of the stock biomass being below 20% and 10% of B_{MSY} are presented in **SKJ-Table 6**. The probability of the stock biomass being below 20% or 10% of B_{MSY} was less than 1% until 2028 assuming a future constant catch at the level of MSY. The projections for both quantities (F/F_{MSY} and SSB/SSB_{MSY}) are presented in **SKJ-Table 7** and **SKJ-Figure 18**.

SKJ-4. Effect of current regulations

The current regulations for tropical tunas, in Rec. 23-01, only entered into force in June 2024, and the impacts on the SKJ stock and fisheries are not yet evident in the available scientific data. However, the previous Recommendations, Rec. 22-01 and Rec. 21-01, included several measures that impacted fishing for the eastern stock, including the first Atlantic-wide, temporal closure on fishing for schools associated with FADs, limits to the number of FADs that can be actively managed by individual purse seiners, changes in FAD design, and others. In addition, taking into consideration the multi-species nature of tropical tuna fisheries, the Total Allowable Catch (TAC) and catch limits adopted for other tropical tuna stocks, mainly bigeye tuna, may also explain the drop in skipjack catches in recent years. Before this closure, the Commission had adopted various FAD spatio-temporal closures (Rec. 98-01, Rec. 99-01, Rec. 14-01, and Rec. 16-01).

The effect of the temporal FAD closure was evaluated by examining catch of each tropical tuna species, by month and by fleet, in 2020 with comparison to a reference period in the 1990s, to account for years in which no closure was in place. There is preliminary evidence that tropical tuna catch was lower during the closure than during the same months in the reference period, and the annual 2020 catch was lower than in 2019. The Committee evaluated the effectiveness of alternative temporal closures (season and duration) using outputs of the most recent stock assessments of bigeye and yellowfin tunas (item 19.38).

Although the measures in Rec. 19-02 also applied to the western stock, no fleets were targeting western skipjack using FADs, so the impact of Rec. 19-02 on the western stock and fisheries was likely to be minimal.

SKJ-5. Management recommendations

Eastern skipjack stock

The stock status of eastern Atlantic skipjack tuna in 2020 was estimated with a high probability (78%) to be in a sustainable condition (green quadrant), with that stock not overfished or subjected to overfishing. According to the Kobe II Strategy Matrix (K2SM), a future constant catch using the median MSY of 216,617 t will have about 55% probability of maintaining the stock in the green quadrant of the Kobe plot through 2028. Assuming a constant catch at MSY[1], the probability of the stock biomass being below 20% of B_{MSY} in 2028 was about 17%, and the probability of stock biomass being below 10% in 2028 was about 14%. Moreover, provisional catches for 2022 are substantially higher than the MSY estimated in the last stock assessment.

The Commission should also be aware that fishing effort for skipjack also impacts other species that are caught in combination with skipjack particularly in the purse seine FOB fisheries (particularly juveniles of yellowfin and bigeye tuna).

Western skipjack stock

The status of the western Atlantic skipjack stock in 2020 was estimated with a high probability (91%) to be in healthy condition and is not overfished nor undergoing overfishing. According to the K2SM, a future constant catch using the median MSY of 35,277 t will have about 70% probability of maintaining the stock in the green quadrant of the Kobe plot by 2028. Assuming a constant catch at MSY, the probabilities of the stock biomass being below 20% or 10% of the B_{MSY} until 2028 are less than 1%.

The Committee recommends that the Commission adopt one of the MSE-tested Management Procedures (MPs) (see Response to the Commission, item 19.33) and that a TAC be set based on that MP for 2025 and beyond.

[1] Projections are conducted with the MSY estimated for each model of the uncertainty grid.

ATLANTIC SKIPJACK SUMMARY		
	Eastern Atlantic	***Western Atlantic***
Maximum Sustainable Yield (MSY)[1]	216,617 t (172,735 – 284,658 t)	35,277 t (28,444 – 46,340 t)
Yield for 2020 at the Stock Assessment	217,874 t	18,183 t
Current yield for 2023	219,874 t	29,555 t
Relative Biomass (B_{2020}/B_{MSY})[2]	1.60 (0.50 – 5.79)	1.60 (0.90 – 2.87)
Relative Fishing Mortality (F_{2020}/F_{MSY})[2]	0.63 (0.18 – 2.35)	0.41 (0.19 – 0.89)
Stock Status (2020)		
Overfished:	No	No
Overfishing:	No	No

[1] Median and 95% confidence interval estimated from the joint uncertainty grid.
[2] Median and 95% confidence interval based on 90,000 iterations of the multivariate lognormal (MVLN) approximation for Stock Synthesis and 90,000 Markov chain Monte Carlo (MCMC) iterations for JABBA.

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

				1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
TOTAL				191405	174846	157151	148939	161407	182246	155475	163315	122120	154872	181467	172499	138376	145663	145104	163604	189933	219484	251498	258603	232672	242142	259762	266002	306442	275439	241138	232198	289441	249429
	ATE			161456	152984	129590	117229	132325	154940	126294	131909	100585	130192	154006	143982	111923	120223	123091	137829	164026	187096	218431	224007	205316	221076	237395	242000	283171	255318	222200	211941	267812	219874
	ATW			29949	21861	27560	31710	29081	27306	29182	31406	21535	24679	27461	28517	26453	25440	22013	25774	25907	32388	33067	34596	27356	21066	22367	24001	23271	20121	18938	20257	21629	29555
Landings	ATE		Bait boat	37767	33840	35861	36993	46506	44901	33705	56493	31167	34428	54194	48279	44700	44316	31863	35105	38607	38085	44814	30670	25682	23843	28875	25776	33437	24415	15677	16664	16194	11212
			Longline	10	3	7	47	85	42	48	53	59	83	67	83	204	428	199	59	46	35	58	79	54	21	540	498	113	350	366	97	360	2179
			Other surf.	366	423	409	425	1228	301	2399	867	597	562	1324	2672	5270	3436	3803	5137	5098	5885	6769	7206	2184	2527	2623	4698	5087	5432	5784	9814	10020	9850
			Purse seine	107452	105709	89096	72015	76790	100459	79507	72492	67097	88350	90464	87660	58570	66817	81431	89059	112070	133696	159881	179759	170477	181824	187683	200669	231980	211524	189742	177116	233280	190145
	ATW		Bait boat	22855	17744	23741	27045	24727	23881	25641	25719	18737	21990	24082	26028	23766	23898	20702	23518	22803	29468	30693	32187	24817	17538	16810	14648	14926	15410	14593	15573	11687	18752
			Longline	16	37	20	5	15	8	11	16	269	26	206	207	286	53	49	20	854	353	62	642	464	209	806	292	322	416	193	420	1216	3596
			Other surf.	1367	2021	450	313	513	481	467	374	413	367	404	316	355	280	361	202	306	708	498	792	837	728	1534	5702	4797	2395	2432	2515	7237	5645
			Purse seine	5712	2059	3349	4347	3826	2936	3063	5297	2116	2296	2769	1967	2045	1209	901	2035	1943	1859	1814	975	1238	2506	3105	3293	3180	1881	1684	1746	1489	1563
Landings(FP)	ATE		Bait boat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	39	39
			Purse seine	15860	13010	4217	7749	7716	9237	10634	2004	1666	6769	7956	5288	3181	5226	5796	8471	8205	9395	6909	6293	6918	12231	17674	10266	12498	13388	10610	8211	7811	6442
	ATW			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	86	112	66	45	19	35	0	0	
Discards	ATE		Bait boat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
			Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0
			Purse seine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	631	0	94	56	208	22	35	106	6
	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	0	0	0	0	0
			Purse seine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
Landings	ATE	CP	Algerie	0	0	0	0	171	43	89	77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Angola	7	3	15	52	2	32	14	14	14	14	10	0	0	0	0	50	636	44	91	514	0	1	1	1	3	0	10	14	0	0
			Belize	0	0	0	0	720	0	229	278	0	0	0	0	0	0	0	1373	2714	7429	15554	6218	10779	12599	7730	9958	20748	17063	19180	18044	29134	23274
			Brazil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1008	4948	2550
			Cape Verde	1176	1585	581	858	1245	1040	789	794	398	343	1097	7157	4754	5453	4682	4909	5155	7883	5535	16016	15254	17600	10925	7823	7852	5785	6068	1281	1250	715
			China PR	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
			Curaçao	0	0	7096	8444	8553	10045	11056	15450	7246	12084	10225	101	3042	1587	6436	9143	9179	11939	12779	17792	18086	19621	22180	20660	24539	17360	10841	12398	3953	181
			Côte d'Ivoire	0	0	0	0	0	0	1173	259	292	143	559	1259	1565	1817	2328	2840	2840	5968	10923	8063	2365	254	675	1534	22	3241	990	1311	2266	335
			EU-Cyprus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3
			EU-España	50538	51594	38538	38513	36008	44520	37226	30954	25466	44837	38751	28178	22292	23723	35124	36722	41235	56908	67040	66911	51628	46085	52110	57458	52912	48378	31804	37865	33569	30980
			EU-France	32798	25239	23068	17035	18323	21800	18149	16320	16180	19336	21326	14850	7033	6196	4439	7790	14900	13067	13139	16173	17674	20960	19342	16574	23112	20438	12800	16178	21217	16452
			EU-Germany	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
			EU-Greece	0	0	0	0	0	0	0	0	0	102	99	99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			EU-Ireland	0	0	0	0	0	0	0	0	0	0	14	14	14	0	0	8	6	0	0	0	0	0	0	7	0	0	0	0	0	0
			EU-Italy	0	0	0	0	0	0	0	0	4	29	34	17	0	0	0	0	0	0	0	0	0	0	47	57	91	131	402	69	176	229
			EU-Lithuania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	95	0	0	6	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	5	2	0	6	5	5
			EU-Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	4	9	0	0	23	0	0	0	0	0	5	1	0	0	0	0	61
			EU-Portugal	7528	4996	8297	4399	4544	1810	1302	2167	2958	4315	8504	4735	11158	8995	6057	1084	12974	4143	2794	4049	1712	1347	708	1785	7480	2799	1033	6640	4026	4345
			El Salvador	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5452	14502	12981	15672	13103	14806	6446	10633	6585
			Gabon	11	51	26	0	59	76	21	101	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	
			Gambia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29	0	0	0
			Ghana	21258	18607	24205	26380	43612	54088	36517	57540	40194	34435	47746	54209	31934	35419	38648	43922	45505	44169	54032	48064	49986	61849	54723	57496	68147	62855	63193	49477	76499	56625
			Guatemala	0	0	0	0	0	0	0	0	0	2120	4808	6389	4959	5546	6319	4036	2951	2829	3631	4907	5811	7078	7386	9800	8648	7626	6503	5873	6839	5472
			Guinea Ecuatorial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1224	1224	1010	0	1	1	3	1	0	1	1	1	1	1	1
			Guinée Rep	0	975	6432	2408	0	0	0	0	0	0	0	0	0	0	0	0	1500	1473	7942	7363	5484	0	0	0	0	0	0	888	5133	2429
			Japan	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	1	4	5	2	4	1	1	3	5	2	3	3	4
			Korea Rep	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	1	1	1	1	0
			Liberia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	61	80	49	98	21	19	29	21	6770	489	1	8
			Maroc	3672	6886	2859	5532	4741	4176	4091	1737	1303	3403	3843	4666	4032	1592	1309	2580	2343	2151	2267	2045	1068	576	258	750	3585	1258	3171	5503	4189	7683
			Namibia	2	15	0	1	0	0	0	8	0	0	0	0	0	0	0	71	2	2	15	1	0	0	1	1	0	0	1	11	19	12
			Nigeria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45	12	4	0	0	0	6	2	0	0	0	0	0	0
			Panama	12978	14853	5855	1300	572	1308	1559	281	342	0	7126	11490	13468	18821	8253	8518	9590	12509	10927	14558	14165	8372	11510	8815	9089	10926	10626	10554	13192	12286
			Russian Federation	1471	1450	381	1146	2086	1426	374	0	0	0	0	0	392	1130	313	260	0	20	0	0	2	1	1	110	178	25	6	0	0	2
			S Tomé e Príncipe	190	180	187	178	169	181	179	179	179	179	117	166	143	0	229	235	241	247	254	260	266	360	380	346	15	36	40	87	120	12
			Senegal	64	282	238	429	1983	1784	1357	1284	1178	639	1456	5033	3858	4552	3045	4566	2743	5441	4477	4659	3931	5943	17082	25431	28476	30633	23286	29537	42671	42710
			South Africa	4	4	1	6	2	1	7	1	1	2	2	1	0	0	4	4	2	6	8	2	5	2	2	1	2	2	1	1	2	5
			St Vincent and Grenadines	2184	1847	1501	1191	1441	2127	1422	1435	524	42	0	0	1	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0
			Syria	0	0	0	0	0	0	0	0	0	0	0	0	0	38	36	0	0	0	15	17	0	0	0	0	0	0	0	0	0	0
			Türkiye	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	418
			UK-Sta Helena	55	115	86	294	298	13	64	205	63	178	317	321	88	110	45	15	25	371	29	7	26	6	127	9	7	28	1	2	1	0
			Venezuela	0	0	0	0	0	0	0	35	2407	1197	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		NCC	Chinese Taipei	10	3	5	47	73	39	41	24	23	26	16	10	9	14	19	6	11	15	2	12	9	4	2	2	3	4	4	4	3	2
		NCO	Benin	2	2	2	7	3	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Congo	7	7	6	0	0	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)	744	2803	0	27	0	0	0	760	148	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Vanuatu	10896	8477	5992	1233	0	1192	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	ATW	CP	Barbados	6	6	5	5	10	3	3	0	0	0	0	0	0	0	0	0	0	1	2	0	1	1	1	2	1	1	0	0	1	1
			Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0	164	0	0	0	0	0	0	0
			Brazil	20588	16560	22528	26564	23789	23188	25164	24146	18338	20416	23037	26388	23270	24191	20846	23307	23456	30571	30863	32438	25195	18133	18231	20068	19687	17925	17432	18788	20544	28885
			Canada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	94	0	88	0	0	0
			China PR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	42	
			Costa Rica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Curaçao	40	35	30	30	30	30	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	100	123	157	35	30	0	151	0
			EU-España	0	0	0	0	0	1	1	0	0	0	0	0	0	5	11	0	0	0	0	0	0	0	641	223	109	192	124	78	147	0
			EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	10	0	0	0	0	25	224	282	23	2	210	10	15
			EU-Portugal	0	0	0	0	0	0	4	1	0	3	3	5	21	11	0	6	0	8	0	0	0	0	0	0	0	0	0	0	0	0
			El Salvador	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	66	30	81	25	0	70	0	37	0
			Ghana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	232	67	160	265	160	411	1234	700	318	209	252	0
			Grenada	11	12	11	15	23	23	23	15	14	16	21	22	15	26	20	0	0	0	0	0	0	22	17	17	18	30	10	13	12	11
			Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	86	54	44	7	91	0	0
			Japan	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1
			Korea Rep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Mexico	1	2	1	1	1	1	2	10	6	6	9	7	10	7	8	9	7	9	8	5	5	7	10	6	6	4	4	3	3	4
			Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	543	410	161	185	0	0	22	40	0	31	0
			St Vincent and Grenadines	56	53	37	42	57	37	68	97	357	92	251	251	355	90	83	54	46	50	0	36	40	47	0	78	36	35	29	0	0	4
			Trinidad and Tobago	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			UK-Bermuda	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			UK-British Virgin Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			USA	99	82	85	84	106	152	44	70	88	79	103	30	61	66	67	119	95	107	99	326	183	94	179	199	78	46	68	65	103	75
			Venezuela	6697	2387	3574	3834	4114	2981	2890	6870	2554	3247	3270	1093	2008	921	757	2250	2119	1473	1742	1002	1180	2019	2317	2222	1276	927	614	694	213	457

				1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
		NCC	Chinese Taipei	7	2	10	1	2	1	0	1	16	14	27	28	29	2	8	0	2	1	11	1	2	21	17	34	32	27	19	19	8	8
		NCO	Argentina	1	0	1	0	2	0	1	0	0	0	30	0	0	0	0	3	12	0	0	0	0	0	0	0	0	0	0	0	0	
			Colombia	789	1583	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Cuba	1268	886	1000	1000	651	651	651	0	0	624	545	514	536	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Dominica	43	33	33	33	33	85	86	45	55	51	30	20	28	32	45	25	0	13	0	4	41	16	27	21	11	10	4	0	0	
			Dominican Republic	257	146	146	0	0	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	62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	0	0	0	
			Saint Kitts and Nevis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	
			Sta Lucia	86	72	38	100	263	153	216	151	106	132	137	159	120	89	168	0	153	143	109	171	139	87	138	142	122	78	44	83	73	94
Landings(FP)	ATE	CP	Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	114	395	368	179	636	301	0	0	0	0	0	0	0	0	0
			Cape Verde	0	0	0	0	0	0	0	0	0	0	0	419	131	162	276	603	726	411	230	428	1362	1485	1046	327	512	355	410	0	0	0
			Curaçao	0	0	0	0	0	0	0	0	0	0	0	88	171	116	105	917	415	441	545	520	351	0	0	0	0	0	0	447	0	0
			Côte d'Ivoire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	42	562	544	202	0	0	0	0	0	0	0	0	0
			EU-España	4719	2899	453	1990	2562	3802	3700	0	0	1738	1907	713	437	366	1158	1994	1394	1842	983	998	1623	3028	3658	2788	1943	2396	1809	2035	2163	2020
			EU-France	7573	5568	2447	3414	3647	4316	4740	1786	1601	3484	3096	918	346	206	287	1120	743	1480	1646	463	440	1716	1920	893	2169	1616	1681	2206	3355	2423
			El Salvador	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1518	2447	1640	1375	3626	0	2928	1223	1664
			Guatemala	0	0	0	0	0	0	0	0	0	0	0	260	69	66	162	59	136	51	102	72	93	0	0	0	0	0	0	180	496	287
			Guinée Rep	0	0	0	0	0	0	0	0	0	0	0	387	0	330	118	359	614	1778	2379	1670	2146	0	0	0	0	0	0	0	0	0
			Panama	0	0	0	0	0	0	0	0	0	0	0	796	548	977	693	680	354	609	284	962	400	0	0	0	0	0	0	415	613	88
		NCO	Mixed flags (EU tropical)	3568	4543	1316	2345	1508	1119	2194	218	65	1547	2953	1708	1478	3003	2998	2624	3427	2372	0	0	0	4484	8603	4618	6499	5396	6710	0	0	
	ATW	CP	Cape Verde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	9	0	9	0	0	0
			EU-España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	67	35	7	13	9	0	0	0
			El Salvador	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	5	10	0	0	0	0	0	0
		NCO	Mixed flags (EU tropical)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	58	37	21	29	6	17	0	0	
Discards	ATE	CP	Côte d'Ivoire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
			EU-España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
			EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	631	0	94	56	208	22	35	106	6
			EU-Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Korea Rep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Russian Federation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0
		NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ATW	CP	EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
			Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			UK-Bermuda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

SKJ-Table 2. CAS (catch-at-size) matrix estimated for SKJ-E (eastern stock) in thousands of fish caught, by year and 2 cm size classes.

	Year																										
Li (2cm)	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
20	0	0	1	0	0	0	0	66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	1	6	0	0	0	0	2	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	6	34	4	0	0	0	0	0	1	0	14	0	0	0	0	0	0	1	1	1	1	2	1	2	2	1
26	1	13	45	4	0	0	0	0	0	3	0	7	37	1	1	1	1	0	5	5	5	6	16	13	19	17	17
28	2	20	98	40	1	14	1	2	0	4	3	10	207	28	8	4	4	2	29	28	31	35	92	78	109	97	81
30	3	18	25	4	6	40	11	59	7	49	30	69	195	82	63	30	22	13	139	145	154	186	462	379	549	471	390
32	3	16	28	18	10	63	15	73	67	58	211	221	315	180	175	90	53	40	436	463	492	587	1430	1189	1645	1521	1261
34	31	57	88	93	131	279	54	169	200	197	314	543	664	489	460	262	206	145	935	975	1064	1188	2765	2283	3192	3004	2456
36	73	112	161	167	358	744	246	386	493	632	895	1950	1008	1194	1037	652	603	573	1475	1638	1634	1860	4149	3373	4643	4385	3768
38	240	377	707	904	1013	2078	644	1318	1345	1514	1718	3110	2914	2512	2115	1264	1301	1183	1788	2595	2452	2874	5454	4087	5796	5489	5337
40	466	834	1771	1850	2584	5500	1396	3105	2984	3467	2818	4613	5792	5083	4161	2828	3003	1923	2873	4772	3890	4250	7835	6102	8632	6798	8127
42	870	1685	3268	3123	4836	8551	2181	4038	4286	5124	3817	6139	8555	7530	7647	5279	5163	3688	5155	8087	5912	6321	12267	9322	12041	10183	12771
44	1555	3301	5077	4843	7418	9364	2744	4676	5359	6572	5133	6514	9817	9390	9033	6635	5633	6784	6801	11022	7190	8355	15072	11687	14621	13058	14890
46	1299	3188	4128	3953	5969	8204	2764	3994	6284	7182	6053	6165	8229	11027	9690	6104	4738	8674	7537	10436	7591	9682	15780	12262	16248	14204	13457
48	1070	2590	3555	3821	3685	6076	2129	3357	6648	5961	4708	5337	5538	7235	6943	5245	3954	7097	5951	7628	5988	8055	12395	8430	11789	11042	9206
50	981	1776	3289	3385	2159	4020	1977	2823	5797	4095	3339	3774	3842	4527	3898	4579	3110	4439	4213	4525	4220	5286	8042	4824	5781	5622	4329
52	1150	1783	3229	3129	1952	2564	1798	1836	3838	2692	2055	2821	2725	3131	2459	3467	2431	2847	3113	2746	2605	3173	4461	2687	2954	3549	2251
54	1138	1627	2775	2693	1915	1760	1470	1529	2528	2046	1420	1875	1767	2110	1420	2119	1756	1617	1648	1592	1396	1965	2516	1507	1815	1647	1053
56	797	1122	1681	1702	1343	1086	1168	1073	1697	1616	967	1110	1005	1648	771	1056	1145	898	943	976	777	1081	1388	887	1132	1009	681
58	498	606	927	853	770	651	579	635	1130	1169	632	639	595	942	445	469	740	468	521	600	411	569	868	595	700	626	583
60	275	317	458	354	294	611	535	385	760	613	565	532	375	516	319	232	494	219	394	401	271	404	469	472	501	441	474
62	115	135	198	194	165	303	236	177	393	445	491	370	315	217	192	199	347	137	248	269	205	288	308	388	336	267	359
64	29	63	111	89	80	105	205	93	238	203	343	223	144	114	135	160	203	74	149	144	117	223	189	330	157	194	220
66	8	24	37	42	52	127	222	45	122	149	201	153	111	91	61	122	104	37	91	51	41	142	137	251	96	129	133
68	8	8	24	19	36	41	106	21	93	107	177	121	66	35	32	75	56	10	30	16	19	78	81	166	95	98	78
70	1	0	0	6	8	27	71	22	37	75	61	69	35	21	7	35	22	2	8	4	32	25	35	99	38	39	37
72	1	0	0	1	1	3	34	6	5	34	29	34	28	9	12	8	7	1	3	4	27	10	13	26	9	25	23
74	4	7	10	12	8	3	23	3	2	9	12	4	8	5	1	6	3	0	1	6	10	1	1	13	7	8	7
76	0	0	0	0	0	2	7	0	6	2	1	2	2	1	0	1	0	0	1	7	1	0	0	4	3	1	1
78	0	0	0	0	0	5	2	1	11	5	0	0	1	1	1	1	0	0	1	9	1	0	0	3	0	0	0
80	0	0	0	0	0	0	7	1	5	0	0	1	0	1	0	1	0	0	1	3	0	0	0	0	0	0	0
82	0	0	0	0	0	0	0	0	9	0	0	0	0	2	0	0	0	0	1	1	0	0	0	0	0	0	0
84	0	0	0	0	0	0	0	0	3	4	13	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0
86	0	0	0	0	0	0	0	0	6	9	26	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
88	0	1	0	0	0	0	0	0	9	9	26	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
90	0	1	0	0	0	232	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
TOTAL	10619	19687	31734	31305	34796	52451	20627	29895	44370	44045	36061	46425	54290	58121	51087	40924	35098	40871	44495	59151	46536	56644	96228	71456	92910	83925	81992

	Year																								
Li (2cm)	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
20	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0	1	0	0	0	0	4145	0	0	1	0
22	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2	0	0	0	3	0	1	15	3	0	5
24	0	1	1	1	2	0	0	1	6	1	3	1	7	10	21	1	0	0	8	6	13	24	11	5	4
26	4	8	8	11	11	7	2	7	10	11	6	8	41	25	55	5	5	4	20	20	30	27	57	30	28
28	27	61	63	60	70	33	26	41	67	35	34	48	95	67	118	22	55	29	80	60	117	134	123	89	116
30	145	330	311	342	366	138	142	293	523	230	183	288	382	269	324	252	383	246	349	455	811	779	719	516	515
32	520	1028	920	1118	1168	483	378	1005	1791	706	584	1081	1045	1054	1046	1108	1326	843	1009	1451	2568	2318	2392	1796	1976
34	1316	2085	1716	2414	2336	953	811	2030	3453	1973	1172	2523	2423	2818	3055	3499	4131	2045	2472	3529	5516	5277	5913	4051	4521
36	2731	3422	2592	3665	3723	2160	1633	3284	4677	3304	1866	4639	3792	5386	5557	7082	7362	3363	4997	5964	7583	9332	10659	7674	7431
38	3556	4249	3244	4565	4638	3721	2716	4526	5178	4478	2954	6275	4740	6189	7031	9873	9477	4466	6209	5823	9489	14112	15679	10985	10105
40	5582	5415	4409	7059	6654	6391	4148	6205	6422	6544	4683	8124	5773	6455	9679	11951	11654	6108	8236	8495	14280	19006	22065	17171	15242
42	9548	7912	6743	10726	8182	9074	5832	8788	8143	9041	6848	8711	7685	7242	10924	13469	12299	7297	9701	13151	16993	20404	25817	19362	16646
44	11521	8926	9530	13306	8473	10222	7138	10306	9769	10159	8166	8429	8521	8344	11115	13559	12459	9324	11775	16208	16143	19485	24687	19420	15613
46	12145	10178	11360	12818	8123	9029	7592	9235	10458	9695	7986	7391	7671	8264	10545	11421	13222	10319	12328	13482	12622	16231	20569	17256	13770
48	8467	7895	9350	8939	6779	7583	6667	7057	9988	7959	6498	5397	6207	6472	9279	8567	10897	9866	10236	9728	10546	11076	13409	12417	9867
50	3815	4210	5722	6353	4950	5544	4486	4954	6982	6023	4470	3551	4249	4631	6480	5888	7511	7909	6708	6814	7857	6535	7502	7507	5843
52	2247	2642	3894	3452	2971	3504	2709	2865	4050	3681	2958	2531	3143	3226	4293	4268	5302	6903	5023	5597	5315	3923	4229	4857	4062
54	1365	1129	1829	2042	2243	2052	1574	1675	2209	2202	2008	1774	2117	2476	2347	2925	3574	6114	3868	3969	3880	2328	2500	3042	2598
56	948	691	1014	1060	1304	1104	938	1091	1433	1552	1408	1148	1388	1750	1525	1942	2645	4544	2919	2828	2601	1664	1534	2528	1996
58	645	489	701	652	900	797	609	776	826	955	800	779	908	1393	918	1373	1866	3474	2147	2038	1943	1070	1154	1785	1547
60	468	345	441	403	563	552	398	576	580	642	435	637	696	924	556	780	1583	2560	1681	1398	1291	866	926	1559	1253
62	305	246	239	220	335	346	227	364	405	460	267	418	412	644	373	504	1144	1969	1233	956	826	621	565	946	811
64	176	129	150	171	152	216	116	224	280	297	137	187	335	472	181	262	637	1322	875	571	584	400	275	614	542
66	111	47	75	107	79	112	54	184	134	155	79	103	126	145	68	134	300	706	584	474	348	169	96	334	362
68	75	38	24	40	38	77	31	91	68	99	61	33	46	75	47	53	139	239	329	378	220	99	48	158	154
70	30	12	20	19	52	20	16	46	28	24	28	17	17	35	9	29	18	85	170	337	104	39	22	44	38
72	5	5	8	11	20	7	12	27	14	15	11	18	11	37	9	9	19	31	50	161	84	33	2	11	7
74	1	0	2	1	3	2	10	12	7	7	5	20	16	11	0	4	4	10	5	88	33	13	1	4	1
76	0	3	2	3	3	2	4	2	3	5	9	12	8	1	1	3	1	2	1	4	8	4	0	0	0
78	0	0	0	0	1	3	3	4	1	3	4	3	1	1	1	3	0	0	1	1	0	2	0	1	0
80	0	0	1	1	0	0	1	2	0	1	3	2	2	0	1	1	0	0	0	0	1	1	0	1	0
82	0	3	1	0	0	0	1	1	18	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
84	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
86	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
88	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
90	0	4	2	0	0	1	0	1	1	2	5	0	0	0	1	2	1	0	2	0	1	0	0	0	0
TOTAL	65756	61508	64371	79561	64138	64134	48273	65674	77527	70263	53671	64151	61860	68417	85562	98989	108017	89778	93021	103985	125952	135986	160957	134165	115056

SKJ-Table 3. CAS (catch-at-size) matrix estimated for SKJ-W (western stock) in thousands of fish caught, by year and 2 cm size classes.

Li (2cm)	Year 1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
24	0	1	1	1	1	1	0	0	0	1	0	2	0	0	0	0	0
26	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	0	0
28	1	2	2	2	2	2	1	1	1	1	0	1	0	0	1	0	0
30	2	3	2	2	2	3	2	2	1	4	1	8	1	2	1	1	12
32	5	7	6	6	6	7	7	8	7	10	5	14	1	1	1	2	15
34	5	7	6	6	6	7	26	30	27	16	11	18	2	1	3	10	14
36	7	10	9	8	9	13	39	45	40	23	22	23	4	3	17	29	74
38	23	34	30	30	30	46	66	70	64	44	49	44	8	6	27	57	59
40	25	38	34	36	35	78	107	117	106	83	84	91	30	34	56	166	694
42	33	50	45	49	47	116	110	110	104	113	95	186	119	342	385	706	1047
44	50	75	67	75	73	161	161	147	140	160	127	273	211	556	600	1016	1100
46	59	87	78	81	89	175	159	149	140	210	153	266	231	253	373	547	945
48	55	82	72	72	89	166	152	154	148	219	154	274	300	289	380	475	1041
50	54	79	69	68	93	129	127	130	123	198	188	241	461	436	588	582	1637
52	43	56	48	52	63	84	107	120	95	165	131	192	792	847	877	986	1448
54	30	39	32	34	43	61	83	87	69	139	106	197	710	1025	933	1122	1437
56	29	36	27	27	31	41	64	72	58	116	119	215	684	932	811	824	1300
58	31	34	22	25	27	30	41	56	49	98	123	278	467	676	643	638	1054
60	37	41	27	31	37	33	43	62	52	76	113	289	496	550	529	527	681
62	21	25	16	16	27	19	19	26	25	55	85	241	400	580	491	592	390
64	21	24	17	18	25	21	16	23	20	51	73	187	313	461	359	422	184
66	11	10	6	9	10	7	12	22	18	49	46	136	253	420	354	419	95
68	8	11	7	7	10	9	5	6	7	38	34	89	121	280	269	255	54
70	16	23	21	19	24	27	8	5	5	26	21	64	83	211	229	238	33
72	10	15	14	12	17	17	5	3	3	13	12	25	50	79	102	79	30
74	2	4	4	3	6	6	4	2	2	7	7	16	36	26	48	22	11
76	0	1	1	1	2	1	1	0	0	4	4	12	24	18	41	12	2
78	0	0	0	0	1	1	0	0	0	6	7	3	10	6	16	7	2
80	0	0	0	0	1	0	0	0	0	4	8	0	0	1	4	5	1
82	0	0	0	0	0	0	0	0	0	9	4	0	0	1	2	11	0
84	0	0	0	0	1	0	0	0	0	6	4	0	0	0	0	2	1
86	0	0	0	0	0	0	0	0	0	1	4	0	0	0	0	1	0
88	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	578	796	665	693	808	1263	1369	1449	1303	1944	1792	3385	5808	8036	8141	9750	13363

Li (2cm)	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	1	1	0	0	2	0	0	0	0	0	0	0	0	0
26	0	1	0	1	0	1	0	0	1	1	0	0	0	0	0	0	0
28	0	2	1	2	1	3	0	1	5	1	0	0	0	0	0	0	0
30	15	3	1	2	1	4	0	17	10	2	1	2	0	2	0	4	0
32	33	4	4	4	2	13	1	56	31	4	2	3	1	3	8	11	2
34	24	5	5	6	3	30	22	127	35	11	8	11	5	11	29	52	8
36	62	16	15	35	33	49	77	305	58	32	27	34	10	27	32	86	16
38	121	75	36	76	48	129	68	512	148	79	65	75	48	75	92	144	29
40	305	105	63	86	67	202	121	586	281	114	152	174	119	147	144	294	45
42	383	93	108	121	101	393	221	687	326	146	173	167	140	125	150	350	74
44	407	311	229	235	147	518	357	894	512	204	208	187	177	132	201	425	103
46	551	385	389	419	357	764	530	855	716	283	320	302	296	185	187	413	188
48	710	648	647	583	756	1070	707	793	837	434	510	466	400	344	312	577	329
50	922	729	919	958	1258	1204	741	833	981	531	579	732	522	517	519	801	526
52	1111	701	929	1183	1473	1291	821	885	1020	621	690	1000	826	697	735	935	689
54	1288	795	778	1129	1437	1214	863	1213	914	607	739	1180	963	821	895	1013	725
56	1323	854	743	952	1067	1093	851	991	899	566	775	1206	935	898	959	952	714
58	1003	792	682	830	565	855	790	898	798	626	850	1063	1004	985	1066	817	620
60	691	528	509	424	287	588	595	553	647	538	743	782	880	861	916	551	407
62	369	251	326	265	187	373	399	362	420	436	584	509	569	556	602	449	321
64	168	155	189	121	68	182	282	271	219	256	340	292	297	291	321	327	230
66	86	103	97	83	49	119	159	97	86	114	157	193	194	190	208	268	196
68	42	90	40	51	19	49	127	41	43	64	85	99	103	104	104	197	136
70	34	51	19	56	9	19	81	66	35	57	73	41	47	46	41	57	48
72	21	53	16	14	5	31	85	18	28	49	54	13	10	12	10	50	40
74	10	29	19	14	13	15	39	21	27	26	26	11	9	9	7	31	25
76	4	10	7	5	5	15	34	30	13	12	8	4	5	2	3	25	16
78	2	3	15	11	11	13	38	8	10	16	13	8	5	5	5	2	2
80	1	1	1	0	0	5	3	4	1	3	5	0	0	0	0	4	3
82	1	1	0	11	7	16	11	2	1	1	2	0	1	0	0	2	2
84	0	0	0	0	0	1	6	2	7	0	0	0	0	0	0	0	0
86	0	1	1	0	0	0	0	0	2	3	4	0	0	0	0	0	0
88	1	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0
90	0	1	0	0	0	0	28	1	1	1	0	0	1	0	0	0	8
TOTAL	9691	6797	6786	7677	7979	10258	8057	11131	9116	5838	7193	8555	7567	7046	7548	8837	5500

Li (2cm)	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
20	0	0	0	0	0	1	0	0	0	1	18	0	0	0	0	0	0	0
22	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0	0	0
24	0	0	0	0	0	0	1	7	0	0	0	0	0	1	0	0	0	0
26	0	0	0	0	1	0	0	6	0	0	0	0	0	1	0	3	0	0
28	0	1	3	0	1	0	1	0	0	0	14	33	0	4	2	2	1	2
30	2	10	6	3	2	1	2	1	1	1	36	0	1	16	10	8	4	4
32	4	16	9	0	9	1	10	5	2	0	12	1	4	39	24	59	30	11
34	10	34	16	0	23	3	23	13	6	0	15	33	29	109	87	62	48	48
36	12	24	34	2	39	12	40	28	21	11	8	1	14	300	271	242	214	207
38	30	47	45	9	78	13	69	47	30	12	10	136	74	453	435	398	378	350
40	84	67	102	30	94	25	76	70	35	26	187	75	141	244	335	248	160	149
42	175	128	247	105	133	190	160	278	242	309	93	150	185	265	571	295	226	165
44	319	382	458	338	223	362	288	479	475	596	295	61	512	396	843	439	350	277
46	473	901	634	477	316	442	615	634	735	742	524	994	571	636	988	769	592	489
48	567	1228	909	899	411	908	847	850	1035	996	507	1622	842	894	1096	1097	894	694
50	614	1316	1337	1207	696	979	963	900	1163	995	2050	2410	486	1004	1061	1140	975	816
52	675	904	1486	1306	775	704	1053	807	1154	981	3063	1783	494	972	980	1025	918	783
54	740	809	1426	1327	587	501	898	686	1026	919	1536	807	439	616	632	834	711	486
56	745	726	1091	955	478	391	758	570	841	784	667	420	429	758	689	599	616	562
58	684	568	543	723	418	388	611	484	692	701	843	341	550	663	661	603	601	562
60	457	471	334	356	404	302	493	396	547	584	526	107	389	218	205	200	184	256
62	371	372	175	188	368	217	322	277	375	416	287	203	446	116	100	79	70	108
64	256	265	107	102	405	113	147	123	170	190	20	68	215	64	46	67	37	48
66	214	109	39	49	322	123	113	129	145	168	2	69	156	35	11	9	5	35
68	149	37	19	11	270	136	78	150	151	186	1	38	96	19	9	9	3	12
70	47	17	21	0	146	117	47	128	121	157	0	2	22	14	5	5	1	27
72	41	14	19	0	75	56	27	72	61	76	1	0	22	12	3	3	3	24
74	26	7	8	6	50	70	10	76	65	91	19	5	24	4	3	3	1	0
76	16	8	4	9	31	41	10	46	38	52	1	1	3	4	2	5	1	22
78	2	6	5	7	5	27	1	29	24	34	20	0	12	1	1	54	28	0
80	6	5	3	6	6	22	5	24	19	26	0	0	0	0	1	10	13	21
82	2	0	0	0	3	7	1	7	6	9	2	0	6	0	1	6	5	21
84	0	0	3	0	0	0	1	0	0	0	0	6	0	0	1	1	0	0
86	0	0	0	0	0	7	1	7	6	9	0	6	3	0	4	0	0	21
88	0	2	0	0	0	0	0	1	0	0	0	0	0	7	1	0	0	0
90	1	3	0	0	1	0	0	1	0	0	24	11	0	14	6	0	1	0
TOTAL	6722	8478	9085	8116	6369	6161	7670	7332	9187	9072	10781	9382	6165	7881	9085	8272	7072	6201

SKJ-Table 4. SKJ-E. The probability of stock biomass being below 10% or 20% of B_{MSY} during the projection period for a given catch level and is based on 180,000 iterations of the Multivariate lognormal (MVLN) and Markov chain Monte Carlo (MCMC) statistical analyses developed from the Stock Synthesis and JABBA model runs (2 model platforms x 3 steepness options x 3 growth/M options x 2 index combinations).

Probability of B<10%*B_{MSY}

TAC (kt)	2023	2024	2025	2026	2027	2028
100	5%	6%	6%	6%	6%	6%
110	5%	6%	6%	6%	6%	7%
120	5%	6%	6%	7%	7%	7%
130	5%	6%	7%	7%	7%	7%
140	5%	6%	7%	7%	7%	7%
150	5%	6%	7%	7%	8%	8%
160	5%	7%	7%	8%	8%	8%
170	5%	7%	7%	8%	8%	9%
180	5%	7%	8%	8%	9%	9%
190	5%	7%	8%	9%	9%	10%
200	5%	7%	8%	9%	10%	10%
210	5%	7%	9%	10%	11%	12%
220	5%	7%	9%	10%	12%	14%
230	5%	7%	9%	11%	14%	15%
240	5%	8%	10%	13%	15%	17%
250	5%	8%	10%	14%	17%	20%
260	5%	8%	11%	15%	19%	23%
270	5%	8%	13%	17%	21%	31%
280	5%	9%	14%	18%	27%	48%
290	5%	9%	15%	21%	41%	51%
300	5%	10%	16%	27%	49%	54%

Probability of B<20%*B_{MSY}

TAC (kt)	2023	2024	2025	2026	2027	2028
100	6%	6%	6%	6%	6%	6%
110	6%	6%	6%	7%	7%	7%
120	6%	6%	7%	7%	7%	7%
130	6%	7%	7%	7%	7%	7%
140	6%	7%	7%	7%	7%	7%
150	6%	7%	7%	8%	8%	8%
160	6%	7%	7%	8%	8%	8%
170	6%	7%	8%	8%	8%	9%
180	6%	7%	8%	9%	9%	9%
190	6%	7%	8%	9%	10%	10%
200	6%	7%	9%	9%	10%	11%
210	6%	8%	9%	10%	11%	14%
220	6%	8%	9%	11%	14%	17%
230	6%	8%	10%	13%	17%	20%
240	6%	8%	11%	16%	19%	22%
250	6%	9%	13%	18%	22%	26%
260	6%	9%	15%	20%	25%	32%
270	6%	10%	17%	22%	29%	43%
280	6%	11%	18%	25%	38%	61%
290	6%	12%	20%	30%	54%	64%
300	6%	13%	22%	38%	61%	67%

SKJ-Table 5. SKJ-E. Joint probabilities of the eastern Atlantic skipjack 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 a given catch level (thousand t), based on 90,000 iterations of the MVLN approximation for Stock Synthesis and 90,000 MCMC iterations for JABBA.

Probaility $F<=F_{MSY}$

TAC (kt)	2023	2024	2025	2026	2027	2028
100	91%	92%	93%	93%	93%	94%
110	90%	92%	92%	93%	93%	93%
120	89%	91%	92%	92%	93%	93%
130	88%	90%	91%	92%	92%	92%
140	87%	89%	90%	91%	91%	92%
150	85%	87%	88%	89%	90%	90%
160	84%	85%	86%	87%	88%	88%
170	82%	84%	84%	85%	85%	86%
180	81%	81%	82%	82%	82%	82%
190	79%	79%	79%	78%	77%	76%
200	77%	76%	75%	73%	71%	70%
210	75%	73%	71%	68%	65%	63%
220	73%	70%	67%	63%	59%	57%
230	71%	67%	62%	57%	53%	50%
240	69%	63%	57%	51%	46%	42%
250	67%	60%	52%	45%	39%	35%
260	65%	56%	47%	38%	32%	27%
270	63%	52%	42%	33%	26%	20%
280	60%	48%	36%	27%	20%	14%
290	58%	44%	31%	21%	14%	10%
300	56%	40%	26%	16%	10%	7%

Probability $SSB>=SSB_{MSY}$ or $B>=B_{MSY}$

TAC (kt)	2023	2024	2025	2026	2027	2028
100	82%	88%	91%	92%	93%	93%
110	82%	88%	90%	92%	92%	93%
120	82%	87%	90%	91%	92%	92%
130	82%	87%	89%	91%	92%	92%
140	81%	86%	88%	90%	91%	91%
150	81%	85%	87%	89%	90%	90%
160	81%	84%	86%	87%	88%	89%
170	80%	83%	84%	85%	86%	87%
180	80%	81%	82%	82%	82%	83%
190	79%	80%	80%	79%	78%	77%
200	79%	78%	77%	74%	72%	70%
210	78%	76%	73%	70%	66%	63%
220	77%	74%	69%	64%	60%	58%
230	77%	72%	65%	59%	55%	52%
240	76%	69%	61%	54%	49%	45%
250	75%	66%	57%	49%	43%	37%
260	74%	63%	53%	44%	36%	29%
270	73%	61%	48%	38%	29%	19%
280	72%	57%	44%	32%	20%	12%
290	71%	54%	39%	24%	12%	9%
300	70%	51%	34%	17%	9%	7%

Probability $F<=F_{MSY}$ and $SSB>=SSB_{MSY}$ or $B>=B_{MSY}$

TAC (kt)	2023	2024	2025	2026	2027	2028
100	82%	88%	91%	92%	93%	93%
110	82%	88%	90%	92%	92%	93%
120	81%	87%	90%	91%	92%	92%
130	81%	86%	89%	90%	91%	92%
140	81%	85%	88%	89%	90%	91%
150	80%	84%	86%	88%	89%	90%
160	79%	83%	84%	86%	87%	88%
170	79%	81%	83%	84%	84%	85%
180	78%	79%	80%	80%	81%	81%
190	77%	77%	77%	77%	76%	75%
200	76%	75%	74%	72%	70%	68%
210	75%	72%	70%	67%	63%	61%
220	73%	70%	65%	61%	57%	55%
230	71%	66%	60%	55%	51%	48%
240	69%	63%	55%	49%	45%	41%
250	67%	59%	50%	43%	38%	33%
260	65%	54%	45%	37%	31%	25%
270	62%	50%	40%	32%	24%	17%
280	60%	46%	34%	26%	17%	10%
290	58%	41%	30%	19%	10%	8%
300	55%	38%	25%	13%	7%	6%

SKJ-Table 6. SKJ-W. The probability of stock biomass being below 10% or 20% of B_{MSY} during the projection period for a given catch level and is based on 200,000 iterations of the MVLN approximation for the Stock Synthesis.

Probability of B<10%*B_{MSY}

TAC (1000s mt)	2023	2024	2025	2026	2027	2028
16	0%	0%	0%	0%	0%	0%
18	0%	0%	0%	0%	0%	0%
20	0%	0%	0%	0%	0%	0%
22	0%	0%	0%	0%	0%	0%
24	0%	0%	0%	0%	0%	0%
26	0%	0%	0%	0%	0%	0%
28	0%	0%	0%	0%	0%	0%
30	0%	0%	0%	0%	0%	0%
32	0%	0%	0%	0%	0%	0%
33	0%	0%	0%	0%	0%	0%
34	0%	0%	0%	0%	0%	0%
35	0%	0%	0%	0%	0%	0%
36	0%	0%	0%	0%	0%	0%
38	0%	0%	0%	0%	0%	0%
40	0%	0%	0%	0%	0%	0%

Probability of B<20%*B_{MSY}

TAC (1000s mt)	2023	2024	2025	2026	2027	2028
16	0%	0%	0%	0%	0%	0%
18	0%	0%	0%	0%	0%	0%
20	0%	0%	0%	0%	0%	0%
22	0%	0%	0%	0%	0%	0%
24	0%	0%	0%	0%	0%	0%
26	0%	0%	0%	0%	0%	0%
28	0%	0%	0%	0%	0%	0%
30	0%	0%	0%	0%	0%	0%
32	0%	0%	0%	0%	0%	0%
33	0%	0%	0%	0%	0%	0%
34	0%	0%	0%	0%	0%	0%
35	0%	0%	0%	0%	0%	0%
36	0%	0%	0%	0%	0%	0%
38	0%	0%	0%	0%	0%	1%
40	0%	0%	0%	0%	1%	3%

SKJ-Table 7. SKJ-W. Estimated probabilities of the western Atlantic skipjack 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 a given catch level (thousand t), based on 200,000 iterations of the MVLN approximation.

Probaility F<=F_{MSY}

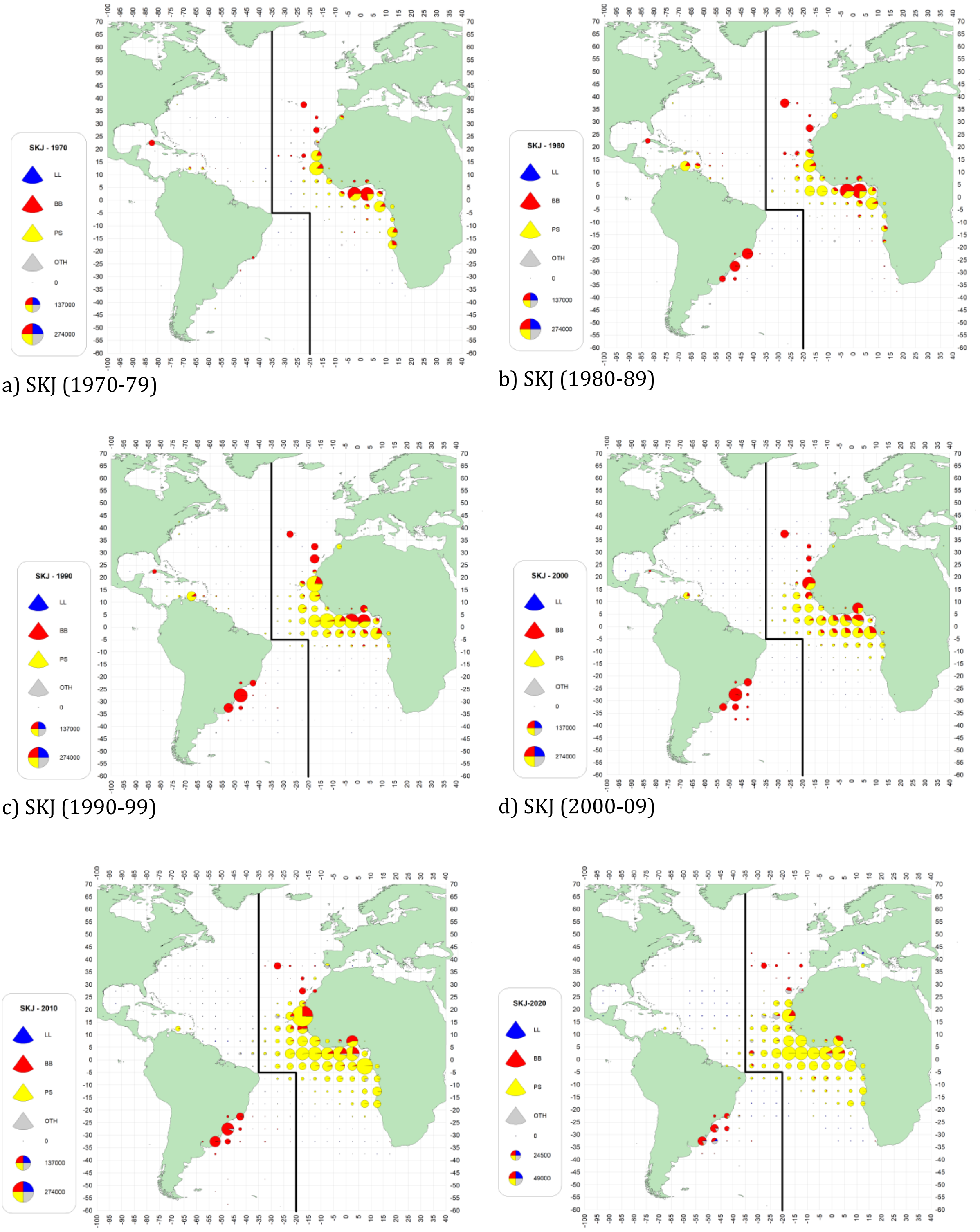
TAC (1000s mt)	2023	2024	2025	2026	2027	2028
16	100%	100%	100%	100%	100%	100%
18	100%	100%	100%	100%	100%	100%
20	100%	100%	100%	100%	100%	100%
22	99%	100%	100%	100%	100%	100%
24	99%	99%	99%	100%	100%	100%
26	98%	98%	98%	99%	99%	99%
28	97%	97%	97%	97%	97%	97%
30	96%	95%	94%	93%	93%	92%
32	94%	92%	91%	89%	87%	85%
33	93%	91%	88%	86%	83%	80%
34	92%	89%	86%	82%	79%	75%
35	91%	87%	83%	78%	74%	70%
36	90%	85%	80%	75%	70%	65%
38	88%	81%	74%	67%	61%	56%
40	85%	76%	67%	59%	53%	48%

Probability SSB>=SSB_{MSY}

TAC (1000s mt)	2023	2024	2025	2026	2027	2028
16	99%	100%	100%	100%	100%	100%
18	99%	100%	100%	100%	100%	100%
20	99%	100%	100%	100%	100%	100%
22	99%	99%	100%	100%	100%	100%
24	99%	99%	99%	100%	100%	100%
26	98%	99%	99%	99%	99%	99%
28	98%	98%	98%	98%	98%	98%
30	98%	97%	96%	96%	95%	94%
32	97%	96%	94%	92%	90%	88%
33	97%	95%	93%	90%	87%	84%
34	96%	94%	91%	87%	83%	79%
35	96%	93%	89%	84%	79%	74%
36	96%	92%	87%	81%	75%	69%
38	95%	89%	82%	73%	66%	60%
40	94%	86%	76%	66%	59%	53%

Probability F<=F_{MSY} and SSB>=SSB_{MSY}

TAC (1000s mt)	2023	2024	2025	2026	2027	2028
16	99%	100%	100%	100%	100%	100%
18	99%	100%	100%	100%	100%	100%
20	99%	100%	100%	100%	100%	100%
22	99%	99%	100%	100%	100%	100%
24	99%	99%	99%	99%	100%	100%
26	98%	98%	98%	99%	99%	99%
28	97%	97%	97%	97%	97%	97%
30	96%	95%	94%	93%	93%	92%
32	94%	92%	91%	89%	87%	85%
33	93%	91%	88%	86%	83%	80%
34	92%	89%	86%	82%	79%	75%
35	91%	87%	83%	78%	74%	70%
36	90%	85%	80%	75%	70%	65%
38	88%	81%	74%	67%	61%	56%
40	85%	76%	67%	59%	53%	48%



a) SKJ (1970-79)

b) SKJ (1980-89)

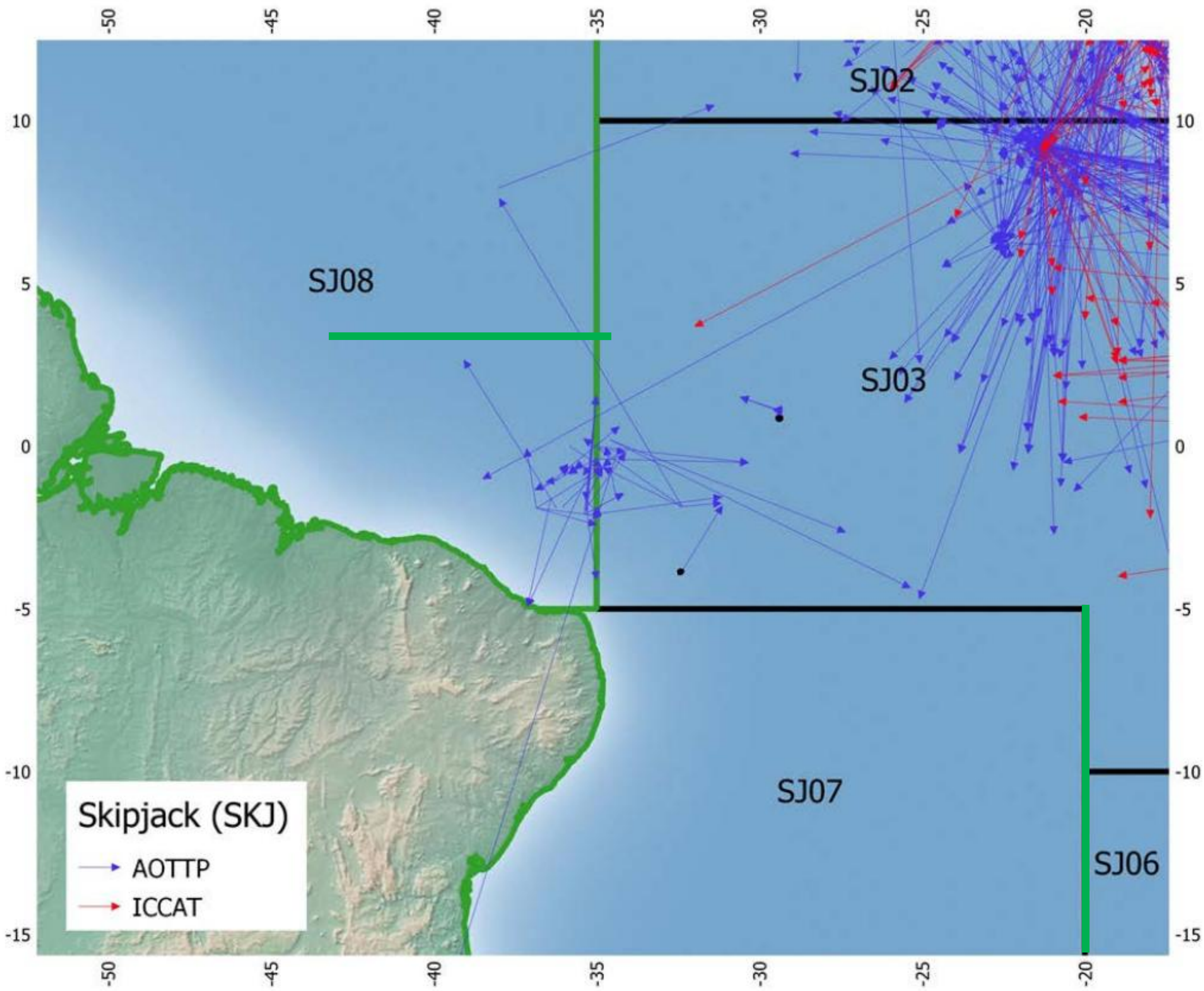
c) SKJ (1990-99)

d) SKJ (2000-09)

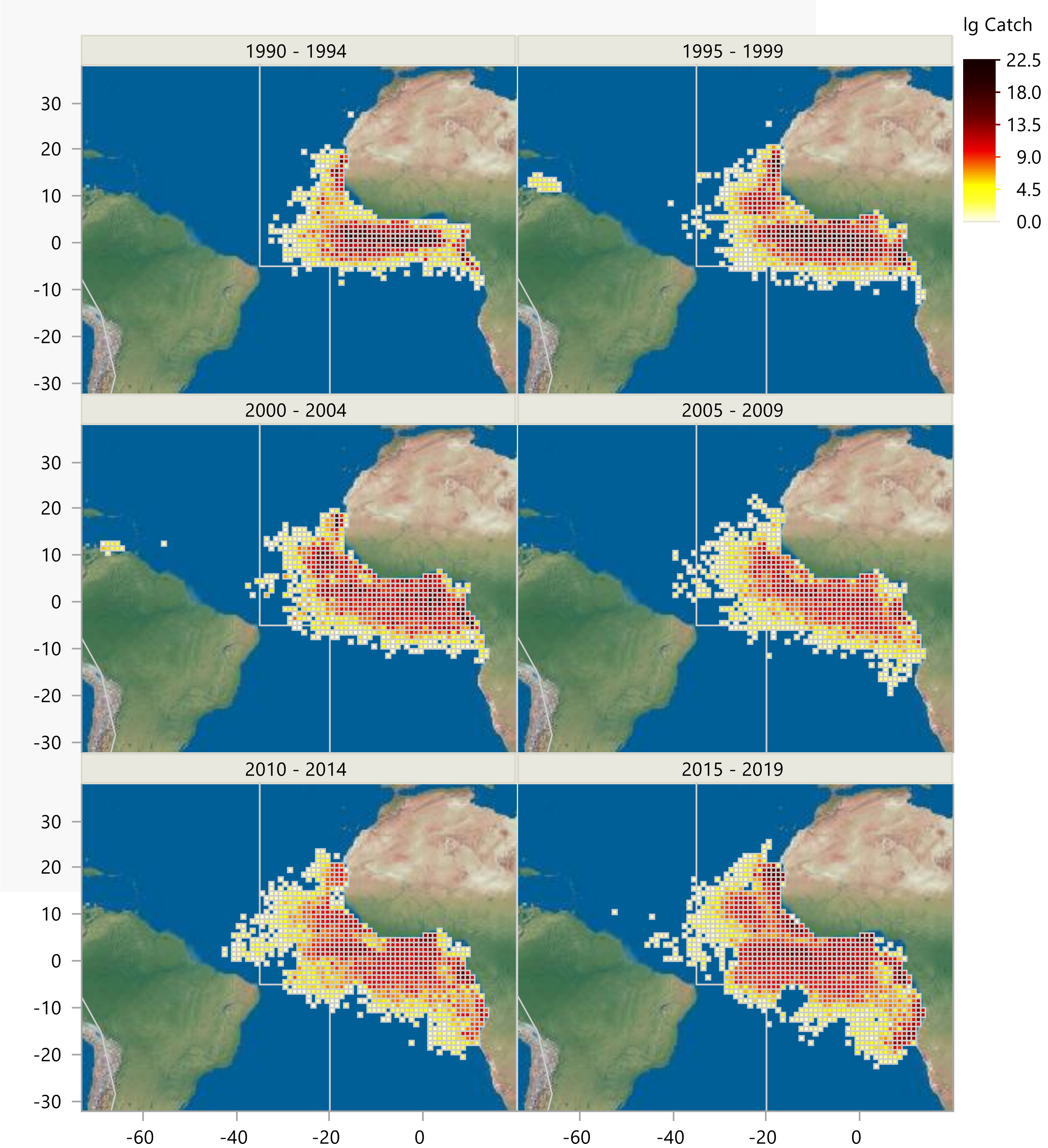
e) SKJ (2010-19)

f) SKJ (2020-22)

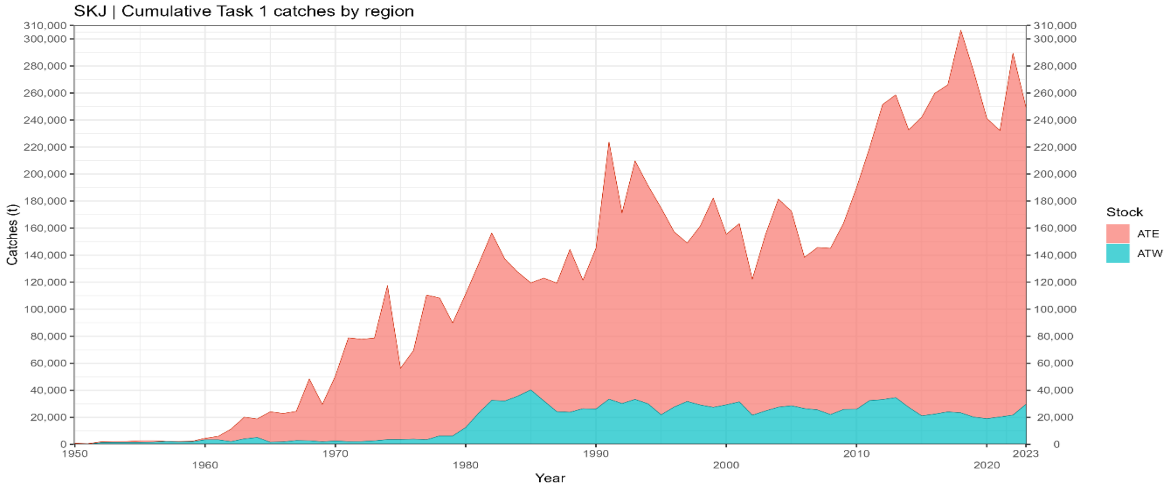
SKJ-Figure 1. [a-f]. Geographical distribution of the skipjack catch by major gears and decade. The maps are scaled to the maximum catch observed during 1970-2022 (last decade only covers 3 years).



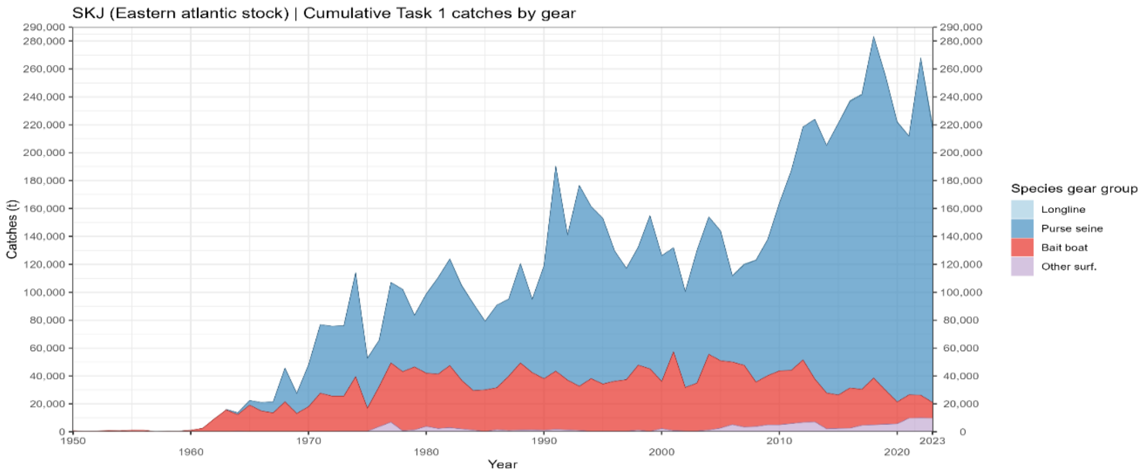
SKJ-Figure 2. A map of the AOTTP (blue lines) and ICCAT (red lines) tagged returns demonstrating the movement of fish in proximity to the eastern-western stock boundary. Area codes correspond to SKJ sample areas. Green line represents the East-West stock boundary.



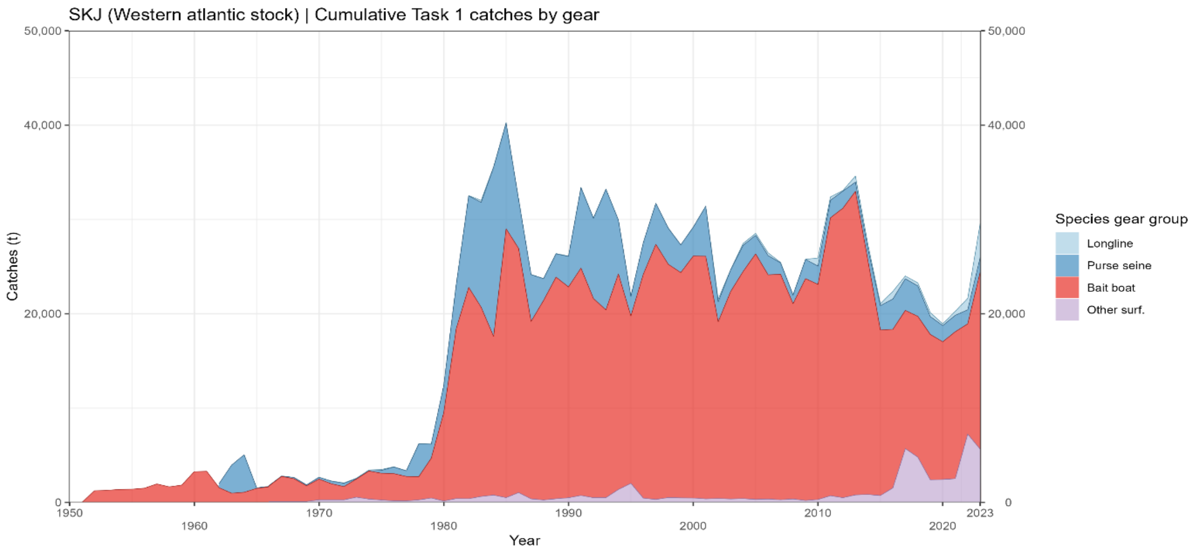
SKJ-Figure 3. Spatial distribution of the total SKJ catch (lg scale) from all PS-FAD fisheries by 1º x 1º of latitude - longitude and by lustrum (each box) 1990 – 2019. Line denotes the SKJ stocks boundary.



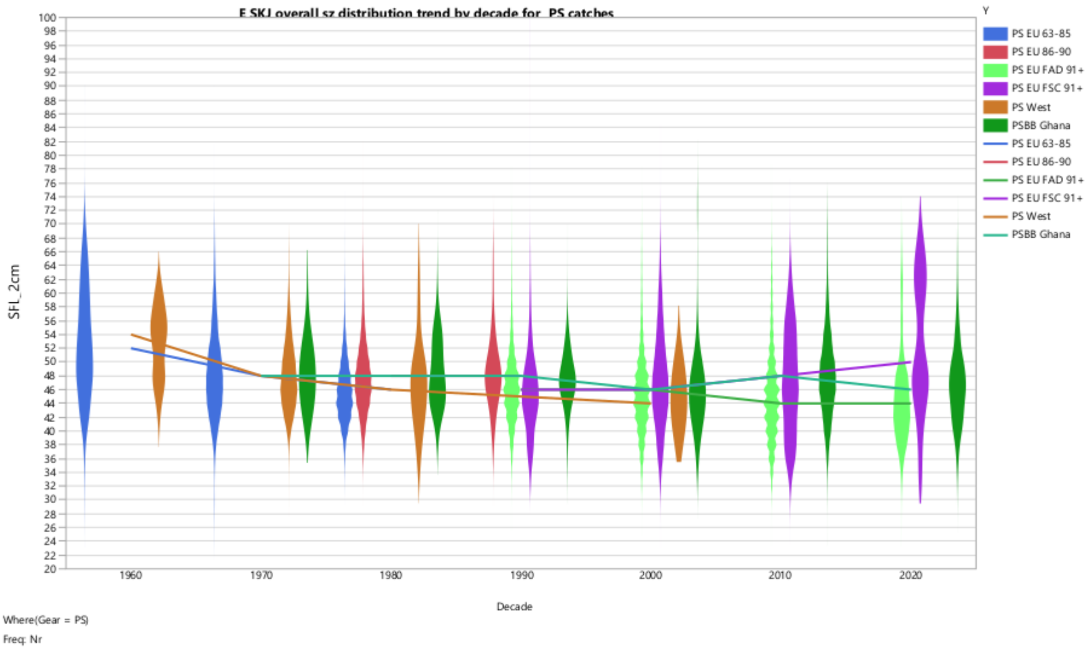
SKJ-Figure 4. Total skipjack catches (t) in the Atlantic and by stock (East and West) between 1950 and 2023. The 2023 figure is still preliminary.



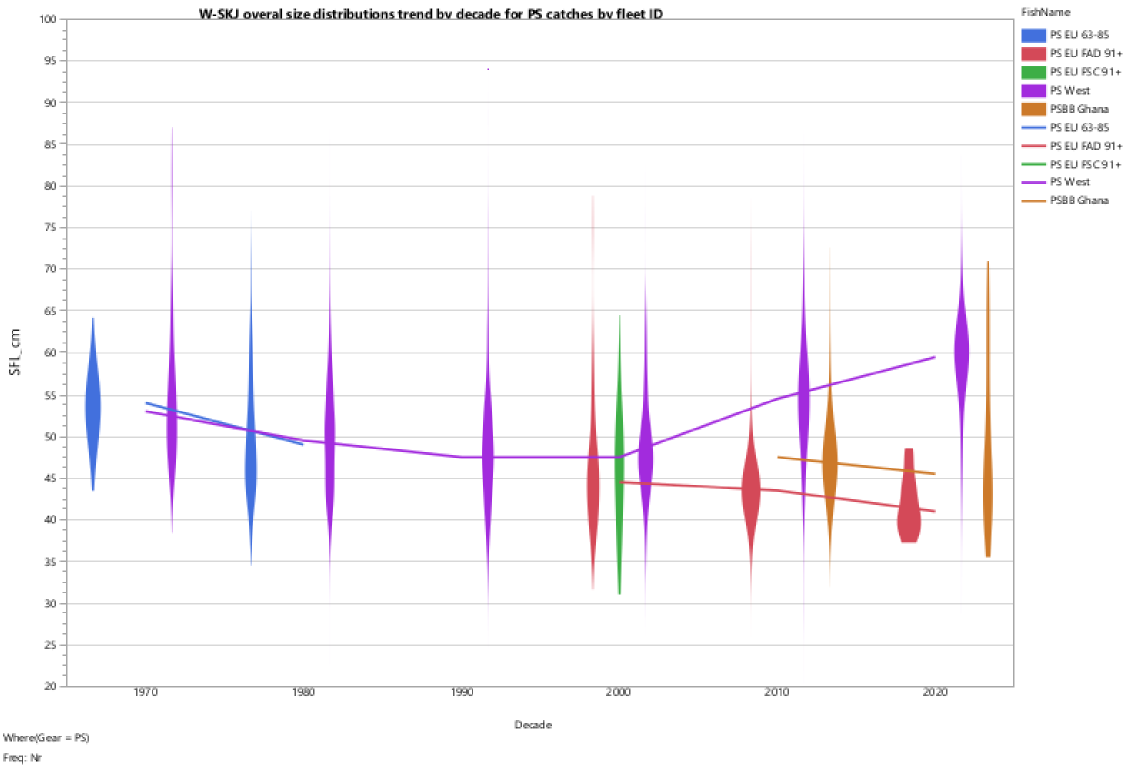
SKJ-Figure 5. Skipjack catches in the eastern Atlantic, by gear (1950-2023). The values for 2023 are preliminary.



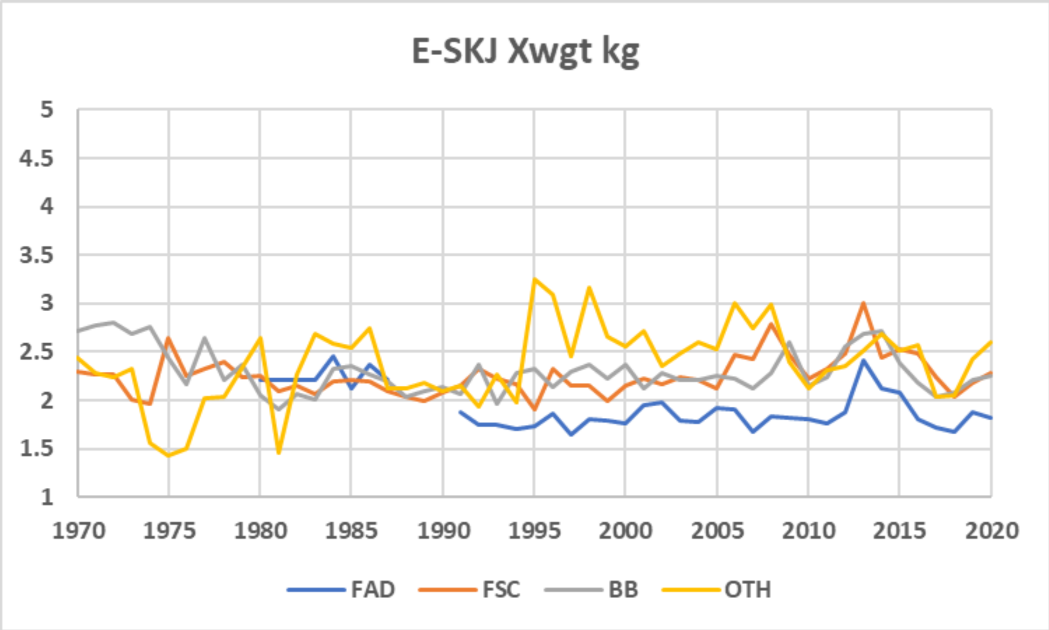
SKJ-Figure 6. Skipjack catches in the western Atlantic, by gear (1950-2023). The values for 2023 are preliminary.



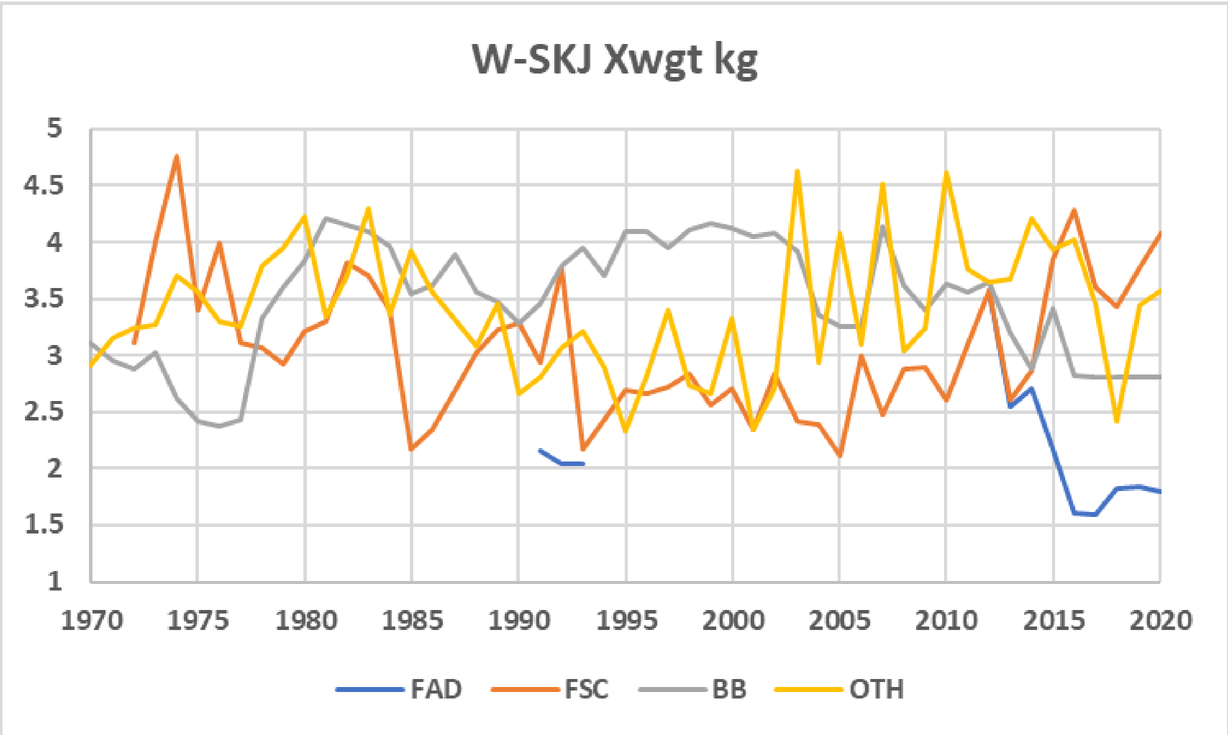
SKJ-Figure 7. SKJ-E. Overall size distribution of catch by decade for the PS fisheries by fleet ID, lines indicate the median of the distribution.



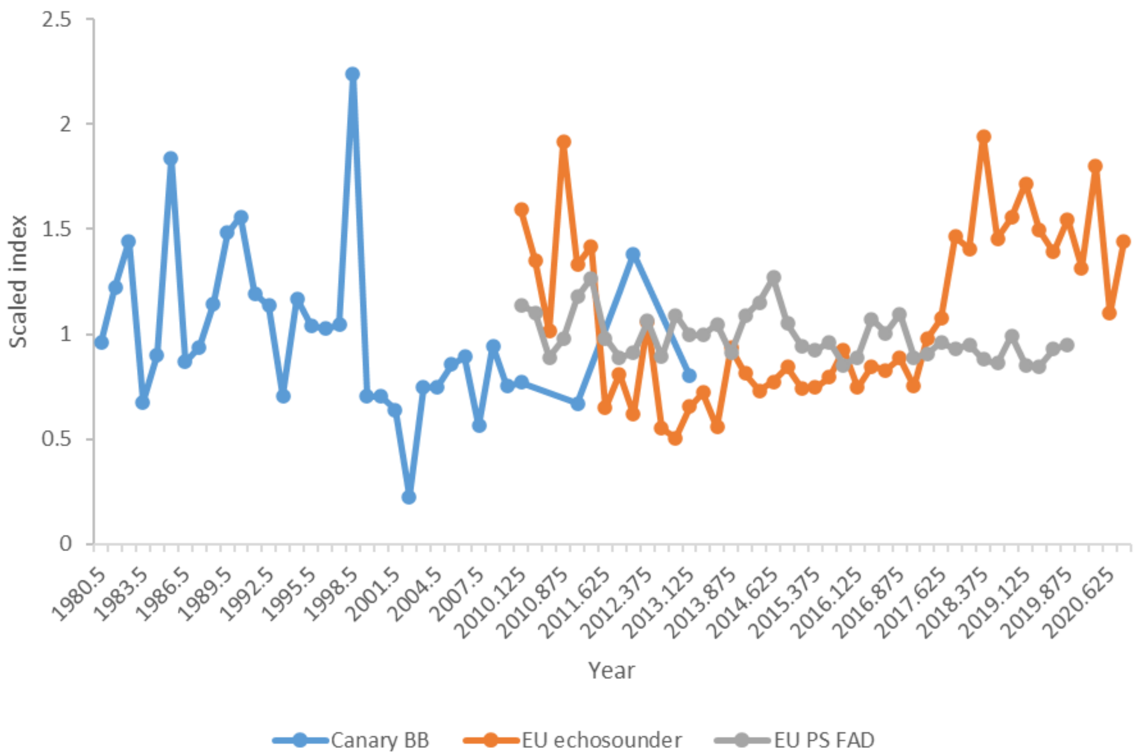
SKJ-Figure 8. SKJ-W. Size distributions by fleet ID from the PS fisheries, lines indicate the median of the distributions.



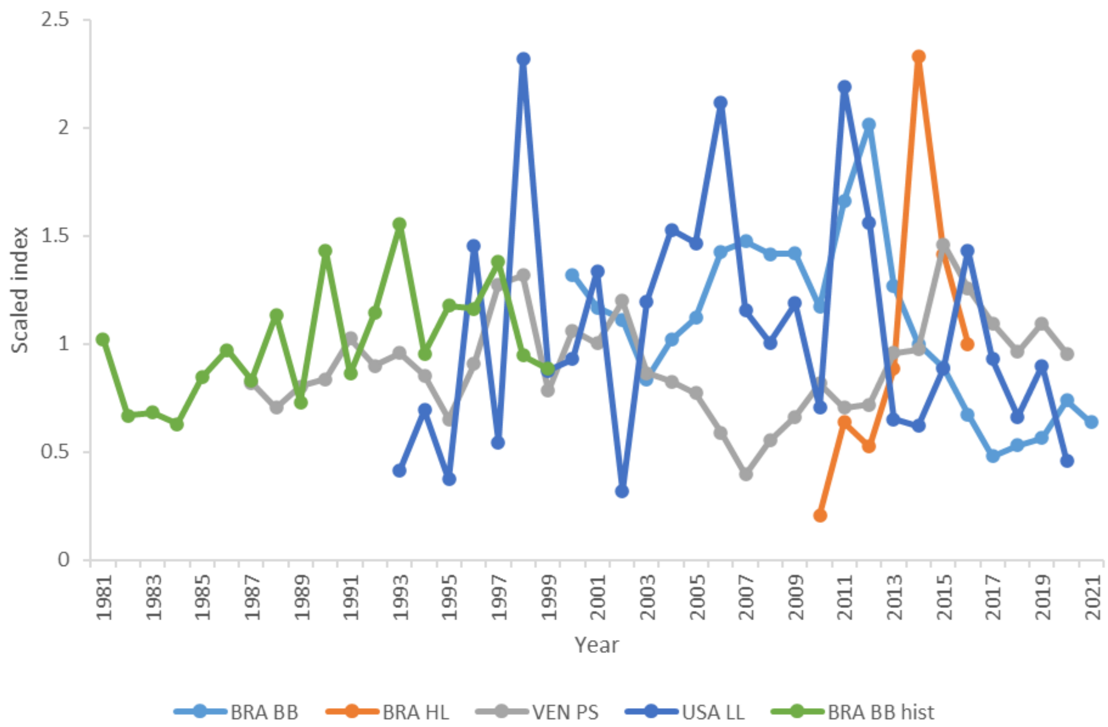
SKJ-Figure 9. SKJ-E. Mean weights (kg) estimated from the overall CAS estimations updated by Secretariat including Fishing mode free-schools (FSC), FOB (FAD), baitboat (BB), and other gears (OTH).



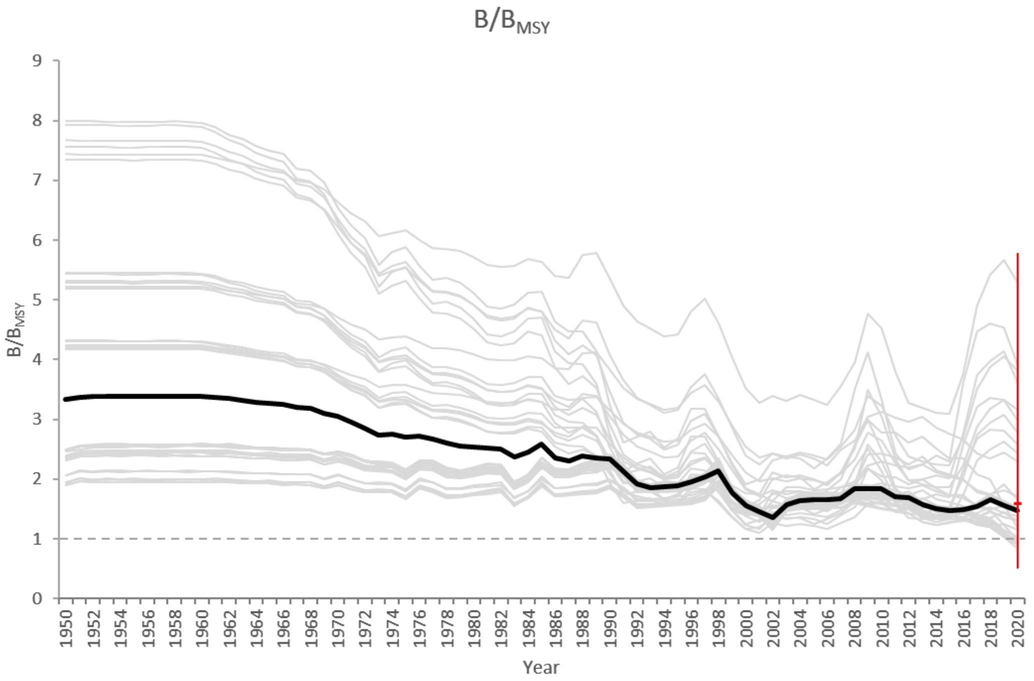
SKJ-Figure 10. SKJ-W. Mean weights (kg) estimated from the overall CAS estimations updated by Secretariat including Fishing mode free-schools (FSC), FOB (FAD), baitboat (BB), and other gears (OTH).

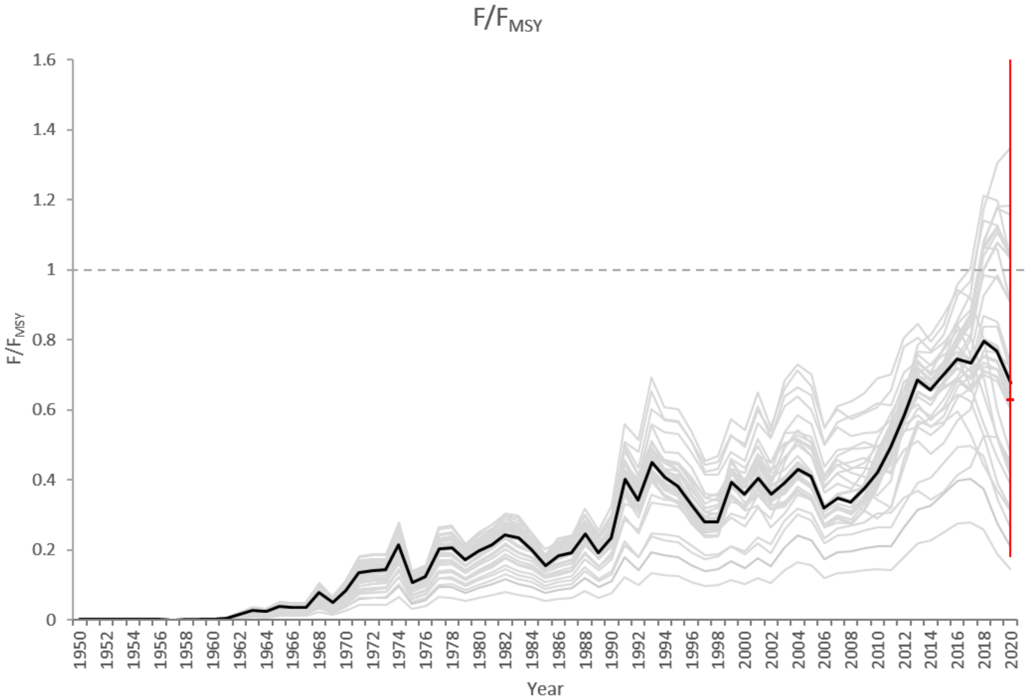


SKJ-Figure 11. SKJ-E. Relative abundance indices included in the final stock assessment models, Stock Synthesis and JABBA, for the eastern skipjack stock. Years in the x axis are non-integers because the model runs at quarterly time steps.

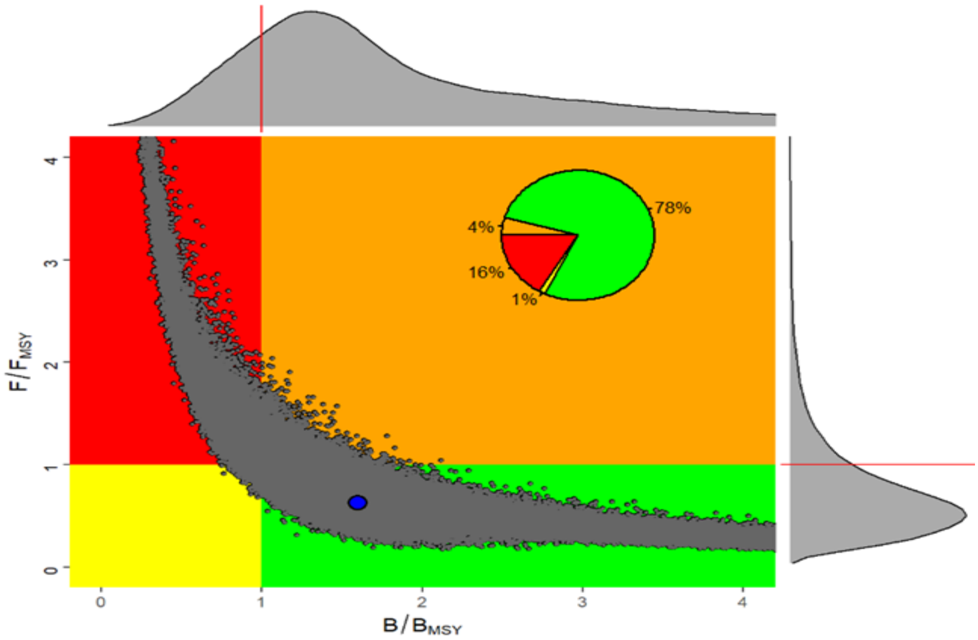


SKJ-Figure 12. SKJ-W. Relative abundance indices included in the final stock assessment model, Stock Synthesis, for the western skipjack stock.

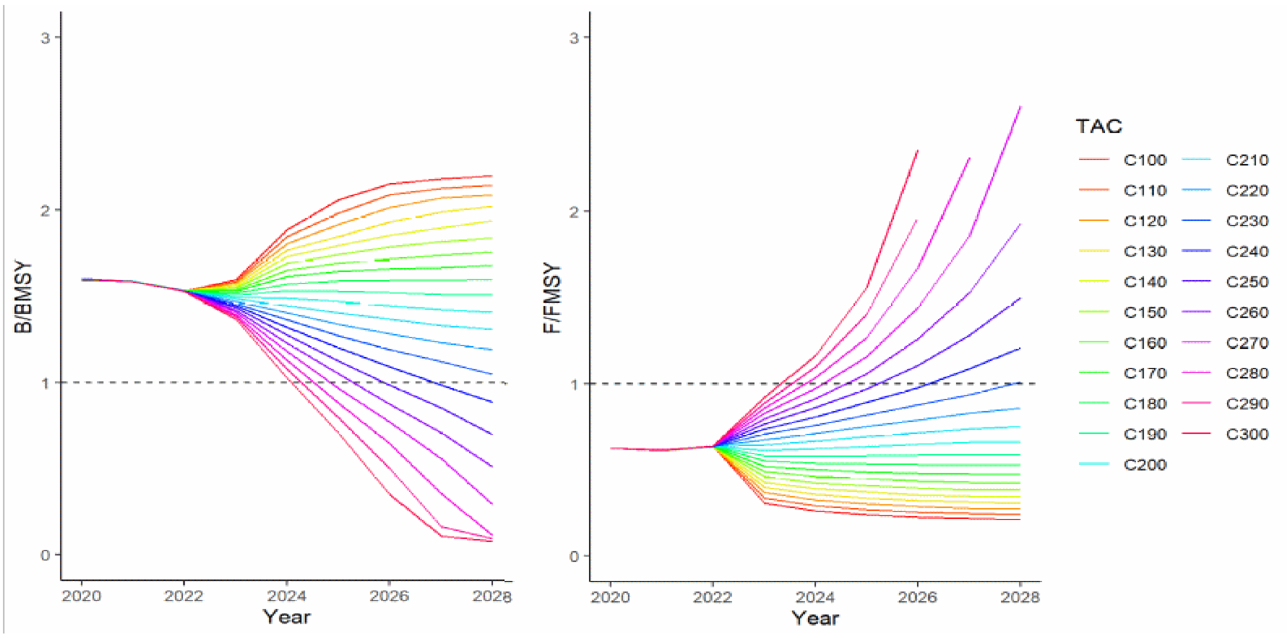




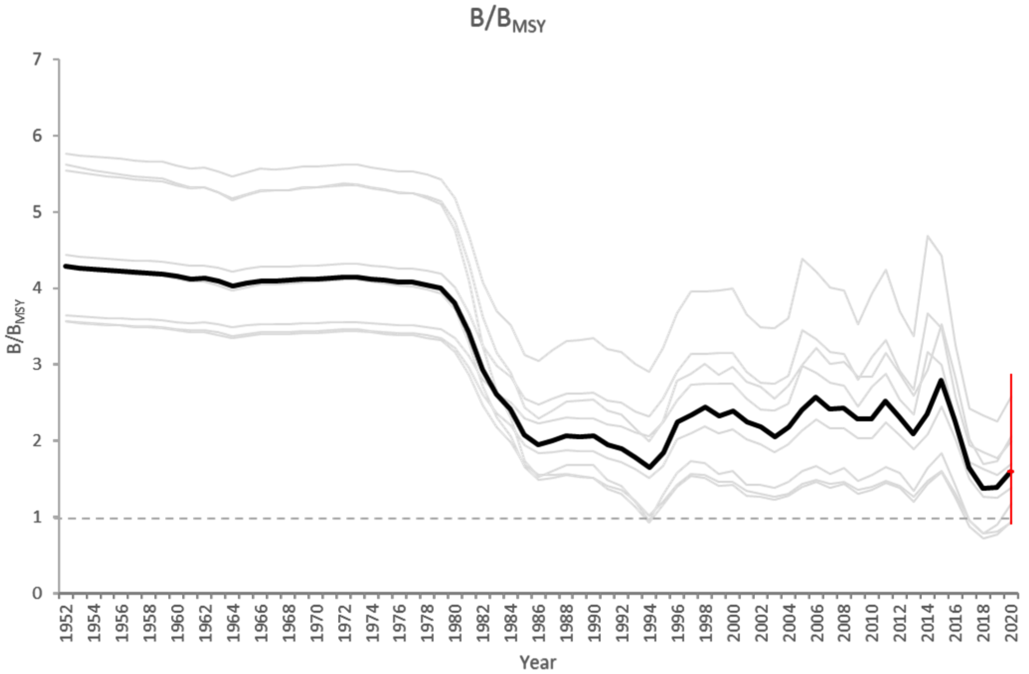
SKJ-Figure 13. SKJ-E. Relative abundance (B/B_{MSY}) (top) and fishing mortality (F/F_{MSY}) (bottom) historic median trends for the eastern skipjack stock estimated by each model from the uncertainty grid, solid line represent the median of the trends plotted, and the vertical red line in 2020, the 95% confidence bound of the stochastic combined results.

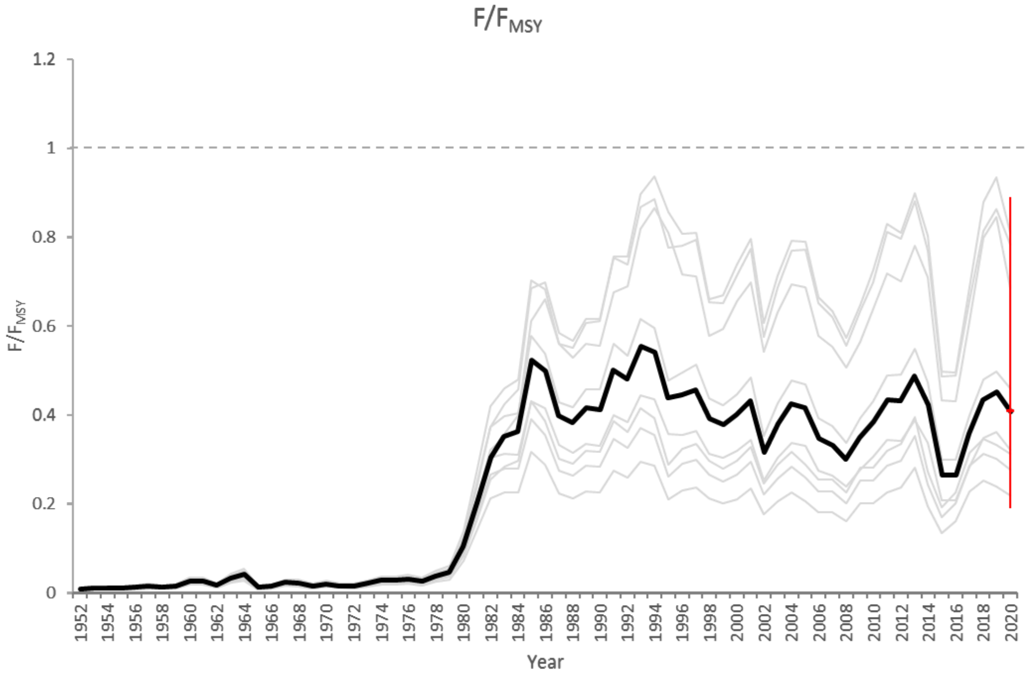


SKJ-Figure 14. SKJ-E. Joint Kobe phase plot for the 18 Stock Synthesis uncertainty grid runs and 18 JABBA uncertainty grid runs for the eastern Atlantic skipjack stock. For each run the benchmarks are calculated from the year-specific selectivity and fleet allocations, and based on 90,000 MVLN iterations for Stock Synthesis and 90,000 MCMC iterations for JABBA. The blue point shows the median of 180,000 iterations for SSB_{2020}/SSB_{MSY} or B_{2020}/B_{MSY} and F_{2020}/F_{MSY} for the entire set of runs in the grid. Grey points represent the 2020 estimates of relative fishing mortality and relative spawning stock biomass for 2020 for each of the 180,000 iterations. The upper graph represents the smoothed frequency distribution of SSB_{2020}/SSB_{MSY} or B_{2020}/B_{MSY} estimates for 2020. The right graph represents the smoothed frequency distribution of F_{2020}/F_{MSY} estimates for 2020. The inserted pie graph represents the percentage of each 2020 estimate that fall in each quadrant of the Kobe plot. All SSB for Stock Synthesis showed the values at the end of years.

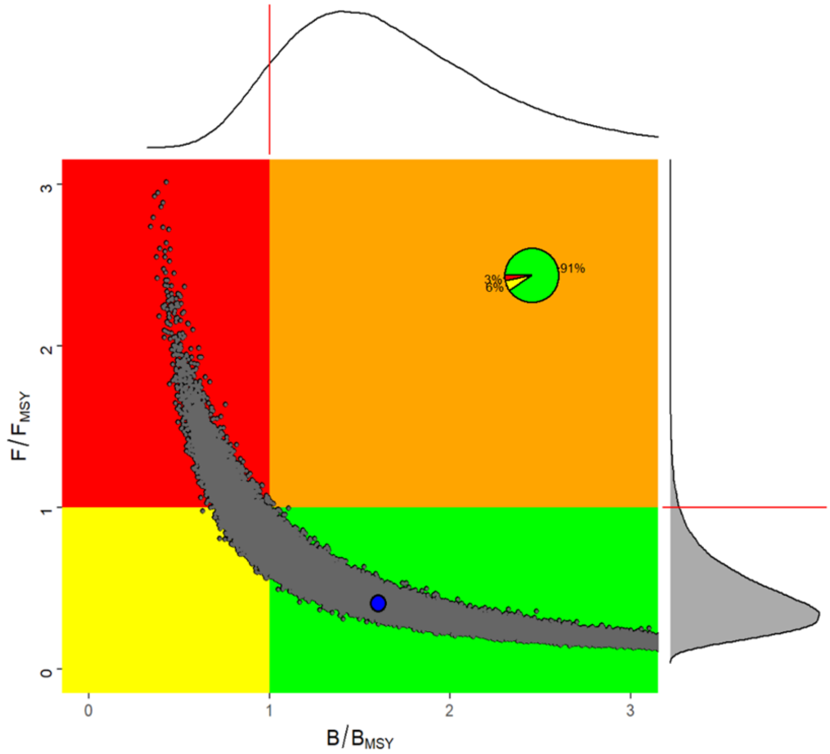


SKJ-Figure 15. SKJ-E. Joint stochastic projections of B/B_{MSY} and F/F_{MSY} for the 18 Stock Synthesis and the 18 JABBA uncertainty grid runs at 100-300 thousand t constant TACs for the eastern Atlantic skipjack stocks. The lines are the median of 180,000 iterations.

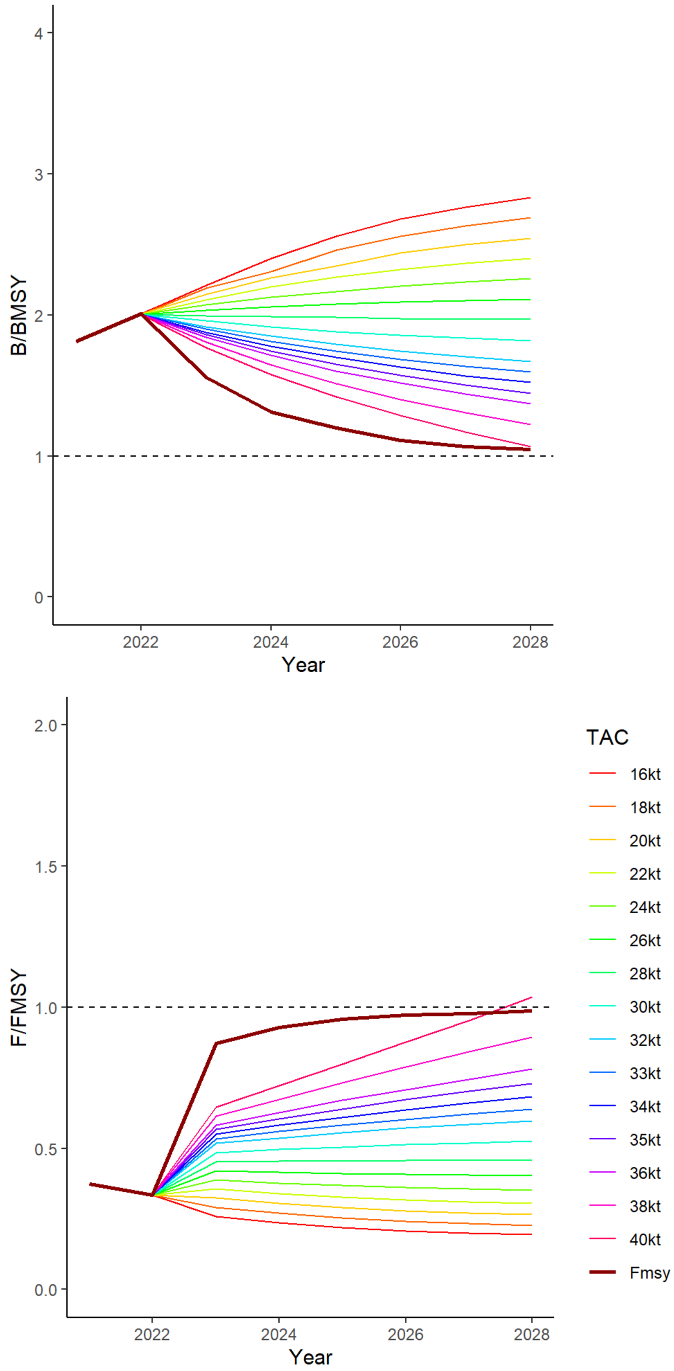




SKJ-Figure 16. SKJ-W. Relative abundance (B/B_{MSY}) (top) and fishing mortality (F/F_{MSY}) (bottom) historical median trends for the western skipjack stock estimated by each model from the uncertainty grid, solid line represents the median of the trends plotted, and the vertical red line in 2020, the 95% confidence bound of the stochastic combined results.



SKJ-Figure 17. **SKJ-W.** Kobe phase plot for the 9 Stock Synthesis uncertainty grid runs for the western Atlantic skipjack stock. For each run the benchmarks are calculated from the year-specific selectivity and fleet allocations and based on 200,000 MVLN iterations. The blue point shows the median of 200,000 iterations for SSB_{2020}/SSB_{MSY} and F_{2020}/F_{MSY} for the entire set of runs in the grid. Black line with black symbols represents the historical evolution of the median of all runs. Grey points represent the 2020 estimates of relative fishing mortality and relative spawning stock biomass for 2020 for each of the 200,000 iterations. The upper graph represents the smoothed frequency distribution of SSB/SSB_{MSY} estimates for 2020. The right graph represents the smoothed frequency distribution of F/F_{MSY} estimates for 2020. The inserted pie graph represents the percentage of each 2020 estimate that fall in each quadrant of the Kobe plot. All SSB showed the values at the end of years.



SKJ-Figure 18. SKJ-W. Stochastic MVLN projections of SSB/SSB_{MSY} and F/F_{MSY} for the 9 Stock Synthesis uncertainty grid runs at 16-40 thousand t constant TACs and constant F_{MSY} for the western Atlantic skipjack stocks. The lines are the median of 200,000 iterations.

9.4 ALB-AT - Atlantic albacore

The status of the North Atlantic albacore stock is based on the analyses conducted in June 2023 with available data up to 2021. Complete information on the assessment can be found in the Report of the 2023 Atlantic Albacore Stock Assessment Meeting (including MSE) (ICCAT, 2023a).

The status of the South Atlantic albacore stock is based on the analyses conducted in July 2020 with available data up to 2018. Complete information on the assessment can be found in the Report of the 2020 Atlantic Albacore Stock Assessment Meeting (ICCAT, 2020a).

ALB-AT-1. Biology

Albacore is a temperate tuna widely distributed throughout the Atlantic Ocean and Mediterranean Sea. On the basis of the biological information available for assessment purposes, the existence of three stocks is assumed: northern and southern Atlantic stocks (separated at 5°N) and a Mediterranean stock (**ALB-AT-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, which are demanding focussed research. The magnitude and direction of Climate Change effects on productivity of Atlantic albacore are uncertain.

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 2023 a new age specific natural mortality vector was adopted by the Committee.

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

ALB-AT-2. Description of fisheries or fishery indicators

North Atlantic

The northern stock is exploited by surface fisheries targeting mainly immature and sub-adult fish (50 cm to 90 cm FL) and longline fisheries targeting immature and adult albacore (60 cm to 130 cm FL). The main surface fisheries are carried out by EU fleets (Ireland, France, Portugal and Spain) in the Bay of Biscay, in the adjacent waters of the Northeast Atlantic, including the Azores Islands in summer and autumn, and in the vicinity of the Canary Islands year around. The main longline fleet is the Chinese Taipei fleet which operates in the central and western North Atlantic year around. However, Chinese Taipei fishing effort decreased in the late 1980s due to a shift towards targeting tropical tunas, 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 reduction of the area fished for albacore 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-AT-Table 1**; **ALB-AT-Figure 2**). Some stabilization was observed in the 1990s and early 2000s, mainly due to increased effort and catch by new surface fisheries (driftnet and mid-water pair pelagic trawl). The lowest catch level of the time series starting in 1950 was observed in 2009 with 15,391 t, but catches have substantially increased since then and have fluctuated around the TAC in the last few years.

The preliminary total reported catch in 2023 was 28,212 t (below the TAC of 37,801 t), and the catch in the last five years has remained slightly above 30,000 t. During the last years, the surface fisheries (mainly by EU-Spain, EU-Ireland and EU-France) contributed to approximately 84% of the total catch (**ALB-AT-Table 1**). Longline catch contributed to approximately 16% 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 bycatch.

South Atlantic

During the last decades, the total annual South Atlantic albacore landings were largely attributed to five fisheries, namely the surface baitboat fleets of South Africa and Namibia, and the longline fleets of Chinese Taipei, Brazil and Japan (**ALB-AT-Table 1**; **ALB-AT-Figure 2**). The surface fleets are 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 is available in coastal waters. The longline Chinese Taipei fleet operates over a larger area and throughout the year, consisting of vessels that target albacore and vessels that take albacore as bycatch, 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 the mid-1960s and the 1980s, 35,000 t until the last decade when they oscillated around 20,000 t. However, total reported albacore landings for 2017 decreased to 13,825 t, which is among the lowest values in the time series. The preliminary total reported catch in 2023 was 22,075 t, mostly by longlines and baitboats. The Chinese Taipei catch in the last years has decreased compared to historical catches, mainly due to a decrease in fishing effort targeting albacore. During the last decades, Japan took albacore as bycatch 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 decade have substantially increased compared to those in the last few decades.

ALB-AT-3. State of stocks

North Atlantic

In 2023 a thorough revision of North Atlantic Task 1 size and age data was conducted, and catch rates were updated with new information for the northern albacore fisheries up to and including data to 2021. In the stock assessment two model formulations with different degrees of complexity were used. In addition to the surplus production model that is part of the adopted Management Procedure (MP), a Stock Synthesis model was also used. The more complex stock synthesis model allowed to incorporate more detailed data and alternative hypotheses, compared to the surplus production model. Both models provided similar results and the Committee agreed to use the Stock Synthesis model to characterize stock status, as well as to verify that catch projections are consistent with the catch advice provided by the Management Procedure.

The five CPUE indices (four longline and one baitboat) specified in the MP were used in the production model (**ALB-AT-Figure 3**). These indices were further split into different areas for the Stock Synthesis model. Despite their variable pattern, these indices showed an overall increasing trend during the last decades.

The Stock Synthesis model results suggest a biomass drop between 1930 and the 1990s and a recovery since then, while fishing mortality decreases. Relative to MSY benchmarks, the base case scenario estimates that the stock remained slightly overfished with B below B_{MSY} between the late 1970s and the 2000s, but has now recovered to levels well above B_{MSY} (**ALB-AT-Figure 4**). Peak relative fishing mortality levels in the order of 1.66 times F_{MSY} were observed in the early 1980s but overfishing stopped in the early 2000s, with the current F_{2021}/F_{MSY} ratio being 0.45. There is large uncertainty around the current stock status estimated by the model. The probability of the stock currently being in the green area of the Kobe plot (not overfished and not undergoing overfishing, $F<F_{MSY}$ and $B>B_{MSY}$) is 99.6% while the probability of being in the yellow area (overfished, $B<B_{MSY}$) is 0.4%. The probability of being in the red area (overfished and undergoing overfishing, $F>F_{MSY}$ and $B<B_{MSY}$) is 0% (**ALB-AT-Figure 4**).

South Atlantic

In 2020, a stock assessment of South Atlantic albacore was conducted including catch and effort data up until 2018 and considering similar methods as in the previous assessment.

For the South Atlantic stock, the standardized CPUE indices are mainly based on longline fisheries, which catch mostly adult albacore. The same three longline CPUEs that were used in 2016 were also selected to update the 2020 stock assessment results. The longest time series of Chinese Taipei showed a strong declining trend in the early part of the time series followed by a less steep decline over the next three decades (similar to the Japanese longline index), and an increasing trend since the early 2000s. The Uruguayan longline CPUE series showed a decrease since the 1980s (**ALB-AT-Figure 5**). The Chinese Taipei CPUE was the only index that informed stock trends in recent years. In addition, standardized CPUE series from the Brazilian longline (2002-2018) and the South African baitboat fishery were made available, which were used for sensitivity analyses.

In the 2020 assessment the Committee selected a base case to best represent the population dynamics of albacore and uncertainty around stock status as well as impact of alternative fishing scenarios. Base case model results suggest that biomass increased since fishing mortality started to decrease in the early 2000s, and currently there is a 99.4% probability that the South Atlantic albacore stock is neither overfished nor subject to overfishing, with only 0.6% probability for the stock to be overfished. The median MSY value was 27,264 t (ranging between 23,734 t and 31,567 t), the median estimate of current B_{2018}/B_{MSY} was 1.58 (ranging between 1.14 and 2.05) and the median estimate of current F_{2018}/F_{MSY} was 0.40 (ranging between 0.28 and 0.59). The wide confidence intervals reflect the large uncertainty around the estimates of stock status (**ALB-AT-Figure 6**).

ALB-AT-4. Outlook

North Atlantic

In 2021, the Commission adopted an MP that uses a production model and a Harvest Control Rule (HCR) to set TACs every three years (Rec. 21-04). MSE tests showed that this MP would meet the management objectives for this stock, i.e. to be in the green quadrant of the Kobe plot with a probability higher than 60%.

The current Management Procedure results in a TAC of 47,251 t for 2024-2026. This represents a 25% increase with respect to the previous one and is in line with the positive stock status estimated in the 2023 assessment. It is noted that this TAC for 2024-2026 is above the MSY estimate for this stock (41,995 t); this is because the current biomass is well above B_{MSY} (B_{2021}/B_{MSY} = 2.19), and therefore this level of catch can be sustained in the near term. Projections conducted by the Stock Synthesis model also supported that level of catch in the short term.

South Atlantic

The Kobe matrix indicates that catches around the MSY level of 27,000 t will maintain biomass levels above B_{MSY} and fishing mortality below F_{MSY} with a high probability of 90% over the projection horizon through 2033 (**ALB-AT-Table 2**). In fact, due to the current high stock biomass, catches of up to 30,000 t are expected to maintain stock levels above B_{MSY} until 2033 with a probability higher than 60%. However, it is important to note that these catch levels would exceed MSY and it would require a reduction in TAC after 2033 to prevent overfishing (**ALB-AT-Table 2**).

ALB-AT-5. Effect of current regulations

North Atlantic

In 2021, the Commission adopted a model-based management procedure including the HCR described in **ALB-AT-Figure 7**, with a maximum TAC of 50,000 t and a maximum change of +25% -20% when $B_{CUR}>B_{THR}$. Its application established a TAC of 37,801 t for 2022-2023 (Rec. 21-04) and 47,251 t for 2024-2026 (Rec. 23-05), and the possibility to carry over some unused portions of the quotas to be caught later in time remained. The Committee noted that, since the establishment of the TAC in the year 2001, catch remained substantially below the TAC in all but four years (**ALB-AT-Figure 2**), which might have accelerated rebuilding over the last decades. The bulk of the catch is caught by traditional surface fisheries operating in the Bay of Biscay and surrounding waters. Thus, it is likely that the fluctuations in catches reflect the fluctuations in the availability of the resource to those local regional fisheries, and the carry-over allows to compensate the fleets for the years when the stock was less available.

Furthermore, Rec. 98-08 that limits fishing capacity to the average of 1993-1995, remains in force. The effect of this Recommendation has not been evaluated but a general decrease of fishing mortality has been observed since its implementation.

South Atlantic

In 2022 the Commission established a new TAC of 28,000 t for 2023-2026 (Rec. 22-06). The Committee noted that reported catches remained below 28,000 t since 2004 (**ALB-AT-Table 1**). The Committee did not test for the effect of perfect implementation of the TAC since 2004.

ALB-AT-6. Management recommendations

North Atlantic

Recommendation 21-04 sets the management procedure to achieve the management objective of maintaining the stock in the green area of the Kobe plot with at least 60% probability while maximizing long-term yield.

In the 2023 assessment, the Committee noted that the relative abundance of North Atlantic albacore has continued to increase over the last two decades and the stock was estimated to be in the green area of the Kobe plot with > 99% probability. Considering that no exceptional circumstances (ECs) were detected that precluded the application of the MP, the Committee recommended applying the MP to the current biomass estimate (B_{2021} in the Summary Table below) to set the TAC for the 2024-2026 period. The recommended TAC obtained by applying the MP was 47,251 t, which represented a 25% increase with respect to the previous one.

In 2024, no exceptional circumstances were detected, thus the Committee recommends continuing the implementation of the TAC set with the management procedure (see section 19.7, response to Rec. 21-04 para 4).

South Atlantic

Results indicate that, most probably, the South Atlantic albacore stock is not overfished and that overfishing is not occurring. Projections at a level consistent with the MSY (27,264 t) showed that probabilities of being in the green quadrant of the Kobe plot would remain very high (90%) by 2033. In fact, due to the current high stock biomass, catches of up to 30,000 t are expected to maintain stock levels above B_{MSY} until 2033 with a probability higher than 60%. However, it is important to note that these catch levels exceed MSY and it would require a reduction in TAC after 2033 to prevent overfishing (**ALB-AT-Table 2**).

ATLANTIC ALBACORE SUMMARY TABLE		
	North Atlantic[1]	**South Atlantic**
Maximum Sustainable Yield	41,995 t (38,860 - 45,130)[2]	27,264 t (23,734 - 31,567)[2]
Current (2023) Yield	28,212 t	22,075 t
$Yield_{current}$ in last year of assessment[3]	31,393 t	17,098 t
SSB_{MSY}	93,202 t (51,136 - 135,269)[2]	124,453 t (79,611 - 223,424)[2]
F_{MSY}	0.115 (0.092 - 0.141)[3]	0.219 (0.116 - 0.356)[2]
B_{2021}	519,799 t (462,465 - 608,819)[3]	
SSB_{2021}/SSB_{MSY}	2.19 (1.21 - 4.01)[2]	
B_{2018}/B_{MSY}		1.58 (1.14 - 2.05)[2]
$F_{current}/F_{MSY}$[4]	0.45 (0.29 - 0.71)	0.40 (0.28 - 0.59)
Stock Status	Overfished: NO Overfishing: NO	Overfished: NO Overfishing: NO
Management measures in effect:	Rec. 98-08: Limit number of vessels to 1993-1995 average. Rec. 23-05: TAC of 47,251 t for 2024-2026, according to MP. Management objective is to keep the stock in (or rebuild it to) the green area of the Kobe plot with at least 60% probability, while maximizing catch and reducing variability of TAC.	Rec. 22-06: TAC of 28,000 t for 2023-2026
Recommended TAC for the period 2024-2026 as estimated following the MP adopted in Rec. 21-04[5]	47,251 t	

[1] All values from the Stock Synthesis model, except for B_{2021} and F_{MSY}, which are used for TAC calculation, where values from the production model are shown.
[2] Mean (North Atlantic) or median (South Atlantic) and 95% CI for the reference/base case.
[3] Median and 95% CI for the production model used for the MP iteration (Rec. 21-04).
[4] Current year (the last year in the assessment) is 2021 for North Atlantic and 2018 for South Atlantic.
[5] The recommended TAC is capped by the maximum allowed increase of 25%, since the TAC obtained when applying the MP equation resulted in a higher value (F_{TAR}*B_{CUR} = 47,673.9 t).

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

				1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
TOTAL				70464	65931	57229	57045	56341	62206	64511	65048	54462	53571	48501	54199	61416	42274	39350	37640	38636	44115	50704	44095	40361	40835	44783	42299	46831	50400	49358	56323	55080	50287
	ATN			35164	38377	28803	29023	25746	34549	33123	26252	22716	25567	25957	35318	36963	21991	20483	15391	19411	19989	25432	24671	26638	25635	30400	28475	29786	34922	31274	31355	31634	28212
	ATS			35301	27554	28426	28022	30595	27656	31388	38795	31746	28005	22545	18882	24453	20283	18867	22248	19225	24126	25272	19424	13723	15201	14383	13825	17045	15478	18084	24968	23446	22075
Landings	ATN		Baitboat	11967	16411	11338	9821	7562	8780	11072	6123	6638	7840	8128	10458	14273	8496	7931	4994	6026	5530	8816	4975	7341	9265	14455	12196	11330	12662	11855	11696	11069	12008
			Longline	7309	4859	4641	4051	4035	6710	7320	7372	6235	7826	7037	6911	5223	3237	2647	2619	3913	3666	3510	6298	3076	4541	5448	5025	4567	4758	5714	4834	4404	4553
			Other surf.	7506	3555	3337	4378	6846	6817	5971	2808	365	470	577	624	625	525	274	427	231	359	344	816	163	136	95	139	62	179	116	115	288	170
			Purse seine	292	278	263	26	91	55	191	263	93	211	344	99	162	198	70	101	70	3	176	40	35	116	50	38	39	65	21	30	1	1
			Trawl	2131	3049	2571	2877	1318	5343	3547	5374	5376	3846	2369	7001	6385	3429	4321	2811	2026	6852	6678	6558	9184	5771	6299	6611	8820	10816	7577	8309	9713	5914
			Troll	5959	10226	6652	7870	5894	6845	5023	4312	4009	5373	7501	10224	10296	6105	5239	4440	7146	3578	5909	5891	6660	5597	3753	4165	4807	6292	5938	6250	6134	5536
	ATS		Bait boat	9334	7009	6913	8092	10352	6708	6815	10343	9710	6973	7475	5084	5876	3375	4350	7926	3748	5938	6931	5211	4765	4965	2949	1846	3228	2852	4297	4434	7014	3349
			Longline	24806	20040	21000	19547	19799	20640	24399	28039	21671	20626	14735	12977	17740	15087	13218	12113	13471	16445	17846	13888	8907	10104	11243	11674	13715	12473	13747	20509	16192	18507
			Other surf.	96	92	256	145	1	74	116	389	325	85	300	323	395	1762	1219	2066	1651	1538	66	266	7	0	108	114	84	113	17	0	196	116
			Purse seine	1065	413	258	118	434	183	58	25	39	308	16	499	442	58	81	144	355	205	428	58	44	131	83	190	19	3	11	21	36	69
			Trawl	0	0	0	120	9	52	0	0	0	12	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Troll	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Discards	ATN		Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	93	179	209	300	302	160	151	53	121	0	17
			Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	13
			Troll	0	0	0	0	0	0	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		Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	37	11	4	8	33
			Purse seine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Landings	ATN	CP	Barbados	0	0	0	1	1	1	0	2	5	8	10	13	9	7	7	4	6	4	20	22	13	16	38	32	15	7	10	13	12	14
			Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	22	26	39	416	351	155	230	79	1	399	448	385	216	326	201	212	381
			Brazil	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	52	148	83	14	0	41
			Canada	32	12	24	31	23	38	122	51	113	56	27	52	27	25	33	11	14	28	34	32	47	32	20	17	26	31	12	40	27	25
			Cape Verde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	**0**
			China PR	14	8	20	0	0	21	16	57	196	155	32	112	202	59	24	27	142	101	21	81	35	21	103	124	124	129	208	291	240	191
			Costa Rica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	5	5	11	5	1	1	2	1	1
			Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0	**0**
			Côte d'Ivoire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	53	39	146	0	0	0	151	549	0	76	14	30	0	27
			EU-España	16998	20197	16324	17295	13285	15363	16000	9177	8952	12530	15379	20447	24538	14582	12725	9617	12961	8357	13719	10502	11607	14126	17077	13964	15691	16536	16205	17408	16870	17293
			EU-France	5934	5304	4694	4618	3711	6887	5718	6005	4320	3456	2444	7266	6559	3179	3009	1139	1293	3352	3370	4625	6716	3441	4229	4191	5824	7881	4753	5397	6362	2889
			EU-Ireland	2534	918	874	1913	3750	4858	3464	2093	1100	755	175	306	521	596	1517	1997	788	3597	3575	2231	2485	2390	2337	2492	3102	3213	2938	2879	3374	3035
			EU-Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	**0**
			EU-Portugal	974	6470	1634	395	91	324	278	1175	1953	553	513	556	119	184	614	108	202	1046	1231	567	2609	929	1111	2527	498	2493	1596	501	281	223
			FR-St Pierre et Miquelon	0	0	0	0	0	0	0	0	4	0	7	2	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Great Britain	613	196	49	33	117	343	15	0	0	0	0	6	19	30	50	67	118	57	50	133	136	31	0	0	0	0	77	165	121	110
			Grenada	0	2	1	6	7	6	12	21	23	46	25	29	19	20	15	18	18	18	0	0	0	79	50	62	37	23	22	6	3	**0**
			Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			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	0	0	0	0	**0**
			Japan	505	386	466	414	446	425	688	1126	711	680	893	1336	781	288	402	288	525	336	400	1745	267	276	297	366	196	334	260	225	280	302
			Korea Rep	0	2	2	1	0	0	0	0	0	0	0	59	45	12	59	82	110	60	200	184	64	5	13	8	27	48	116	115	124	106
			Liberia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	90	3	0	0	0	0	2
			Maroc	0	0	0	0	0	0	0	0	55	81	120	178	98	96	99	130	0	0	0	0	0	0	20	20	20	25	29	40	60	90
			Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	2	0	7	0	1	1	0	0
			Panama	117	73	11	5	0	0	0	0	0	0	0	0	96	298	113	45	154	103	0	246	108	103	200	0	196	185	176	183	181	169
			Philippines	0	0	0	0	151	4	0	0	0	0	0	9	0	8	19	54	0	0	83	0	0	0	0	0	0	0	0	0	0	**0**
			Senegal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	**0**
			Sierra Leone	0	0	0	0	0	0	0	91	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	1	704	1370	300	1555	89	802	76	263	130	135	177	329	305	286	328	305	291	297	173	180	252	202	0	**0**
			Trinidad and Tobago	0	0	0	2	1	1	2	11	9	12	12	9	12	18	32	17	17	23	47	67	71	95	71	48	33	22	16	27	22	12
			UK-Bermuda	0	0	0	1	0	2	2	2	0	0	1	1	0	0	0	0	0	1	0	0	1	0	1	0	0	1	2	4	5	2
			UK-Turks and Caicos	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	**0**
			USA	741	545	472	577	829	315	406	322	480	444	646	488	400	532	257	189	221	369	409	819	458	354	250	238	103	221	328	296	311	181
			Venezuela	282	279	315	75	107	91	299	348	162	346	457	175	321	375	222	398	288	247	312	181	285	351	287	301	165	221	246	299	317	213
		NCC	Chinese Taipei	6409	3977	3905	3330	3098	5785	5299	4399	4330	4557	4278	2540	2357	1297	1107	863	1587	1367	1180	2394	947	2857	3134	2385	2926	2770	3549	2896	2806	2782
			Guyana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	**0**
			Suriname	0	0	0	0	0	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
		NCO	Cuba	0	0	0	0	0	0	0	0	1	322	435	424	527	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	3	1	1	1	0	2	0	0	0	
			Dominican Republic	0	0	0	323	121	73	95	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)	10	8	11	3	8	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Saint Kitts and Nevis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Sta Lucia	0	1	1	0	0	0	1	3	2	10	0	2	2	2	2	0	130	2	3	2	0	0	2	1	0	1	0	0	0	2
			Vanuatu	0	0	0	0	0	0	0	0	0	0	414	507	235	95	20	140	187	196	172	228	195	0	0	0	0	0	0	0	0	
	ATS	CP	Angola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	168	0	5	0	0	0	0	0	0	0	0	**0**
			Belize	0	2	0	0	0	8	2	0	0	0	0	0	54	32	31	213	303	365	171	87	98	0	123	219	311	158	162	31	15	**0**
			Brazil	1227	923	819	652	3418	1872	4412	6862	3228	2647	522	556	361	535	487	202	271	1269	2077	2016	462	490	658	497	343	854	534	502	543	524
			Cape Verde	0	0	0	0	0	0	0	0	0	0	0	8	46	24	0	5	0	5	0	0	0	0	0	0	0	0	0	0	0	**0**
			China PR	0	0	0	0	0	39	89	26	30	26	112	95	100	35	25	89	97	80	61	65	34	120	94	185	116	132	184	10	31	91
			Curaçao	0	0	0	9	192	0	2	0	0	0	0	0	0	0	0	21	4	4	24	0	0	1	14	10	0	0	0	0	18	**0**
			Côte d'Ivoire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	47	43	45	50	0	0	0	0	0	6	19	45	47	20	17
			EU-España	831	457	184	256	193	1027	288	573	836	376	81	285	367	758	933	1061	294	314	351	369	259	418	195	347	303	186	30	37	32	30
			EU-France	130	83	191	39	40	13	23	11	18	63	16	443	347	12	50	43	109	50	151	40	41	54	64	78	16	3	10	21	16	3
			EU-Portugal	1185	655	494	256	124	232	486	41	433	415	9	43	8	13	49	254	84	44	11	1	3	1	9	9	11	3	2	3	3	2
			Ghana	0	0	0	0	0	0	0	0	0	53	0	0	0	5	10	14	25	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Great Britain	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	40	0	0	0	56	0	0	15	0	1	3	1	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	6	0	0	0	0	1	0	0	0	0	**0**
			Guinée Rep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	7	74	0	0	0	0	0	0	0	0	0	0	**0**
			Honduras	0	2	0	7	1	6	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	651	389	435	424	418	601	554	341	231	322	509	312	316	238	1370	921	973	1194	2903	3106	1131	1752	1096	1189	2985	1506	900	1645	1773	1942
			Korea Rep	3	3	18	4	7	14	18	1	0	5	37	42	66	56	88	374	130	70	89	33	2	4	48	86	167	170	131	131	153	88
			Maroc	24	24	0	5	4	0	0	0	14	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Namibia	1111	950	982	1199	1429	1162	2418	3419	2962	3152	3328	2344	5100	1196	1958	4936	1320	3791	2420	848	1057	1062	994	214	888	260	2166	8165	6319	5773
			Panama	458	228	380	53	60	14	0	0	0	0	0	17	0	87	5	6	1	0	12	3	18	6	5	13	1	13	31	17	12	5
			Philippines	0	0	0	0	5	4	0	0	0	0	0	52	0	13	79	45	95	96	203	415	18	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	4	0	0	0	24	0	0	0	**0**
			South Africa	6931	5214	5634	6708	8412	5101	3610	7236	6507	3469	4502	3198	3735	3797	3468	5043	4147	3380	3553	3510	3719	4030	2065	1785	2572	2455	4026	3823	5587	2670
			St Vincent and Grenadines	29	30	41	0	23	0	2116	4303	44	0	0	0	65	160	71	51	31	94	92	97	110	100	107	101	98	31	0	14	23	0
			Trinidad and Tobago	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			UK-Sta Helena	5	82	47	18	1	1	58	12	2	3	1	35	62	46	94	81	3	120	2	2	0	0	0	0	0	0	0	0	0	**0**

				1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
			USA	0	0	1	5	1	1	1	2	8	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Uruguay	16	49	75	56	110	90	90	135	111	108	120	32	93	34	53	97	24	37	12	209	0	0	0	0	0	0	0	0	0	**0**
		NCC	Chinese Taipei	22573	18351	18956	18165	16106	17377	17221	15833	17321	17351	13288	10730	12293	13146	9966	8678	10975	13032	12812	8519	6675	7157	8907	9090	9227	9626	9851	10519	8894	10895
		NCO	Argentina	2	0	0	120	9	52	0	0	0	12	18	0	0	0	0	0	130	43	0	0	0	0	0	0	0	0	0	0	0	
			Cambodia	0	0	0	0	0	5	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)	1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			NEI (Flag related)	124	102	169	47	42	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Seychelles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	684	1400	96	131	64	104	85	35	83	91	0	0	0	0	0	0	0	0	
Discards	ATN	CP	Canada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	13
			EU-Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Japan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	**0**
			Korea Rep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			UK-Bermuda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	93	179	209	300	302	160	151	52	121	0	17
		NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
	ATS	CP	Côte d'Ivoire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	37	11	4	8	26
			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	0	0	0	0	7
			South Africa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	**0**

ALB-AT-Table 2. South Atlantic albacore estimated probabilities (in %) based on Bayesian surplus production model that the stock fishing mortality is below F_{MSY} a), biomass is above B_{MSY} b) and both c). Projections for constant catch levels (16,000 t to 34,000 t) are shown.

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

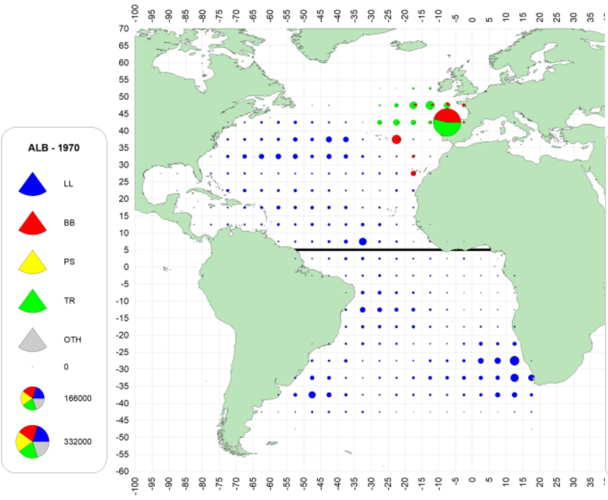
TAC | Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
16000	100	100	100	100	100	100	100	100	100	100	100	100	100
18000	100	100	100	100	100	100	100	100	100	100	100	100	100
20000	100	100	100	100	100	100	100	100	100	100	100	100	100
21000	100	100	100	100	100	100	100	100	100	100	100	100	100
22000	100	100	100	100	100	100	100	100	100	100	99	99	99
23000	100	100	100	100	100	100	99	99	99	99	99	99	99
24000	100	100	100	99	99	99	99	99	99	99	99	98	98
25000	100	100	99	99	99	99	98	98	98	98	98	97	97
26000	99	99	99	99	98	98	98	97	97	96	95	95	94
27000	99	99	98	98	97	97	96	95	94	93	92	91	90
28000	99	98	98	97	96	95	93	92	91	89	87	86	84
29000	99	98	97	96	94	93	90	88	85	82	80	77	74
30000	98	97	96	94	91	89	85	81	78	73	70	65	62
32000	97	95	92	88	82	76	69	62	56	49	44	39	35
34000	95	91	85	77	67	57	48	40	32	27	22	19	16

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

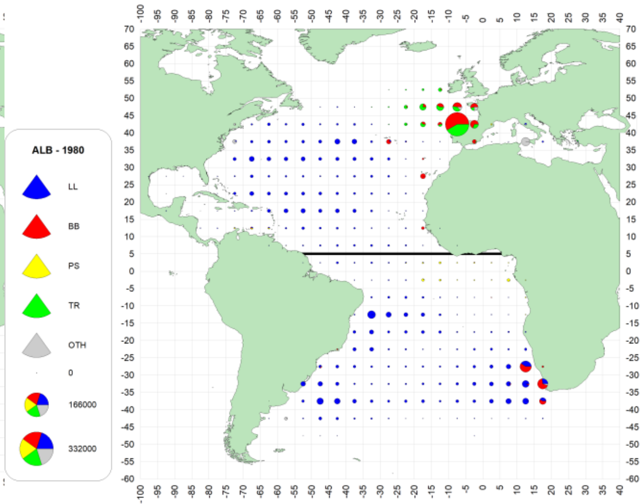
TAC | Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
16000	100	100	100	100	100	100	100	100	100	100	100	100	100
18000	100	100	100	100	100	100	100	100	100	100	100	100	100
20000	100	100	100	100	100	100	100	100	100	100	100	100	100
21000	100	100	100	99	99	99	99	99	99	99	99	99	99
22000	100	100	100	99	99	99	99	99	99	99	99	99	99
23000	100	100	100	99	99	99	99	99	99	99	99	99	98
24000	100	99	99	99	99	99	99	99	98	98	98	98	98
25000	100	100	99	99	99	99	98	98	98	98	97	97	97
26000	100	99	99	99	99	99	98	98	97	97	96	95	95
27000	100	99	99	99	98	98	97	97	96	95	94	93	92
28000	100	99	99	99	98	97	96	95	94	93	91	90	88
29000	100	99	99	98	98	97	96	94	92	90	88	85	83
30000	100	99	99	98	97	96	94	92	89	86	83	79	76
32000	100	99	99	98	96	93	89	85	80	74	68	62	56
34000	100	99	98	96	93	89	82	75	66	58	49	42	36

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

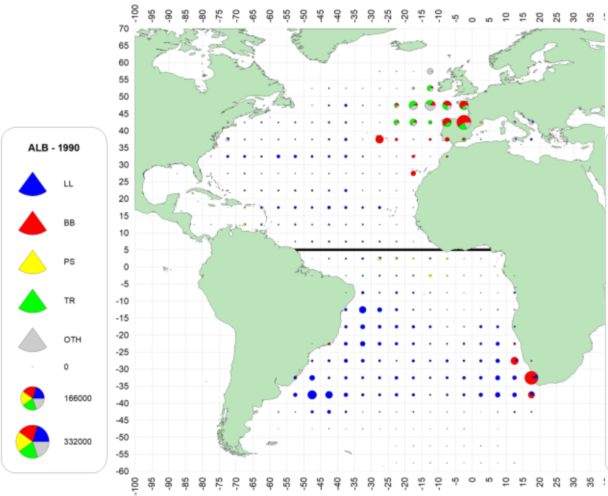
TAC | Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
16000	100	100	100	100	100	100	100	100	100	100	100	100	100
18000	100	100	100	100	100	100	100	100	100	100	100	100	100
20000	100	100	100	100	100	100	100	100	100	100	100	100	100
21000	100	100	100	99	99	99	99	99	99	99	99	99	99
22000	100	100	100	99	99	99	99	99	99	99	99	99	99
23000	100	100	99	99	99	99	99	99	99	99	99	98	98
24000	100	99	99	99	99	99	99	98	98	98	98	98	98
25000	100	99	99	99	99	98	98	98	98	97	97	97	96
26000	99	99	99	98	98	98	97	97	96	96	95	94	94
27000	99	99	98	98	97	97	96	95	94	93	92	91	90
28000	99	98	98	97	96	95	93	92	90	89	87	85	83
29000	99	98	97	96	94	93	90	88	85	82	79	77	74
30000	98	97	96	94	91	89	85	81	78	73	69	65	61
32000	97	95	92	88	82	76	69	62	56	49	44	39	35
34000	95	91	85	77	67	57	48	40	32	27	22	19	16



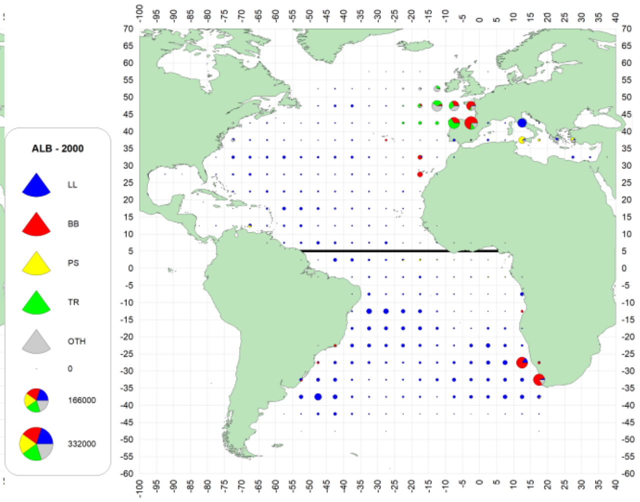
a. ALB (1970-79)



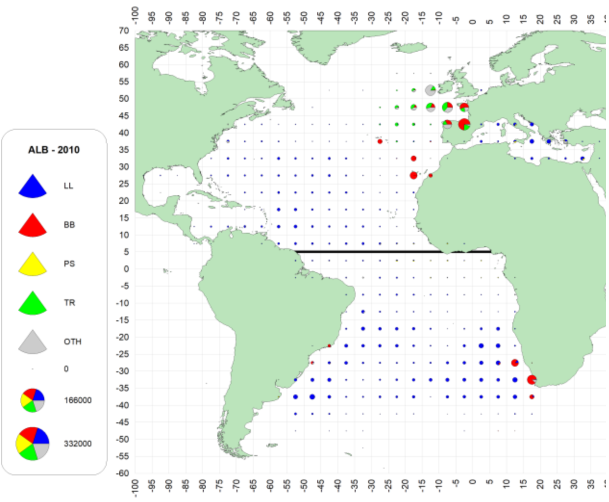
b. ALB (1980-89)



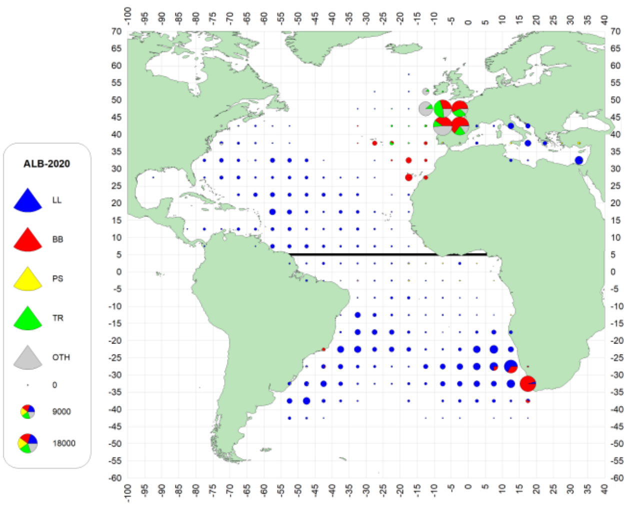
c. ALB (1990-99)



d. ALB (2000-09)

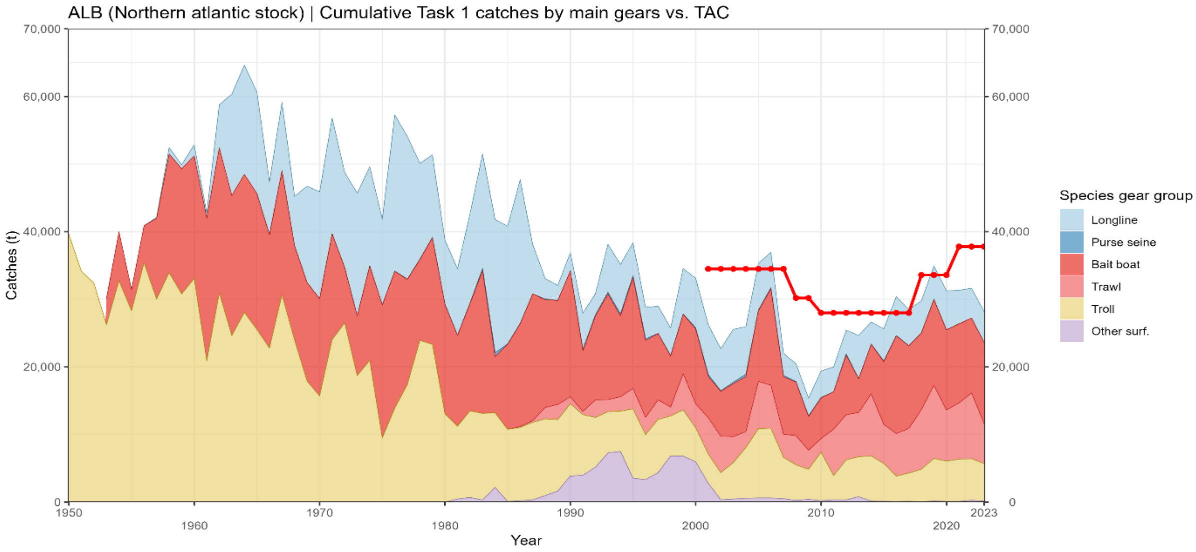


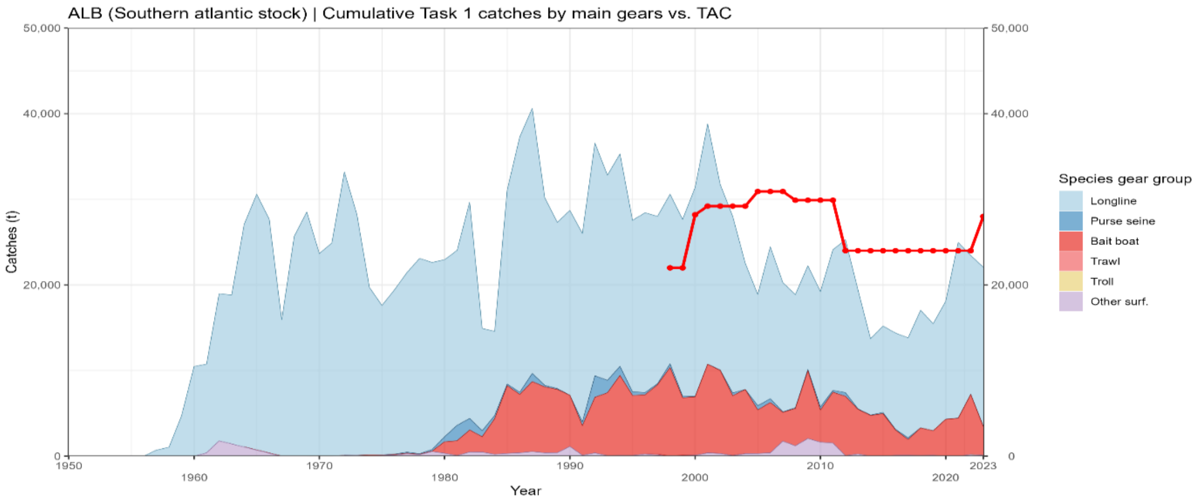
e. ALB (2010-19)



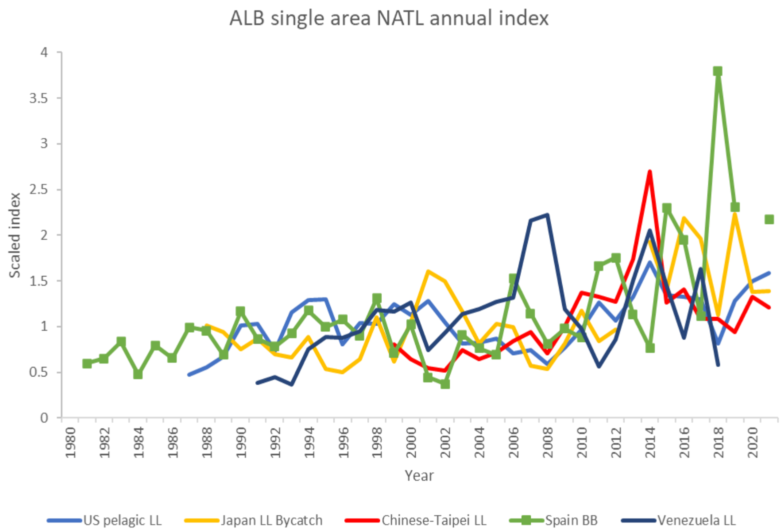
f. ALB (2020-22)

ALB-AT-Figure 1. Geographic distribution of albacore accumulated catch by major gears and decade (1970-2022). 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 1970 to 2022 (last decade only covers 3 years).

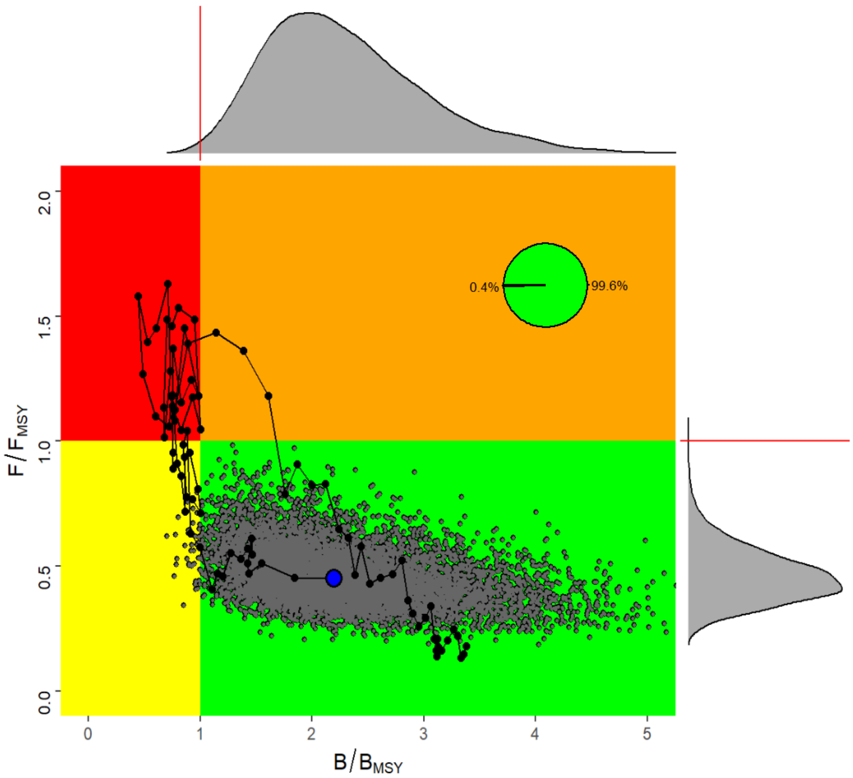




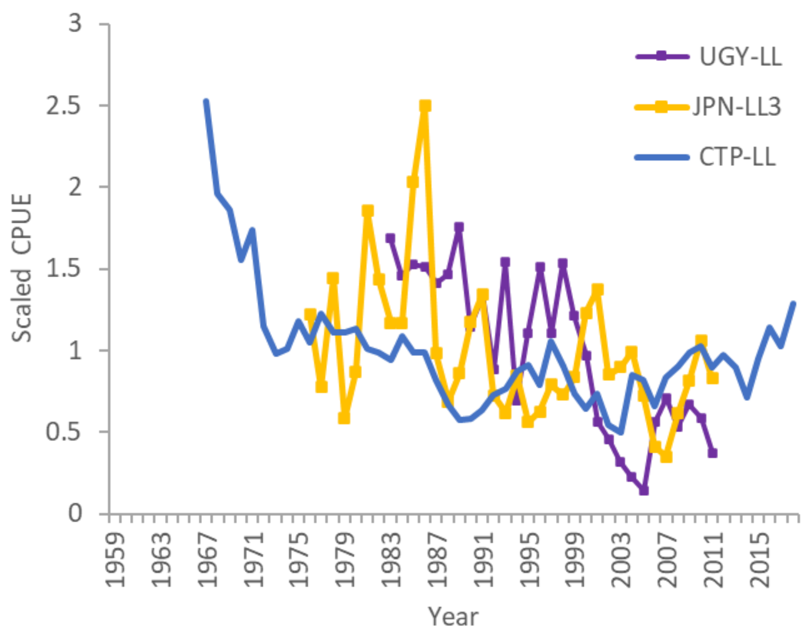
ALB-AT-Figure 2. Total albacore catches reported to ICCAT (Task 1) by gear for the northern (top) and southern (bottom) Atlantic stocks including TAC (red dotted line).



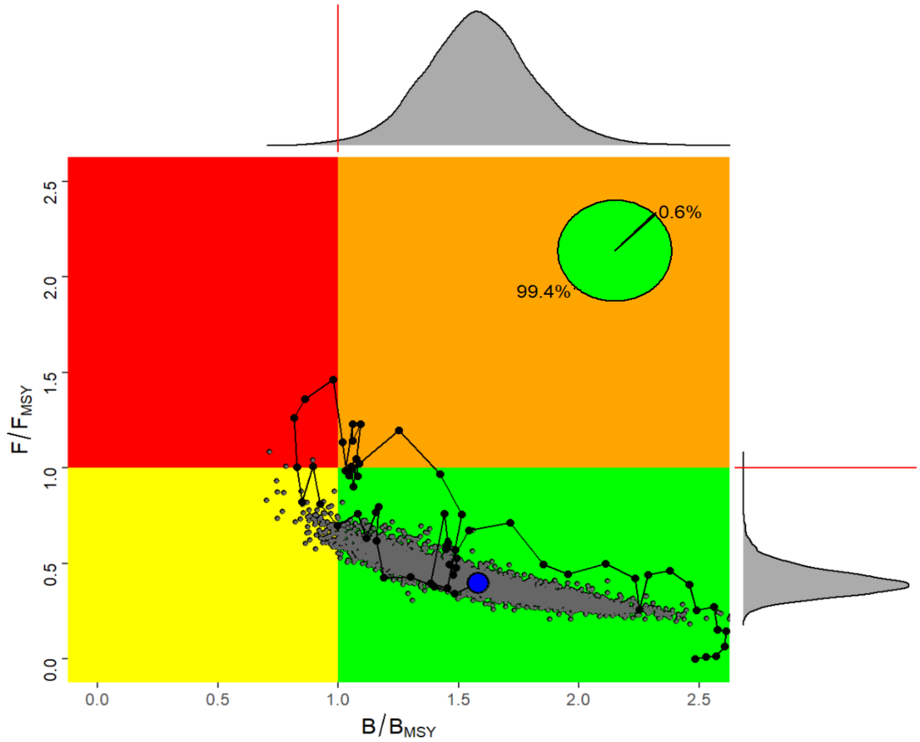
ALB-AT-Figure 3. North Atlantic albacore. Standardized catch rate indices used in the 2023 stock assessment from the surface fishery (baitboat) which take mostly juvenile fish, and from the longline fisheries which take mostly adult fish.



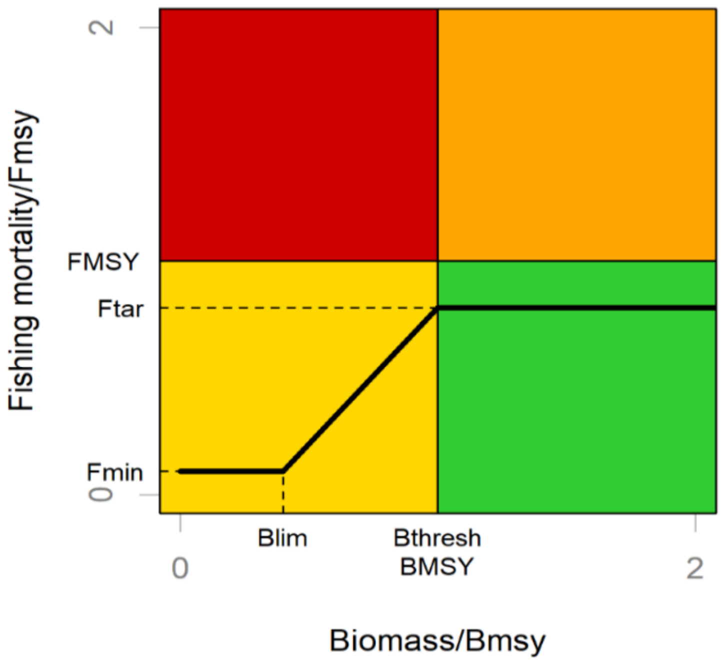
ALB-AT-Figure 4. North Atlantic albacore (Kobe plot). Stock status trajectories of B/B_{MSY} and F/F_{MSY} over time (1930-2021), as well as uncertainty (grey dots) around the current (F_{2021}/F_{MSY}, B_{2021}/B_{MSY}) estimate (blue point) based on Stock Synthesis model with probability of being overfished and overfishing (red, 0%), of being neither overfished nor overfishing (green, 99.6%), and of being overfished (yellow, 0.4%).



ALB-AT-Figure 5. South Atlantic albacore. Standardized catch rates used for the base case of the 2020 stock assessment (ICCAT, 2020b).



ALB-AT-Figure 6. South Atlantic albacore (Kobe plot). Stock status trajectories of B/B_{MSY} and F/F_{MSY} over time (1956-2018), as well as uncertainty (grey dots) around the current (2018) estimate (blue point) based on Bayesian surplus production model with probability of being overfished and overfishing (red, 0%), of being neither overfished nor overfishing (green, 99.4%), and of being overfished (yellow, 0.6%).



ALB-AT-Figure 7. Graphic form of the HCR adopted in Rec. 17-04. B_{LIM} (set at 0.4B_{MSY}) is the limit biomass reference point, B_{THRESH} (set at B_{MSY}) is the point below which fishing mortality decreases linearly, F_{TAR} (set at 0.8F_{MSY}) is the target fishing mortality rate to be applied to achieve the management objectives, and F_{MIN} (set at 0.1F_{MSY}) is the fishing mortality to be applied when B<B_{LIM}.

9.5 ALB-MD - Mediterranean albacore

The status of the Mediterranean albacore stock is based on the 2024 assessment using 2022 as the terminal year for catch data. Complete information is found in the Report of the Intersessional Meeting of the Albacore Species Group including the Mediterranean Albacore Stock Assessment (ICCAT, 2021c) and the Report of the 2024 ICCAT Mediterranean Albacore Data Preparatory and Stock Assessment Meeting (ICCAT, 2024f).

ALB-MD-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: North and South Atlantic stocks (separated at 5°N) and a Mediterranean stock (**ALB-MD Figure 1**). However, some studies support the hypothesis that various sub populations of albacore exist in the Mediterranean.

Scientific studies on albacore stocks, in the North Atlantic, North Pacific and the Mediterranean, suggest that environmental variability may have a substantial impact on albacore stocks, affecting fisheries due to a shift in species distribution, as well as productivity and potential maximum sustainable yield (MSY) of the stocks.

The expected lifespan for Mediterranean albacore is around 15 years. 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 in some areas.

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

ALB-MD-2. Description of fisheries or fishery indicators

During the assessment, the catch series were revised and approved by the Group. It is known that the catch series of some ICCAT CPCs are still incomplete, and efforts are being made to recover those catches to complete Task 1 estimations. In 2022 and 2023, the reported landings were 2,295 t and 2,286 t, respectively, below those in the last decade (**ALB-MD-Table 1** and **ALB-MD-Figure 2**). The majority of the catch came from longline fisheries. EU-Italy is the main harvester of Mediterranean albacore, with around 44% of the catch during the last 10 years. Catches from the Italian fleet in 2023 (1,167 t) were around 95% of the average annual levels calculated for EU-Italy over the period 2018-2022 (1,220 t). However, the historical catch needs to be revised to get the precise contribution by gear and country to the total removals.

ALB-MD-3. State of stocks

In 2024, the stock assessment for Mediterranean albacore was conducted using catch and catch per unit effort (CPUE) data up to 2022. A Bayesian state space surplus production model (JABBA) was used for assessment purposes.

Eight indices were used: Spanish, Ionian, Ligurian, Med-South, and historical Italian longline indices, western Mediterranean larval index (providing information on the trends of the spawning biomass), and the Spanish Tournament index and the Greek longline index (new). These indices (expressed in fish number or weight) showed a general noisy but rather constant trend over time. Comparatively, the larval survey suggests the largest decrease in biomass during the 2000s and early 2010s (**ALB-MD-Figure 3**). The historical part of the index used data collected with a different gear and was calibrated to be consistent with the latter data. However, there was uncertainty as to whether this calibration was appropriate for ALB. Thus, it was decided to consider two scenarios: a continuous series and one splitting the index into two time series (2001-2005/2012-2022).

Overall, the data inputs to the model remain uncertain, including: possible underreporting of the catch; limitations both in spatial and temporal coverage of available indices of abundance; the fact that most indices are limited to the most recent years of the fisheries; and, conflicting trends among these indices. In fact, the treatment of the larval index (split or not) proved crucial when characterizing the current state of the stock.

The results from these two scenarios provided very different perceptions of the stock status. Under scenario 1 that considered the larval index as a continuous index like in the 2021 assessment (referred to as "scenario S12" in the detailed report), estimated current fishing mortality levels (2022) are above F_{MSY} (1.22; 0.66-2.10, median and 95% Confidence Interval (CI)), and the current biomass is below the B_{MSY} level (0.58; 0.31-1.10, median and 95% CI) (**ALB-MD-Figure 4**). The probability of being in the red, yellow, orange and green quadrants of the Kobe plot is 74.2%, 21.2%, 0.4% and 4.2%, respectively (**ALB-MD-Figure 4**). In contrast, under scenario 2 (splitting the larval index, referred to as "scenario S19" in the detailed report) results indicate that current fishing mortality levels (2022) are below F_{MSY} (0.42; 0.13-1.17, median and 95% CI), and the current biomass is above the B_{MSY} level (1.44; 0.59-2.64, median and 95% CI) (**ALB-MD-Figure 4**). The probability of being in the red, yellow, orange and green quadrants of the Kobe plot is 5.5%, 15.2%, 0.2% and 79.1%, respectively (**ALB-MD-Figure 4**).

ALB-MD-4. Outlook

The Committee emphasized that the substantial uncertainties in the assessment, which resulted in two very different stock statuses, prevent the provision of a clear outlook for the stock at this time. The two alternative scenarios considered would support substantially different TAC values in the future and the Committee is unable to judge which one reflects the most appropriate scenario.

The two alternative scenarios considered in the assessment were projected to 2036 using the current TAC (2,500 t) and probabilities of $B>B_{MSY}$ were at or above 60% by the end of the projection period for both scenarios. While the Committee is unable to judge which one of the scenarios was the most appropriate it appears that the current TAC will recover the stock and achieve $B>B_{MSY}$ with a probability higher than 60% regardless of which is the most appropriate scenario.

ALB-MD-5. Effect of current regulations

In 2021, the Commission enacted the *Recommendation by ICCAT to establish a Rebuilding Plan for Mediterranean Albacore* (Rec. 21-06), initiating a 15-year rebuilding plan commencing in 2022 and extending until 2036, aimed at achieving B_{MSY} with at least minimum 60% likelihood. Subsequently, in 2022, the Commission replaced Rec. 21-06 with the *Recommendation by ICCAT amending the Recommendation 21-06 to establish a Rebuilding Plan for Mediterranean albacore* (Rec. 22-05), the one currently in force. Recommendation 22-05 confirms the 15-year recovery plan and includes various provisions such as: a 2,500 t Total Allowable Catch (TAC) for the years 2022, 2023, and 2024; a restricted number of fishing vessels (based on 2017 or 2018 data); a census of licensed sport and recreational vessels (with a maximum catch limit of three albacore specimens per vessel per day); and a seasonal closure spanning three months from 1 October to 30 November, along with an additional month between 15 February and 31 March, or alternatively, from 1 January to 31 March. The Committee was not able to test the effectiveness of these recent regulations.

ALB-MD-6. Management recommendations

The Committee reiterates that the substantial uncertainties in the assessment prevent providing specific TAC advice at this time. However, the Committee noted that, in both scenarios, the current TAC (2,500 t) would allow to meet the management objectives to recover the stock above B_{MSY} with a probability higher than 60%.

Further work is required to address the key issues identified, including the treatment of the western Mediterranean larval index and the reliability of the catch data, before the Committee can provide robust management recommendations for the Mediterranean albacore stock. The Committee emphasized that the uncertainty in total catch is of paramount importance in production models and was not adequately addressed in the models presented. To the extent that the reported catches are inaccurate or incomplete, the ability of these models to reflect the stock dynamics accurately is undermined. The Committee concluded that the previous assessments of 2021 and 2017 (ICCAT, 2017a) were likely affected by the same issues. Therefore, the Committee suggests re-evaluating the stock status only after addressing the main concerns expressed.

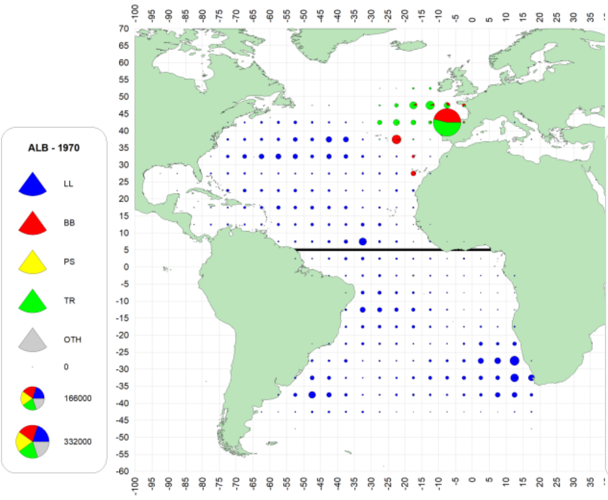
MEDITERRANEAN ALBACORE SUMMARY TABLE	
Maximum Sustainable Yield	Scenario 1: 3,564 t (2,584 - 4,663) Scenario 2: 4,174 t (2,831 - 7,936)[1]
Current (2023) Yield	2,286 t
Yield in last year of assessment (2022)	2,295 t
B_{2022}/B_{MSY}	Scenario 1: 0.58 (0.31-1.10) Scenario 2: 1.44 (0.59-2.64)[1]
F_{2022}/F_{MSY}	Scenario 1: 1.22 (0.66-2.10) Scenario 2: 0.42 (0.13-1.17)[1]
Stock Status	Overfished: Scenario 1: YES Scenario 2: NO Overfishing: Scenario 1: YES Scenario 2: NO
Management measures in effect:	Rec. 22-05: 15-year Rebuilding plan (2022-2036); TAC for years 2022, 2023 and 2024: 2,500 t Limited number of vessels (reference year 2017 or 2018); Census of authorized sport & recreational vessels (maximum three albacore specimens/vessel/day); Time closure: 01/10-30/11 + 1 month between 15/02-31/03; alternatively, 01/01-31/03.

[1] Median and 95% credibility intervals for the Bayesian surplus production model under the two alternative scenarios considered.

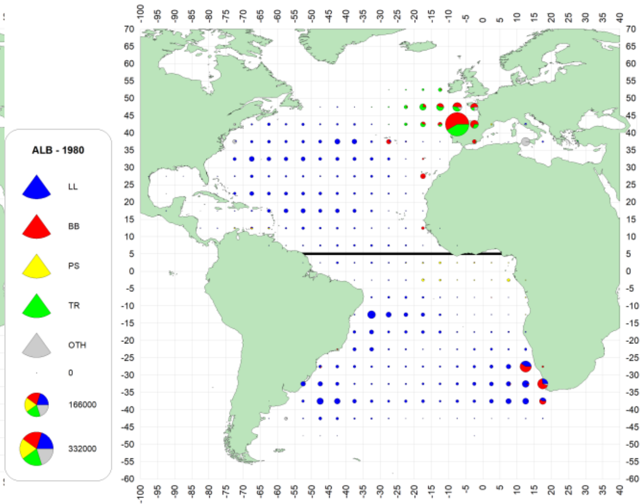
ALB-MD-Table 1. Estimated catches (t) of albacore (*Thunnus alalunga*) by area, gear, and flag

				1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
TOTAL	MED			1349	1587	3150	2541	2698	4856	5577	4870	5608	7898	4874	3529	5965	6520	2970
Landings			Bait boat	81	163	205	0	33	96	88	77	29	0	0	0	0	0	0
			Longline	350	87	391	348	194	416	2796	2597	3704	4248	2335	1997	3026	4101	2694
			Other surf.	766	1031	2435	1991	2426	4271	2693	2196	1757	46	87	169	134	182	246
			Purse seine	23	0	0	0	0	0	0	0	1	3557	2452	1362	2803	2237	25
			Trawl	0	0	0	0	0	0	0	0	0	48	0	0	0	0	5
			Troll	129	306	119	202	45	73	0	0	117	0	0	0	2	0	1
Discards			Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Landings		CP	EU-Croatia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			EU-Cyprus	0	0	0	0	0	0	6	0	12	30	255	425	507	712	209
			EU-España	218	475	429	380	126	284	152	200	209	1	138	189	382	516	238
			EU-France	23	3	0	5	5	0	0	0	1	0	0	0	0	2	1
			EU-Greece	1	0	952	741	1152	2005	1786	1840	1352	950	773	623	402	448	191
			EU-Italy	1107	1109	1769	1414	1414	2561	3630	2826	4032	6913	3671	2248	4584	3970	2104
			EU-Malta	0	0	0	1	1	6	4	4	2	5	10	15	18	1	5
			EU-Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Egypt	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
			Korea Rep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Libya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Maroc	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	19	14
			Türkiye	0	0	0	0	0	0	0	0	0	0	27	30	73	852	208
Discards			EU-Cyprus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			EU-España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

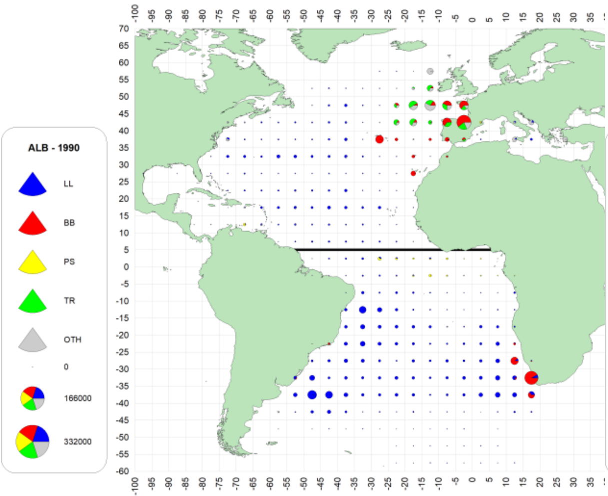
				2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
TOTAL	MED			4024	2124	4628	2047	1503	2400	3800	4396	3176	2863	2762	2675	2895	2295	2286
Landings			Bait boat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Longline	2160	1719	2327	1959	1392	2343	3235	4333	3087	2378	2656	2497	2798	2112	2126
			Other surf.	634	404	1408	8	18	27	5	4	2	2	8	29	1	34	20
			Purse seine	1230	0	869	68	86	15	543	34	82	481	30	66	72	110	129
			Trawl	0	0	0	0	0	5	7	9	3	2	2	5	13	1	0
			Troll	0	1	0	6	0	3	0	0	2	1	67	62	5	0	0
Discards			Longline	0	0	25	6	7	8	10	16	0	0	0	16	5	39	11
Landings		CP	EU-Croatia	0	2	7	12	20	30	11	7	2	2	1	1	0	0	0
			EU-Cyprus	223	206	222	315	350	377	495	542	568	624	714	632	513	448	346
			EU-España	204	277	343	389	244	283	53	51	206	71	68	67	133	98	134
			EU-France	0	1	2	0	0	1	1	0	0	0	15	15	24	36	13
			EU-Greece	116	125	126	126	165	287	541	1332	608	522	297	158	182	145	245
			EU-Italy	2727	1109	2501	1117	615	1353	1602	1490	1348	1044	1287	1423	1192	1154	1167
			EU-Malta	1	2	5	19	29	62	37	56	4	104	77	13	137	50	30
			EU-Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Egypt	0	0	0	0	0	0	246	77	396	429	278	316	622	177	164
			Japan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Korea Rep	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Libya	0	0	0	0	0	0	750	800	0	30	21	19	17	20	15
			Maroc	120	0	0	0	0	0	0	0	0	0	0	0	10	10	10
			Syria	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
			Türkiye	631	402	1396	62	71	0	53	25	44	38	4	16	58	118	150
Discards			EU-Cyprus	0	0	25	6	7	8	10	16	0	0	0	16	5	37	8
			EU-España	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3



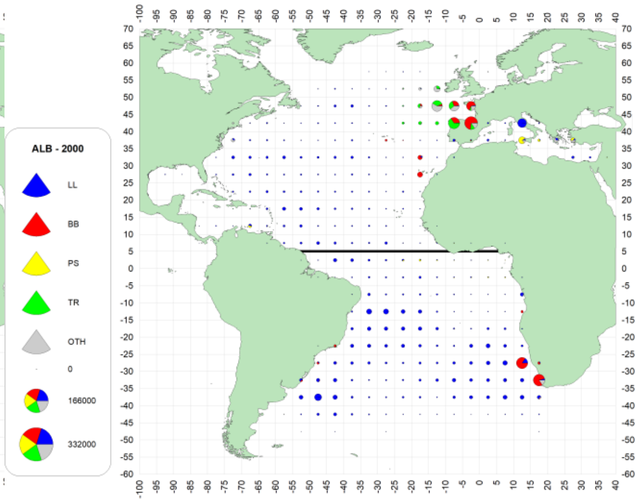
a. ALB (1970-79)



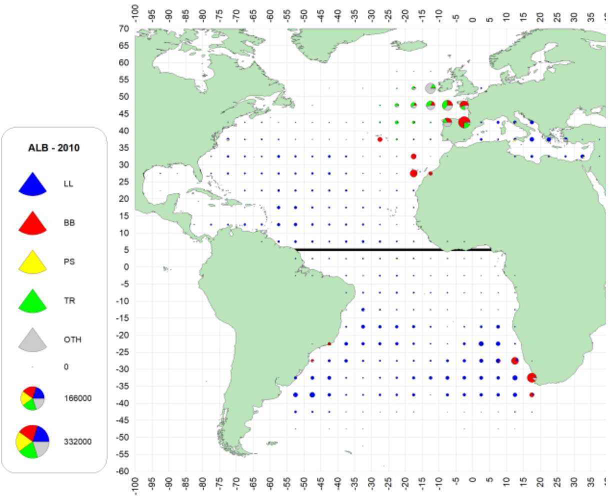
b. ALB (1980-89)



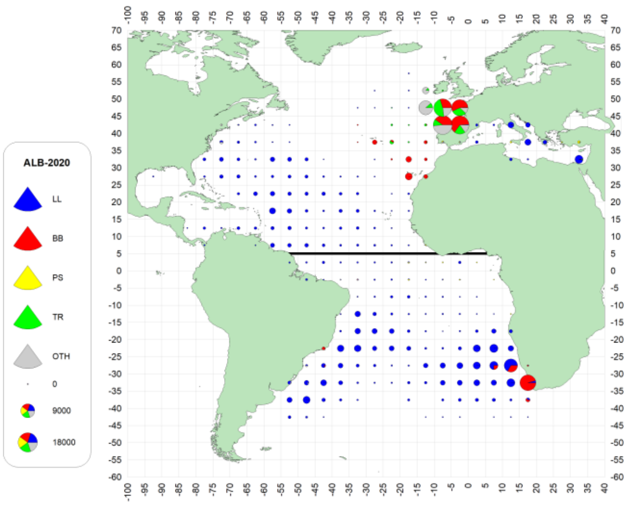
c. ALB (1990-99)



d. ALB (2000-09)

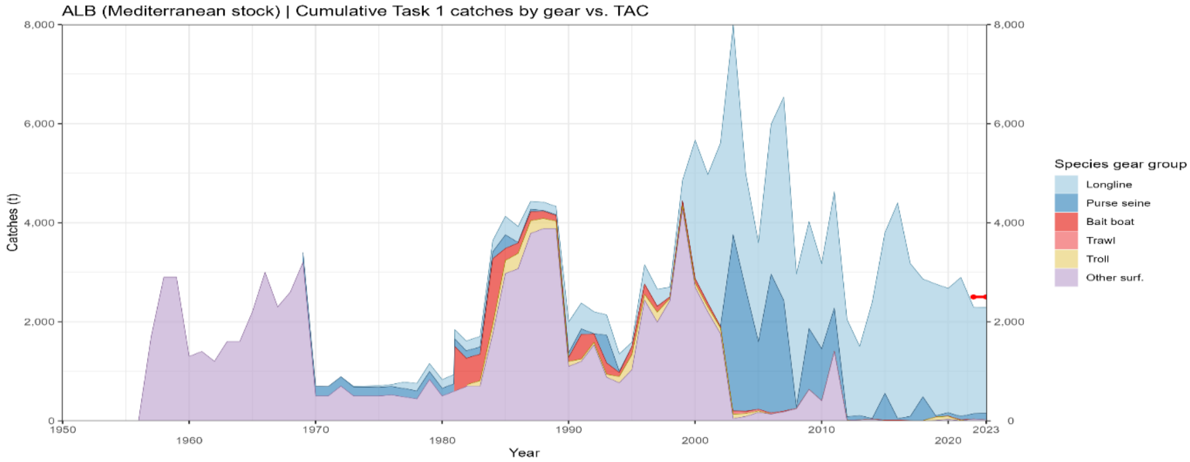


e. ALB (2010-19)

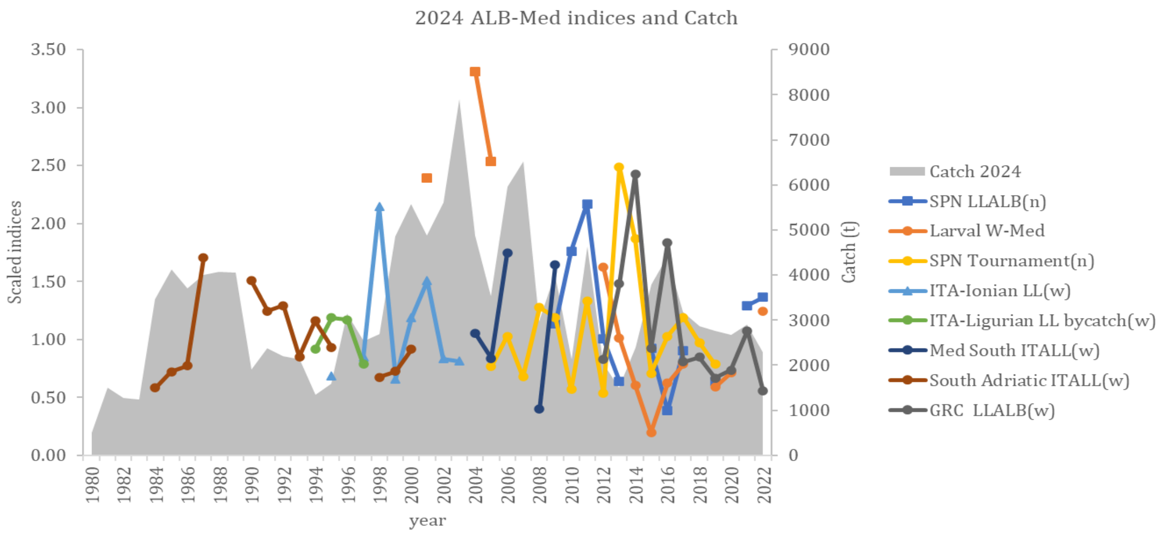


f. ALB (2020-22)

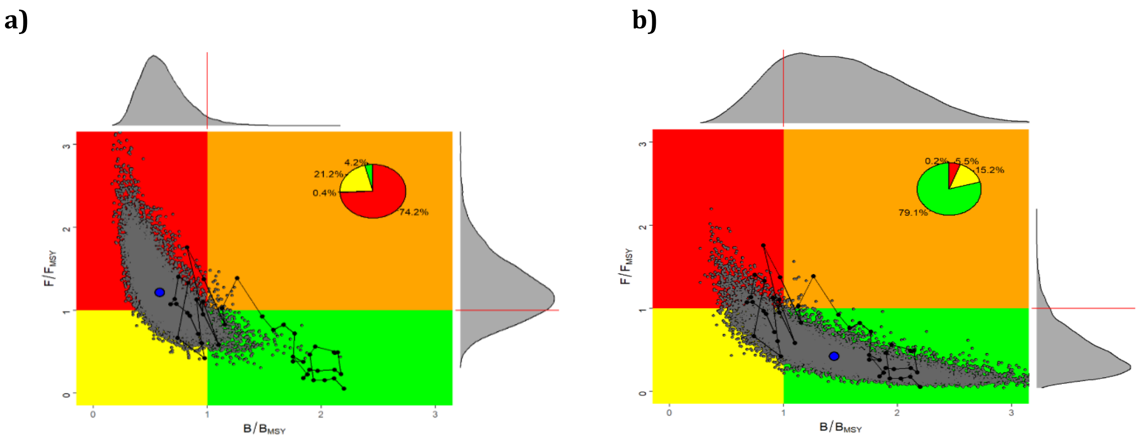
ALB-Figure 1. Geographic distribution of albacore accumulated catch by major gears and decade (1970-2022). Baitboat and troll catches prior to the 1990s, these catches were assigned to only one 5ºx5º stratum in the Bay of Biscay. Plots are scaled to the maximum catch observed from 1970 to 2022 (last decade only covers 3 years).



ALB-MD-Figure 2. Total albacore catches reported to ICCAT (Task 1) by gear for the Mediterranean stock. The red line is the current TAC.



ALB-MD-Figure 3. Mediterranean albacore. Abundance indices used in the 2024 Mediterranean Albacore Stock Assessment (ICCAT, 2024f). n and w refer to abundance indices in number and weight, respectively.



ALB-MD-Figure 4. Mediterranean albacore. Stock status trajectories of B/B_{MSY} and F/F_{MSY} over time (1980-2022) with uncertainty around the current estimate (Kobe plots) for Bayesian surplus production model, as well as probability of being overfished and overfishing (red), of being neither overfished nor overfishing (green), of being overfished but not overfishing (yellow) and of overfishing but not overfished (orange), for scenarios 1 a) and 2 b). The probability distributions shown in each axis represent uncertainty around current B/B_{MSY} and F/F_{MSY}.

9.6 BFT - Atlantic bluefin tuna

In 2022, the ICCAT Commission adopted a Management Procedure (MP) for both the western Atlantic and eastern Atlantic and Mediterranean management areas (Rec. 22-09). The adoption of the MP represents a foundational change in how bluefin tuna (BFT) will be managed. This approach links eastern and western area Total Allowable Catch (TACs) under one management framework, providing joint management advice, and requires the Executive Summaries for the East and West BFT (BFT-E and BFT-W) to have common or closely related sections. The MP frees the assessment process from having to provide annual TAC advice and allows the stock assessment process to return to its traditional strengths which are to provide a determination of relative stock status. According to the adopted MP, stock assessments will continue to be conducted but on a more reduced frequency. The next assessment will be held in 2026 or 2027, pending further dialogue between the Committee and the Commission.

Until such time as a new assessment occurs, the Committee retains the stock status determination from the most recent assessments: West (ICCAT, 2021d) and East Atlantic and Mediterranean (ICCAT, 2022d). Previous stock assessments utilized $F_{0.1}$ as a reasonable proxy for F_{MSY} as fishing at $F_{0.1}$ would, over the longer term, allow the resource to fluctuate around the true, but unknown, value of $B_{0.1}$ regardless of the future recruitment level. The $F_{0.1}$ strategy compensates for the effect of recruitment changes on biomass by allowing higher catches when recent recruitment is higher and reducing catches when recent recruitments are lower. Given that it remains unknown whether future stock assessments will be able to estimate a stock-specific F_{MSY}, $F_{0.1}$ remains a useful proxy to evaluate overfishing status. The Committee notes that $F_{0.1}$ was not used to evaluate status within the Management Strategy Evaluation (MSE) as the true F_{MSY} was known within each of the operating models.

For many years, the Committee has been concerned that environmental factors and changing fishing practices may affect many of the relative abundance indices used in the MP leading to exceptional circumstances (EC) and challenges to assess stock status. Furthermore, there still remains a key source of uncertainty in the scale of the total population size. The Committee has provided "Eastern Atlantic Bluefin Tuna Close-Kin Mark Recapture (CKMR) Implementation Plan Proposal" and the "Bluefin tuna workplan for 2025" to address these concerns.

Annually, the Committee evaluates the updated indices of abundance for determination of EC. Based upon the current EC protocols (Rec. 23-07), the Committee provides details and results of such determination in section 19.12.

BFT-1. Biology

Atlantic bluefin tuna have a wide geographical distribution but live mainly in the temperate pelagic ecosystem of the entire North Atlantic and its adjacent waters, for example the Gulf of Mexico, Gulf of St Lawrence and the Mediterranean Sea. Historical catch information documents the presence in the South Atlantic (**BFT-Figure 1**). Electronic archival tagging information has confirmed that bluefin tuna can tolerate cold as well as warm water temperatures while maintaining a stable internal body temperature. Bluefin tuna preferentially occupy the surface and subsurface waters of the coastal and open-sea areas, but archival electronic tagging and ultrasonic telemetry data indicate that they frequently dive to depths of more than 1,000 m. Bluefin tuna are a highly migratory species that seems to display a homing behaviour and spawning site fidelity to primary spawning areas in both the Mediterranean Sea and the Gulf of Mexico. Evidence indicates spawning in other areas, for example the vicinity of the Slope Sea off the Northeast USA and more recently the Cantabrian Sea, though the persistence and importance of these other areas as spawning grounds remain to be determined. Electronic tagging is also resolving the movements to the foraging areas within the Mediterranean and the North Atlantic and indicates that bluefin tuna movement patterns vary by tagging site, by month of tagging and according to the age of the fish. The reappearance of bluefin tuna in historical fishing areas (e.g. Norway and, more recently, the Black Sea) suggest that important changes in the spatial dynamics of bluefin tuna may also have resulted from interactions between biological factors, environmental variations and a reduction in fishing effort.

The fisheries for Atlantic bluefin tuna were managed as two separate management units, but now are managed with an MP that explicitly considers the mixing of the two biological populations. However, TAC advice remains area specific with separation at the 45 W meridian.

The ICCAT Atlantic-Wide Bluefin Tuna Research Programme (GBYP), as well as national research programmes, have provided the basis for improved biological studies. A genotyping assay has been developed and tested for stock identification, sex determination and kinship analysis. A pilot study on epigenetic aging indicates the viability of this approach for both eastern and western BFT. Modelling has been carried out to assess the feasibility of implementing the close-kin mark-recapture methodology for BFT-E. Within the GBYP, the aerial survey in the Mediterranean has continued, as well efforts to increase and improve the information available on the spatial distribution and mixing of the BFT and to promote and support electronic tagging campaigns. Substantial progress has been made in estimating regional, time varying mixing rates for Atlantic bluefin tuna, using otolith stable isotope and genetic analyses. Research on the larval ecology of Atlantic bluefin tuna has advanced in recent years through oceanographic habitat suitability models.

Currently, the Committee assumes for assessment purposes that eastern Atlantic and Mediterranean bluefin tuna contributes fully to spawning at age 5. There are also indications that some young individuals (of age 5) of unknown origin caught in the West Atlantic are mature, but there is considerable uncertainty with regards to their contribution to the western stock spawning. Therefore, the Committee has considered two spawning schedules for the western stock; one identical to that used for the East and one with peak spawning at age 13. However, the latest review of reproductive biology has shown that both the current vectors for spawning fraction at-age might be biased, and that the magnitude of that bias is unknown. Juvenile growth is rapid for a teleost fish, but slower than for other tuna and billfish species. Fish born in June attain a length of about 30-40 cm and a weight of about 1 kg by October. After one year, fish reach about 4 kg and 60 cm in length. At 10 years of age, a bluefin tuna is about 200 cm and 170 kg and reaches about 270 cm and 400 kg at 20 years of age. Bluefin tuna is a long-living species, with a lifespan of about 40 years as indicated by radiocarbon deposition and can reach 330 cm straight fork length (SFL) and weigh up to 725 kg. In 2017, the Committee revised the natural mortality assumptions and adopted a single new age specific natural mortality vector for both stocks.

Important electronic and conventional tagging activity has been conducted for both juvenile and adult fish for several years in the Atlantic and Mediterranean by the ICCAT GBYP, National Programmes and non-governmental organizations (NGOs). Contributions from e-tag data from all groups are supporting ongoing efforts to provide important insights into bluefin tuna stock structure, distribution, mixing and migrations, and are helping to estimate fishing mortality rates and to condition the MSE operating models. Three workshops organized by the GBYP on larval indices, close-kin mark-recapture and electronic tagging were held in 2023. In these workshops there has been a large participation and contributions that have allowed progress and planning in the three research areas.

East bluefin tuna

BFT-E-2. Fishery trends and indicators – East Atlantic and Mediterranean

Reported catches in the East Atlantic and Mediterranean (**BFT-Figure 1**) reached a peak of over 50,000 t in 1996 and then decreased substantially, stabilizing at around the TAC levels established by ICCAT for the most recent period (**BFT-E-Figure 1**). Catches between 2019 and 2023 (as of September 2024) were respectively 31,136 t, 35,048 t, 35,097 t, 35,110 t and 39,247 t for the East Atlantic and Mediterranean, of which 22,092 t, 24,174 t, 24,789 t, 24,632 t and 28,250 t were reported for the Mediterranean for those same years (**BFT-Table 1**). The Committee is aware of ongoing, unquantified, illegal, unreported and unregulated fishing (IUU) catches that represents a serious impediment to being able to determine the productivity of the stock and to provide reliable TAC advice. In response, the Committee urges identification and quantification of IUU catches so that it can provide more accurate biomass-based catch advice and obtain more accurate scientific understanding of stock productivity.

Available information has demonstrated that catches of bluefin tuna from the East Atlantic and Mediterranean were seriously under-reported between the mid-1990s through 2007. The Committee estimated that the realized total catch during this period was likely of 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. Since the 2017 Bluefin Tuna Stock Assessment (ICCAT, 2018a), these estimates (1998-2007) have been treated as the actual catches.

During the 2022 Stock Assessment Meeting (ICCAT, 2022d), the decision was made to use ten abundance indices up to 2020 (seven CPUE series and three fisheries independent indices, **BFT-E-Figure 2**). The current MP uses five indices in each management area (in the East, two CPUE indices and three surveys, **BFT-Figure 2**).

Review of the indices for ECs is based on the combined index, however it is informative to evaluate trends in individual indices relative to those predicted by the operating models in the MSE (**BFT Figures 2 and 3**). The data for the West Mediterranean Larval survey have been collected but the index was not able to be updated at the time of publication. The Moroccan-Portugal trap index data point for 2023 reflected substantial changes in the fishing operations hence the index data point for this year is considered unavailable under the EC protocols (Rec. 23-07).

BFT-E-3. State of the stock

There have been considerable improvements in data quality and quantity over the past few years; nevertheless, important gaps remain in the temporal and spatial coverage for detailed size and catch-effort statistics for several fisheries, especially in the Mediterranean before the implementation of stereo video cameras in 2014. The catch at size (CAS) and catch-at-age (CAA) of the not elsewhere included (NEI) catch (1998-2007) were revised.

Three modelling platforms were used to conduct the assessment of the BFT-E in 2022. As in previous assessments, a virtual population analysis (VPA) was conducted, and two additional platforms, Stock Synthesis (SS) and the age-structured assessment programme (ASAP), were applied.

The three models showed similar trends in spawning stock biomass (SSB), with a progressive decline in SSB from the 1970s until the implementation of a Recovery Plan developed in 2006 (Rec. 06-05). Since the late 2000s there has been a strong increase in SSB, although the magnitude and rate of increase differ among the three models, with VPA indicating the lowest biomass while ASAP indicates the largest increase. Uncertainty in the rate and magnitude of the increase in SSB is evident for all three platforms and in the sensitivity tests conducted for each platform, especially in recent years (**BFT-E-Figure 3**). The fishing mortality of the age group 2-5 and age 10+ fish showed an increasing trend since the 1970s, whereas the F for both the age group 2-5 and age 10+ shows a drastic decline in fishing mortality since the establishment of the 2006 Recovery Plan (**BFT-E-Figure 3**). Recently, fishing mortality has been increasing, however, when average over all three models, fishing mortality is still below fishing mortality target.

Recruitments estimated by the three assessment platforms show considerable variability, especially over the recent period. In general, however, there are two distinct periods, one with low recruitments before 1990 and the other with higher recruitments thereafter (**BFT-E-Figure 3**).

The current perception of the stock status depends on recruitment estimates which are highly uncertain. The different models showed a relatively wide range of stock status estimates relative to the $F_{0.1}$ reference level, ranging from overfishing to not overfishing ($F_{CURRENT}/F_{0.1}$): VPA = 1.16; SS = 0.72 and ASAP = 0.54. To inform stock status, the Committee recommended that the results of the three models be considered equally, by integrating the results. The resultant point estimate of F_{CUR} is below $F_{0.1}$ ($F_{CURRENT}/F_{0.1}$= 0.81; 95% CI 0.48-1.62), indicating a stock status determination of not overfishing. Furthermore, fishing mortality rates are much lower than those during the 1998-2007 period.

BFT-E-4. Outlook

The Committee considers that the three assessment platforms (VPA, SS and ASAP) have disparate and highly uncertain estimates of recent recruitment and absolute biomass, which would make short-term catch advice based on $F_{0.1}$ not robust in terms of both the consequences of taking a particular TAC and the accuracy of absolute $F_{0.1}$ estimate.

The adopted management procedure accounts for many of the long-standing uncertainties regarding stock mixing, biomass-based reference points and recruitment that created uncertainty for the outlook for the stock. Furthermore, the Committee is no longer providing projections, TAC advice or Kobe 2 strategy matrices derived from the stock assessments using an $F_{0.1}$ strategy, as the MP provides TAC advice that was simulation tested to achieve MSY-based management objectives.

BFT-E-5. Effect of current regulations

The TAC for 2023 to 2025 is set at 40,570 t. The Committee noted that reported catches in 2023 are in line with the TACs. However, the Committee has been previously informed of the existence of unquantified illegal catches.

BFT-E-6. Management recommendations

The management plan established in Rec. 22-08 and based on the MP for BFT sets a TAC for BFT-E of 40,570 t for 2023 to 2025.

According to the EC protocol in Rec. 23-07 and noted in section 19.12 no EC exists that would warrant deviating from the TAC calculated under the MP for 2025.

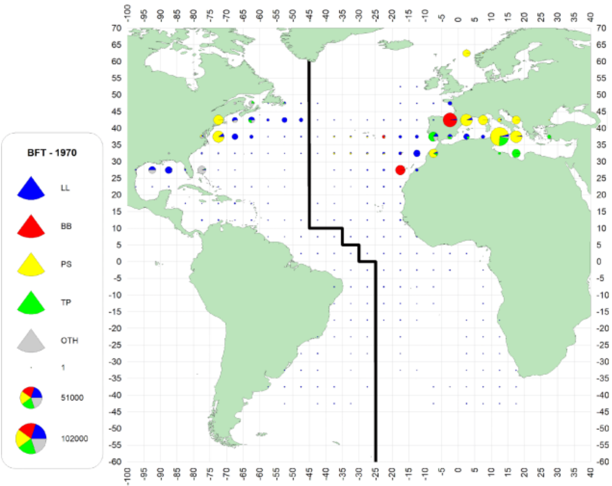
EAST ATLANTIC AND MEDITERRANEAN BLUEFIN TUNA SUMMARY	
Current reported catch (2023)	39,247 t*
$F_{CURRENT}/F_{0.1}$[1] (2020)	0.81 (0.48-1.62)[2]
Stock Status (2020)[3]	Overfishing: No
TAC 2023-2025	40,570 t

[1] $F_{CURRENT}$ refers to the geometric mean of the estimates (a proxy for recent F levels) for 2017-2020 for VPA, and for 2018-2020 for ASAP and SS. For the VPA and ASAP, F is measured as apical F, for SS F is exploitation rate in biomass.
[2] Mean and approximate 95% CI from integrating across the uncertainty for each model.
[3] Biomass reference points to determine stock status were not estimated since the 2017 assessment due to uncertainty in recruitment potential.
* As of September 2024.

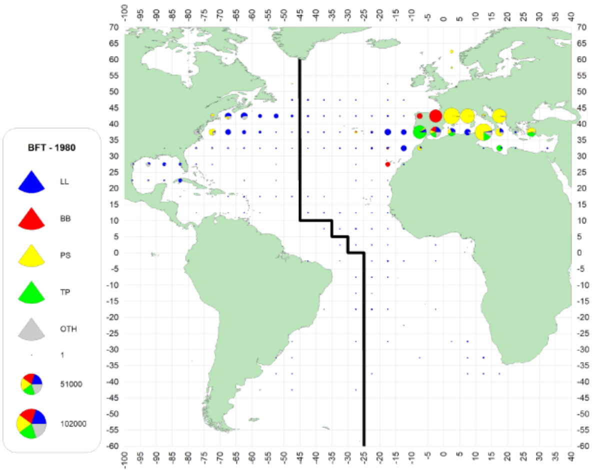
BFT-Table 1. Estimated catches (t) of northern bluefin tuna (*Thunnus thynnus*) by area, gear, and flag.

				1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
TOTAL				48881	49751	54009	53546	52658	52772	52775	52785	53319	52306	52125	51757	51813	62639	26463	21799	13197	11782	12689	14726	14889	18057	21314	25517	29853	33442	37255	37407	37809	41814
	ATE			7054	9780	12098	16379	11630	10247	10061	10086	10347	7394	7402	9023	7529	8441	8243	6685	4379	3984	3834	4163	3918	4841	5968	7216	8157	9044	10874	10308	10477	10998
	MED			39715	37523	39399	34832	38371	39754	39940	39914	39654	42606	42599	40977	42473	52560	16220	13135	6961	5791	7101	9082	9344	11374	13445	16451	19626	22092	24174	24789	24632	28250
	ATW			2113	2448	2512	2334	2657	2772	2775	2784	3319	2305	2125	1756	1811	1638	2000	1980	1857	2007	1754	1482	1627	1842	1901	1850	2069	2306	2208	2310	2700	2566
Landings	ATE		Bait boat	2284	3093	5369	7215	3139	1554	2032	2426	2635	1409	1902	2282	1263	2436	2393	1260	725	636	283	243	95	172	1085	1195	692	845	936	1031	1026	1036
			Longline	2311	4522	4212	4057	3789	3570	3736	3303	2896	2748	2064	2700	2033	1705	2491	1951	1194	1125	1139	1167	1194	1467	1829	2208	2730	3128	3313	3249	3294	3633
			Other surf.	590	555	273	60	387	404	509	558	631	521	290	424	831	502	181	297	124	35	49	141	210	193	261	295	340	320	381	359	368	434
			Purse seine	213	458	323	828	700	726	661	153	887	490	1078	1197	408	0	0	2	1	0	0	2	0	0	42	49	11	56	190	147	107	111
			Sport (HL+RR)	25	0	0	237	28	33	126	61	63	109	89	11	99	11	12	11	44	51	53	46	43	104	35	101	118	92	156	267	245	237
			Traps	1630	1152	1921	3982	3586	3960	2996	3585	3235	2116	1978	2408	2895	3788	3166	3164	2292	2137	2311	2564	2376	2905	2716	3362	4258	4594	5889	5255	5434	5541
	MED		Bait boat	0	206	5	4	11	4	38	28	1	9	17	5	0	0	0	38	1	0	2	2	9	25	0	50	56	72	103	81	88	117
			Longline	6993	8469	9856	7313	4117	3338	3424	4144	3234	3484	3036	3427	3408	3269	2376	1344	1242	962	587	605	588	776	1523	1184	1518	1485	1889	1657	1785	2030
			Other surf.	776	545	418	283	284	229	729	354	340	198	197	175	83	86	3	2	3	2	2	21	31	5	38	3	36	53	42	68	61	76
			Purse seine	27948	23799	26021	24279	31792	33799	33237	33043	34044	37291	37869	36639	38363	48994	13540	11448	4986	4293	6172	7982	8184	9993	11340	14493	17128	19515	20872	21987	21596	24659
			Sport (HL+RR)	2307	3562	2149	2340	1092	1533	1773	1167	1520	1404	1325	619	494	117	149	160	448	356	202	240	289	373	308	440	582	611	865	740	717	875
			Traps	1691	942	951	613	1074	852	739	1177	515	221	154	112	125	93	152	144	281	165	125	222	232	192	227	272	300	353	399	252	384	407
	ATW		Longline	539	491	545	382	764	915	858	610	729	186	644	425	565	420	606	366	529	743	478	470	498	553	562	559	706	675	576	653	913	889
			Other surf.	307	384	429	293	342	279	283	201	107	139	97	89	85	63	78	121	107	147	117	121	119	138	93	123	77	168	134	175	209	190
			Purse seine	301	249	245	250	249	248	275	196	208	265	32	178	4	28	0	11	0	0	2	29	38	34	0	0	0	0	0	0	0	
			Sport (HL+RR)	804	1114	1032	1181	1108	1125	1121	1650	2036	1399	1139	924	1005	1023	1134	1251	1009	888	917	692	810	1085	1204	1144	1263	1450	1482	1444	1521	1461
			Traps	79	72	90	59	68	44	16	16	28	84	32	8	3	4	23	23	39	26	17	11	20	6	10	13	3	4	4	4	0	0
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	5	7	9	8	1	4	5
			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	0	0	0	0	0	2
	MED		Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	82
			Purse seine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	12	9	11	2	9	10	6	4	5	4	2	3
	ATW		Longline	83	138	167	155	123	160	222	105	211	232	181	131	149	100	159	207	174	202	224	145	139	19	29	10	18	7	8	31	54	25
			Other surf.	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	1	2	2	4	3	3	1
			Purse seine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	4	5	0	0	0	0	0	0	0	
			Sport (HL+RR)	0	0	0	14	3	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Landings	ATE	CP	Brazil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
			China PR	0	0	0	0	85	103	80	68	39	19	41	24	42	72	119	42	38	36	36	38	37	45	54	64	79	89	101	101	72	116
			EU-Denmark	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	3	6	6
			EU-España	3137	3819	6186	9519	4565	4429	3493	3633	4089	2172	2801	3102	2339	3680	3536	2409	1550	1483	1329	1553	1282	1655	1986	2509	2489	2729	3289	2953	3301	3464
			EU-France	336	725	563	269	613	588	542	629	755	648	561	818	1218	629	253	366	228	135	148	223	212	254	343	350	461	462	557	559	540	637
			EU-Ireland	0	0	0	14	21	52	22	8	15	3	1	1	2	1	1	1	2	4	10	13	19	14	32	16	17	6	16	16	20	19
			EU-Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1
			EU-Portugal	363	169	199	712	323	411	441	404	186	61	27	82	104	29	36	53	58	180	223	235	243	263	327	429	450	475	592	614	583	634
			Great Britain	0	1	0	1	1	12	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	3	0	0	0	0	2	5	22
			Guinea Ecuatorial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	7	0	0	0	0	**0**
			Guinée Rep	330	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Iceland	0	0	0	0	2	27	0	0	1	0	0	0	0	0	0	0	0	2	5	4	30	37	6	0	0	0	1	1	0	1
			Japan	2075	3971	3341	2905	3195	2690	2895	2425	2536	2695	2015	2598	1896	1612	2351	1904	1155	1089	1093	1129	1134	1386	1578	1905	2262	2514	2773	2779	2867	3083
			Korea Rep	4	205	92	203	0	0	6	1	0	0	3	0	1	0	0	0	0	0	0	0	0	0	161	181	208	232	247	242	252	274
			Maroc	720	678	1035	2068	2341	1591	2228	2497	2565	1795	1953	2389	1923	2418	1947	1909	1348	1055	990	960	959	1176	1433	1703	2164	2476	3089	2884	2704	2611
			Norway	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	44	51	12	49	194	152	123	117
			Panama	1	19	550	255	0	13	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	6	0	0	0	0	0	0	0	0	0	**0**
			Sierra Leone	0	0	0	0	0	0	93	118	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		NCC	Chinese Taipei	20	4	61	226	350	222	144	304	158	0	0	10	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		NCO	Faroe Islands	0	0	0	0	67	104	118	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			ICCAT (RMA)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	6	2	2	2
			NEI (Flag related)	68	189	71	208	66	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	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	MED	CP	Albania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0	0	9	34	40	47	56	100	156	168	148	178	264
			Algerie	1560	156	638	829	1674	1760	2083	2098	2056	1504	1440	1500	1673	1489	1311	0	0	0	69	244	244	370	448	1038	1300	1437	1649	1650	1655	1995
			China PR	97	137	93	49	0	20	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	1410	1220	1360	1105	906	970	930	903	977	1139	828	1017	1022	825	834	619	389	371	369	384	385	456	515	630	738	827	903	903	816	988
			EU-Cyprus	10	10	10	10	21	31	61	85	91	79	105	149	110	1	132	2	3	10	18	17	18	22	59	110	133	151	153	169	168	189
			EU-España	2741	4607	2588	2209	2000	2003	2772	2234	2215	2512	2353	2758	2689	2414	2465	1769	1056	942	1064	948	1164	1238	1467	1688	2706	2660	2774	3228	2760	3243
			EU-France	11843	9604	9171	8235	7122	6156	6794	6167	5832	5859	6471	8638	7663	10200	2670	3087	1755	805	791	2191	2216	2565	3054	3661	4360	4919	5316	5289	5303	5963
			EU-Greece	886	1004	874	1217	286	248	622	361	438	422	389	318	255	285	350	373	224	172	176	178	161	195	218	235	267	313	354	327	424	367
			EU-Italy	6901	7076	10200	9619	4441	3283	3847	4383	4628	4981	4697	4853	4708	4638	2247	2749	1061	1783	1788	1938	1946	2273	2725	3196	3860	4286	4731	4699	4727	5136
			EU-Malta	580	590	402	396	409	449	378	224	244	258	264	350	270	334	296	316	136	142	137	155	160	182	212	261	308	338	387	382	387	428
			EU-Portugal	306	313	274	37	54	76	61	64	0	2	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Egypt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	64	77	77	155	99	124	181	263	122	327	67	**0**
			Iceland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Japan	536	813	765	185	361	381	136	152	390	316	638	378	556	466	80	18	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Korea Rep	684	458	591	410	66	0	0	0	0	0	700	1145	26	276	335	102	0	0	77	81	81	0	0	0	0	0	0	0	0	**0**
			Libya	1422	1540	1388	1029	1331	1195	1549	1941	638	752	1300	1091	1327	1358	1318	1082	645	0	756	929	933	1153	1368	1631	1792	2052	2228	2232	2223	2530
			Maroc	1092	1035	586	535	687	636	695	511	421	762	827	108	463	641	531	369	205	182	223	309	310	322	350	439	407	444	365	410	862	1053
			Panama	1499	1498	2850	236	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Syria	0	0	0	0	0	0	0	0	0	0	0	0	0	50	41	0	34	0	0	0	0	40	47	57	66	72	79	0	79	**0**
			Tunisie	2773	1897	2393	2200	1745	2352	2184	2493	2528	791	2376	3249	2545	431	2679	1932	1042	852	1017	1057	1047	1248	1486	1783	2102	2380	2653	2730	2659	2698
			Türkiye	3466	4219	4616	5093	5899	1200	1070	2100	2300	3300	1075	990	806	918	879	665	410	519	536	551	555	1091	1324	1515	1284	1771	2258	2266	2295	3282
		NCC	Chinese Taipei	709	494	411	278	106	27	169	329	508	445	51	267	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		NCO	Gibraltar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	14	16	15	17	20	22	25	28
			ICCAT (RMA)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	3	1	0	1	1	0	0	0	0	1	0
			Israel	0	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			NEI (Flag related)	427	639	171	1058	761	78	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			NEI (combined)	773	211	0	101	1030	1995	109	571	508	610	709	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			NEI (inflated)	0	0	0	0	9471	16894	16458	15298	15880	18873	18376	14164	18343	28234	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Palestine	0	0	0	1	1	1	0	0	1	0	1	0	1	1	3	2	2	2	1	1	1	2	2	2	2	2	10	2	2	1
			Serbia & Montenegro	0	2	4	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	ATW	CP	Brazil	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2
			Canada	392	576	597	503	595	576	549	524	604	557	537	600	733	491	575	530	505	474	477	480	463	531	466	472	550	666	580	626	613	598
			EU-España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			EU-Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			FR-St Pierre et Miquelon	0	0	0	0	0	1	0	0	3	1	10	5	0	4	3	2	8	0	0	0	0	9	0	0	0	0	0	0	0	**0**
			Japan	427	387	436	322	691	365	492	506	575	57	470	265	376	277	492	162	353	578	289	317	302	347	345	346	406	406	407	410	657	610
			Korea Rep	0	0	0	0	0	0	0	0	0	0	0	1	52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Mexico	4	23	19	2	8	14	29	10	12	22	9	10	14	7	7	10	14	14	51	23	51	53	55	34	80	39	28	63	60	39
			Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**

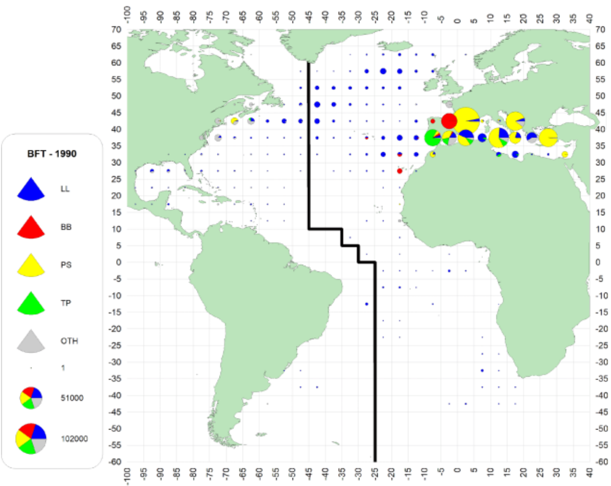
				1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
			UK-Bermuda	0	0	1	2	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	1
			UK-British Virgin Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	0	0	0	0	**0**
			USA	1163	1311	1285	1334	1235	1213	1212	1583	1840	1426	899	717	468	758	764	1068	803	738	713	502	667	877	1002	986	1013	1185	1178	1177	1311	1292
		NCC	Chinese Taipei	0	4	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		NCO	Argentina	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Cuba	0	0	0	0	0	0	0	0	74	11	19	27	19	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	0	0	0	0	0	
			ICCAT (RMA)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			NEI (Flag related)	0	0	0	0	0	429	270	49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Sta Lucia	43	9	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Discards	ATE	CP	EU-Denmark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
			Japan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	7	9	8	1	4	5
	MED		Albania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			EU-Croatia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	5	5	2	2	4	5	6	4	5	4	2	3
			EU-Cyprus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
			EU-España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	77
			Libya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	4	0	0	0	0	0	0	0	0	0	**0**
			Tunisie	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	5	5	0	0	0	0	0	**0**
			Türkiye	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	**0**
	ATW		Canada	0	0	0	6	16	11	46	13	37	14	15	0	2	0	1	3	25	36	17	0	0	3	8	1	4	3	5	5	6	4
			Japan	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
			Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
			USA	83	138	171	155	110	149	176	98	174	218	167	131	147	100	158	204	150	166	206	159	143	22	24	10	15	6	8	28	50	20



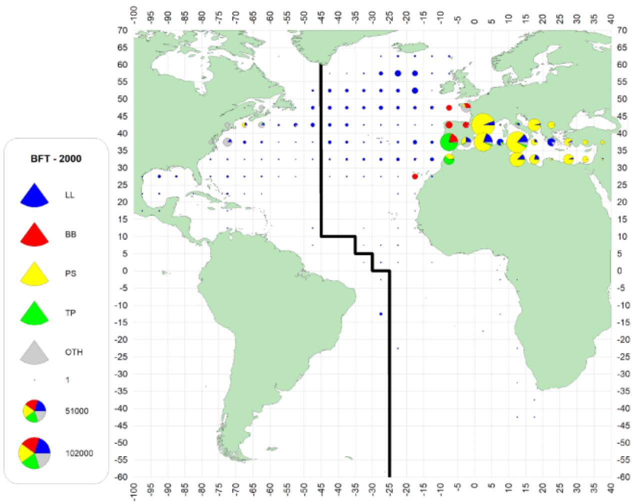
a) BFT (1970-79)



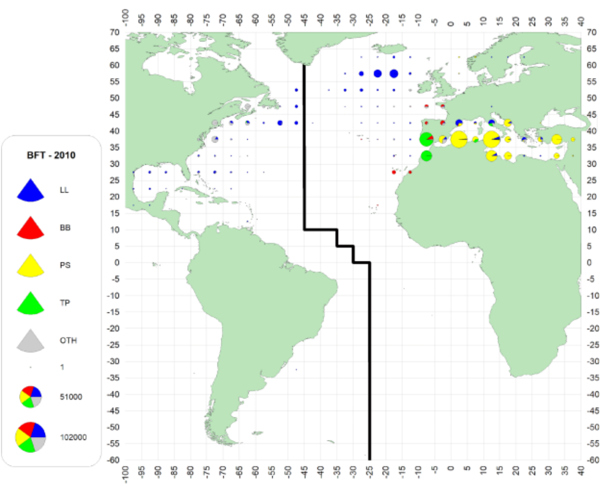
b) BFT (1980-89)



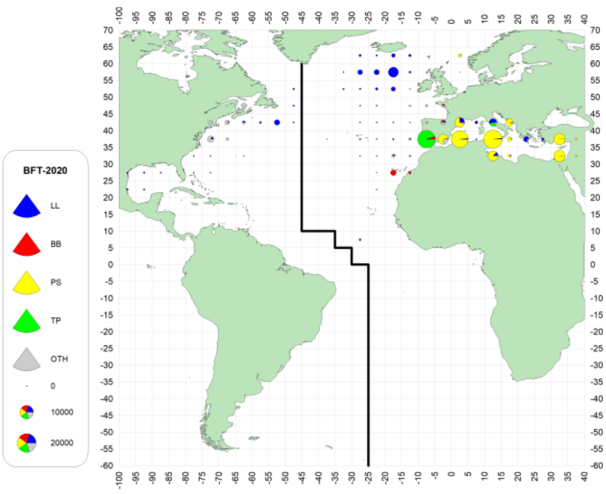
c) BFT (1990-99)



d) BFT (2000-09)

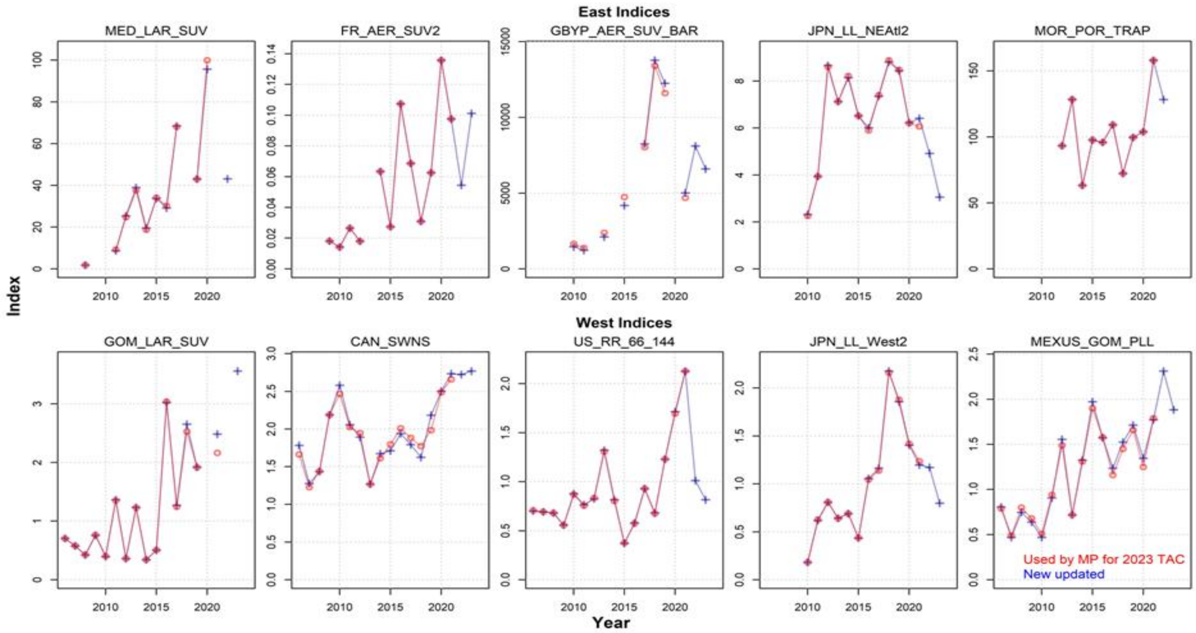


e) BFT (2010-19)

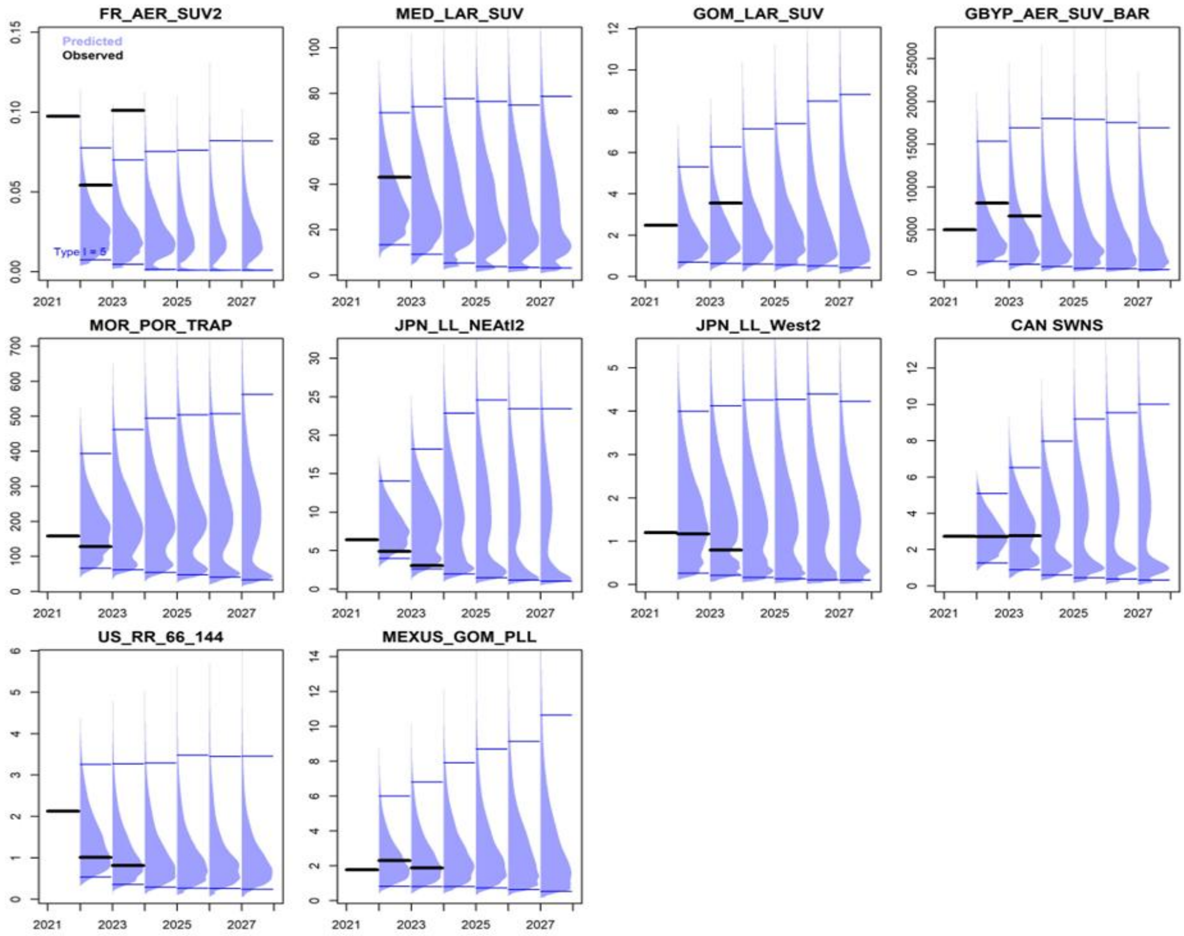


f) BFT (2020-22)

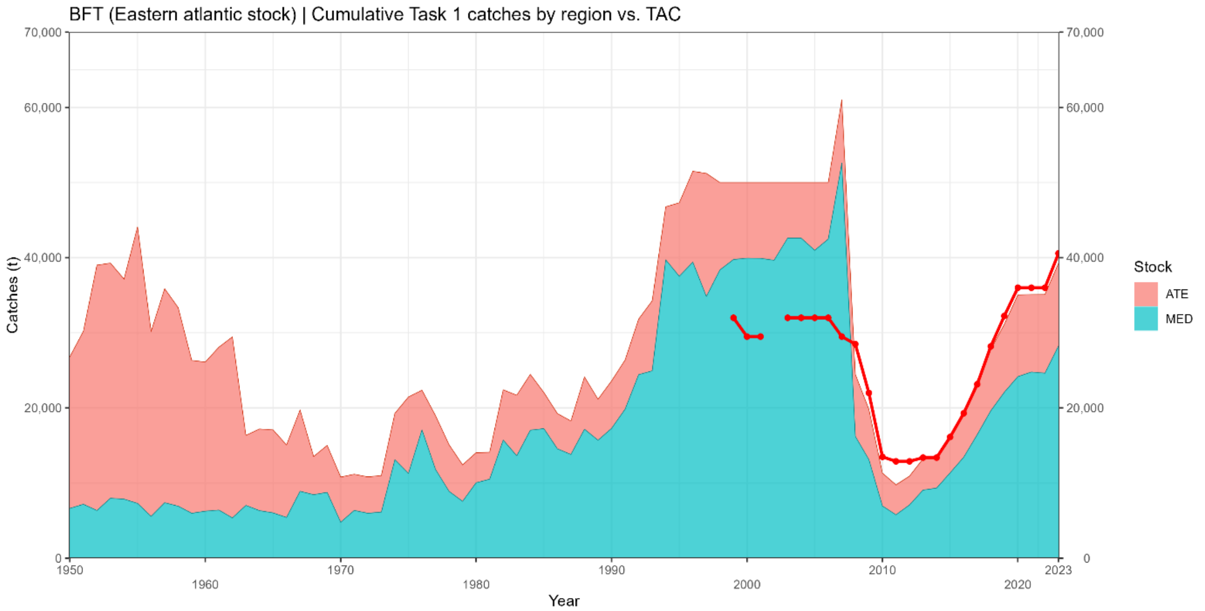
BFT-Figure 1. Geographic distribution of bluefin tuna catches per 5x5 degrees and per main gears from 1970 to 2022 (last decade only covers 3 years).

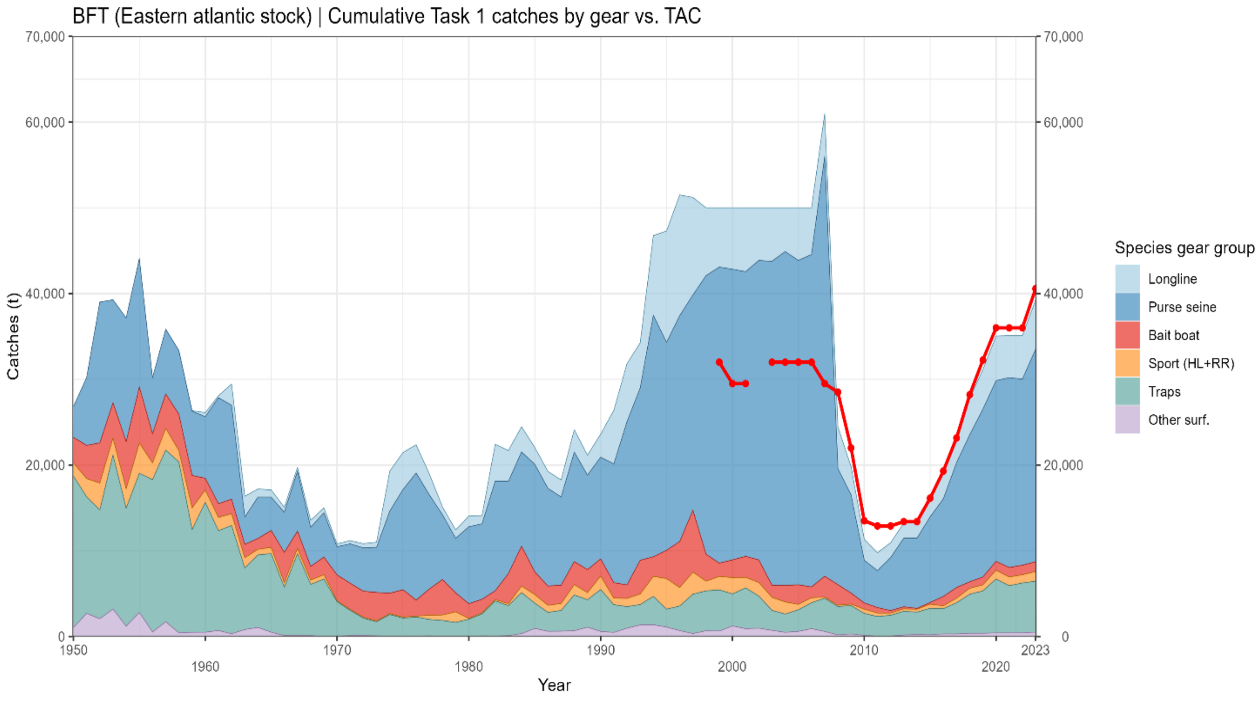


BFT-Figure 2 Comparison of the indices used in the MP calculations in 2022 (with data up to 2021, red) and the updated versions of these indices using data up to 2023 (blue). The West Mediterranean Larval survey and the Moroccan-Portugal trap data point for 2023 were not available.

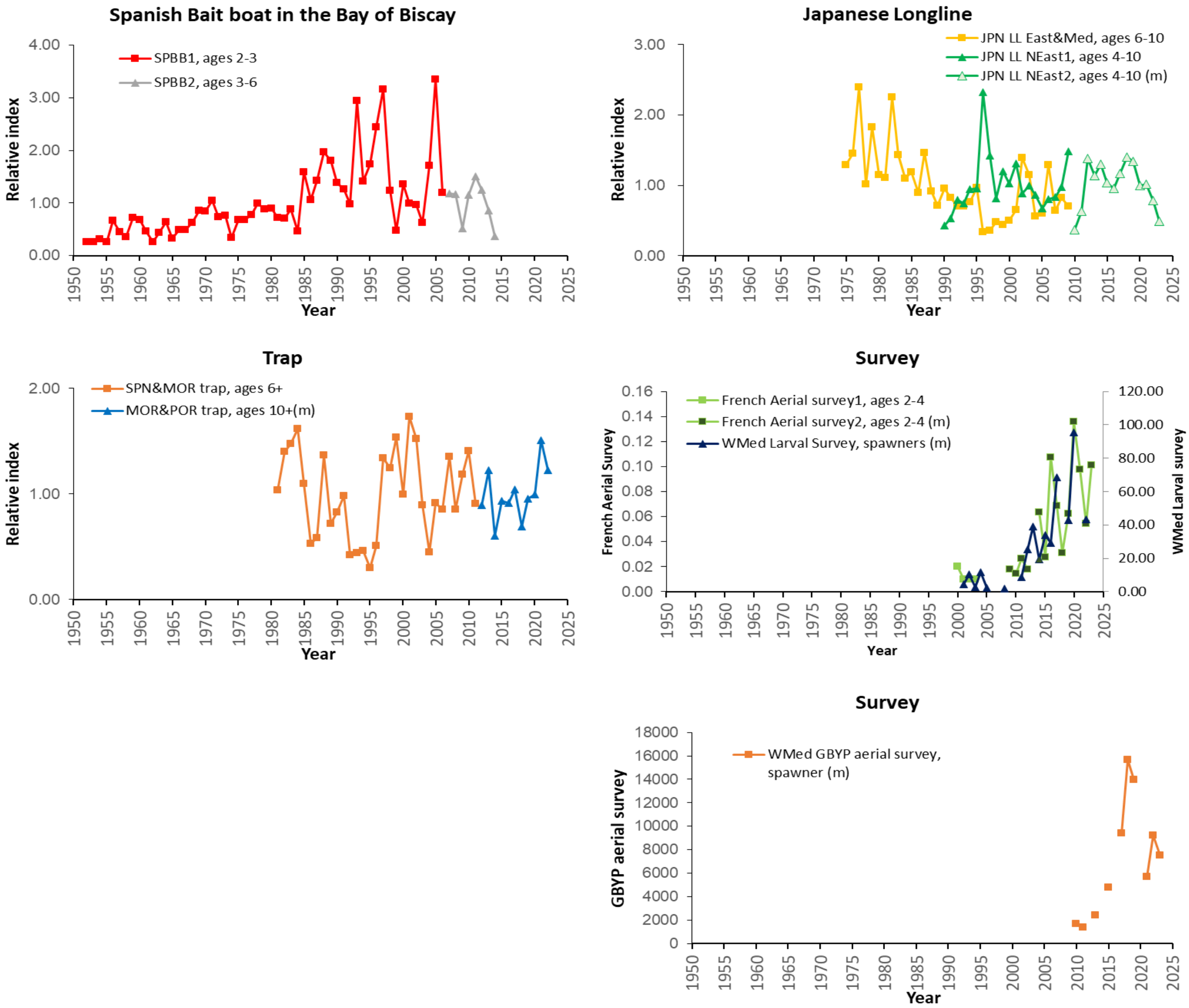


BFT-Figure 3. Plots of observed individual indices (black bars) and distribution of predicted data (blue density distribution) for the reference grid of operating models (n =2304, 48 operating models, 48 simulations each). Blue bars represent the 95% intervals. The West Mediterranean Larval survey and the Moroccan-Portugal trap index data point for 2023 were not available.

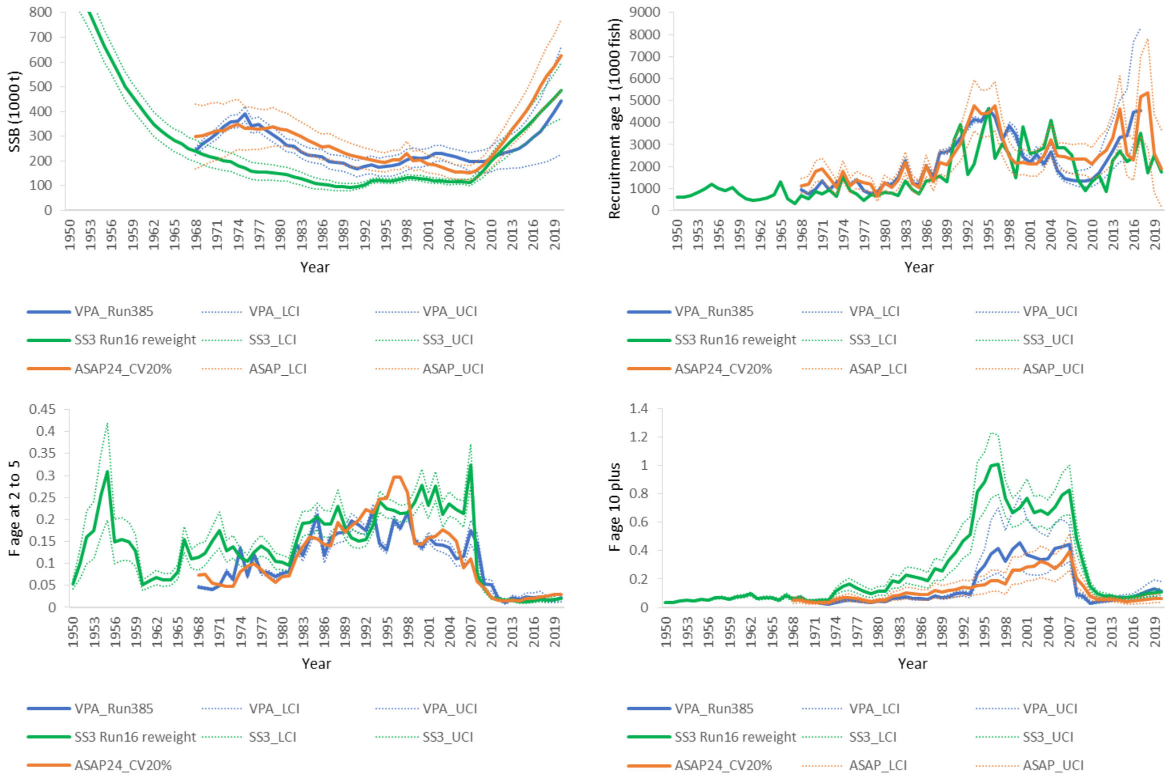




BFT-E-Figure 1. Reported catch for the East Atlantic and Mediterranean from Task 1 data from 1950 to 2023 split by main geographic areas (top panel) and by gears (bottom panel) together with unreported catch estimated by the Committee from 1998 to 2007 and TAC levels since 1998 (red dotted lines).



BFT-E-Figure 2. Plots of the updated fishery dependent and independent indicators used for the East Atlantic and Mediterranean bluefin tuna stock. All fishery dependent indicators are standardized series and scaled to their averages. Indices denoted with a 'm' are used in the management procedure. The Spanish BB series was split in two series to account for changes in selectivity patterns, and the latest series was calculated using French BB data due to the sale of the quota by the Spanish fleet. The Japanese longline CPUE for the Northeast Atlantic was split in 2009/2010 and the French aerial survey index was split in 2008/2009. The data for the western Mediterranean Larval survey have been collected but the index was not able to be updated at the time of publication. The Moroccan-Portugal index data point for 2023 reflected substantial changes in the fishing operations, hence the index data point for this year is considered unavailable under the EC protocols (Rec. 23-07).



BFT-E-Figure 3. Comparisons of the trends in estimated spawning stock biomass (SSB), recruitment (age 1), F at age 2 to 5, and F at age 10 plus group between base cases by model platform: VPA (blue lines), Stock Synthesis (green lines), and ASAP (orange lines). The time series of recruitments for the VPA have the terminal three years removed as it is standard practice not to consider these due to their estimates being unreliable.

9.7 BFT-W-Western bluefin

BFT-W-2. Fishery indicators

The total catch for the West Atlantic peaked at 18,608 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**, **BFT-W-Figure 1**). Catches dropped sharply thereafter to slightly above 3,000 t in 1969 with declines in longline catches off Brazil in 1967 and in purse seines (**BFT-Figure 1**). Catches increased to 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. Catches declined abruptly in 1982 from close to 6,000 t in the late 1970s and early 1980s with the imposition of a catch limit. The total catch for the West Atlantic, including discards, fluctuated without trend after 1982, reaching 3,319 t in 2002 (the highest since 1981, with all three major fishing nations indicating higher catches). Total catch in the West Atlantic subsequently declined steadily to 1,638 t in 2007 and then fluctuated without pronounced trend. The catch in 2021, 2022 and 2023 was 2,310 t, 2,700 t and 2,566 t, respectively (as of 20 September 2024) (**BFT-W-Figure 1**).

The Committee notes that work conducted as part of the MSE process evaluated the sensitivity to assumed stock of origin of the large historical catches from the off Brazil and found that management procedure (MP) performance was insensitive to the stock of origin of these catches.

The Committee notes that the Total Allowable Catch (TAC) in the West has not been caught for the last 10 years. Based on information received, the Committee considers that this is not due to low stock abundance but rather to market and operational conditions.

For continuity of information, the Committee presents the indices used in the 2021 Western Bluefin Stock Assessment (ICCAT, 2021d) and their updated time series, however the primary source of information on recent indicators comes from the update of the five indices used for the current MP. The current MP uses five indices in each management area (**BFT-Figure 2**). The indices are individually weighted by the inverse of their variance in the MP and are used to develop an overall index that is used to determine the TAC according to specifications outlined in Rec. 22-09. Annually, the Committee evaluates the updated indices for determination of exceptional circumstances (ECs). The Committee evaluated the indicators for determination of ECs according to Rec. 23-07 and results are provided in section 19.12.

The most recent 2021 Western Bluefin Stock Assessment (ICCAT, 2021d) used 10 catch per unit effort (CPUE) and two survey indices up to and including the year 2020 (**BFT-W-Figure 2**). As noted previously, several indices exhibit trends that may be indicative of environmentally driven changes in availability and three of these indices (Can-GSL, US RR>177 and Canada Acoustic index) were not recommended for use in MPs. As in 2017 and 2020, the Stock Synthesis assessment reconciled the conflicting trends in some Canadian and United States indices under a hypothesis of environmentally mediated availability of fish to the two regions. The Canada Acoustic index experienced a very low value for 2018 and subsequently also for 2019; it appears that the index is in a state of transition, possibly due to environmentally driven changes in the spatial distribution of the fish or of their prey. The 2021 Western Bluefin Stock Assessment split the index and, as two years of data would be uninformative for the models, the years 2018 and 2019 were removed until such time as the differences between the time periods can be reconciled.

BFT-W-3. State of the stock

Until such time as a new assessment occurs, the Committee retains the stock status determination from the most recent assessments. In 2021, Stock Synthesis with alternative spawning-at-age scenarios equally weighted across model scenarios was used to determine stock status but not specifically to provide TAC advice. Current F (average of 2018-2020) relative to the $F_{0.1}$ reference point was 0.53 (0.49-0.58, 80% CI), indicating that overfishing was not occurring. The Committee retains the time series of estimated biomass, recruitment and fishing mortality between the two models run in the 2021 Western Bluefin Stock Assessment (SS and VPA (**BFT-W-Figure 3**)). As in the 2020 assessment (ICCAT, 2020a), two spawning fraction scenarios (a young age at spawning, consistent with the eastern stock and older age of spawning with 100% spawning contribution at age 13) were considered in the assessment methods. Rather than presenting two series of spawning stock biomass (SSB) based on these two spawning fraction scenarios, total biomass is presented as this does not depend on which of these scenarios is selected.

The trajectory of $F/F_{0.1}$ for the most recent three Stock Synthesis and VPA assessments (2017, 2020, 2021), illustrates that trend in stock status relative to $F_{0.1}$ are quite similar across model platforms and across assessment years (**BFT-W-Figure 4**). The similarity in stock status relative to overfishing across models and model runs illustrates the utility of using the stock assessments to provide overfishing status, despite many well-documented uncertainties.

BFT-W-4. Outlook

In 1998, the Commission initiated a 20-year rebuilding plan designed to achieve SSB_{MSY} with at least 50% probability. As indicated above, the Committee did not use biomass-based reference points in previous stock assessments. The Committee is not evaluating if the stock is rebuilt because it has been unable to resolve the long-term recruitment potential.

The adopted MP accounts for many of the long-standing uncertainties regarding stock mixing, biomass-based reference points and recruitment that created uncertainty for the outlook for the stock. Furthermore, the Committee is no longer providing projections, TAC advice or Kobe 2 strategy matrices derived from the stock assessments using an $F_{0.1}$ strategy, as the MP provides TAC advice that was simulation tested to achieve MSY-based management objectives.

As noted above, stock assessments will continue to be valuable in providing status checks, to determine whether the MP is achieving the goal of maintaining stock status as well as to estimate recent recruitment. For continuity, the Committee provides the previous time series of $F/F_{0.1}$ showing the fishing status over time relative to the year-specific estimate of $F_{0.1}$ (**BFT-W-Figure 4**) and will update this figure with the next scheduled stock assessment.

BFT-W-5. Effect of current regulations

The 2021 and 2022 TAC recommendations were unlikely to have led to overfishing relative to $F_{0.1}$. The three-year TACs from the adopted MP are, by design, intended to ensure a high probability of maintaining stock status above B_{MSY} and avoiding overfishing.

BFT-W-6. Management recommendations

The Commission adopted a TAC of 2,350 t in 2021 (Rec. 20-06), and a moderate increase to 2,726 t in 2022 (Rec. 21-07) and, with the adoption of the management procedure in 2022 (Rec. 22-09), TAC of 2,726 t for 2023, 2024, and 2025 (Rec. 22-10).

According to the EC protocol in Rec. 23-07 and noted in section 19.12, no EC exist that would warrant deviating from the TAC calculated under the MP for 2025.

Summary table

The estimated mean of the SS models (two maturity specifications) for recent fishing mortality rate for each model was calculated as the geometric mean of F over 2018 to 2020 relative to the F reference point, $F_{0.1}$ (a proxy for F_{MSY}). The values in parenthesis represent the approximate 80% confidence intervals from the hessian-based standard errors or multivariate lognormal approximation approach.

WEST ATLANTIC BLUEFIN TUNA SUMMARY TABLE	
Current catch including discards (2023)	2,566 t*
$F_{CURRENT\ (2018\text{-}2020)}$	0.063 (0.059-0.067)[1]
$F_{0.1}$	0.118 (0.113-0.123)[2]
$F_{CURRENT\ (2018\text{-}2020)}/F_{0.1}$	0.53 (0.49-0.58)[1]
Estimated probability of overfishing ($F_{CURRENT\ (2018\text{-}2020)})/F_{0.1}$)	<1%
Stock status (2020)[3]	Overfishing: No
Management Measures:	Rec. 22-10: TAC of 2,726 t in 2023, 2024 and 2025, including dead discards.

* As of 20 September 2024.

[1] Mean and approximate 80% confidence interval from the multivariate lognormal approximation approach from the assessment.

[2] Mean and approximate 80% confidence interval from the hessian-based standard errors.

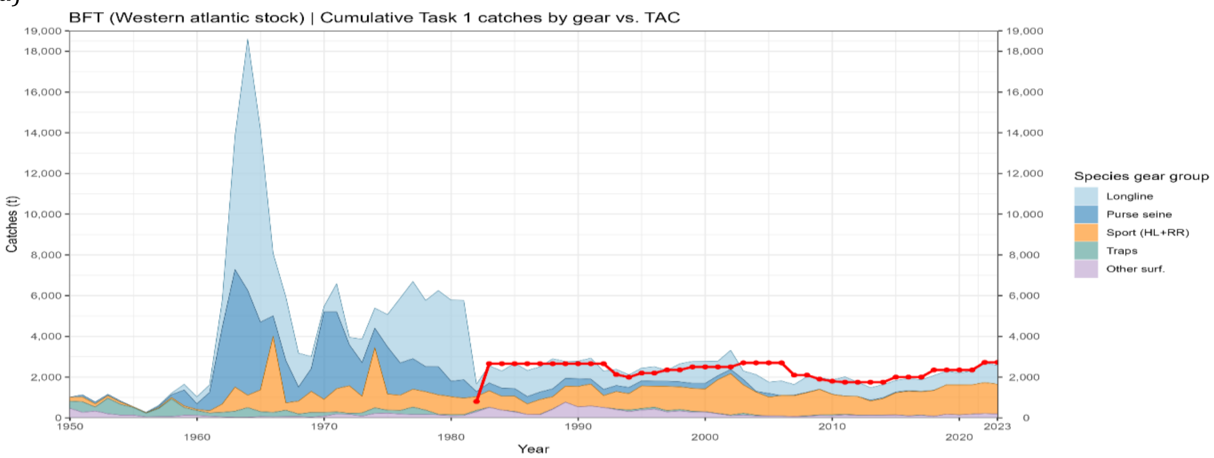
[3] Biomass reference points to determine stock status were not estimated in the 2021 BFT-W SA due to uncertainty in recruitment potential.

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

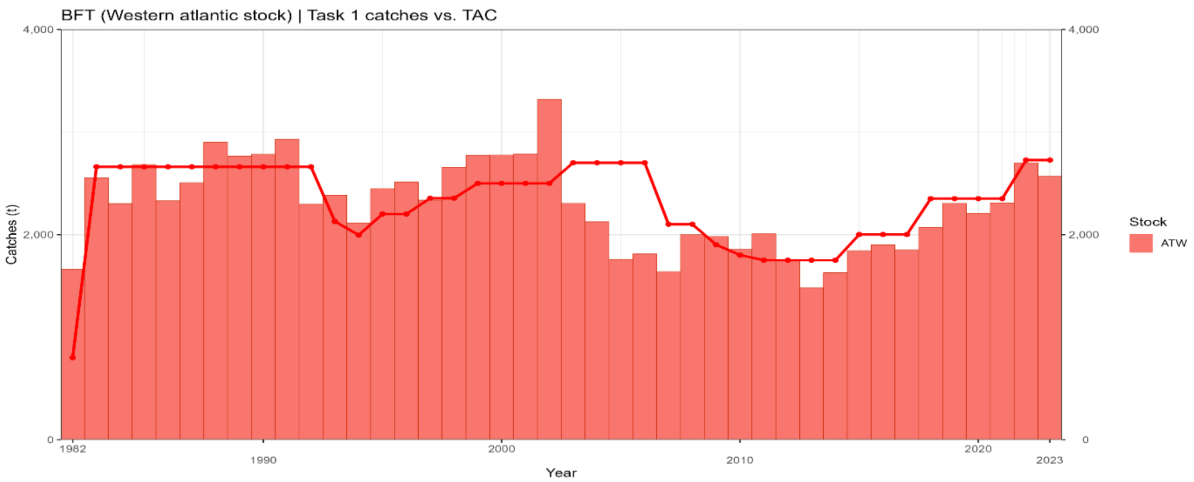
				1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
TOTAL				48881	49751	54009	53546	52658	52772	52775	52785	53319	52306	52125	51757	51813	62639	26463	21799	13197	11782	12689	14726	14889	18057	21314	25517	29853	33442	37255	37407	37809	41814
	ATE			7054	9780	12098	16379	11630	10247	10061	10086	10347	7394	7402	9023	7529	8441	8243	6685	4379	3984	3834	4163	3918	4841	5968	7216	8157	9044	10874	10308	10477	10998
	MED			39715	37523	39399	34832	38371	39754	39940	39914	39654	42606	42599	40977	42473	52560	16220	13135	6961	5791	7101	9082	9344	11374	13445	16451	19626	22092	24174	24789	24632	28250
	ATW			2113	2448	2512	2334	2657	2772	2775	2784	3319	2305	2125	1756	1811	1638	2000	1980	1857	2007	1754	1482	1627	1842	1901	1850	2069	2306	2208	2310	2700	2566
Landings	ATE		Bait boat	2284	3093	5369	7215	3139	1554	2032	2426	2635	1409	1902	2282	1263	2436	2393	1260	725	636	283	243	95	172	1085	1195	692	845	936	1031	1026	1036
			Longline	2311	4522	4212	4057	3789	3570	3736	3303	2896	2748	2064	2700	2033	1705	2491	1951	1194	1125	1139	1167	1194	1467	1829	2208	2730	3128	3313	3249	3294	3633
			Other surf.	590	555	273	60	387	404	509	558	631	521	290	424	831	502	181	297	124	35	49	141	210	193	261	295	340	320	381	359	368	434
			Purse seine	213	458	323	828	700	726	661	153	887	490	1078	1197	408	0	0	2	1	0	0	2	0	0	42	49	11	56	190	147	107	111
			Sport(HL+RR)	25	0	0	237	28	33	126	61	63	109	89	11	99	11	12	11	44	51	53	46	43	104	35	101	118	92	156	267	245	237
			Traps	1630	1152	1921	3982	3586	3960	2996	3585	3235	2116	1978	2408	2895	3788	3166	3164	2292	2137	2311	2564	2376	2905	2716	3362	4258	4594	5889	5255	5434	5541
	MED		Bait boat	0	206	5	4	11	4	38	28	1	9	17	5	0	0	0	38	1	0	2	2	9	25	0	50	56	72	103	81	88	117
			Longline	6993	8469	9856	7313	4117	3338	3424	4144	3234	3484	3036	3427	3408	3269	2376	1344	1242	962	587	605	588	776	1523	1184	1518	1485	1889	1657	1785	2030
			Other surf.	776	545	418	283	284	229	729	354	340	198	197	175	83	86	3	2	3	2	2	21	31	5	38	3	36	53	42	68	61	76
			Purse seine	27948	23799	26021	24279	31792	33799	33237	33043	34044	37291	37869	36639	38363	48994	13540	11448	4986	4293	6172	7982	8184	9993	11340	14493	17128	19515	20872	21987	21596	24659
			Sport(HL+RR)	2307	3562	2149	2340	1092	1533	1773	1167	1520	1404	1325	619	494	117	149	160	448	356	202	240	289	373	308	440	582	611	865	740	717	875
			Traps	1691	942	951	613	1074	852	739	1177	515	221	154	112	125	93	152	144	281	165	125	222	232	192	227	272	300	353	399	252	384	407
	ATW		Longline	539	491	545	382	764	915	858	610	729	186	644	425	565	420	606	366	529	743	478	470	498	553	562	559	706	675	576	653	913	889
			Other surf.	307	384	429	293	342	279	283	201	107	139	97	89	85	63	78	121	107	147	117	121	119	138	93	123	77	168	134	175	209	190
			Purse seine	301	249	245	250	249	248	275	196	208	265	32	178	4	28	0	11	0	0	2	29	38	34	0	0	0	0	0	0	0	
			Sport (HL+RR)	804	1114	1032	1181	1108	1125	1121	1650	2036	1399	1139	924	1005	1023	1134	1251	1009	888	917	692	810	1085	1204	1144	1263	1450	1482	1444	1521	1461
			Traps	79	72	90	59	68	44	16	16	28	84	32	8	3	4	23	23	39	26	17	11	20	6	10	13	3	4	4	4	0	0
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	5	7	9	8	1	4	5
			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	0	0	0	0	0	2
	MED		Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	82
			Purse seine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	12	9	11	2	9	10	6	4	5	4	2	3
	ATW		Longline	83	138	167	155	123	160	222	105	211	232	181	131	149	100	159	207	174	202	224	145	139	19	29	10	18	7	8	31	54	25
			Other surf.	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	1	2	2	4	3	3	1
			Purse seine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	4	5	0	0	0	0	0	0	0	
			Sport (HL+RR)	0	0	0	14	3	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Landings	ATE	CP	Brazil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
			China PR	0	0	0	0	85	103	80	68	39	19	41	24	42	72	119	42	38	36	36	38	37	45	54	64	79	89	101	101	72	116
			EU-Denmark	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	3	6	6
			EU-España	3137	3819	6186	9519	4565	4429	3493	3633	4089	2172	2801	3102	2339	3680	3536	2409	1550	1483	1329	1553	1282	1655	1986	2509	2489	2729	3289	2953	3301	3464
			EU-France	336	725	563	269	613	588	542	629	755	648	561	818	1218	629	253	366	228	135	148	223	212	254	343	350	461	462	557	559	540	637
			EU-Ireland	0	0	0	14	21	52	22	8	15	3	1	1	2	1	1	1	2	4	10	13	19	14	32	16	17	6	16	16	20	19
			EU-Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1
			EU-Portugal	363	169	199	712	323	411	441	404	186	61	27	82	104	29	36	53	58	180	223	235	243	263	327	429	450	475	592	614	583	634
			Great Britain	0	1	0	1	1	12	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	3	0	0	0	0	2	5	22
			Guinea Ecuatorial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	7	0	0	0	0	0
			Guinée Rep	330	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Iceland	0	0	0	0	2	27	0	0	1	0	0	0	0	0	0	0	0	2	5	4	30	37	6	0	0	0	1	1	0	1
			Japan	2075	3971	3341	2905	3195	2690	2895	2425	2536	2695	2015	2598	1896	1612	2351	1904	1155	1089	1093	1129	1134	1386	1578	1905	2262	2514	2773	2779	2867	3083
			Korea Rep	4	205	92	203	0	0	6	1	0	0	3	0	1	0	0	0	0	0	0	0	0	0	161	181	208	232	247	242	252	274
			Maroc	720	678	1035	2068	2341	1591	2228	2497	2565	1795	1953	2389	1923	2418	1947	1909	1348	1055	990	960	959	1176	1433	1703	2164	2476	3089	2884	2704	2611
			Norway	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	44	51	12	49	194	152	123	117
			Panama	1	19	550	255	0	13	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	6	0	0	0	0	0	0	0	0	0	0
			Sierra Leone	0	0	0	0	0	0	93	118	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		NCC	Chinese Taipei	20	4	61	226	350	222	144	304	158	0	0	10	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		NCO	Faroe Islands	0	0	0	0	67	104	118	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			ICCAT (RMA)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	6	2	2	2
			NEI (Flag related)	68	189	71	208	66	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	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	MED	CP	Albania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0	0	9	34	40	47	56	100	156	168	148	178	264
			Algerie	1560	156	638	829	1674	1760	2083	2098	2056	1504	1440	1500	1673	1489	1311	0	0	0	69	244	244	370	448	1038	1300	1437	1649	1650	1655	1995
			China PR	97	137	93	49	0	20	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	1410	1220	1360	1105	906	970	930	903	977	1139	828	1017	1022	825	834	619	389	371	369	384	385	456	515	630	738	827	903	903	816	988
			EU-Cyprus	10	10	10	10	21	31	61	85	91	79	105	149	110	1	132	2	3	10	18	17	18	22	59	110	133	151	153	169	168	189
			EU-España	2741	4607	2588	2209	2000	2003	2772	2234	2215	2512	2353	2758	2689	2414	2465	1769	1056	942	1064	948	1164	1238	1467	1688	2706	2660	2774	3228	2760	3243
			EU-France	11843	9604	9171	8235	7122	6156	6794	6167	5832	5859	6471	8638	7663	10200	2670	3087	1755	805	791	2191	2216	2565	3054	3661	4360	4919	5316	5289	5303	5963
			EU-Greece	886	1004	874	1217	286	248	622	361	438	422	389	318	255	285	350	373	224	172	176	178	161	195	218	235	267	313	354	327	424	367
			EU-Italy	6901	7076	10200	9619	4441	3283	3847	4383	4628	4981	4697	4853	4708	4638	2247	2749	1061	1783	1788	1938	1946	2273	2725	3196	3860	4286	4731	4699	4727	5136
			EU-Malta	580	590	402	396	409	449	378	224	244	258	264	350	270	334	296	316	136	142	137	155	160	182	212	261	308	338	387	382	387	428
			EU-Portugal	306	313	274	37	54	76	61	64	0	2	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Egypt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	64	77	77	155	99	124	181	263	122	327	67	0
			Iceland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Japan	536	813	765	185	361	381	136	152	390	316	638	378	556	466	80	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Korea Rep	684	458	591	410	66	0	0	0	0	0	700	1145	26	276	335	102	0	0	77	81	81	0	0	0	0	0	0	0	0	0
			Libya	1422	1540	1388	1029	1331	1195	1549	1941	638	752	1300	1091	1327	1358	1318	1082	645	0	756	929	933	1153	1368	1631	1792	2052	2228	2232	2223	2530
			Maroc	1092	1035	586	535	687	636	695	511	421	762	827	108	463	641	531	369	205	182	223	309	310	322	350	439	407	444	365	410	862	1053
			Panama	1499	1498	2850	236	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Syria	0	0	0	0	0	0	0	0	0	0	0	0	0	50	41	0	34	0	0	0	0	40	47	57	66	72	79	0	79	0
			Tunisie	2773	1897	2393	2200	1745	2352	2184	2493	2528	791	2376	3249	2545	431	2679	1932	1042	852	1017	1057	1047	1248	1486	1783	2102	2380	2653	2730	2659	2698
			Türkiye	3466	4219	4616	5093	5899	1200	1070	2100	2300	3300	1075	990	806	918	879	665	410	519	536	551	555	1091	1324	1515	1284	1771	2258	2266	2295	3282
		NCC	Chinese Taipei	709	494	411	278	106	27	169	329	508	445	51	267	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		NCO	Gibraltar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	14	16	15	17	20	22	25	28
			ICCAT (RMA)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	3	1	0	1	1	0	0	0	0	1	0
			Israel	0	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			NEI (Flag related)	427	639	171	1058	761	78	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			NEI (combined)	773	211	0	101	1030	1995	109	571	508	610	709	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			NEI (inflated)	0	0	0	0	9471	16894	16458	15298	15880	18873	18376	14164	18343	28234	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Palestine	0	0	0	1	1	1	0	0	1	0	1	0	1	1	3	2	2	2	1	1	1	2	2	2	2	2	10	2	2	1
			Serbia & Montenegro	0	2	4	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	ATW	CP	Brazil	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2
			Canada	392	576	597	503	595	576	549	524	604	557	537	600	733	491	575	530	505	474	477	480	463	531	466	472	550	666	580	626	613	598
			EU-España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			EU-Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			FR-St Pierre et Miquelon	0	0	0	0	0	1	0	0	3	1	10	5	0	4	3	2	8	0	0	0	0	9	0	0	0	0	0	0	0	0
			Japan	427	387	436	322	691	365	492	506	575	57	470	265	376	277	492	162	353	578	289	317	302	347	345	346	406	406	407	410	657	610
			Korea Rep	0	0	0	0	0	0	0	0	0	0	0	1	52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Mexico	4	23	19	2	8	14	29	10	12	22	9	10	14	7	7	10	14	14	51	23	51	53	55	34	80	39	28	63	60	39
			Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

				1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
			UK-Bermuda	0	0	1	2	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	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	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	0	0	0	0	0
			USA	1163	1311	1285	1334	1235	1213	1212	1583	1840	1426	899	717	468	758	764	1068	803	738	713	502	667	877	1002	986	1013	1185	1178	1177	1311	1292
		NCC	Chinese Taipei	0	4	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		NCO	Argentina	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Cuba	0	0	0	0	0	0	0	0	74	11	19	27	19	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	0	0	0	0	0	
			ICCAT (RMA)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			NEI (Flag related)	0	0	0	0	0	429	270	49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Sta Lucia	43	9	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Discards	ATE	CP	EU-Denmark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
			Japan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	7	9	8	1	4	5
	MED		Albania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			EU-Croatia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	5	5	2	2	4	5	6	4	5	4	2	3
			EU-Cyprus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
			EU-España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	77
			Libya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	4	0	0	0	0	0	0	0	0	0	0
			Tunisie	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	5	5	0	0	0	0	0	0
			Türkiye	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0
	ATW		Canada	0	0	0	6	16	11	46	13	37	14	15	0	2	0	1	3	25	36	17	0	0	3	8	1	4	3	5	5	6	4
			Japan	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
			Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
			USA	83	138	171	155	110	149	176	98	174	218	167	131	147	100	158	204	150	166	206	159	143	22	24	10	15	6	8	28	50	20

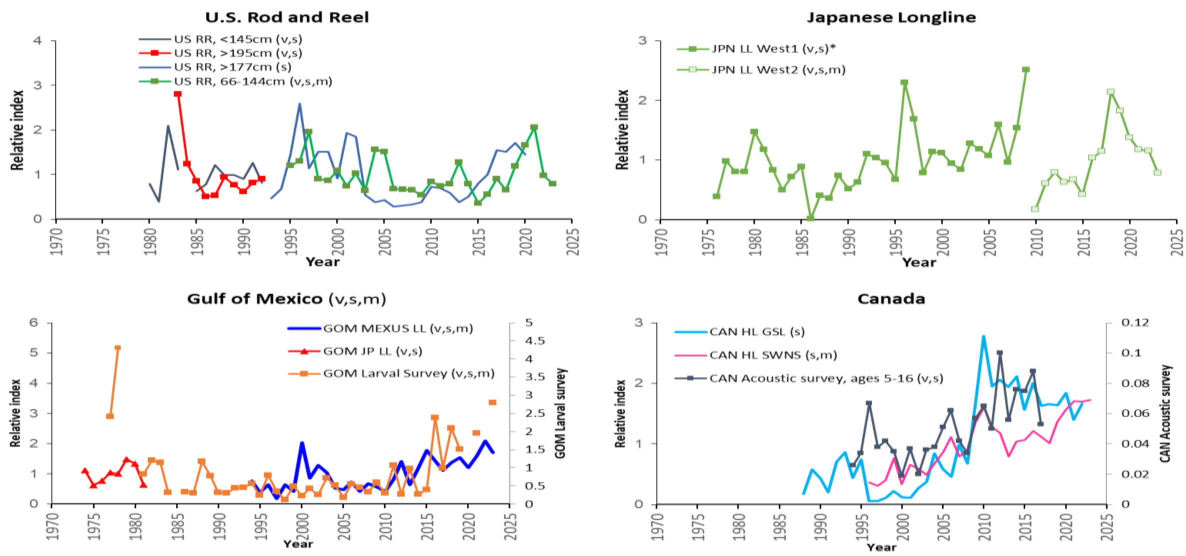
a)



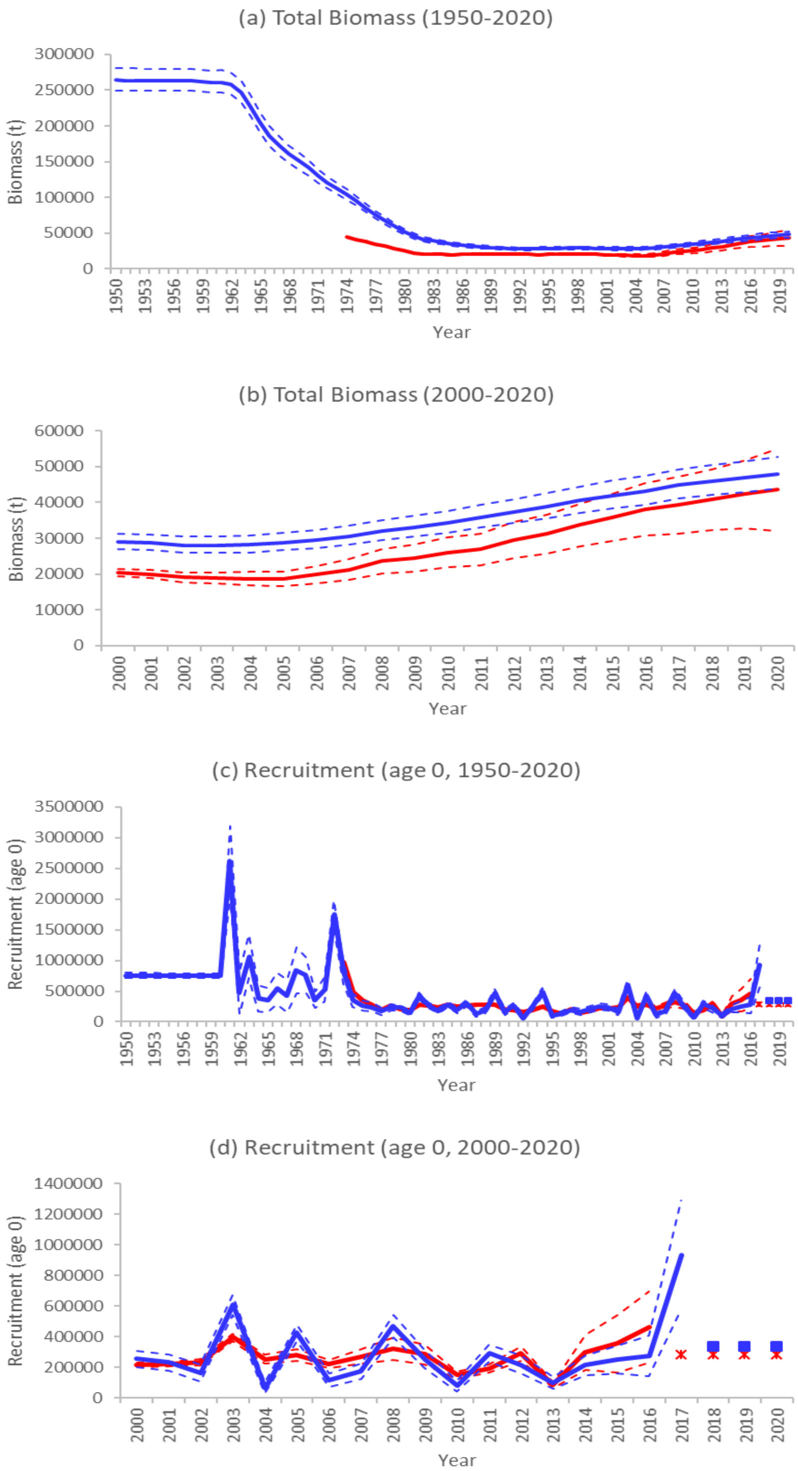
b)



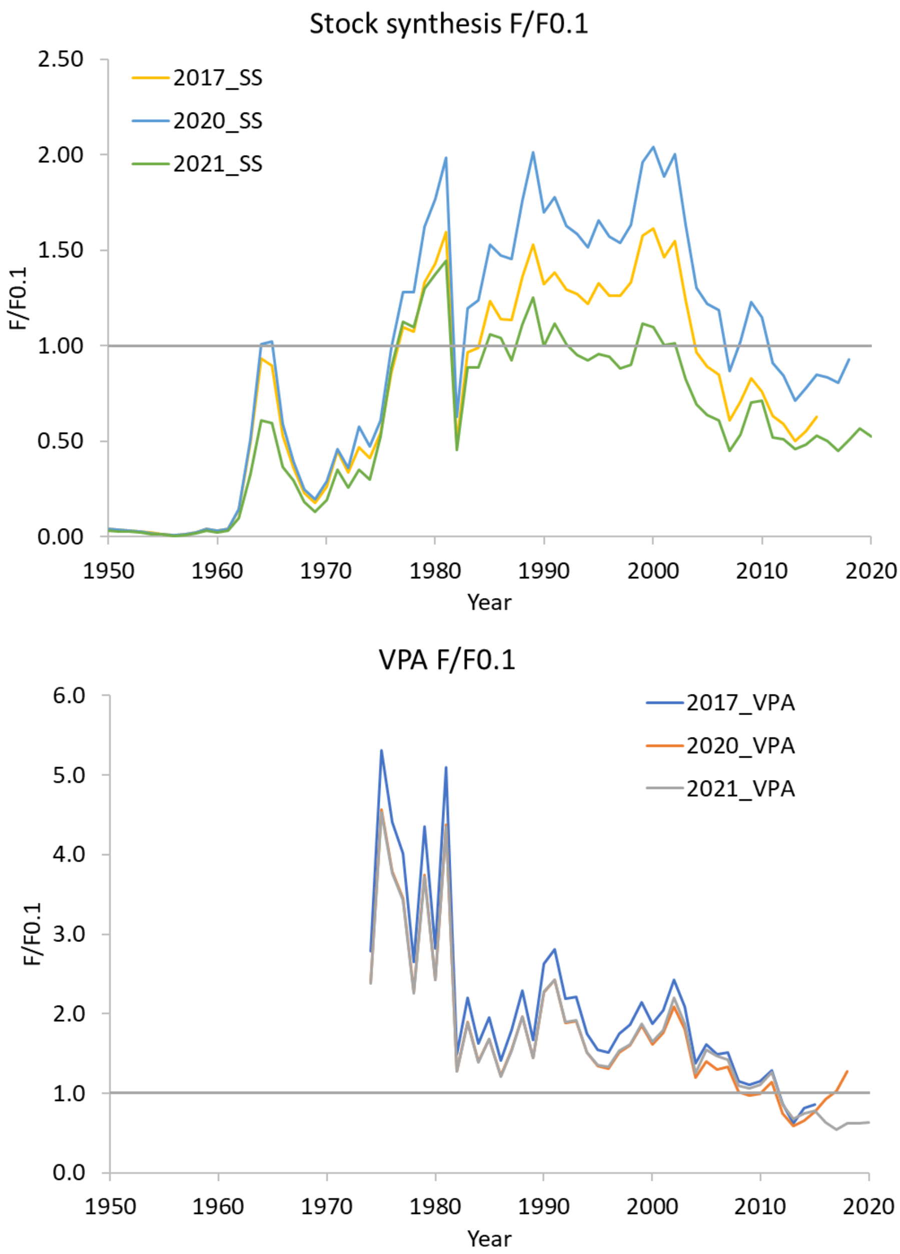
BFT-W-Figure 1. Historical catches of western bluefin tuna: a) by gear type and b) TACs agreed by the Commission (which are shown for comparison) (red dotted lines).



BFT-W-Figure 2. Indices of relative abundance for western bluefin tuna. Indices denoted with an "s" were used in Stock Synthesis, indices with a "v" were used in VPA and indices with a 'm' are used in the management procedure. (*) The 1986 low data point of the Japanese longline in the West Atlantic was removed in the Stock Synthesis models.



BFT-W-Figure 3. Estimates of a) total stock biomass for 1950-2020 and b) for 2000-2020, and c) recruitment (age 0) for 1950-2020 and d) for 2000-2020 for the base VPA (red) and Stock Synthesis (blue) models from the 2021 assessment. The 80% confidence intervals are indicated with dashed lines. Recruitment estimates for the recent years (2017-2020 for VPA; 2018-2020 for Stock Synthesis) have been replaced by the average recruitment in the recent 6 years (2012-2017).



BFT-W-Figure 4. Fishing mortality relative to the $F_{0.1}$ reference point as estimated by Stock Synthesis a) and VPA b) for the 2017, 2020 and 2021 assessments.

9.8 SBF - South bluefin

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.

9.9 BUM - Blue marlin

The most recent assessment for blue marlin was conducted in 2024 through a process that included a data preparatory meeting in March 2024 (ICCAT, 2024a) and an assessment meeting in June 2024 (ICCAT, 2024i). The last year of fishery data used in the assessment was 2022.

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 vessels 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 catch per unit effort (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 1 catches as the basis for the estimation of total removals (**BUM-Figure 2**). Total removals (landings and dead discards) for the period 1990-2022 were obtained during the 2024 Blue Marlin Data Preparatory Meeting (ICCAT, 2024a) by modifying Task 1 values with the addition of blue marlin that the Committee estimated from catches reported as billfish unclassified. Additionally, the reporting gaps in landed catch reports were filled with estimated values for major fleets.

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 1 there is 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. As of 21 September 2024, Task 1 catches of blue marlin (**BUM-Table 1**) for 2022 and 2023 amount to 1,789 t and 2,068 t, respectively. These catches are likely underestimated because few CPCs have reported discards.

A series of indices of abundance for blue marlin were presented and discussed during the 2024 Blue Marlin Data Preparatory Meeting (ICCAT, 2024a). Eleven standardized CPUE series from Japan (historical and current longline), Chinese Taipei (longline with three time series), USA (longline), Venezuela (longline, gillnet and rod & reel), Brazil (longline) and Ghana (gillnet) CPUE series were used in the assessment. The standard errors from the CPUE standardized series were applied as weighting factors in all assessment models. All estimated standardized CPUE indices for blue marlin showed a sharp decline during the period 1960-1975, and thereafter have fluctuated around lower levels (**BUM-Figure 3**).

BUM-3. State of the stocks

A full stock assessment was conducted for blue marlin in 2024, applying to the available data through 2022, using a grid approach for both surplus production and age-structured models to capture uncertainty around biological parameters.

The results of the final combined model of the 2024 assessment indicated that the estimated B/B_{MSY} and F/F_{MSY} were such that the current stock status is overfished but not subject to overfishing (**BUM-Figure 4**). By the end of the assessment period 2022, the stock relative biomass is below B_{MSY} and fishing mortality is below F_{MSY}.

The estimated MSY was determined to be 3,331 t with approximate 95% confidence limits of 2,323 to 4,659 t. The current status of the blue marlin stock is presented in **BUM-Figure 5.** The probability of the stock being in the red quadrant of the Kobe plot was estimated to be 39% by 2022. The probability of being in the yellow quadrant of the Kobe plot was estimated to be 46%, and of being in the green quadrant 16%.

However, the Committee recognizes the high uncertainty with regard to catch (landings and dead discards) data and the productivity of the stock.

BUM-4. Outlook

A combination of projection results from the Bayesian Surplus Production model and the age structure model was used to produce the advice outlook, including the Kobe strategy matrices. Projections were conducted until 2034 by assuming 12 constant catch (i.e., landings plus dead discards) scenarios (0 t, 1,000-3,500 t with 250 t intervals). All scenarios were equally weighted in the joint results. For the Stock Synthesis, projections were conducted using the multi-variate lognormal (MVLN) approach in each scenario, and reference point B/B_{MSY} was delivered from the spawning stock biomass for joint results.

The updated trends of joint projected relative stock biomass and fishing mortality are provided in **BUM-Figure 6**. The Kobe 2 matrices are available in **BUM-Table 2**.

The percentage of the model runs that resulted in biomass levels <= 10% or 20% of B_{MSY} (**BUM-Table 3**) were lower than 5% in constant catch scenarios equal to or less than 2,250 t during the projection period. These percentages increased with higher catch scenarios.

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 Commission further strengthened the plan to rebuild blue marlin stock by extending for 2016, 2017, 2018, and 2019 the annual limit of 2,000 t for blue marlin (Rec. 15-05, Rec. 18-04). The Commission established a landings limits of 1,670 t beginning in 2020 (Rec. 19-05). Landings in 2020, 2021, and 2023 have substantially exceeded the limit in the Rec. 19-05.

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

Currently, ICCAT Rec. 22-12 and four ICCAT Contracting Parties (Brazil, Canada, Mexico, and the United States) mandate or encourage the use of circle hooks on their pelagic longline fleets. Recent research has demonstrated that in some longline fisheries, the use of non-offset circle hooks resulted in a reduction of billfish 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.

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 bycatch and increase the survival of marlins. Such studies have also provided information on the rates of live releases for those fleets. However, there is not enough information on the proportion of fish being released alive for all fleets, to evaluate the effectiveness of the ICCAT Recommendation relating to the live release of marlins.

BUM-6. Management recommendations

The Committee emphasizes that unaccounted uncertainties, mostly associated with the levels of landings and dead discards, continue to hamper the ability of the Committee to provide sound management advice. Therefore, the Committee recommends that the Commission maintain or lower the current 1,670 t landings limit until the increasing biomass trend observed in the 2024 stock assessment is confirmed at the next blue marlin assessment. The Committee once again recommends instead of adopting landings limits (such as those adopted in Rec. 19-05) the Commission should adopt limits corresponding to true catch (i.e. landings + dead discards). The Committee reiterates that it is of the utmost importance that CPCs report their total catch of BUM (i.e. landings and dead discards).

ATLANTIC BLUE MARLIN SUMMARY TABLE

Maximum Sustainable Yield	3,331 t (2,323 – 4,659 t)[1]
Yield at last assessment year (2022)[2]	1,789 t
Yield (2023)	2,068 t
Relative Biomass (B_{2022}/B_{MSY})[4]	0.67 (0.30 – 1.35)[1]
Relative Fishing Mortality (F_{2022}/F_{MSY})	0.91 (0.40 -1.64)[1]
Stock Status (2022)	Overfished: Yes (84% probability of being overfished)[3] Overfishing: No (39% probability of be subject to overfishing)[3]
Conservation and management Measures in effect:	Rec. 18-05 and Rec. 19-05 Landing limit of 1,670 t beginning in 2020.

[1] Combined Bayesian surplus production model and age structured assessment model results. Values correspond to median estimates, 95% confidence interval values are provided in parenthesis.
[2] The term yield refers to the total catch (i.e. landings + dead discards).
[3] Based on the Kobe plot proportions by quadrant.
[4] Relative biomass from stock synthesis is on spawning stock biomass, while from Bayesian SPM is on total biomass.

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

			1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
TOTAL	A+M		4216	4187	5366	5670	5637	5326	5395	4376	3807	4316	3106	3470	3070	4263	3602	3121	3005	2750	2758	2143	2769	2075	2128	2694	1962	1979	2394	2514	1789	2068
Landings		Longline	3115	3000	3835	4302	3721	3513	3253	2595	1924	2227	1824	1963	1940	2369	2479	2069	1977	1438	1339	991	1300	1268	1207	1539	1076	1231	1393	1224	929	1089
		Other surf.	870	956	1267	1098	1734	1658	2014	1635	1618	1765	1073	1430	989	1672	815	839	832	1019	1055	951	1212	584	636	780	489	495	743	985	558	529
		Sport (HL+RR)	120	77	68	132	130	72	69	123	216	305	174	51	103	179	269	152	177	237	289	142	200	112	220	276	255	134	136	152	156	307
Landings(FP)		Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	12
Discards		Longline	111	153	197	139	51	83	60	22	37	19	34	24	38	42	37	40	19	56	70	55	54	106	52	73	44	55	58	45	36	47
		Other surf.	0	0	0	0	1	0	0	2	11	0	1	1	0	0	1	21	1	0	5	4	3	5	13	27	97	65	64	108	80	83
Landings	CP	Angola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0	0
		Barbados	19	31	25	30	25	19	19	18	11	11	0	0	25	0	0	0	9	13	14	11	12	34	11	24	21	13	22	12	9	10
		Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	3	3	7	47	19	8	5	13	1	6	0	2	0	0	0
		Brazil	81	180	331	193	486	509	467	780	387	577	195	612	298	262	182	150	130	63	48	114	105	89	79	64	37	20	13	2	3	5
		Canada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	0	0	0	2	0	0
		China PR	62	73	62	78	120	201	23	92	88	89	58	96	99	65	13	77	100	99	61	45	40	44	50	40	42	46	37	4	10	35
		Costa Rica	0	0	0	0	0	3	2	2	0	0	2	1	3	2	11	9	12	19	14	19	34	53	48	74	35	27	15	24	11	8
		Curaçao	40	40	40	40	40	40	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	44	2	20	15	2	6	1
		Côte d'Ivoire	151	134	113	157	66	189	288	208	111	171	115	21	8	132	66	72	54	17	48	48	87	15	72	44	32	163	41	148	6	70
		EU-España	55	40	158	122	195	125	140	94	28	12	51	24	91	38	55	160	257	131	190	147	209	287	225	321	106	103	437	460	203	53
		EU-France	149	154	197	232	257	285	305	329	340	340	345	360	361	358	395	265	281	284	263	162	303	190	167	209	152	170	282	131	170	215
		EU-Portugal	11	10	7	3	61	20	22	18	8	32	27	48	105	135	158	106	140	54	55	25	23	46	50	57	74	18	28	37	36	48
		El Salvador	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
		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	0	0	0	0	0
		Gabon	2	0	304	5	0	0	0	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Ghana	441	471	422	491	447	624	639	795	999	415	470	759	405	683	191	140	116	332	234	163	236	88	44	162	60	44	53	278	121	196
		Great Britain	0	0	0	0	0	0	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	50	26	47	60	100	87	104	69	72	45	42	33	49	54	32	69	53	32	63	63	56	53	54	62	69	49	31	30	37
		Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	23	0	15	0	0	0
		Japan	1523	1409	1679	1349	1185	790	883	335	267	442	540	442	490	920	1028	822	731	402	430	189	280	293	296	430	287	357	293	284	327	468
		Korea Rep	56	56	144	56	2	3	1	1	0	0	1	6	33	64	91	36	85	57	34	24	10	3	26	25	25	13	20	12	10	13
		Liberia	0	87	148	148	701	420	712	235	158	115	188	304	162	274	76	56	46	133	94	178	293	35	127	65	24	18	21	119	25	55
		Maroc	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0	4	7	82	64	46	27	46	39	37
		Mexico	13	13	13	13	27	35	68	37	50	70	90	86	64	91	81	93	89	68	106	86	67	72	66	60	68	51	39	43	29	44
		Namibia	0	0	0	0	0	0	0	0	3	0	5	9	57	0	50	2	23	10	0	8	36	8	32	57	84	53	51	70	8	99
		Panama	0	0	0	0	0	0	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	21	0	14	12	0	0
		Philippines	0	0	0	0	7	71	38	0	0	0	0	0	0	0	8	0	3	4	1	2	2	0	0	0	0	0	0	0	0	0
		Russian Federation	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		S Tomé e Príncipe	28	33	36	35	33	30	32	32	32	32	9	21	26	66	68	70	72	74	76	78	81	11	10	13	5	88	34	109	75	152
		Senegal	9	0	2	5	0	0	0	11	24	32	11	1	5	91	114	61	41	64	164	45	72	10	82	39	25	21	358	73	38	38
		South Africa	0	0	0	0	0	0	0	1	4	0	0	0	0	2	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0
		St Vincent and Grenadines	2	2	1	1	0	1	0	0	20	0	0	0	0	1	3	2	1	0	0	2	0	0	0	2	2	1	2	2	0	0
		Trinidad and Tobago	16	28	14	50	16	20	51	17	16	9	11	7	14	16	35	26	22	25	46	48	48	35	19	0	0	0	0	1	0	0
		UK-Bermuda	15	15	15	3	5	1	2	2	2	2	2	2	2	2	2	0	1	2	2	3	3	3	2	1	2	1	1	1	1	1
		UK-British Virgin Islands	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		UK-Sta Helena	0	2	2	1	2	4	4	3	4	1	1	2	2	3	4	2	2	2	12	2	1	1	0	0	0	0	0	0	0	0
		UK-Turks and Caicos	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		USA	88	43	43	46	50	37	24	16	17	19	26	16	17	9	13	6	4	6	14	9	1	9	19	13	20	17	17	22	22	23
		Uruguay	3	1	1	26	23	0	0	0	1	5	3	2	8	5	0	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0
		Venezuela	122	117	148	142	226	240	125	84	88	120	101	160	172	222	130	120	155	122	161	123	158	144	180	197	132	116	73	96	123	131
	NCC	Chinese Taipei	663	467	660	1478	578	486	485	240	294	319	315	151	99	233	148	195	153	199	133	78	62	61	75	73	74	40	70	76	40	58
		Guyana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	128	39	75	81	0
	NCO	Benin	5	5	5	5	5	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Cuba	39	85	43	53	12	38	55	56	34	3	4	7	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Dominica	0	0	0	0	0	0	0	64	69	75	36	44	55	58	106	76	76	60	0	0	85	62	49	74	52	45	64	54	54	57
		Dominican Republic	0	0	0	41	71	29	23	23	115	207	142	30	38	47	67	60	65	100	98	99	96	73	170	183	176	87	58	72	72	67
		Jamaica	0	0	0	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Mixed flags (FR+ES)	133	126	96	82	80	83	147	151	131	148	171	150	136	135	139	164	178	186	181	191	173	176	0	0	0	0	0	0	0	
		NEI (BIL)	0	0	0	0	0	0	53	184	258	167	89	7	160	209	205	177	0	34	0	0	0	0	0	0	0	0	0	0	0	
		NEI (ETRO)	326	362	435	548	803	761	492	274	17	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Saint Kitts and Nevis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	8	12	0	2	5	4	4
		Sta Lucia	0	0	0	4	1	0	10	5	9	18	17	21	53	46	70	72	58	64	119	99	111	53	91	134	93	82	78	61	85	0
		Togo	0	0	0	23	0	73	53	141	103	775	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	2	1	0	0	0	0	7	8	6	3	2	0	0	0	0	0	0	0	0	
Landings(FP)	CP	EU-España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	0
		EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	12
Discards		Brazil	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Canada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0
		Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	1	0	0	0
		EU-España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	0	0	1	4	3	5	7	6	80	57	55	102	71	76
		EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	1	0	0	6	11	12	9	5	5	8	7
		Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	2	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	5	8	16	8	2	15
		Korea Rep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	1	1	0	0	0	0	0	0	0	0
		Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	2	2	0	2	0	0	0
		UK-Bermuda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		USA	111	153	197	139	52	83	60	25	49	19	35	25	36	42	38	42	19	50	39	55	53	81	25	47	22	24	20	9	16	19
	NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32	0	0	24	27	26	16	22	21	20	18	13

BUM-Table 2. Kobe II matrices for Atlantic blue marlin giving the probability that $F<F_{MSY}$, $B> B_{MSY}$ and the joint probability of $F<F_{MSY}$ and $B>B_{MSY}$, between 2025 and 2034, with various constant catch (landing plus dead discards) levels based on Bayesian Surplus Production model and Stock Synthesis model base case model results.

a) Probability that $F<F_{MSY}$.

Catch (t)	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
1000	97%	98%	98%	99%	99%	99%	99%	99%	99%	99%
1250	93%	94%	95%	96%	96%	97%	97%	97%	98%	98%
1500	85%	87%	89%	90%	91%	92%	93%	94%	94%	95%
1750	74%	77%	80%	82%	84%	85%	86%	87%	88%	89%
2000	63%	66%	69%	71%	73%	75%	77%	78%	79%	80%
2250	52%	55%	58%	60%	62%	64%	66%	67%	69%	70%
2500	42%	45%	48%	50%	52%	53%	55%	56%	58%	59%
2750	35%	37%	39%	40%	42%	43%	44%	45%	46%	47%
3000	28%	30%	31%	32%	33%	34%	35%	36%	36%	37%
3250	23%	24%	24%	25%	26%	26%	27%	27%	27%	28%
3500	18%	19%	19%	19%	19%	20%	19%	20%	20%	20%

b) Probability that $B>B_{MSY}$.

Catch (t)	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
0	35%	45%	56%	65%	72%	78%	83%	86%	89%	92%
1000	32%	39%	46%	53%	59%	64%	69%	73%	76%	79%
1250	31%	37%	44%	50%	55%	60%	65%	69%	72%	75%
1500	30%	36%	41%	47%	52%	56%	60%	64%	67%	70%
1750	29%	34%	39%	44%	48%	52%	56%	59%	62%	65%
2000	29%	33%	37%	40%	44%	47%	51%	54%	56%	59%
2250	28%	31%	35%	38%	41%	43%	46%	48%	51%	53%
2500	27%	30%	32%	35%	37%	39%	41%	43%	45%	46%
2750	27%	29%	30%	32%	34%	35%	37%	38%	39%	40%
3000	26%	27%	28%	29%	30%	31%	32%	33%	34%	34%
3250	25%	26%	27%	27%	27%	28%	28%	28%	29%	29%
3500	25%	25%	25%	24%	24%	24%	24%	24%	24%	24%

c) Probability that $F<F_{MSY}$ and $B>B_{MSY}$.

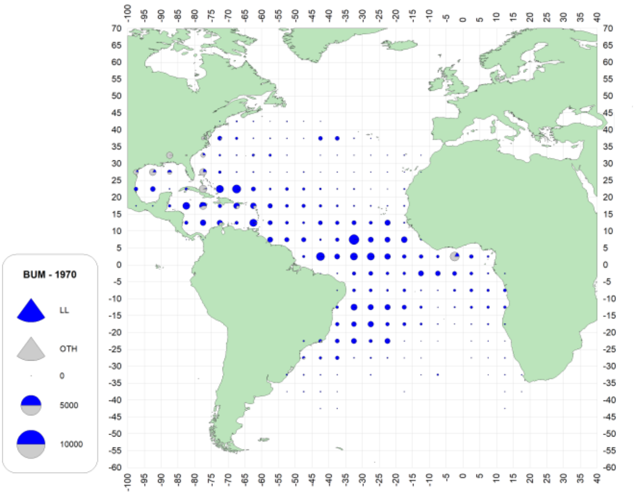
Catch (t)	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
0	35%	45%	56%	65%	72%	78%	83%	86%	89%	92%
1000	32%	39%	46%	53%	59%	64%	69%	73%	76%	79%
1250	31%	37%	44%	50%	55%	60%	65%	69%	72%	75%
1500	30%	36%	41%	47%	52%	56%	60%	64%	67%	70%
1750	29%	34%	39%	44%	48%	52%	56%	59%	62%	65%
2000	29%	33%	37%	40%	44%	47%	51%	54%	56%	59%
2250	28%	31%	35%	38%	40%	43%	46%	48%	51%	53%
2500	27%	30%	32%	35%	37%	39%	41%	43%	44%	46%
2750	26%	28%	30%	31%	33%	34%	36%	37%	38%	39%
3000	24%	25%	26%	28%	29%	30%	30%	31%	32%	32%
3250	21%	22%	22%	23%	23%	24%	24%	25%	25%	25%
3500	17%	18%	18%	18%	18%	19%	18%	19%	19%	19%

BUM-Table 3. Estimated probabilities of biomass the Atlantic blue marlin stock levels < 10% of B_{MSY}. Catch (t) scenarios include landing and dead discards. It should be noted that the reference chosen, 10% of biomass that supports MSY, was selected only for informational purposes and is not intended to be a recommendation by the SCRS as a limited reference point.

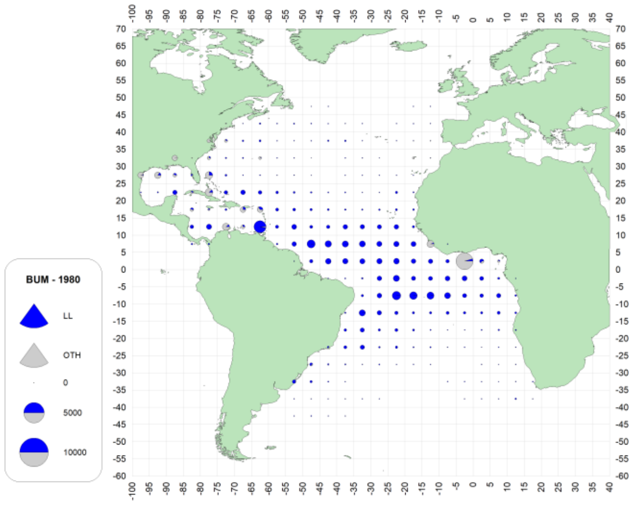
Catch (t)	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1000	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1250	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1500	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1750	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%
2000	0%	0%	0%	0%	0%	1%	1%	1%	1%	1%
2250	0%	0%	0%	0%	1%	1%	1%	2%	2%	2%
2500	0%	0%	0%	1%	1%	1%	2%	3%	3%	4%
2750	0%	0%	0%	1%	2%	2%	3%	4%	5%	6%
3000	0%	0%	1%	1%	2%	4%	5%	6%	8%	9%
3250	0%	0%	1%	2%	4%	5%	7%	9%	11%	13%
3500	0%	0%	1%	3%	5%	8%	10%	13%	16%	18%

BUM-Table 4. Estimated probabilities of biomass the Atlantic blue marlin stock levels < 20% of B_{MSY}. Catch (t) scenarios include landing and dead discards. It should be noted that the reference chosen, 20% of biomass that supports MSY, was selected only for informational purposes and is not intended to be a recommendation by the SCRS as a limited reference point.

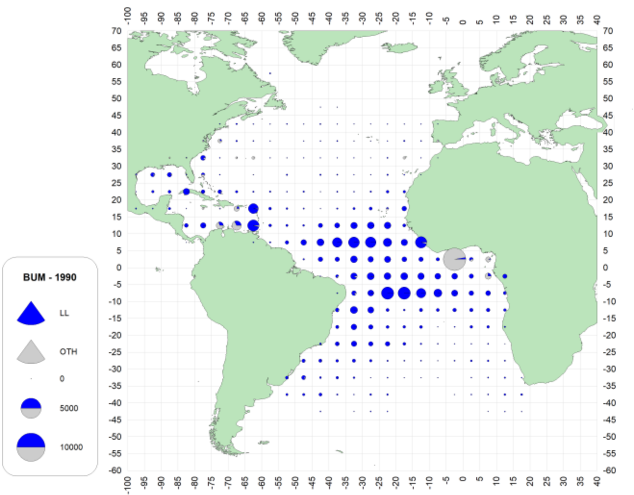
Catch (t)	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1000	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1250	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1500	0%	0%	1%	1%	1%	1%	1%	1%	1%	1%
1750	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
2000	1%	1%	1%	1%	1%	2%	2%	2%	2%	2%
2250	1%	1%	1%	2%	2%	2%	3%	3%	3%	4%
2500	1%	1%	2%	2%	3%	3%	4%	5%	5%	6%
2750	1%	1%	2%	3%	4%	5%	6%	7%	8%	9%
3000	1%	2%	3%	4%	5%	7%	8%	10%	11%	13%
3250	1%	2%	3%	5%	7%	9%	11%	13%	15%	17%
3500	1%	2%	4%	7%	9%	12%	15%	18%	20%	23%



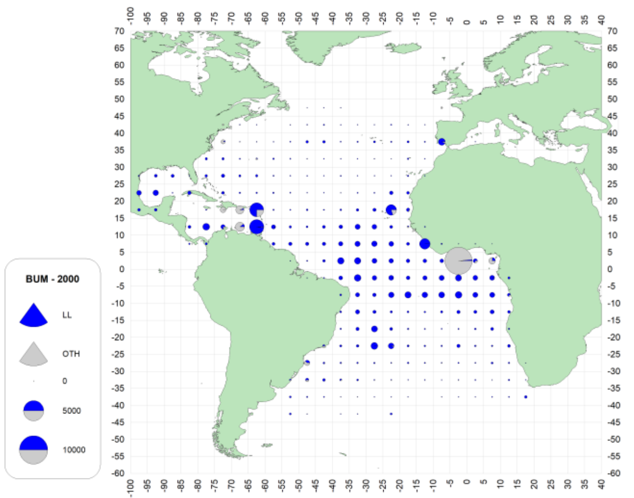
a) BUM (1970-79)



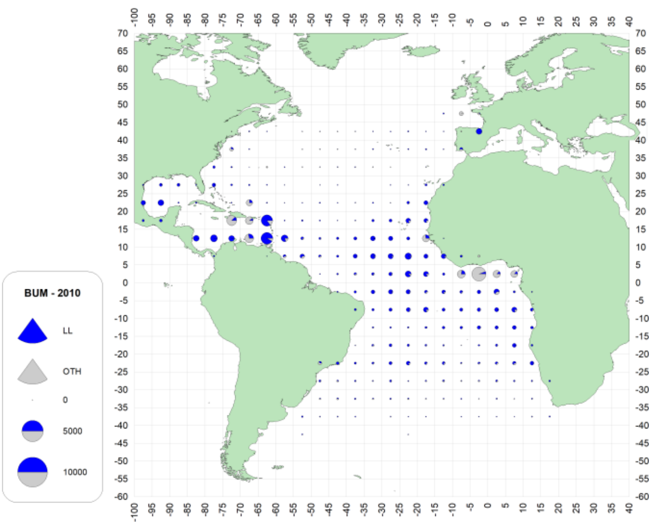
b) BUM (1980-89)



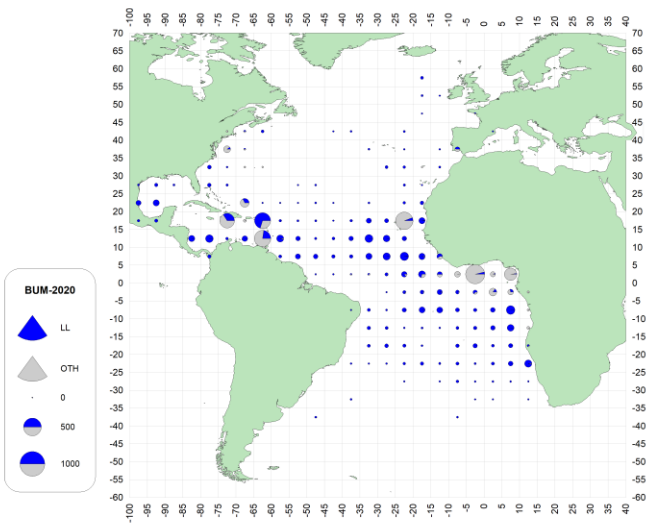
c) BUM (1990-99)



d) BUM (2000-09)

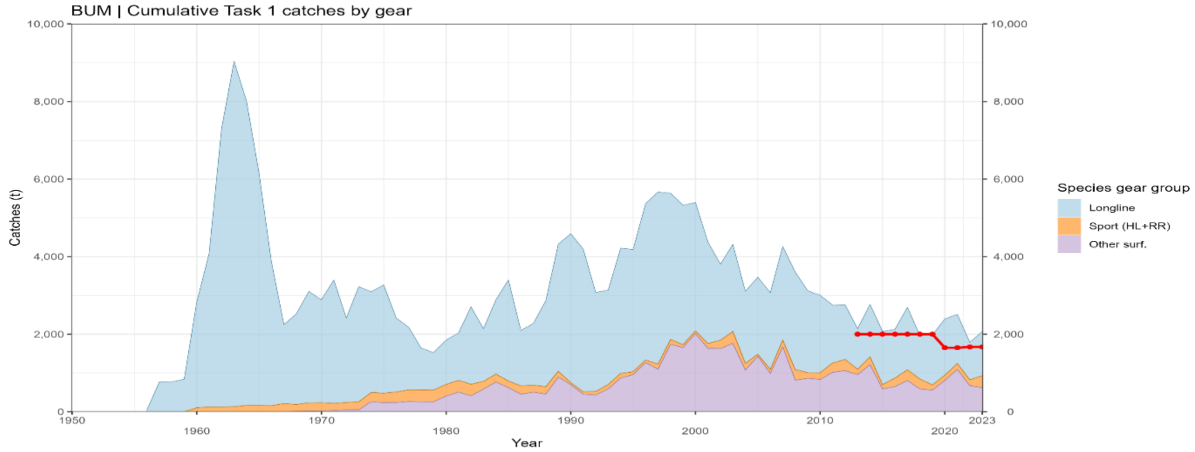


e) BUM (2010-19)

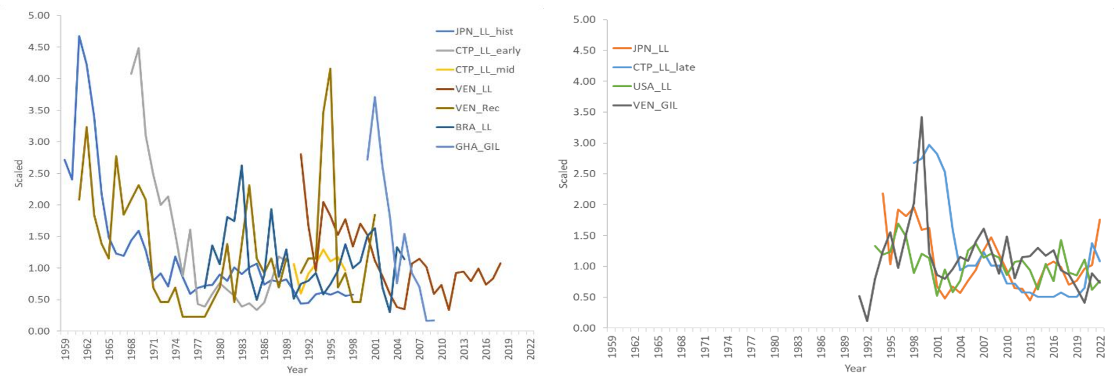


f) BUM (2020-22)

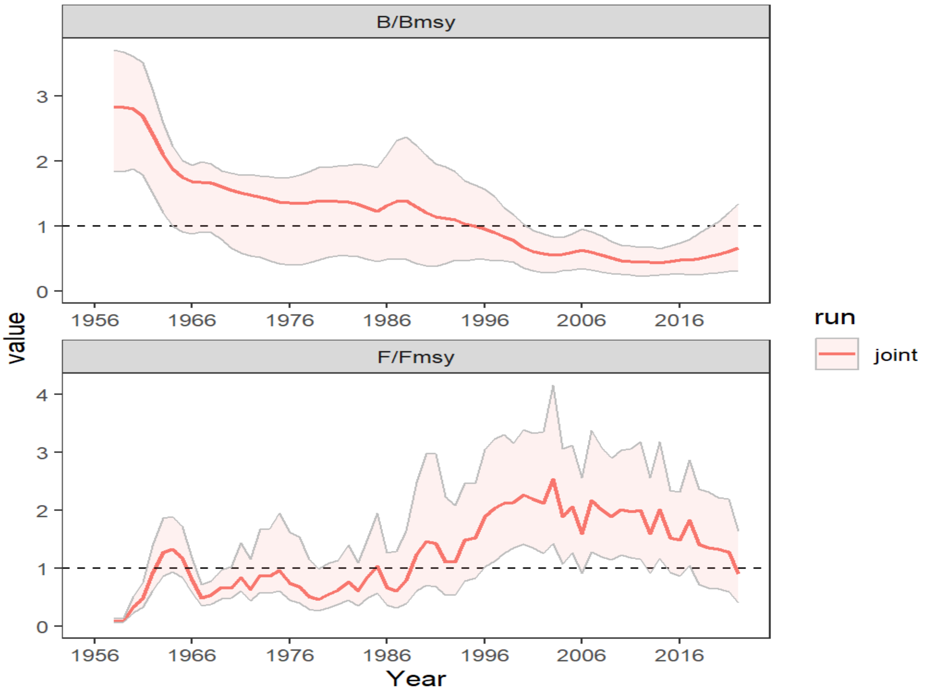
BUM-Figure 1. Geographic distribution of blue marlin total catches by decade (last decade only covers 3 years).



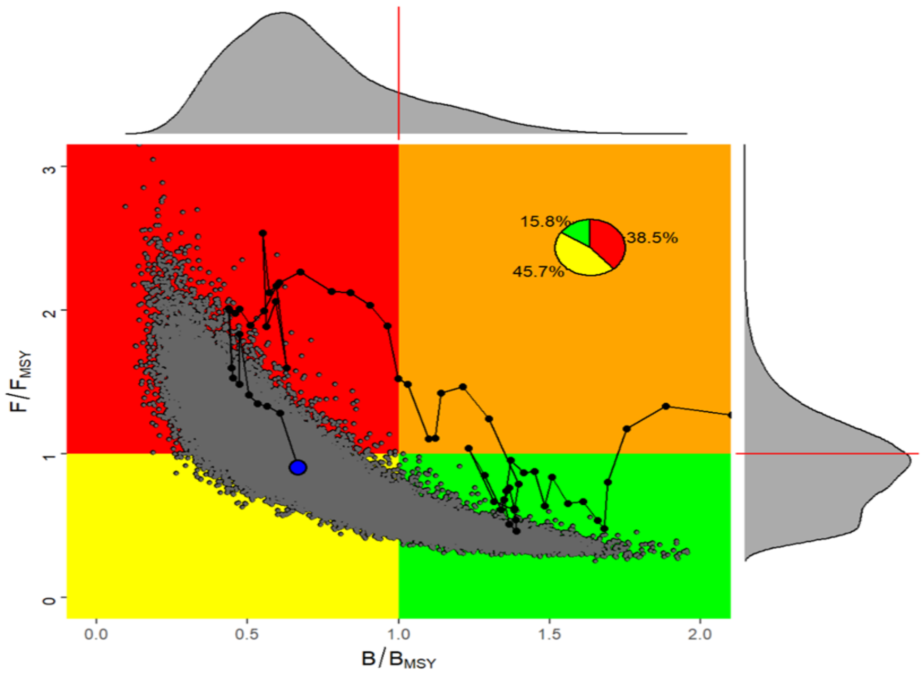
BUM-Figure 2. Atlantic blue marlin (*Makaira nigricans*) Task 1 catches (landings + dead discards) (t) by gear type between 1950 and 2023. The dotted red line indicates the landings limit for the stock.



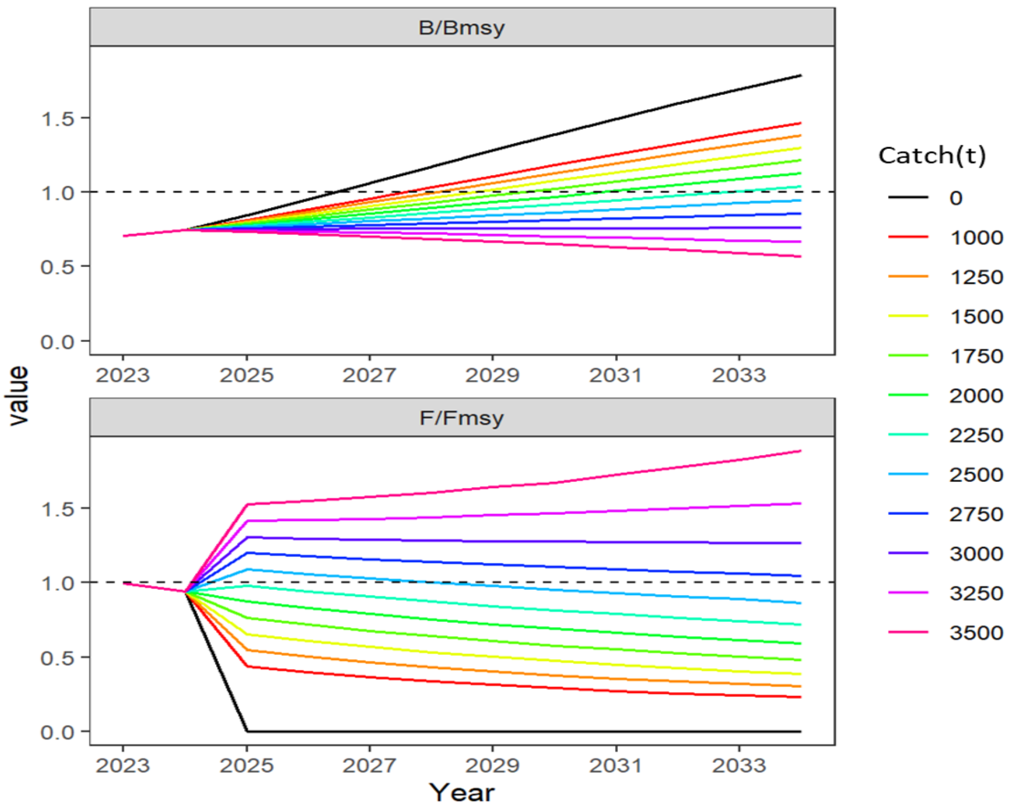
BUM-Figure 3. Plots of the indices of abundance used in the 2024 blue marlin stock assessment.



BUM-Figure 4. Annual trends of relative biomass (B/B_{MSY}) and fishing mortality (F/F_{MSY}) from the final combined grid model scenarios for Atlantic blue marlin. The dark line indicates the mean of all scenarios, and the shaded area the overall 95% confidence bounds of the results.



BUM-Figure 5. Combined Kobe plots for the final base cases of the Bayesian Surplus Production model and Stock Synthesis model for the Atlantic blue marlin.



BUM-Figure 6. Joint projection: Trends of projected relative stock biomass (upper panel, B/B_{MSY}) and fishing mortality (bottom panel, F/F_{MSY}) for Atlantic blue marlin under different fixed catch (landings plus dead discards) scenarios of 0–3,500 t, based upon the projections of both JABBA and Stock Synthesis grids. Each line represents the median of 80,000 iterations by projected year.

9.10 WHM - White marlin

The most recent assessment for white marlin was conducted in 2019 through a process that included a 2019 White Marlin Data Preparatory Meeting (12-15 March 2019) (ICCAT, 2019b) and 2019 White Marlin Stock Assessment Meeting (10-14 June 2019) (ICCAT, 2020b). The last year of fishery data used in the assessment was 2017.

WHM-1. Biology

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

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

White marlin inhabits the surface mixed layer of the open ocean. Although they spend about 50% of daylight hours and 81% of nighttime hours in the warmer waters of the mixed surface layer, they do explore temperatures ranging from 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 catch per unit effort (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. The Committee reviewed recent scientific nomenclature for billfish (Collette *et al*., 2006) and adopted the scientific name of *Kajikia albida* (Poey, 1860) for white marlin in ICCAT.

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 1 catches as the basis for the estimation of total removals (**WHM-Figure 2**). Total removals for the period 1990-2017 were obtained during the 2019 White Marlin Stock Assessment Meeting (ICCAT, 2020b) by modifying Task 1 values with the addition of white marlin that the Committee estimated from catches reported as billfish unclassified. The dead discards were estimated for those longline fleets that have not reported dead discards (2010-2018) based on data from fleets that had reported dead discards.

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.

Preliminary Task 1 catches of white marlin and roundscale spearfish, as well as the combined WHM/roundscale spearfish (RSP) Task 1 used in the stock assessment is presented in **WHM-Table 1**. For combined white marlin and roundscale spearfish the catches in 2019, 2020, 2021, 2022 and 2023 were 287, 223, 178, 164 and 204 t respectively, compared to 265 t reported for 2018. Landings for 2023 are preliminary.

A series of indices of abundance for white marlin were presented and discussed during the 2019 White Marlin Data Preparatory Meeting (ICCAT, 2019b) and the 2019 White Marlin Stock Assessment Meeting (ICCAT, 2020b). Following the guidelines developed by the SCRS Working Group on Stock Assessment Methods (WGSAM), 14 catch per unit effort (CPUE) series were available and 13 selected for their inclusion in the final assessment models. In general, the indices showed no discerning trend during the latter part of the time series examined (**WHM-Figure 3**). During the 2019 stock assessment, all standardized CPUE indices for white marlin showed a sharp decline during the period 1960-1991, and variables patterns and no consistent trend among indices thereafter (**WHM-Figure 3**).

WHM-3. State of the stock

A full stock assessment was conducted for the combined white marlin/roundscale spearfish in 2019, applying to the available data through 2017, using both surplus production and age-structured models, which included estimations of management benchmarks. As recommended by the Committee in 2010, the model configuration was an effort to use all available data on white marlin, including lengths, dimorphic growth patterns, steepness 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 catch data and some of the biological parameters of their life history. The uncertainty of the magnitude of the catch is especially a problem with the landings and discards data reported after 1998 when recommendations promoting or mandating the release of 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 led 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 Committee addressed this issue by including estimates of dead discards for the longline fisheries.

The results of the 2019 assessment indicated that the stock of Atlantic white marlin was overfished but not undergoing overfishing (**WHM-Figure 4**). The probability of being in the red quadrant of the Kobe plot was estimated to be 1%. The probability of being in the yellow quadrants of the Kobe plot was estimated to be 99% and that of being in the green quadrant less than 1%. The estimated MSY was determined to be 1,495 t with approximate 95% confidence intervals of 1,316 t-1,745 t.

Generally, all models estimated similar annual trends and values of both B/B_{MSY} and F/F_{MSY}. Relative fishing mortality has been declining since the late 1990s and is now most likely to be below F_{MSY} (**WHM-Figure 5**). Relative biomass has probably stopped declining over the last ten years prior to the assessment, but still remains well below B_{MSY} (**WHM-Figure 5**). There is considerable uncertainty in these results. These results are conditional on the reported catch being a true reflection of the fishing mortality experienced by white marlin. The Committee reiterated that this evaluation is for both stocks of white marlin and roundscale spearfish, and that the presence of unknown quantities of roundscale spearfish in the catches and data used to estimate relative indices of abundance increases the uncertainty of white marlin stock status and outlook for this species.

WHM-4. Outlook

All assessment models estimated that the stock has been less productive than usual (e.g. lower recruitment) since the 1990s, which can be observed in **WHM-Figure 5** wherein relative biomass has not increased by much despite relative fishing mortality having declined considerably over that time period. Projections were carried out using the assessment models, but those projections assumed higher productivity into the future. This resulted in projections of the stock building quickly in the future, responding with much more productivity in the future than has been observed for the past two decades, even when the same levels of catch are assumed into the future as have been experienced by the stock in the past 20 years.

As such, the Committee considered the projections to be overly optimistic and did not support their use to develop Kobe strategy matrices.

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. In 2019, the Commission further strengthened the plan to rebuild white marlin stock by imposing a landings limit to 335 t for white marlin/spearfish (Rec. 19-05).

The Committee is concerned with the significant increase in the contribution from fishing by artisanal and small-scale fleets to the total white marlin harvest and that these fisheries are not fully accounted for in the current ICCAT statistics. 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 about 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.

Currently, ICCAT Rec. 22-12 and four ICCAT Contracting Parties (Brazil, Canada, Mexico, and the United States) mandate or encourage the use of circle hooks on their pelagic longline fleets. Research has demonstrated that in some longline fisheries the use of non-offset circle hooks resulted in a reduction of billfish mortality, while the catch rates of several of the target species remained the same or were greater than the catch rates observed with the use of conventional J hooks or offset circle hooks.

The Committee 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

The Committee notes that Rec. 19-05 states "An annual limit of [1,670 t for blue marlin and] 335 t for white marlin/roundscale spearfish".

In 2012, the Commission adopted Rec. 12-04, intended to reduce the total harvest to 400 t in 2013-2015 to allow the rebuilding of the white marlin stock from the overfished condition. Subsequently, the Commission extended the 400 t annual catch limit to 2016-2018 (Rec. 15-05), 2019 (Rec. 18-04), and in 2019 (Rec. 19-05) established a landings limit of 335 t. Although there is some evidence of slow rebuilding in recent years, the Committee noted that catches have exceeded the 400 t landings limit in every year since its initial implementation and warns that if catches continue to exceed the landings limit, the rebuilding of the stock will proceed more slowly, or be put at risk of further declines. Further reductions in fishing mortality are likely to speed up the rebuilding of the stock. Unfortunately, the inability to accurately estimate fishing mortality will continue to compromise the Committee's ability to predict and monitor the stock's recovery period. This is due to the inadequate reporting of discards, as well as the lack of reports from some artisanal and recreational fisheries that take marlin species.

- Measures should be taken to ensure that monitoring and reporting of all landings and discards, including live releases, are appropriate, accurate, and complete. This will likely require improvements to the observer programmes of many CPCs, as well as the implementation of discard estimation methods using those data.

- Efforts should be made, building on previous work, to fully account for the catches of artisanal and all recreational fisheries.

Given the overfished status of the stock and the uncertainties in the data, including for both total removals and indices of abundance:

- the Commission, at the minimum, should ensure that catches do not exceed current TAC until the stock has fully recovered.

Given that experimental research has demonstrated that in longline fisheries the use of circle hooks resulted in a reduction of marlin catch rates and haulback mortality, and noting that they have different impacts on both target and bycatch species; then to reduce the chance of exceeding any established landings limit or TAC, the Commission should consider:

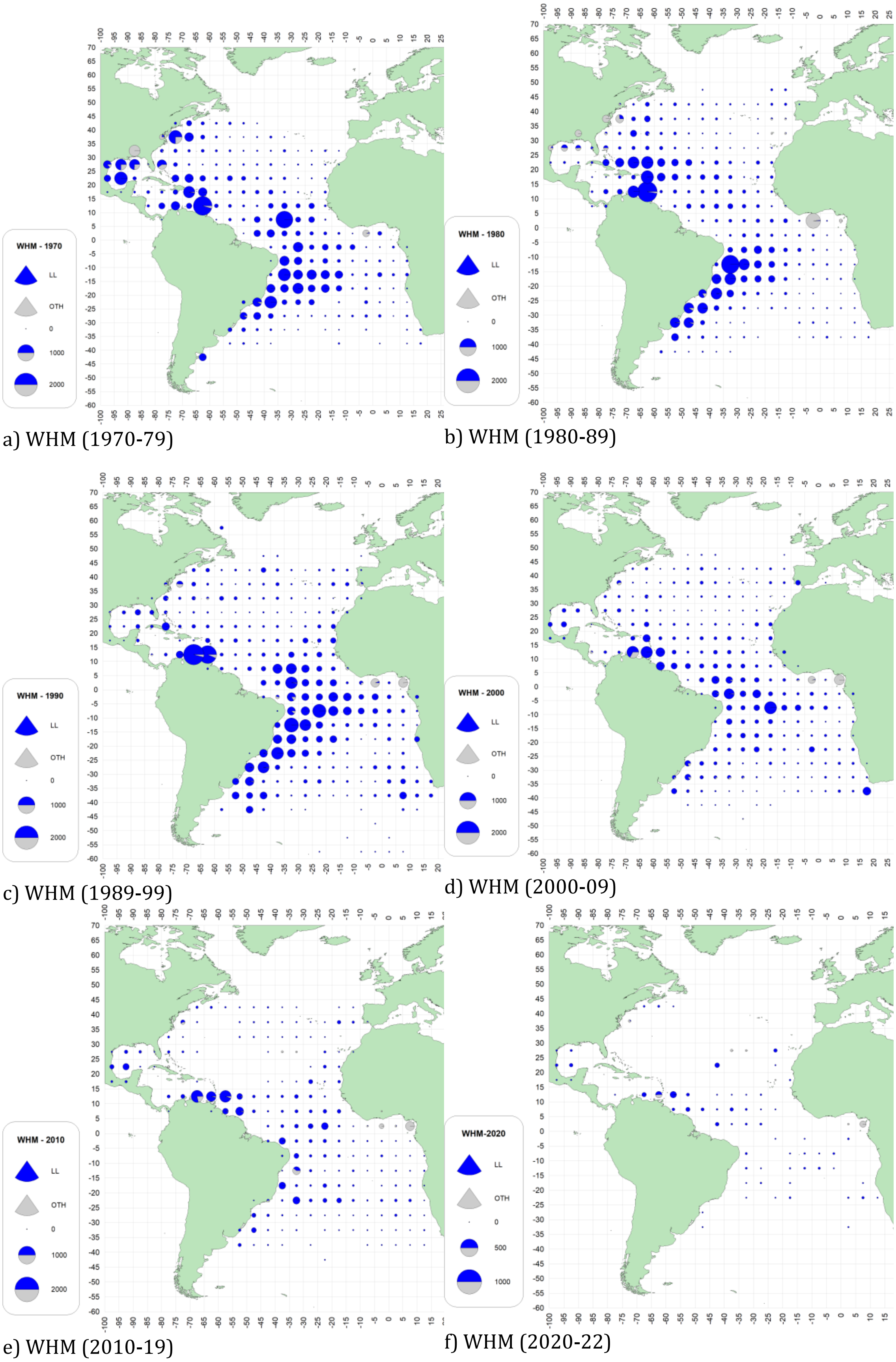
- the use of non-offset circle hooks,
- the release of all marlins that are alive at haul back in ways that maximize their survival.

ATLANTIC WHITE MARLIN/ROUNDSCALE SPEARFISH SUMMARY TABLE	
MSY	1,495 (1,316 – 1,745) t[1]
Current (2023) Yield	204 t [2]
Relative Biomass: B_{2017}/B_{MSY}	0.58 (0.27-0.87)[1]
Relative Fishing Mortality: F_{2017}/F_{MSY}	0.65 (0.45-0.93)[1]
Stock Status (2017)	Overfished: Yes [99% prob][3] Overfishing: Not [99% prob][3]
Conservation and Management Measure in Effect:	Rec. 18-04 and Rec. 19-05. Landing limit of 335 t beginning in 2020 Minimum size for recreational fisheries (168 cm Lower Jaw Fork Length (LJFL))

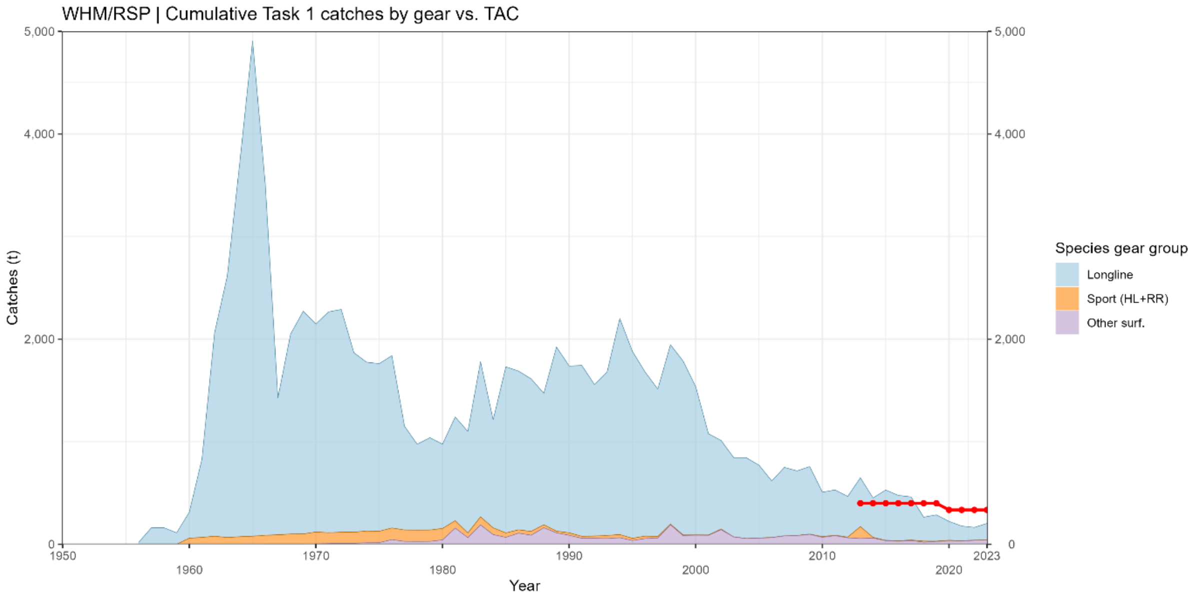
[1] Median of combined estimates from 2 Stock Synthesis models and 1 JABBA model with approximate 95% confidence intervals.
[2] 2023 yield should be considered provisional.
[3] Based on the Kobe plot probability by quadrant.

WHM+RSP-Table 1. Estimated catches (t) of Atlantic white marlin (*Kajikia albida*) and roundscale spearfish (*Tetrapturus georgii*) by area, gear, and flag.

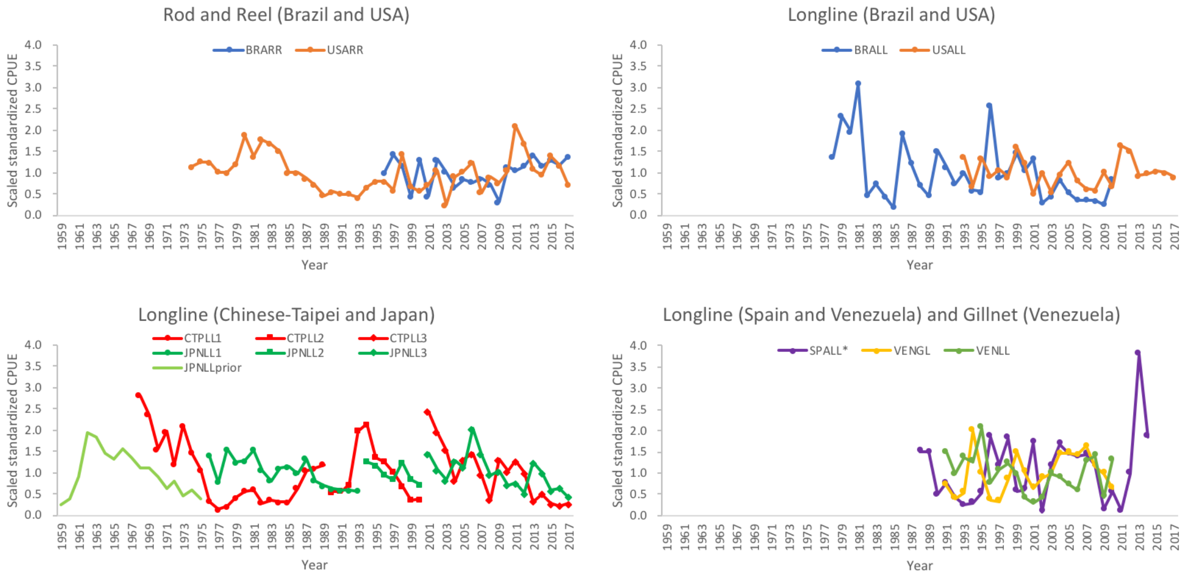
			1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
TOTAL	A+M		2202	1880	1679	1513	1945	1786	1535	1078	1012	845	843	770	618	749	716	757	508	530	467	648	452	529	477	462	265	287	223	178	164	204
Landings		Longline	2065	1720	1535	1367	1717	1638	1403	970	834	756	759	692	538	631	608	634	421	414	373	465	373	481	434	408	200	196	175	136	120	145
		Other surf.	64	36	56	62	189	85	89	86	139	71	55	60	65	81	84	95	68	85	62	56	61	35	29	36	20	27	31	31	38	39
		Sport (HL+RR)	30	22	24	14	6	6	2	4	6	1	1	1	2	1	2	2	6	4	6	116	7	3	4	5	10	3	7	3	2	6
Discards		Longline	43	101	65	70	32	57	41	17	30	17	27	17	12	36	21	24	12	27	24	11	11	10	9	12	34	60	10	8	4	13
		Other surf.	0	0	0	0	1	0	0	1	4	0	0	0	0	0	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Landings	CP	Barbados	26	43	15	41	33	25	25	24	15	15	18	16	33	22	24	26	6	3	5	6	6	10	14	17	22	12	14	10	10	8
		Belize	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Brazil	91	105	75	105	217	158	106	172	407	266	80	244	90	52	55	53	35	75	71	352	102	121	67	47	62	76	46	0	0	17
		Canada	4	4	8	8	8	5	5	3	2	1	2	5	3	2	2	1	2	1	2	3	5	3	1	2	1	1	1	2	1	1
		China PR	9	11	9	11	15	30	2	20	23	8	6	9	6	10	5	9	8	3	4	2	0	0	0	3	2	3	2	2	2	2
		Costa Rica	0	0	0	0	0	3	14	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0
		Côte d'Ivoire	0	0	1	2	1	5	1	2	2	3	1	1	1	1	3	2	1	1	0	1	1	1	1	1	1	0	0	0	1	1
		EU-España	26	36	151	93	101	119	186	61	6	22	64	58	51	46	35	16	113	5	35	42	99	125	96	118	11	11	44	56	47	15
		EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1
		EU-Portugal	0	0	0	0	1	1	0	0	1	5	19	30	22	2	35	40	11	18	25	10	9	7	11	13	0	0	1	9	1	4
		El Salvador	0	0	0	0	0	0	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	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Ghana	1	2	1	3	7	6	8	21	2	1	1	1	0	1	4	4	3	1	1	1	1	1	1	0	0	0	0	0	0	0
		Grenada	0	0	0	0	0	0	1	15	8	14	33	10	12	11	17	14	0	0	0	0	0	37	15	9	11	19	14	1	5	7
		Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Honduras	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Japan	92	57	112	58	56	40	83	56	16	33	36	34	39	21	34	43	41	31	42	24	6	8	9	10	6	11	7	8	3	11
		Korea Rep	43	23	59	23	35	39	0	0	0	11	40	7	0	113	96	78	43	43	0	0	0	0	0	0	0	0	0	0	0	0
		Liberia	0	0	1	1	3	8	4	3	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	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	1	0	0	0	0	0
		Mexico	7	11	3	1	3	6	11	13	16	15	28	25	16	14	14	19	20	28	36	30	20	26	20	12	16	9	10	12	8	8
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Philippines	0	0	0	0	1	12	0	0	0	0	0	0	0	0	1	1	2	2	1	2	2	0	0	0	0	0	0	0	0	0
		S Tomé e Príncipe	21	21	30	45	40	36	37	37	37	37	21	33	29	35	36	37	38	39	40	41	42	17	15	13	1	10	11	20	27	54
		Senegal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0
		South Africa	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2	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	1	0	44	0	0	0	0	0	0	0	0	0	0	0	0	0	8	8	5	9	0	0	1
		Trinidad and Tobago	11	18	8	32	10	13	4	2	5	12	6	6	5	12	10	11	15	14	39	33	38	32	20	0	0	0	0	0	0	0
		UK-Bermuda	1	1	1	1	1	1	0	0	0	0	1	1	1	1	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	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		USA	13	7	12	8	5	5	1	3	6	1	1	1	1	0	2	2	2	2	1	4	2	3	1	2	3	2	6	2	2	1
		Uruguay	3	0	1	24	22	16	21	20	1	9	2	5	9	3	6	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0
		Venezuela	236	286	270	177	310	228	178	182	215	168	138	159	196	133	64	130	118	160	123	78	99	120	184	187	78	64	44	42	53	59
	NCC	Chinese Taipei	1350	907	566	441	506	465	437	152	178	104	172	56	44	54	38	28	20	28	15	7	7	10	10	5	6	2	2	4	1	1
	NCO	Cambodia	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Cuba	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Mixed flags (FR+ES)	11	9	7	7	9	8	12	13	12	13	13	11	10	9	10	12	12	37	0	0	0	0	0	0	0	0	0	0	0	
		NEI (BIL)	0	0	0	0	0	0	34	77	4	30	134	42	37	170	204	199	0	11	0	0	0	0	0	0	0	0	0	0	0	
		NEI (ETRO)	214	237	285	359	526	499	322	180	11	9	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	0	0	0	0	0	0	0	0	2	1	1	1	0	1	1	0	1	0	0	
		Togo	0	0	0	0	0	1	1	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Discards	CP	Brazil	0	0	0	0	0	0	0	0	0	0	0	0	2	19	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Canada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	1
		EU-España	0	0	0	0	0	0	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-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		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	2	1	1	0	0	1
		Korea Rep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0
		Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		UK-Bermuda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		USA	42	100	65	70	33	58	41	18	33	17	27	17	10	8	10	14	8	23	21	10	11	8	3	5	2	2	1	1	1	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	0	26	54	1	0	0	10
	NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	2	2	1	3	3	1	1	0
	NCO	NEI (BIL)	1	1	0	0	0	0	1	0	0	0	0	0	1	10	11	11	2	2	2	1	0	0	4	6	3	0	3	2	0	



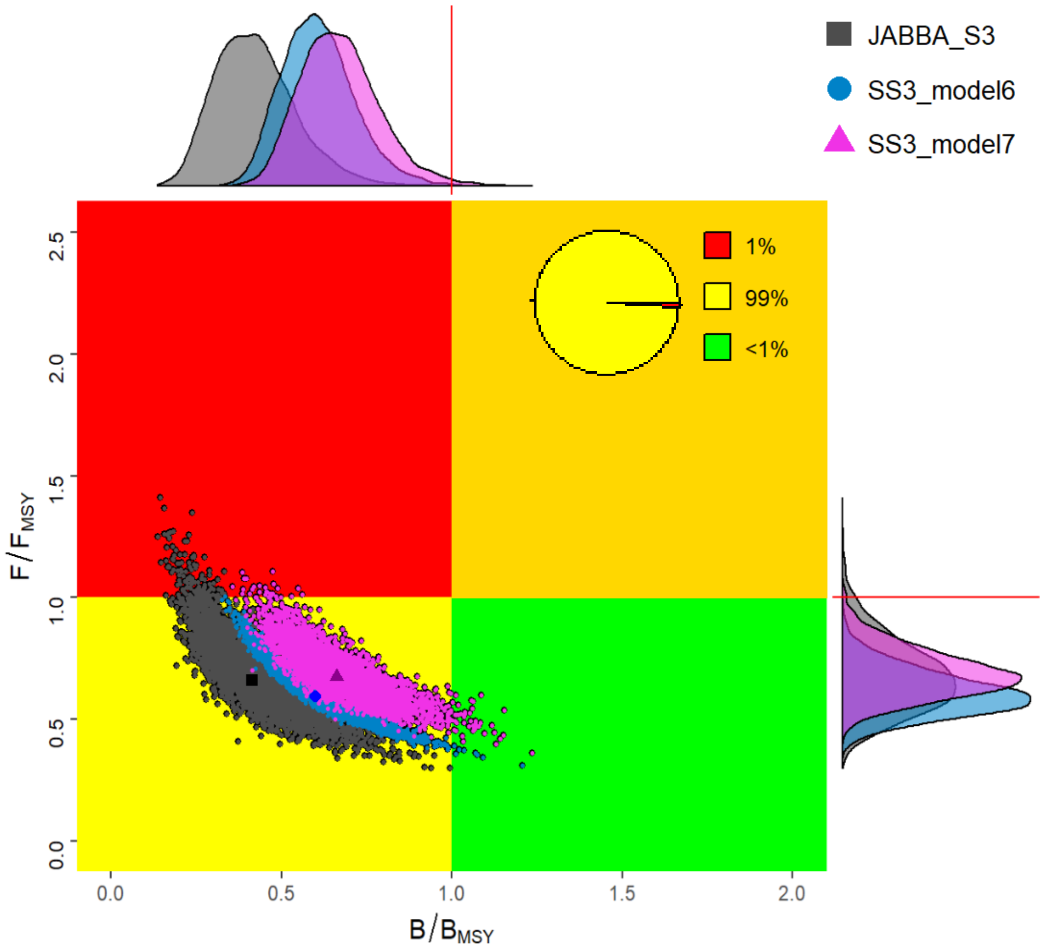
WHM-Figure 1. Geographic distribution of white marlin total catches by decade (last decade only covers 3 years).



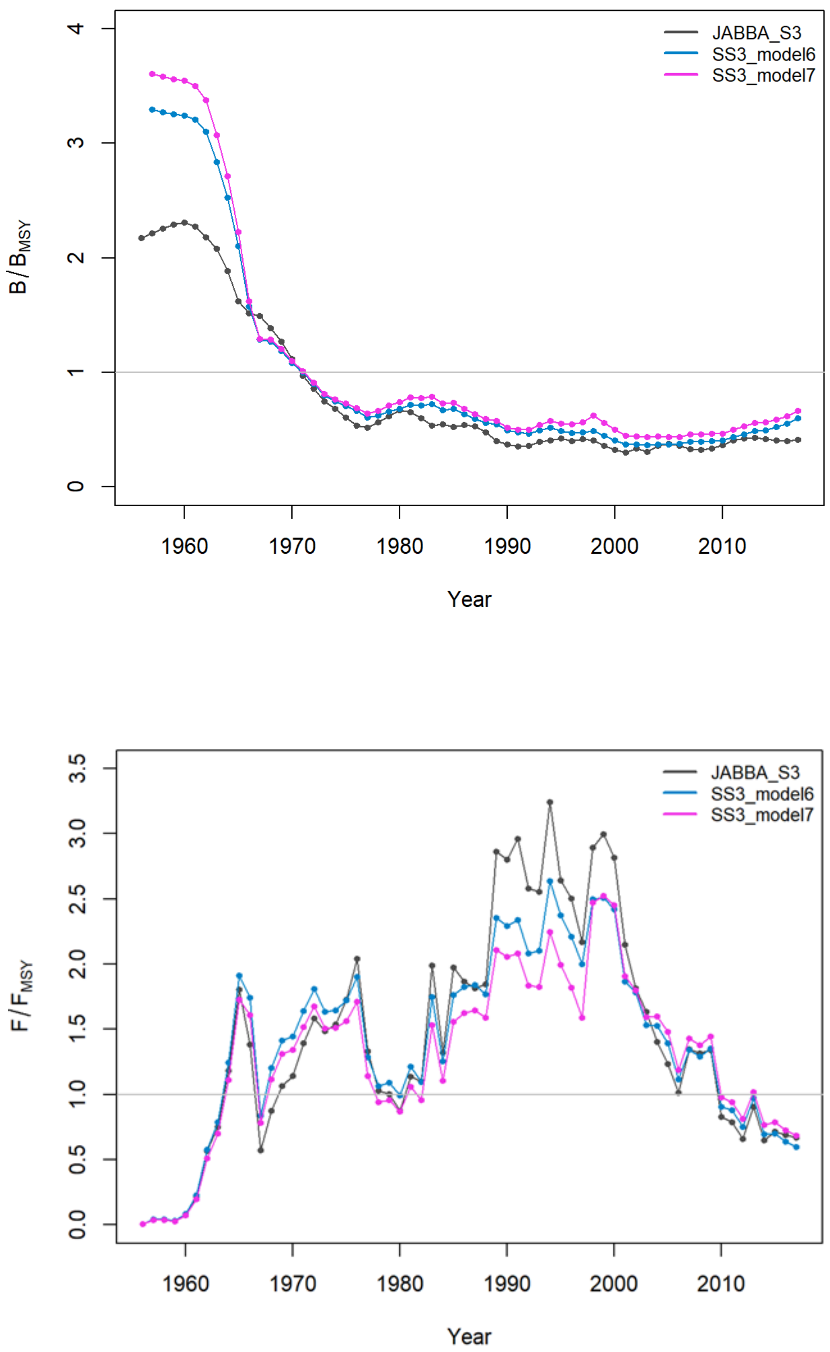
WHM-Figure 2. Total catch of white marlin and roundscale spearfish reported in Task 1 for the period 1956-2023. The dotted red line represents the landing limits.



WHM-Figure 3. Standardized CPUE series used in the 2019 white marlin stock assessment. Spanish longline index* is used only for sensitivity analysis by JABBA.



WHM-Figure 4. Combined Kobe phase plots and pie chart from 2 Stock Synthesis runs (models 6 and 7, blue and pink, respectively) and 1 JABBA run (grey) in 2019 Atlantic white marlin stock assessment. 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 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) are individual probabilities of Stock Synthesis and JABBA runs overlaid.



WHM-Figure 5. Historical estimates of biomass over biomass at MSY ratio (upper panel) and fishing mortality overfishing mortality at MSY ratios (lower panel) for the final base cases of JABBA (S3, black) and Stock Synthesis (models 6 and 7, blue and pink, respectively) models for the Atlantic white marlin.

9.11 SAI - Sailfish

The most recent stock assessments for East and West sailfish were conducted in the 2023 Atlantic Sailfish Data Preparatory and Stock Assessment Meeting (ICCAT, 2023b) held in June 2023 using catch data available to 2021, through a process that included a single meeting for the data preparatory and stock assessment. The previous stock assessment was conducted in the 2016 Sailfish Stock Assessment Meeting (ICCAT, 2017b) held in June 2016.

SAI-1. Biology

Sailfish have a mainly pan-tropical distribution in the Atlantic Ocean, with occasional catches reported from temperate waters. Based on life history information, migration rates, and geographic distribution of catch, ICCAT has established two management units for sailfish, eastern and western Atlantic stocks (**SAI-Figure 1**). However, two recent studies using mitogenome and genome-wide genetics for sailfish showed measured genetic differences between the Atlantic and the Indo-Pacific areas but not within the Atlantic, suggesting there is a single panmictic sailfish genetic stock in the Atlantic. The lack of evidence of a single stock in the current conventional tagging data warrants the need for deployment of electronic tags throughout the potential mixing range of Atlantic sailfish.

Sailfish are more coastally oriented than other billfish species. Conventional tagging data suggest they move shorter distances than the other billfish (**SAI-Figure 2**). Temperature preferences for adult sailfish appear to be in the range of 25-28°C. Sailfish generally seek out the warmest water available, and electronic tagging studies indicate that about 96% of darkness, 86% of twilight, and 82% of daylight hours are spent near the surface (Hoolihan *et al*., 2011). Vertical habitat use is more complex however, with frequent short duration excursions to deeper depths in excess of 100 m, with some dives as deep as 350 m.

Sailfish grow rapidly and reach a maximum size of around 160 cm for males and 220 cm for females, with a mean maximum age of at least 12 years. Estimates of length at 50% maturity (L50) are currently available for western Atlantic sailfish (146 cm Lower Jaw Fork Length (LJFL) for females and 135 cm LJFL for males); no values are available for eastern Atlantic sailfish.

Sailfish spawn over a wide area and year around. For the western stock, evidence of spawning has been detected in the Straits of Florida, and off the Venezuelan, Guyanese, and Surinamese coasts. In the southwestern Atlantic, spawning has been confirmed 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. In the western Atlantic, 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 are captured to a lesser extent as bycatch in longline and purse seine fisheries (**SAI-Figure 3**). 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**).

Several standardized CPUE data series were available in 2023 for the Atlantic sailfish stock assessment. For the eastern Atlantic stock, the indices of abundance used were: Senegal artisanal, Chinese Taipei longline, Japan longline (early and late), EU-Portugal longline, and EU-Spain longline. For the western Atlantic stock, the indices used were: Brazilian longline, Chinese Taipei longline, Japanese longline (early and late), EU-Spain longline, US longline observer, Venezuelan longline, and Venezuelan rod & reel (**SAI-Figure 4**). For both stocks, some of the available CPUE time series showed a decreasing trend while others showed an increasing trend. Therefore, there were clear conflicting trends among the indicators of stock abundance (**SAI-Figure 4**).

East Atlantic

The eastern stock is exploited by surface fisheries, mainly artisanal gillnet and troll, and to a lesser degree by purse seine, as well as longline and recreational fisheries. The main surface fisheries are carried out by the artisanal fleets of Côte d'Ivoire, Ghana and Senegal, followed by the industrial scale EU fleets (France and Spain) in the Gulf of Guinea and the waters of the tropical eastern Atlantic. The main longline fleets are EU-Spain, Japan, and Chinese Taipei fleets which operate in the central, eastern and western Atlantic. Total reported landings, increased abruptly after 1973, to peak above 5,000 t in 1975-1976, remaining relatively high (>2000 t), largely due to the incorporation of artisanal fishing effort by the traditional surface (gillnet and troll) fisheries (**SAI-Table 1**; **SAI-Figure 3a**). A generally decreasing trend in catch is apparent since 2008, mainly due to a decreased catch by the surface fisheries (gillnet and purse seine) (**SAI-Figure 3a**). Preliminary Task 1 catches of eastern sailfish in 2023 were 1,293 t, compared to 1,176 t reported for 2022 (**SAI-Table 1**).

West Atlantic

The western stock is exploited by longline, recreational fisheries, and by artisanal surface fisheries, drift gillnet and longline. The main longline fleets include Brazil, EU-Spain, Panama, Venezuela and Grenada, which operate in the western and central Atlantic. The main surface fisheries are carried out by the artisanal longline fleets of Grenada and Venezuela in the Caribbean Sea and waters of the tropical western Atlantic, and those artisanal fleets operating around anchored fish aggregating devices (FADs) like those of Martinique and Guadalupe and the Dominican Republic.

Total reported landings steadily increased since 1960 to peak at 2,060 t in 2002 (**SAI-Figure 3b**). A steep decreasing trend of catch is observed from 2005, mainly due to a variable decreased catch by the surface (artisanal drift-gillnet) fisheries. Preliminary Task 1 catches of western sailfish in 2023 were 1,149 t, compared to 1,070 t reported for 2022 (**SAI-Table 1**).

Although there has been progress, historical catches of unclassified billfish continue to be reported to the Committee, confounding sailfish catch estimates. 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 continues to be underreported. This also seems to be the case in recent times where more and more fleets encounter sailfish as bycatch or direct targeting.

SAI-3. State of the stocks

Compared to the 2016 Sailfish Stock Assessment (ICCAT, 2017b), during the 2023 assessment further progress was made on the integration of new data sources, in particular standardized catch rate data, size data, and modeling approaches. For both stocks (East and West), uncertainty in data inputs and model configuration continued to be explored through sensitivity analysis. Conflicting trends in the available CPUEs challenged a clear interpretation of trends in abundance; results were sensitive to CPUEs included in the model.

East Atlantic

For the SAI-E stock, a single assessment platform was used for the stock assessment; Just Another Bayesian Biomass Assessment (JABBA), a Bayesian Surplus Production based model. The trajectories of B/B_{MSY} and F/F_{MSY} are shown in **SAI-Figure 5**. The stock was determined to be not overfished with B_{2021}/ B_{MSY} = 1.83 (1.14 - 2.88), and not undergoing overfishing, with F_{2021}/ F_{MSY} = 0.362 (0.212-0.585). The Kobe phase plot shows a typical anti-clockwise trajectory, with the stock status moving from underexploited through a period of unsustainable fishing to the overexploited phase and then to the recovery phase after a decrease in fishing mortality. The resultant stock status for 2021 has a 99% probability of being in the green quadrant of the Kobe phase plot, indicating that the stock is not overfished nor undergoing overfishing (**SAI-Figure 6**).

The Committee recognizes that there has been a substantial change in the stock status compared to the last stock assessment. This change can mainly be attributed to improved estimates of the life history parameters for the East sailfish stock. However, other factors may also contribute to this change including, the lack of some of the indices of abundance from small-scale fisheries (i.e. Côte d'Ivoire and Ghana).

West Atlantic

During the data preparatory and stock assessment meeting, the Committee agreed to combine the results from both JABBA and Stock Synthesis models to determine stock status and to conduct projections to estimate the Kobe II Strategic Matrix (K2SM). However, post-meeting examination of the Stock Synthesis results identified issues with the model solution that could not be addressed in time for the results to be presented here and included in the management advice. Therefore, the state of the stock for West Atlantic sailfish is based on the JABBA model runs.

The Bayesian surplus production model JABBA was applied. The trajectories of B/B_{MSY} and F/F_{MSY} are shown in **SAI-Figure 7**. The stock was determined to be overfished with B_{2021}/ B_{MSY} = 0.96 (0.59-1.49), but not undergoing overfishing with F_{2021}/ F_{MSY} = 0.585 (0.364-0.952). The Kobe phase plot shows a typical anti-clockwise trajectory, with the stock status moving from underexploited through a period of unsustainable fishing to the overexploited phase and then to the recovery phase after a decrease in fishing mortality (**SAI-Figure 8**). The resultant stock status in 2021 for the final model has a 57% probability of being overfished but not subject to overfishing (i.e. yellow quadrant of the Kobe phase plot). There is a 98% probability that the stock is not undergoing overfishing.

SAI-4. Outlook

East Atlantic

The Committee conducted JABBA stochastic stock projections for the SAI-E stock with eleven constant catch scenarios (0; 1,000 – 3,000 t with 250 t interval; 2,336 t MSY level). The annual medians of relative B/B_{MSY} and F/F_{MSY} are provided in **SAI-Figure 9**. The Kobe II Strategic Matrices (**SAI-Table 2**) were estimated and show the probability that overfishing is not occurring ($F<= F_{MSY}$), the stock is not overfished ($B>=B_{MSY}$), and the joint probability of being in the green quadrant of the Kobe plot (i.e. $F<= F_{MSY}$ and $B>= B_{MSY}$).

West Atlantic

The Committee conducted JABBA stochastic stock projections for the western stock also with ten constant catch scenarios (0; 1,000-2,000 t). The annual medians of relative B/B_{MSY} and F/F_{MSY} are provided in **SAI-Figure 10**. The Kobe II Strategic Matrices (**SAI-Table 3**) were estimated and show the probability that overfishing is not occurring ($F<=F_{MSY}$), the stock is not overfished ($B>=B_{MSY}$), and the joint probability of being in the green quadrant of the Kobe plot (i.e., $F<= F_{MSY}$ and $B>= B_{MSY}$).

Given the uncertainty projection probabilities should be interpreted with caution for both stocks. The probabilities of the stock biomass to fall below 20% B_{MSY} under different scenarios of constant catch are presented in **SAI-Table 4** and **SAI-Table 5** for the East and West sailfish stocks, respectively.

SAI-5. Effect of current regulations

In 2016, the Commission established catch limits for both sailfish stocks (Rec. 16-11) and included several provisions that would allow the Committee to enhance data collection initiatives to reduce fishing mortality estimates and overcome data gap issues in all fisheries.

East Atlantic

It was established in Rec. 16-11 that if the total catch harvested in any year exceeds 1,271 t, the Commission shall review the Recommendation and effectiveness of this. Catches in 2019 (2,244 t), 2021 (1,706 t), and 2023 (1,293 t) did exceed this amount. However, catches in 2022 (1,176 t) were lower.

West Atlantic

It was established in Rec. 16-11 that if the total catch harvested in any year exceeds 1,030 t, the Commission shall review the Recommendation and effectiveness of this, the reported catch levels in 2018, 2019, 2020, 2022 and 2023 exceeded this level. However, catches in 2021 (880 t) did not.

In line with other ICCAT conservation measures, some countries have established domestic regulations to limit the catch of sailfish. Among these regulations are: the requirement of releasing all billfish from longline vessels, minimum size restrictions, use of circle hooks and catch and release strategies in sport fisheries.

Currently, Rec. 22-12 and four ICCAT Contracting Parties (Brazil, Canada, Mexico, and the United States) mandate or encourage the use of circle hooks on their pelagic longline fleets. Recent research has demonstrated that in some longline fisheries, the use of non-offset circle hooks resulted in a reduction of billfish 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.

SAI-6. Management recommendations

As in the 2016 stock assessment (ICCAT, 2017b), important sources of uncertainty still remain in the assessments of both the eastern and western stocks. Available abundance indices demonstrate conflicting trends for both stocks, and the Committee believes that reported catches, including dead discards, are significantly incomplete and unreported. These important sources of uncertainty should be taken into consideration by the Commission when adopting management measures. Nevertheless, it should be noted that there have been some improvements since the last assessment.

East Atlantic

The stock status of SAI-E indicates that the stock is not overfished and not undergoing overfishing. Given the number of unquantified uncertainties described above, the Commission should consider managing catch levels that will keep the stock in the green quadrant of the Kobe phase plot with a high probability.

West Atlantic

The Committee noted that while the reported catches in the past few years have been below the estimated MSY (1,612 t), the stock remains overfished. The Committee believes that the reported catches are significantly underreported. Given the important uncertainties described above, the Committee recommends that the results provided in the Kobe II Strategy Matrix be interpreted with extreme caution. Should the Commission choose to continue setting the catch level at 67% of the current MSY, that value will be 1,080 t.

ATLANTIC SAILFISH SUMMARY Table

	West Atlantic	**East Atlantic**
Maximum Sustainable Yield (MSY)	1,612 (1,357-1,968) t[1]	2,337 (2,003-2,833) t[1]
Current Yield (2023)	1,149 t[2]	1,293 t[2]
B_{2021}/B_{MSY}	0.96 (0.59-1.45)[1]	1.83 (1.14-2.88)[1]
F_{2021}/F_{MSY}	0.59 (0.36 - 0.95)[1]	0.36 (0.21-0.59)[1]
Overfished	Yes (59% prob.)[3]	No (99% prob.)[3]
Overfishing	No (98% prob.)[3]	No (100% prob.)[3]
Management Measures in effect:	Rec. 16-11: Limit Atlantic sailfish catches of either stock to the level of 67% of MSY	

[1] 95% credibility interval.
[2] Current data as of 21 September 2024.
[3] As estimated from the Kobe plot probability in each quadrant.

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

				1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
TOTAL				2292	2445	3023	2604	2978	2922	3976	4603	4411	4137	4339	4059	3855	4138	3963	3755	3083	2890	2869	2325	2047	2251	2840	3067	2630	3743	2536	2610	2245	2441
	ATE			1171	1231	1880	1347	1363	1342	1980	2805	2347	2639	2612	2220	1916	2577	2229	2129	1853	1553	1591	1339	1163	1246	1422	1631	942	2266	1211	1730	1176	1293
	ATW			1121	1214	1143	1257	1615	1580	1996	1798	2065	1498	1727	1839	1939	1562	1734	1626	1230	1337	1278	986	884	1005	1419	1436	1689	1476	1325	880	1070	1149
Landings	ATE		Longline	234	261	729	216	275	273	198	568	752	497	335	319	580	590	628	622	514	546	543	457	423	436	338	356	498	963	350	216	365	646
			Other surf.	871	836	970	644	859	883	1231	1470	1496	1860	2057	1758	1289	1798	1493	932	900	870	985	754	730	749	1082	1175	435	1273	792	973	644	477
			Sport (HL+RR)	67	135	182	488	228	186	551	767	98	282	219	143	46	189	108	575	439	136	58	128	10	56	0	94	1	2	50	537	71	144
	ATW		Longline	651	581	453	641	1033	1102	1711	1661	1641	1161	1271	1704	1738	1300	1407	1154	1132	1215	1084	882	735	917	1330	1248	1513	1351	1278	750	961	1054
			Other surf.	225	256	390	209	287	244	163	66	311	331	449	131	194	248	310	457	92	102	155	86	126	75	67	168	163	115	42	119	91	82
			Sport (HL+RR)	217	348	230	350	267	163	76	60	106	0	0	0	2	6	7	4	2	10	19	7	12	5	15	13	6	5	2	8	15	10
Landings(FP)	ATE		Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	79	5
Discards			Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	0	0	6	1	4	2	6	5	2	4	12
			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	3	6	23	14	2	13	9
	ATW		Longline	28	29	69	57	27	72	45	11	7	5	7	3	5	8	9	10	4	10	20	12	11	7	7	7	7	5	3	2	3	3
			Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Landings	ATE	CP	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	0	0	0	0	0
			Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	0	0	0	0	0	0	0	0	0	0	0	1	3
			Brazil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
			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	0	0	0	1	0	0
			China PR	3	3	3	3	5	9	4	5	11	4	4	8	16	8	1	4	5	2	4	1	1	2	2	4	2	11	25	1	4	169
			Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
			Côte d'Ivoire	54	66	91	65	35	80	45	47	65	121	73	93	78	52	448	74	24	108	192	80	99	55	38	405	35	959	404	336	60	85
			EU-España	8	13	42	48	15	20	8	195	245	197	169	202	214	227	239	318	206	197	257	229	302	333	225	236	278	324	108	106	285	87
			EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	12	8	31	8	2	11	4
			EU-Portugal	1	2	1	2	27	53	13	4	10	13	19	31	137	43	49	132	170	121	72	109	33	41	30	27	123	65	51	13	30	14
			El Salvador	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0
			Gabon	3	110	218	2	0	0	0	0	0	4	4	1	0	0	0	0	0	0	0	0	4	0	0	5	0	0	2	1	0	1
			Ghana	450	353	303	196	351	305	275	568	592	566	521	542	282	420	342	358	417	299	201	220	191	99	238	267	82	78	68	0	0	0
			Great Britain	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Guinea Ecuatorial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	1	3	0	0	0	2	3	5	3	28
			Honduras	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Japan	45	52	47	19	58	16	26	6	20	22	70	50	62	144	199	94	115	143	157	71	59	36	52	45	47	62	48	30	14	37
			Korea Rep	5	5	11	4	0	0	0	0	0	0	0	0	0	0	0	1	0	10	1	6	10	2	6	15	9	8	10	5	1	6
			Liberia	0	33	85	43	136	122	154	56	133	127	106	122	118	115	0	0	0	0	0	0	0	0	0	59	11	50	47	3	25	9
			Maroc	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Namibia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	22	0	47
			Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	12	0	0	0
			Russian Federation	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			S Tomé e Príncipe	88	92	96	139	141	141	136	136	136	136	515	346	292	384	114	119	121	124	127	131	134	312	212	219	2	234	28	223	224	449
			Senegal	162	167	240	560	260	238	786	953	240	673	567	463	256	737	446	630	484	174	247	165	37	60	586	301	313	397	350	972	417	310
			Sierra Leone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
			South Africa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			St Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	1	5	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	
		NCC	Chinese Taipei	38	58	24	56	44	66	45	50	62	49	15	25	36	109	121	80	21	52	54	42	17	21	23	26	21	16	17	6	2	14
		NCO	Benin	20	20	19	6	4	5	5	12	2	2	5	3	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Cuba	83	72	533	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Mixed flags (FR+ES)	160	128	97	110	138	131	353	400	365	413	336	264	274	205	251	308	265	275	275	275	275	275	0	0	0	0	0	0	0	
			NEI (BIL)	0	0	0	0	0	0	28	269	408	213	55	1	105	43	20	11	0	44	0	0	0	0	0	0	0	0	0	0	0	
			NEI (ETRO)	51	57	69	86	127	120	77	43	3	2	16	7	8	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Togo	0	0	0	9	22	36	23	62	55	95	135	47	31	71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	ATW	CP	Barbados	46	74	25	71	58	44	44	42	26	27	26	42	58	42	0	0	18	36	36	39	44	54	56	42	20	15	15	20	18	17
			Belize	0	0	0	0	0	0	0	0	0	0	0	5	0	12	0	0	52	8	7	4	3	0	11	19	62	104	42	0	0	0
			Brazil	129	245	310	137	184	356	598	412	547	585	534	416	139	123	268	433	71	138	108	76	57	72	59	39	43	17	28	24	11	9
			China PR	3	3	3	3	3	9	4	3	1	0	1	0	0	0	1	1	1	1	2	0	1	1	3	6	2	9	160	8	5	92
			Costa Rica	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	2	3	1	5	14	9	13	14	6	2	4	1	3
			Curaçao	15	15	15	15	15	15	15	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	19	36	5	20	42	7	14	309	414	183	160	89	134	214	361	412	275	190	184	203	244	311	207	454	256	228	62	73	314	50
			EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	4	10	7
			EU-Portugal	0	0	0	0	0	0	4	0	0	12	12	110	18	53	101	20	19	9	2	0	0	0	0	1	37	9	3	0	1	2
			El Salvador	0	0	0	0	0	0	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	151	119	56	83	151	148	164	187	151	171	112	147	159	174	216	183	191	191	191	191	191	210	137	165	150	111	97	61	58	71
			Japan	8	2	4	17	3	10	12	3	3	10	5	22	4	1	33	43	36	12	16	7	11	12	13	7	3	18	3	6	7	6
			Korea Rep	4	4	12	5	0	0	0	0	0	0	0	0	0	0	0	1	0	40	3	1	1	0	0	0	0	0	0	0	0	0
			Mexico	19	19	10	9	65	40	118	36	34	45	51	55	41	46	45	48	34	32	51	63	42	35	47	51	24	27	20	24	17	20
			Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	415	0	461	378	417	198	122	96
			St Vincent and Grenadines	4	2	1	3	2	1	0	2	168	3	86	73	59	18	13	8	7	4	4	3	4	1	85	8	10	5	19	0	0	6
			Trinidad and Tobago	2	1	4	10	25	37	3	7	6	8	10	9	17	13	32	16	16	39	72	34	29	51	53	64	51	56	47	43	37	31
			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	0	0	0	0	0
			USA	180	348	232	349	267	163	76	58	103	0	0	0	0	0	3	3	0	0	7	3	2	2	3	3	3	3	1	1	2	2
			Venezuela	223	180	255	279	515	367	261	249	277	327	509	607	1042	549	382	416	498	591	543	341	230	225	305	543	534	481	396	408	461	695
		NCC	Chinese Taipei	117	19	19	2	65	17	11	33	31	13	8	21	5	14	10	11	6	8	26	6	3	6	5	5	5	4	7	2	1	5
			Suriname	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32
		NCO	Aruba	10	10	10	10	10	10	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Cuba	46	37	37	40	28	196	208	68	32	18	50	72	47	56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Dominica	0	0	0	0	0	0	0	5	3	0	1	0	3	3	4	2	0	2	0	0	5	3	3	3	2	1	2	2	2	1
			Dominican Republic	90	40	40	101	89	27	67	81	260	91	144	165	133	147	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			NEI (BIL)	0	0	0	0	0	0	297	268	0	0	0	0	68	81	252	17	0	21	0	0	0	0	0	0	0	0	0	0	0	
			NEI (ETRO)	27	30	36	46	67	64	41	23	1	1	9	4	4	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Saint Kitts and Nevis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	
			Seychelles	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Sta Lucia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	2	2	3	2	3	1	1	4	2	0	0	0	1	
Landings(FP)	ATE	CP	EU-España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	74	
			EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5
Discards			Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			EU-España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	21	13	2	12	9
			EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	2	1	0	1	0
			El Salvador	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	1	3	0	1	10
			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	0	0	0	0	0
			Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	6	1	4	2	4	2	2	3	2

			1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
ATW	CP	Brazil	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
		EU-España	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
		Korea Rep	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
		USA	28	29	69	57	27	72	45	11	7	5	7	4	5	7	10
	NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

			2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
ATW	CP	Brazil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		EU-España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		EU-France	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**
		Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		USA	10	4	10	19	11	11	6	7	6	6	5	3	2	2	3
	NCC	Chinese Taipei	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0

SAI-Table 2. Kobe 2 Strategic Matrices for the East Atlantic sailfish stock. Top: the probability that overfishing is not occurring ($F \leq F_{MSY}$); middle: the probability that the stock is not overfished ($B \geq B_{MSY}$); and bottom: the joint probability of being in the green quadrant of the Kobe plot (i.e., $F \leq F_{MSY}$ and $B \geq B_{MSY}$).

Probaility $F<=F_{MSY}$

Catch (t)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
1000	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
1250	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
1500	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
1750	100%	100%	100%	99%	99%	99%	99%	99%	99%	99%
2000	99%	99%	98%	98%	97%	97%	96%	95%	94%	94%
2250	98%	97%	95%	94%	92%	90%	88%	86%	84%	83%
2336	98%	96%	94%	91%	89%	87%	84%	82%	79%	77%
2500	97%	94%	90%	86%	83%	79%	75%	71%	68%	65%
2750	94%	88%	82%	75%	69%	64%	58%	52%	48%	44%
3000	90%	81%	72%	62%	54%	46%	40%	35%	30%	27%

Probability $B>=B_{MSY}$

Catch (t)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
0	98%	99%	100%	100%	100%	100%	100%	100%	100%	100%
1000	98%	99%	99%	99%	99%	99%	99%	100%	100%	100%
1250	98%	99%	99%	99%	99%	99%	99%	99%	99%	99%
1500	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%
1750	98%	98%	97%	97%	97%	97%	96%	96%	95%	96%
2000	98%	97%	97%	96%	95%	94%	93%	92%	91%	91%
2250	98%	97%	95%	93%	92%	90%	88%	86%	84%	82%
2336	98%	97%	95%	92%	90%	88%	85%	83%	81%	78%
2500	98%	96%	94%	91%	87%	84%	80%	77%	73%	70%
2750	98%	96%	92%	87%	82%	76%	71%	65%	60%	55%
3000	98%	95%	89%	83%	75%	67%	60%	52%	46%	40%

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

Catch (t)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
0	98%	99%	100%	100%	100%	100%	100%	100%	100%	100%
1000	98%	99%	99%	99%	99%	99%	99%	100%	100%	100%
1250	98%	99%	99%	99%	99%	99%	99%	99%	99%	99%
1500	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%
1750	98%	98%	97%	97%	97%	97%	96%	96%	95%	96%
2000	98%	97%	96%	96%	95%	94%	93%	92%	91%	91%
2250	98%	96%	94%	93%	91%	89%	87%	85%	82%	81%
2336	98%	96%	93%	91%	88%	86%	83%	81%	78%	76%
2500	97%	93%	90%	86%	82%	78%	74%	71%	67%	64%
2750	94%	88%	82%	75%	69%	63%	58%	52%	48%	44%
3000	90%	81%	72%	62%	54%	46%	40%	35%	30%	27%

SAI-Table 3. Kobe II Strategic Matrices for the West Atlantic sailfish stock. Top: the probability that overfishing is not occurring ($F \leq F_{MSY}$); middle: the probability that the stock is not overfished ($B \geq B_{MSY}$); and bottom: the joint probability of being in the green quadrant of the Kobe plot (i.e., $F \leq F_{MSY}$ and $B \geq B_{MSY}$).

Probaility F<=F_{MSY}

Catch (t)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
1000	95%	96%	97%	97%	98%	98%	98%	99%	99%	99%
1250	86%	87%	88%	89%	89%	90%	90%	90%	91%	91%
1500	74%	73%	72%	71%	70%	70%	69%	68%	68%	68%
1600	68%	66%	65%	63%	61%	60%	59%	57%	56%	55%
1700	63%	59%	56%	53%	51%	50%	47%	45%	44%	43%
1750	59%	55%	52%	49%	47%	45%	42%	40%	38%	37%
1800	56%	52%	48%	45%	42%	40%	37%	35%	33%	31%
1900	50%	45%	41%	37%	34%	30%	28%	26%	24%	22%
2000	45%	39%	34%	30%	26%	23%	21%	19%	16%	15%

Probability B>=B_{MSY}

Catch (t)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
0	68%	87%	95%	98%	99%	100%	100%	100%	100%	100%
1000	68%	75%	80%	84%	87%	89%	91%	92%	93%	94%
1250	68%	71%	74%	76%	78%	79%	81%	82%	83%	83%
1500	68%	67%	67%	66%	66%	66%	65%	65%	64%	64%
1600	68%	66%	64%	62%	61%	60%	58%	56%	55%	54%
1700	68%	64%	61%	58%	55%	53%	51%	48%	47%	45%
1750	68%	63%	60%	56%	53%	50%	47%	44%	43%	40%
1800	68%	62%	58%	53%	50%	47%	44%	40%	38%	36%
1900	68%	61%	55%	49%	45%	41%	36%	33%	30%	28%
2000	68%	59%	52%	45%	40%	35%	30%	27%	23%	21%

Probability F<=F_{MSY} and B>=B_{MSY}

Catch (t)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
0	68%	87%	95%	98%	99%	100%	100%	100%	100%	100%
1000	68%	75%	80%	84%	87%	89%	91%	92%	93%	94%
1250	68%	71%	74%	76%	78%	79%	81%	82%	83%	83%
1500	67%	66%	66%	66%	65%	65%	65%	64%	63%	63%
1600	65%	63%	61%	60%	58%	57%	56%	54%	54%	53%
1700	61%	58%	55%	52%	50%	48%	46%	44%	43%	42%
1750	59%	55%	52%	48%	46%	44%	41%	39%	38%	36%
1800	56%	52%	48%	45%	42%	39%	37%	34%	32%	31%
1900	50%	45%	41%	36%	34%	30%	28%	26%	24%	22%
2000	45%	39%	33%	30%	26%	23%	21%	19%	16%	15%

SAI-Table 4. Estimated probabilities of the East Atlantic biomass sailfish stock levels being below 20% of B_{MSY} during the projection period for a given catch level. It should be noted that the reference chosen, 20% of biomass that supports MSY, was selected only for informational purposes and is not intended to be a recommendation by the SCRS as a limited reference point.

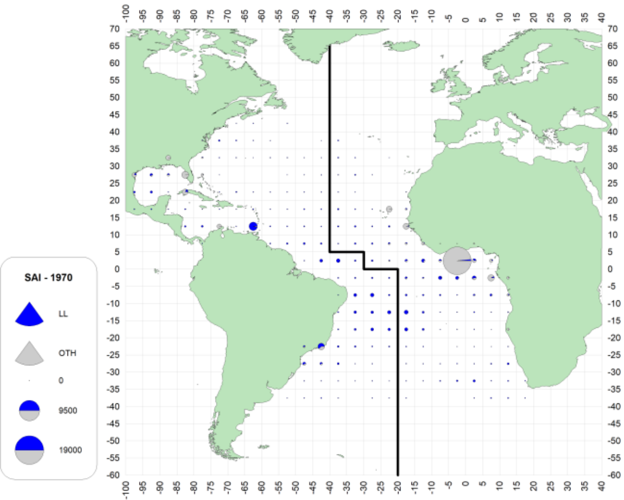
Probability of B < 20% of B_{MSY}

Catch (t)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1000	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1250	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1500	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1750	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2000	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2250	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%
2336	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%
2500	0%	0%	0%	0%	0%	0%	0%	1%	2%	3%
2750	0%	0%	0%	0%	0%	1%	1%	3%	5%	8%
3000	0%	0%	0%	0%	1%	2%	4%	7%	12%	17%

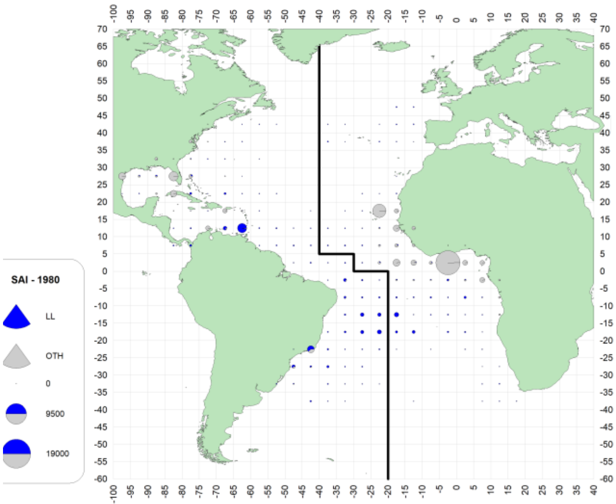
SAI-Table 5. Estimated probabilities of the West Atlantic biomass sailfish stock levels being below 20% of B_{MSY} during the projection period for a given catch level. It should be noted that the reference chosen, 20% of biomass that supports MSY, was selected only for informational purposes and is not intended to be a recommendation by the SCRS as a limited reference point.

Probability of B < 20% of B_{MSY}

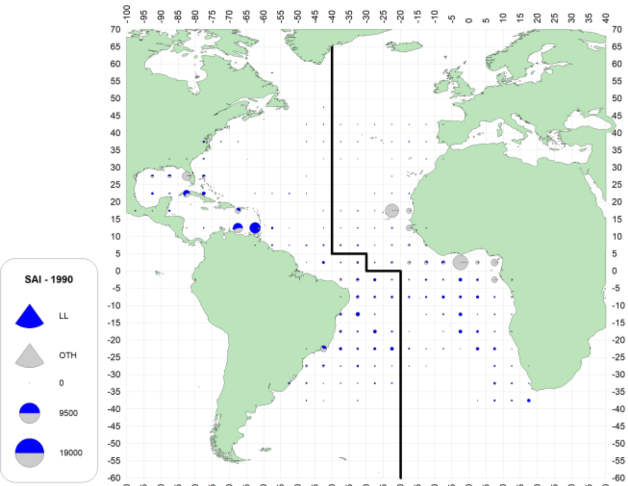
Catch (t)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1000	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1250	0%	0%	0%	0%	0%	0%	1%	1%	1%	1%
1500	0%	0%	0%	1%	2%	2%	3%	4%	6%	7%
1600	0%	0%	0%	1%	2%	4%	5%	8%	10%	12%
1700	0%	0%	1%	2%	4%	6%	9%	12%	15%	18%
1750	0%	0%	1%	2%	4%	7%	11%	14%	18%	22%
1800	0%	0%	1%	2%	5%	9%	13%	17%	21%	25%
1900	0%	0%	1%	3%	7%	12%	18%	23%	29%	35%
2000	0%	0%	1%	5%	10%	17%	24%	31%	38%	44%



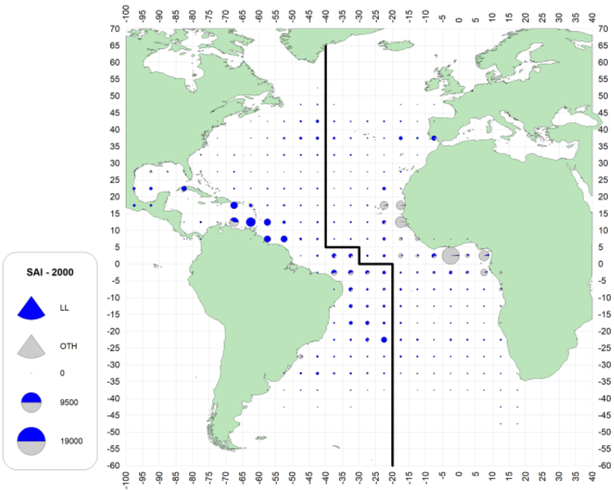
a. SAI (1970-79)



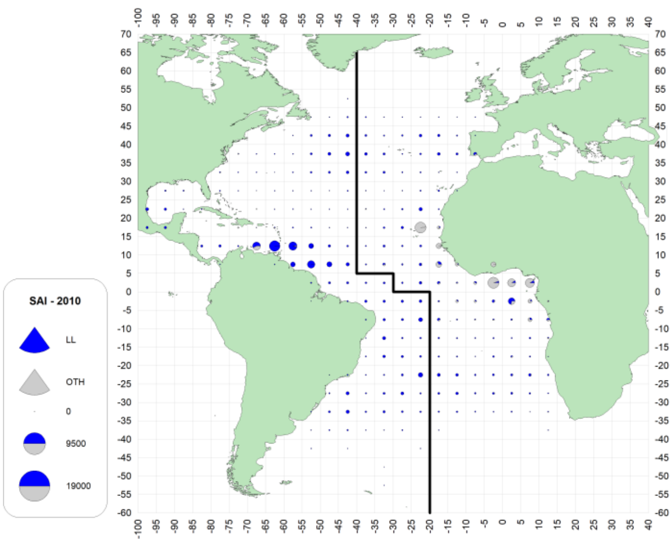
b. SAI (1980-89)



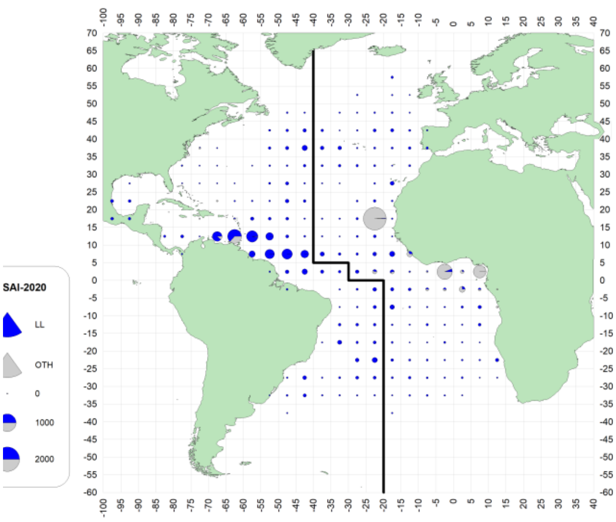
c. SAI (1990-99)



d. SAI (2000-09)

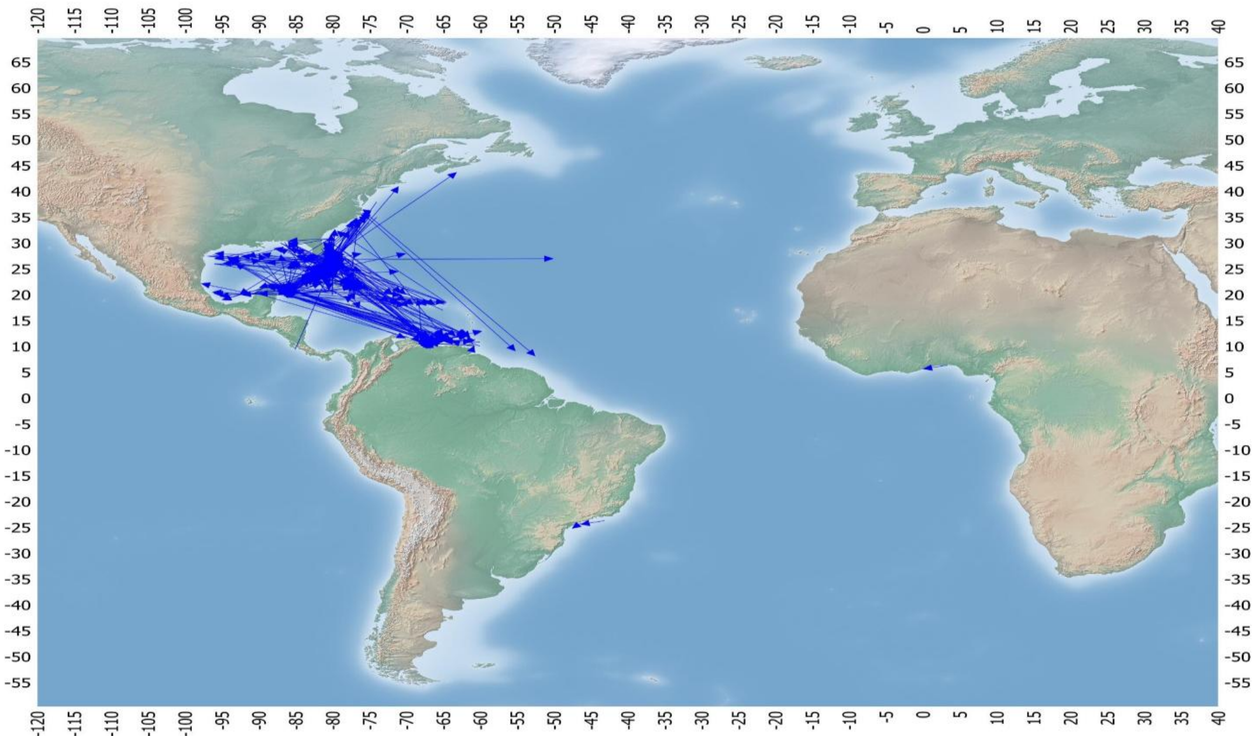


e. SAI (2010-19)

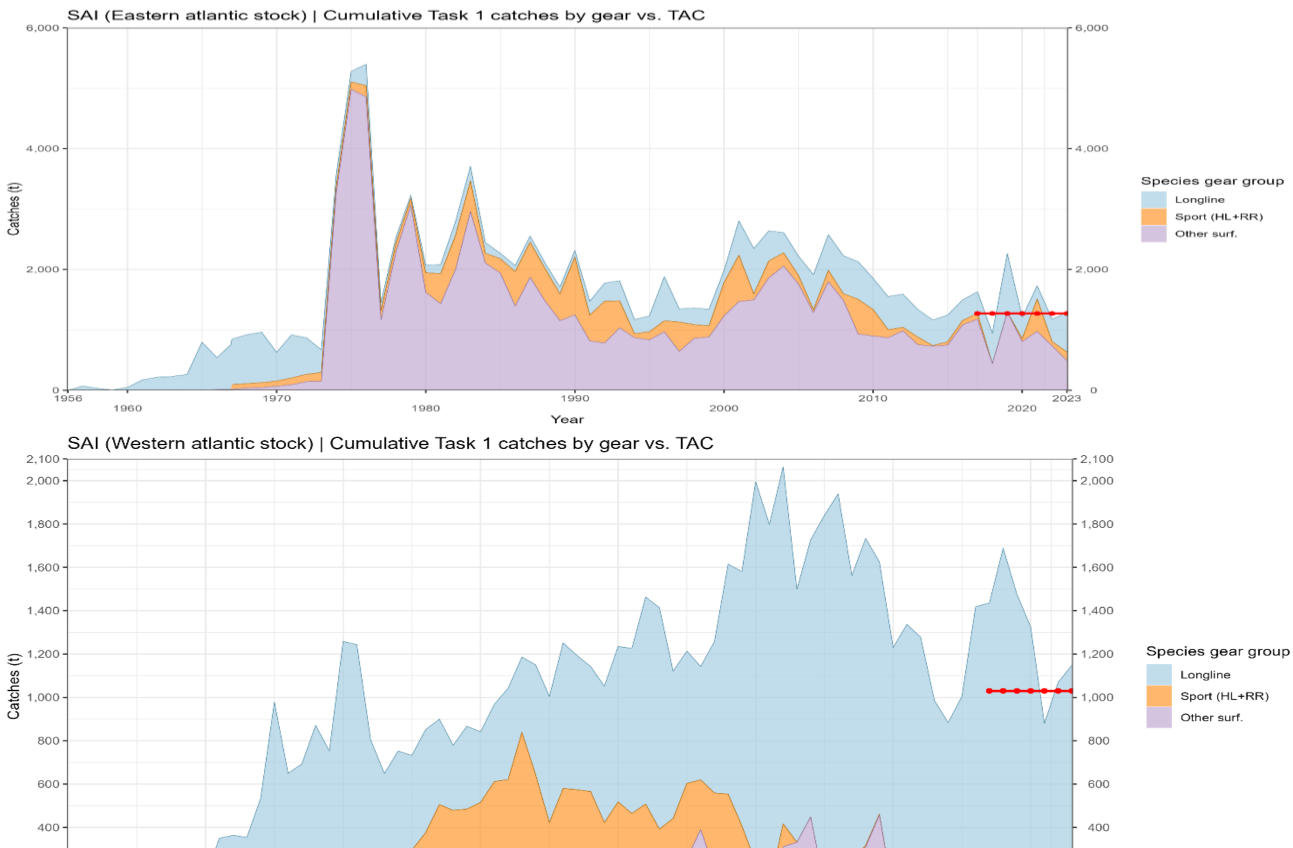


f. SAI (2020-22)

SAI-Figure 1. Geographic distribution of sailfish total catches by decade (last decade only covers 3 years). The dark line denotes the separation between stocks.

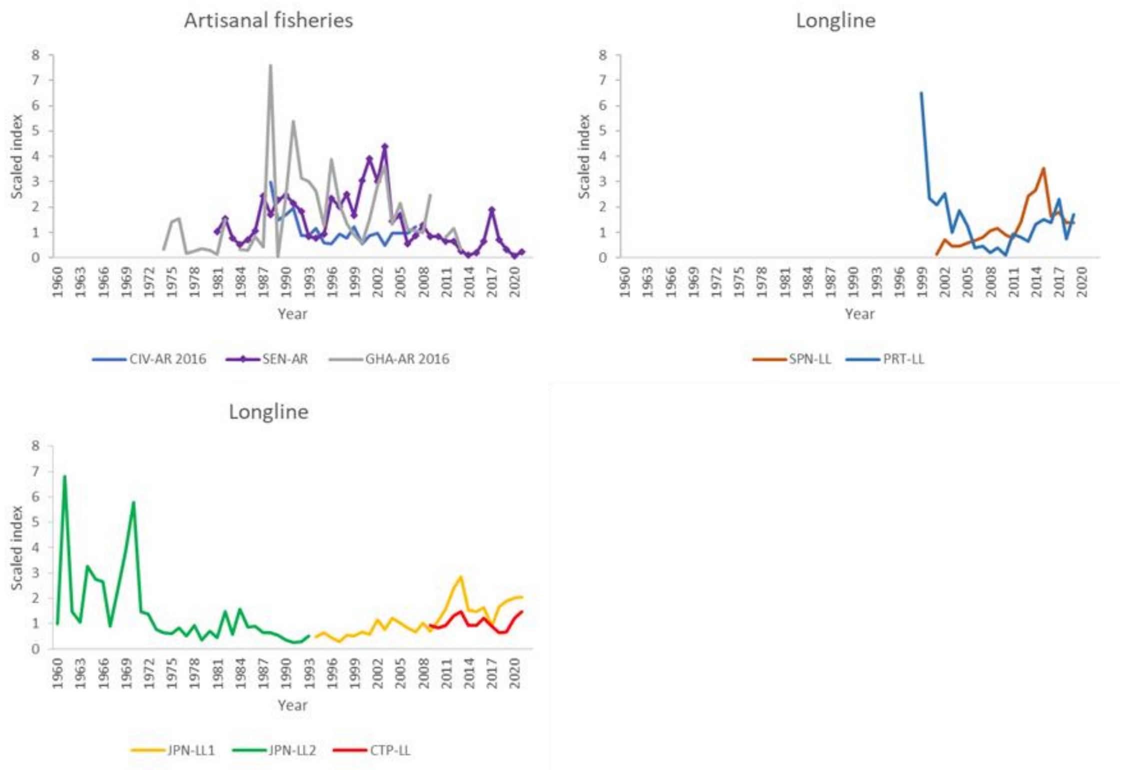


SAI-Figure 2. Conventional tag returns for Atlantic sailfish. Lines join the locations of release and recapture.

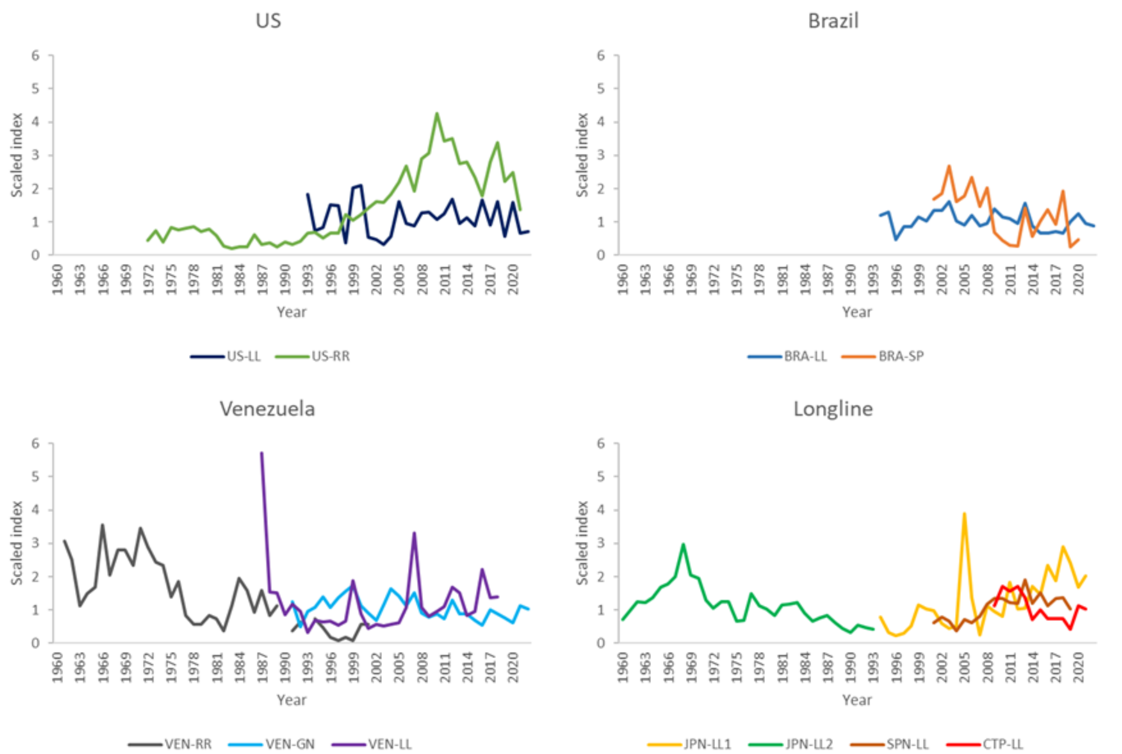


SAI-Figure 3. Task 1 catches of sailfish for each of the two Atlantic stocks, East and West. In 2017 catch levels of 1271 t and 1030 t that triggers the review of Rec. 16-11 were implemented, for East and West stocks, respectively. The dotted red line indicates the landings limit for each stock.

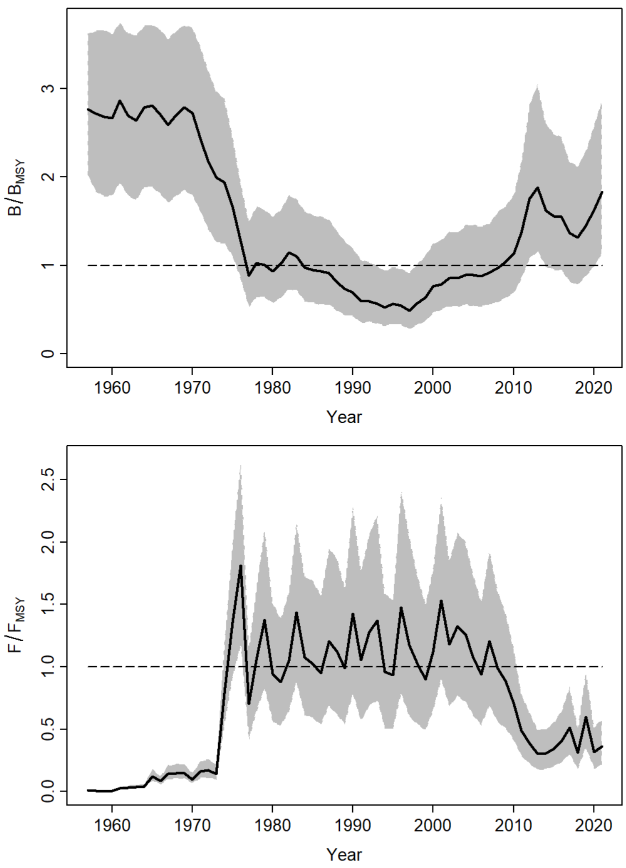
East Atlantic



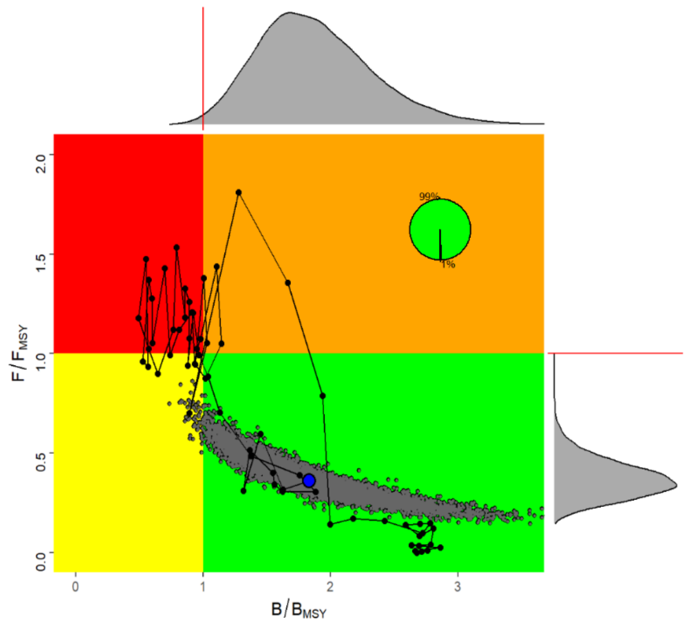
West Atlantic



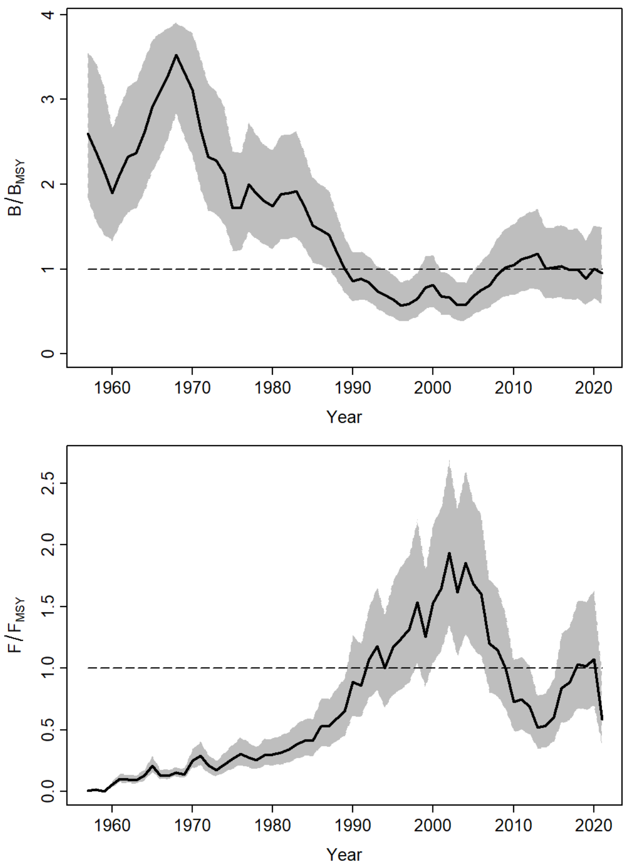
SAI-Figure 4. Relative abundance indices considered in the assessments of the East and West Atlantic sailfish stocks. All indices were scaled to the mean of each series prior to graphing.



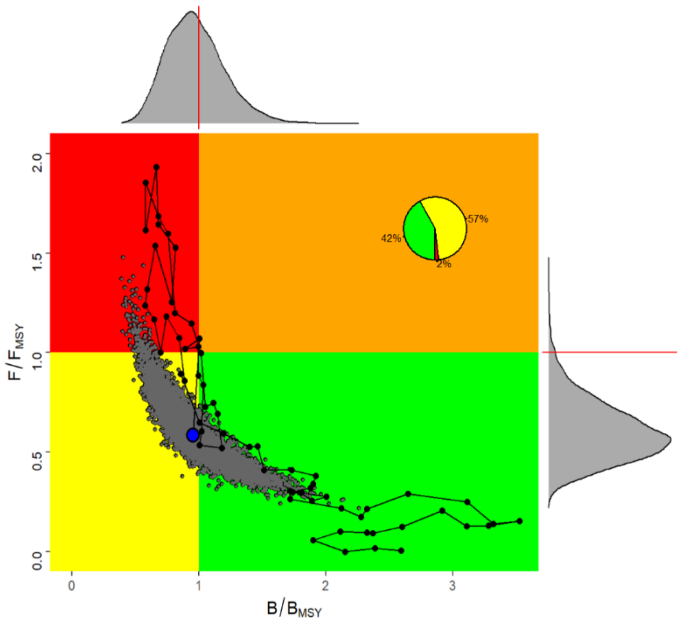
SAI-Figure 5. Estimated annual trend for the East Atlantic sailfish stock for B/B_{MSY} (upper panel), and F/F_{MSY} (lower panel) with 95% CI.



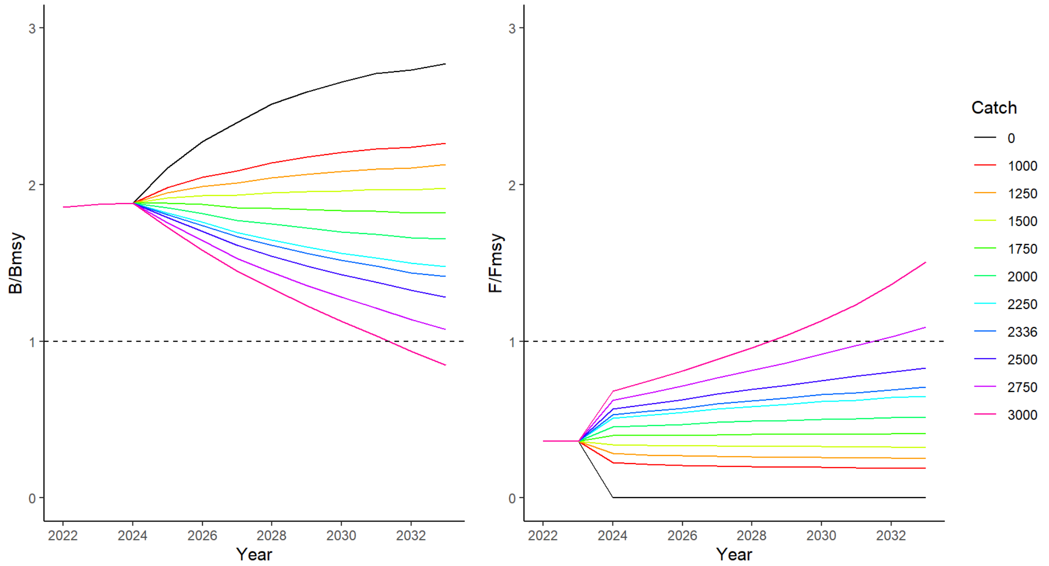
SAI-Figure 6. Kobe phase plot for the East Atlantic sailfish stock. Solid black dots and solid line indicate the stock status trajectory, with the blue dot indicating the terminal year (2021), and grey dots are the interactions for the terminal year with the marginal distributions plotted in the lateral axis.



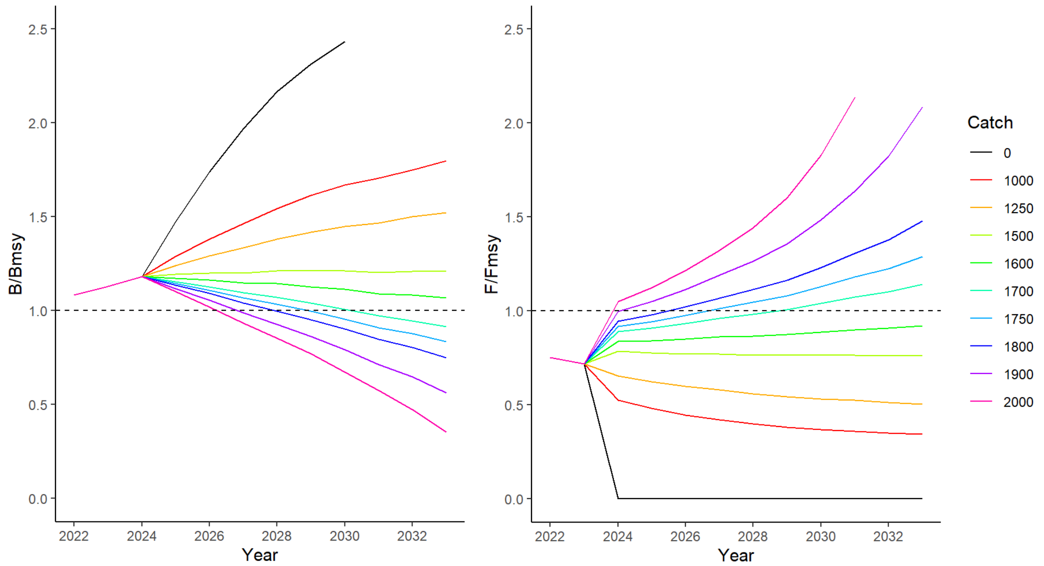
SAI-Figure 7. Estimated annual trend for the West Atlantic sailfish stock for B/B_{MSY} (upper panel), and F/F_{MSY} (lower panel) with 95% CI.



SAI-Figure 8. Kobe phase plot for the West Atlantic sailfish stock. Solid black dots and solid line indicate the stock status trajectory, with the blue dot indicating the terminal year (2021), and grey dots are the interactions for the terminal year with the marginal distributions plotted in the lateral axis.



SAI-Figure 9. Projections for B/BMSY and F/FMSY for the East Atlantic sailfish stock for various levels of future constant catch ranging from 1,000-3,000 t, including a zero-catch scenario starting in 2024. The initial catch for the years 2022-2023 was set to 1,586 t, which is the average catch of the recent three years (2019-2021). The projections were run until 2033 (10 years).



SAI-Figure 10. Projections for B/BMSY and F/FMSY for the West Atlantic sailfish stock for various levels of future constant catch ranging from 1,000-2,000 t, including a zero-catch scenario starting in 2024. The initial catch for the years 2022-2023 was set to 1,313 t, which is the geometric mean catch of the recent three years (2019-2021). The projections were run until 2033 (10 years).

9.12 SWO-AT - Atlantic swordfish

The status of the North and South Atlantic swordfish stocks was assessed in 2022, by means of applying statistical modelling to the available data up to 2020. Complete information on the data availability and assessment can be found in the Report of the 2022 ICCAT Atlantic Swordfish Data Preparatory Session (ICCAT, 2022e) and Report of the 2022 ICCAT Atlantic Swordfish Stock Assessment (ICCAT, 2022f). Statistics relevant to Atlantic swordfish are included as **Appendix 5** to this SCRS Report, and recommendations pertinent to Atlantic swordfish are presented in Item 18.

The Commission is scheduled to adopt a management procedure (MP) for North Atlantic swordfish in 2024. As the MP has not yet been chosen, the following text is reflective of stock status and advice as prepared by the Committee in 2022.

MSE development in 2025 requires that an exceptional circumstances (EC) protocol be developed for the stock. The Committee will work with Panel 4, as requested, to develop an EC protocol.

SWO-AT-1. Biology

Swordfish (*Xiphias gladius*) are members of the family Xiphiidae and are in the suborder Perciformes. 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.

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 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 lower-jaw fork length (LJFL) by age three, but grow slowly thereafter. Females reach a larger maximum size than males. 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.

The analysis of seasonal movement patterns indicate swordfish generally move towards the equator by winter and return to the temperate foraging grounds in spring and summer. Broader areas of mixing between some eastern and western areas were also suggested. Results obtained by satellite tags also fully confirm the previous knowledge that was available from fishery data.

Beginning in 2018, an ICCAT Swordfish Biology Programme, encompassing all three ICCAT stocks, has been conducting studies on swordfish growth, reproductive biology, and genetic analysis for identification of stock boundaries and mixing. Since programme inception, 4,712 fish have been sampled for otolith, fin spines, gonads and other tissues. The three research areas address key uncertainties important for improving the scientific advice for management of the stocks. Within each of the project areas, important scientific advances have been made:

- Ageing and growth: standards for ageing spines and otoliths; preliminary work on new growth models.
- Reproductive biology: standards for classifying reproductive status of swordfish and preliminary updates to maturity schedules.
- Genetics: identified genetic markers important for stock differentiation; identified key stock mixing areas in the North-East Atlantic; identified subpopulations within the Mediterranean.

These Swordfish Year Programme (SWOYP) biological studies are ongoing and complementary studies by CPCs will contribute to addressing uncertainties in future assessments of stock status.

SWO-AT-2. Fishery indicators

Due to the broad geographical distribution of Atlantic swordfish (**SWO-AT-Figure 1**) in coastal and offshore areas (mostly ranging from 50ºN to 45ºS), this species is available to a large number of fishing countries. **SWO-AT-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, EU-Portugal, Morocco, Namibia, and South Africa. The primary bycatch or opportunistic fisheries that take swordfish are tuna fleets from Chinese Taipei, Japan, Korea (Rep.) 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 bycatch 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.

Trends by area (NE vs. NW Atlantic) in the catch per unit effort (CPUE) indexes were consistent with the seasonal movement patterns observed in the electronic tagging data, as well as in the catches and sex-ratio distributions. Relationships observed for the eastern Atlantic were opposite to those in the western Atlantic. This pattern was correlated with the decadal cycling of the Atlantic Multidecadal Oscillation (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 and change in prey distribution. To support this hypothesis testing the Committee 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 analyses could be conducted.

For both the North and South Atlantic some 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 some indices had to be split into consistent time periods. Recent reports note the emergence of a new gear (trap lines) with reported high swordfish catchability and low bycatch that warrants the Species Group's consideration. The impact of the trap line gear should be evaluated as soon as data are available.

Total Atlantic

Catch reports are considered to be nearly complete for 2023, however, few countries, which typically represent a small portion of the catch, have not yet reported their 2023 catches and because of unknown unreported catches, this value should be considered provisional and subject to further revision.

North Atlantic

For the past decade, the North Atlantic estimated catch (landings plus dead discards) has averaged about 10,470 t per year (**SWO-AT-Table 1**). The catch in 2023 (12,611 t) represents 62% of the 1987 peak in North Atlantic landings (20,238 t). These reduced landings have been attributed to ICCAT management measures, a reduction in total longline effort (Taylor *et al.,* 2020), and shifts in fleet distributions, including the movement of some vessels in certain years to the South Atlantic (e.g. EU-Spain longline fleet) or out of the Atlantic. In addition, some fleets, including at least the United States, EU-Spain and EU-Portugal 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 bycatch in some fleets. Recently, socio-economic factors, and oceanography patterns may have also contributed to the decline in catch. Task 1 and 2 data coverage is generally good; however, the Committee noted the sparse discarding data for most CPCs as well as gaps in the catch and effort data for some CPCs.

Available longline CPUE series were evaluated by the Committee and certain indices were identified as suitable for use in the assessment models (Canada, Chinese Taipei, EU-Portugal, EU-Spain, Japan, Morocco, and USA). Trends in standardized CPUE series by fleets (with terminal years 2019 or 2020) contributing to the stock assessment models are shown in **SWO-AT-Figure 3**. Most of the series have an increasing trend since the late 1990s but show a decrease or plateau in the more recent years. There have been some recent changes in United States regulations (such as time-area closures for other species like Atlantic bluefin tuna, among others) that may have impacted catch rates. The combined index used in the surplus production models (JABBA, used in this assessment; ASPIC, used as a continuity run) is shown in **SWO-AT-Figure 4**.

South Atlantic

The historical trend of catch (landings plus dead discards) can be divided in two periods: until 1980 and after 1980. The first one is characterized by relatively low catches, generally less than 5,000 t (with an average value of 1,824 t). After 1980, landings increased continuously up to a peak of 21,931 t in 1995, levels that are comparable to the peak of North Atlantic harvest (20,238 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 regulatory changes and was partly due to effort shifting to other oceans and target species. In 2023, the reported catch (8,212 t) was 63% lower than the 1995 reported catch (**SWO-AT-Table 1**).

Available longline CPUE series for South Atlantic swordfish were evaluated by the Committee for the 2022 stock assessment (ICCAT, 2022f) and certain indices were identified as suitable for use in assessment models (Brazil, Chinese Taipei, EU-Spain, Japan, South Africa, Uruguay). The available indices are illustrated in **SWO-AT-Figure 5**.

Discards

Since 1991, very few fleets have reported dead discards (see **SWO-AT-Table 1**). The volume of North Atlantic reported dead discards reached a maximum of 1,138 t in 2000. Recent reported dead discards for the North Atlantic are significantly lower (101 t in 2021; 71 t in 2022; 75 t in 2023). For the South Atlantic, the reported discards peaked at 147 t in 2010. In 2021, 2022 and 2023 129 t, 85 t, and 110 t of dead discards were respectively reported for the South Atlantic. The Committee continued to express concerns due to the low percentage of fleets that have reported annual dead discards (in t) and in many cases what has been reported is not scaled to the entire fishery.

SWO-AT-3. State of the stocks

North Atlantic

In 2022, two stock assessment platforms were used to provide estimates of stock status for the North Atlantic swordfish stock as a basis for management advice. They were a Bayesian surplus production model (JABBA - Just Another Bayesian Biomass Assessment) and the integrated assessment model Stock Synthesis (SS).

The Committee noted that the 2022 stock assessment represents a significant improvement in the characterization of uncertainty of current stock status for North Atlantic swordfish using updated information and integration of JABBA. The Committee agreed that management advice for North Atlantic swordfish, including stock status and projections, should be based on JABBA and SS models.

There were important developments to the modelling in 2022. In particular, the SS model provided estimates of the full weight of dead discards due to the size limit (i.e. reported and unreported) in the estimation of stock status. This analysis is consistent with the request of the Commission that the SCRS monitor and analyse the effects of the minimum size limit (Rec. 17-02, paragraph 10). This capacity will also be useful in future MSE simulations.

Based on the combined results from the two stock assessment model platforms (Stock Synthesis and JABBA), the North Atlantic swordfish stock biomass was above B_{MSY} (median B_{2020}/B_{MSY} = 1.08 and 95% CI of 0.71 and 1.33) and fishing mortality was below F_{MSY} (median F_{2020}/F_{MSY} = 0.80 and 95% CI of 0.64 and 1.24) in 2020 (**SWO-AT-Figure 6**). The median MSY was estimated as 12,819 t with 95% CI of (10,864 t and 15,289 t).

The joint Kobe phase plot shows that JABBA model results provide wider range of uncertainty than the Stock Synthesis results. Probabilities of the stock being in each quadrant of the Kobe plot (**SWO-AT-Figure 9**) were 63% in the green (not overfished not subject to overfishing), 22% in the yellow (overfished but not subject to overfishing) and 15% in the red (overfished and subject to overfishing). The results point to a stock status of not overfished (37% probability of overfished status), with no overfishing (15% probability of overfishing taking place). The estimate of stock status in 2020 was very similar to the estimated status from the previous assessment in the terminal year (2015).

South Atlantic

In 2022, two stock assessment platforms were used to assess the South Atlantic swordfish stock. These were a Bayesian surplus production model (JABBA) and Stock Synthesis. While Stock Synthesis was explored in 2022, only the JABBA model was used for providing advice.

The Committee acknowledged the progress made to implement a Stock Synthesis model for the South stock for the first time, but revision of size data and further model development are still required before it can be fully used for management advice. As such, the Stock Synthesis model was considered preliminary, and the Committee agreed that stock status estimates and projections for management advice should be done using only the JABBA model. For the purpose of comparison of model results across platforms only, results from Stock Synthesis are presented in **SWO-AT-Figure 7** to illustrate the overall consistency among models.

Both models were consistent and suggested a decline in stock biomass as the fishing mortality increased in the 1990s. The final JABBA results estimated that B_{2020} was also below B_{MSY} (median = 0.77, 95% CIs = 0.53-1.13) while F_{2020} was marginally above F_{MSY} (median = 1.03, 95% CIs = 0.67-1.51) (**SWO-AT-Figure 8**). The JABBA's MSY_{2020} was estimated to be 11,481 t.

The southern swordfish stock biomass is overfished, and overfishing is occurring. The JABBA base case assessment indicates a 56% probability that the stock is within the red quadrant of the Kobe plot (**SWO-AT-Figure 10**).

SWO-AT-4. Outlook

North Atlantic

Based on the currently available information to the Committee, both the JABBA and Stock Synthesis base models were projected to the year 2033 under constant total allowable catch (TAC) scenarios of 9,000 to 16,000 t, as well as a zero-catch scenario.

For the projections, catches for 2021 and 2022 are assumed to be constant at 10,476 t (the catch value for 2020 at the time of the assessment). Different levels of constant catch are projected for the period 2023-2033 (**SWO-AT-Table 2**). The combined Stock Synthesis and JABBA projections show that a 13,200 t constant catch, which is the current TAC level (Rec. 22-03, extended in Rec. 23-04), will have a 60% probability of being in green quadrant in 2033. However, given that the estimated MSY (that is inclusive of dead discards) is 12,819 t and B_{2020}/B_{MSY}=1.08, catches above MSY will result in biomass declines over the projection period (**SWO-AT-Figure 11**). Under 2021 catch (9,729 t), there was an 84-87% probability of the stock being in green quadrant by 2033 (**SWO-AT-Table 2**).

South Atlantic

The 2022 stock assessment's stock status results are similar to the 2017 stock assessment (ICCAT, 2017b), but updated information used in the 2022 stock assessment resulted in estimates of a less productive stock (MSY_{2020} = 11,481 t; MSY_{2015} = 14,570 t). Specifically, a new surplus production function associated with a prior for the intrinsic growth rate was objectively derived using biological information, and updated CPUE indices.

Results of projections from the 2017 stock assessment indicated that if catches remained below 11,000 t, there was a 60% chance of the stock falling within the green quadrant by 2020. The average catch for the period 2016-2020 was 10,125 t, yet the assessment still indicates a 56% probability that the stock is within the red quadrant in 2020 (**SWO-AT-Figure 10**). The Committee notes that this apparent inconsistency can be explained by the lower productivity (see above) of the stock determined in the 2022 stock assessment.

Projections were conducted for the base case JABBA model under constant TAC scenarios of 6 to 15 thousand tons, as well as a zero-catch scenario (**SWO-AT-Figure 12**). Projections were implemented in 2023 and catches for 2021 and 2022 were assumed to remain constant (9,826 t) at the average from the previous three years. Using this three-year average (9,826 t) assumed in the 2022 stock assessment, the South Atlantic swordfish stock has a 55% probability of being in the green quadrant of the Kobe plot by 2033 (**SWO-AT-Table 3**).

SWO-AT-5. Effect of current regulations

For the North Atlantic, the most germane recommendations can be found in Rec. 23-04, which replaces Rec. 22-03 and extends and amends Rec. 17-02. Should an MP be adopted in 2024, it is expected that a new recommendation would replace these. In the South, relevant recommendations can be found in Rec. 22-04, modifying Rec. 21-03.

Catch limits

Rec. 17-02 set the TAC for North Atlantic swordfish for 2018 at 13,200 t. This TAC has remained in place for 2024 (Rec. 23-04). The reported catch from 2018-2023 has averaged 10,407 t and has not exceeded the TAC in any year.

Rec. 17-03 set the TAC for South Atlantic swordfish at 14,000 t for 2018, this TAC was in place from 2018 to 2022 (Rec. 21-03). Rec. 22-04 set the TAC for South Atlantic swordfish at 10,000 t for 2023-2026. The reported catch from 2018-2023 averaged 9,303 t and did not exceed the enforced TACs in any year.

Minimum size limits (Rec. 17-02)

There are three minimum size options that are applied to the entire Atlantic: 125 cm LJFL/25 kg with a 15% tolerance (of the number of swordfish *per landing*); or 119 cm LJFL/15 kg with zero tolerance and evaluation of the discards; and for dressed fish, cleithrum to keel length of 63 cm.

Since the implementation of the minimum landing sizes in 2000, the proportion of swordfish less than 125 cm LJFL reported in the landings (in numbers) has been generally decreasing in the North Atlantic and stable in the South. In the North Atlantic, the estimate was 33% in 2000 and decreased to 23% in 2015. In the South Atlantic the estimate was 18% in 2000, had a maximum of 19% in 2006 and decreased to 13% in 2015. The Committee notes that these estimates are based on low sample sizes, are uncertain and may be biased. They will remain uncertain until CPCs fully report size samples from the entire catch. A figure of the estimated absolute biomass and numbers of fish as well as estimated proportions of undersized fish in the catch that are discarded in the North Atlantic is shown in **SWO-AT-Figure 13**. The decreasing trend can be due to a decrease in encounter rate of undersized fish due to changes in fleet behaviour, or a decrease in recruitment over time, or a combination of both.

The Committee also noted high values of hooking mortality (ranging between 78-88%) on small swordfish (<125 cm LJFL) by surface longline fisheries targeting swordfish (**SWO-AT-Figure 14**). The post-release mortality of specimens discarded alive from commercial fishing gear is unknown. Evaluating other strategies to reduce fishing mortality on juvenile swordfish will need complete datasets on fishing effort and size data over the entire Atlantic and should take into account the effects of these strategies on other species. In view of the Commission objective to reduce fishing mortality on small swordfish, the Committee therefore recommends that future work should be carried out to determine more precisely the spatial distribution and magnitude of fishing effort, the size and sex distribution of undersized swordfish in the Atlantic, using high resolution observer data.

SWO-AT-6. Management recommendations

North Atlantic

The Committee recommends that the Commission adopt one of the MSE-tested management procedures (MPs) (see item 19.27 Response to the Commission's request), and that the TAC be set based on that MP for 2025 and beyond.

SWO-AT-Table 2 from the 2022 stock assessment shows the probabilities of maintaining $B>B_{MSY}$, maintaining $F<F_{MSY}$, and maintaining the stock in the green quadrant of the Kobe plot over a range of TAC options for North Atlantic swordfish over a period of 10 years. The combined Stock Synthesis and JABBA projections show that a 13,200 t constant catch, which is the current TAC level (Rec. 23-04), will result in a 60% probability of being in the green quadrant in 2033 (**SWO-AT-Table 2**). However, given that the estimated MSY (that is inclusive of dead discards) is 12,819 t, catches above MSY will result in biomass declines over the projection period (**SWO-AT-Figure 11**).

The Committee also recognizes that the above advice does not fully account for removals associated with the actual mortality of unreported dead and live discards, quota carryovers (15% in the North Atlantic), quota transfers across the North, and South stock management boundaries nor the total cumulative quota, which includes catch allocated to "other CPCs" and would fall above the TAC if achieved. The Committee emphasizes that the importance of this uncertainty be taken into consideration by the Commission when adopting a TAC.

South Atlantic

SWO-AT-Table 3 shows the probabilities of maintaining $B>B_{MSY}$, maintaining $F<F_{MSY}$, and maintaining the stock in the green quadrant of the Kobe plot over a range of TAC options for South Atlantic swordfish over a period through 2033. The current TAC of 10,000 t (Rec. 22-04) will result in a 52% probability of being in the green quadrant in 2033 (**SWO-AT-Table 3**). The reported catch for 2023 was 8,212 t. Catch levels less than 10,000 t will accelerate rebuilding.

The Committee also recognizes that as was the case for the northern stock, the above advice does not fully account for removals associated with the mortality of unreported dead and post release mortality of live discards, quota carryovers (30% in the South Atlantic) nor quota transfers across the North and South stock management boundaries. The Committee emphasizes the importance of these uncertainties and recommends that the stock be closely monitored in the upcoming years to confirm rebuilding.

ATLANTIC SWORDFISH SUMMARY TABLE		
	North Atlantic	***South Atlantic***
Maximum Sustainable Yield	12,819 t (10,864 t-15,289 t)[1]	11,481 t (9,793 t-13,265 t)[2]
Current (2023) TAC	13,200 t	10,000 t
Current (2023) Yield[3]	12,611 t	8,212 t
Yield in last year used in assessment (2020)[4]	10,668 t	9,020 t
B_{MSY} (CI)	57,919 t (23,666 t-153,156 t)[5]	74,641 t (60,179 t-92,946 t)[2]
F_{MSY}	0.15 (0.08-0.23)[5]	0.15 (0.12-0.19)[2]
Relative Biomass (B_{2020}/B_{MSY})	1.08 (0.71-1.33)[5]	0.77 (0.53-1.11)[2]
Relative Fishing Mortality (F_{2020}/F_{MSY})	0.80 (0.64-1.24)[5]	1.03 (0.67-1.51)[2]
Stock Status (2020)	Overfished: NO	Overfished: YES
	Overfishing: NO	Overfishing: YES
Management Measures in Effect	Country-specific TACs Rec. 22-03, amended in Rec. 23-04: Minimum size 125/119 cm LJFL[6]	Country-specific TACs Rec. 22-04: Minimum size 125/119 cm LJFL[7]

[1] Median from base case JABBA and Stock Synthesis models; range corresponding to the lowest and highest 95% CIs from the two models.
[2] Median and 95% CIs from base case JABBA model.
[3] Provisional and subject to revision.
[4] Based on catch data available in July 2021 for the stock assessment session.
[5] Median and 95% quantiles from base case Stock Synthesis and JABBA models.
[6] Associated alternatives listed in Rec. 17-02.
[7] Associated alternatives listed in Rec. 17-03.

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

				1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
TOTAL				34460	39036	33511	31567	26356	27124	27181	25139	23758	24078	25153	25544	25724	27935	23472	24814	24267	23914	24576	21282	20678	21097	21112	20833	19404	20337	19384	19274	19040	20823
	ATN			15501	17105	15222	13025	12329	11622	11453	10011	9654	11444	12071	12380	11528	12306	11102	12146	11672	12709	13890	12078	10708	10752	10501	10295	9026	10245	10445	9785	10333	12611
	ATS			18958	21931	18289	18542	14027	15502	15728	15128	14104	12634	13082	13163	14196	15629	12370	12668	12596	11205	10686	9204	9970	10345	10611	10537	10379	10091	8939	9488	8708	8212
Landings	ATN		Longline	14365	15864	13822	12204	11062	10717	9922	8678	8799	10334	11410	11531	10896	11479	10394	11504	11077	11796	12976	11366	10089	10194	9913	9462	8401	9340	9746	9167	9802	11997
			Other surf.	428	715	812	370	782	376	393	432	240	486	341	516	409	546	465	485	441	511	512	513	463	391	483	684	472	600	587	517	459	539
	ATS		Longline	17839	21584	17859	18299	13748	14823	15448	14302	13576	11714	12558	12915	13984	15318	11980	12301	12087	10854	10255	8958	9736	10047	10461	10281	10323	9975	8814	9312	8570	8062
			Other surf.	1119	347	429	222	269	672	278	826	527	920	523	248	212	221	384	368	361	277	291	246	189	254	148	145	27	65	66	47	52	40
Discards	ATN		Longline	708	526	562	439	476	525	1137	896	607	618	313	323	215	273	235	151	148	392	391	199	156	167	105	149	152	304	113	99	68	74
			Other surf.	0	0	26	12	9	4	1	6	8	5	7	10	8	8	9	7	5	9	10	0	0	0	0	0	0	1	0	2	3	1
	ATS		Longline	0	0	1	21	10	6	1	0	0	0	1	0	0	91	6	0	147	74	140	0	46	43	2	111	26	50	57	128	85	110
			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	2	1	1	1	0	0
Landings	ATN	CP	Barbados	0	0	33	16	16	12	13	19	10	21	25	44	39	27	39	20	13	23	21	16	21	29	20	21	18	10	12	13	8	9
			Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	9	1	112	106	184	141	142	76	1	3	59	145	117	111	121	70	77
			Brazil	0	0	0	0	0	0	117	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	256
			Canada	1676	1610	739	1089	1115	1119	968	1079	959	1285	1203	1558	1404	1348	1334	1300	1346	1551	1489	1505	1604	1579	1548	1188	782	995	1334	1377	1342	1923
			China PR	86	104	132	40	337	304	22	102	90	316	56	108	72	85	92	92	73	75	59	96	60	141	135	81	87	92	96	44	38	105
			Costa Rica	0	0	0	0	0	1	1	0	0	1	4	3	2	4	11	6	11	23	21	22	30	34	26	44	43	23	19	51	26	27
			Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Côte d'Ivoire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	30	0	0	0	0	0	0	0	0	0	26	8	17	0
			EU-España	6185	7176	5547	5140	4084	3996	4595	3968	3957	4586	5376	5521	5448	5564	4366	4949	4147	4889	5622	4084	3750	4013	3916	3586	3186	3112	3587	3235	3717	4957
			EU-France	46	84	97	164	110	104	122	0	74	169	102	178	92	46	14	15	35	16	94	44	28	66	90	79	80	82	90	103	120	163
			EU-Germany	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			EU-Ireland	0	0	15	15	132	81	35	17	5	12	1	1	3	2	2	1	2	2	5	2	3	15	15	10	13	3	24	9	22	31
			EU-Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
			EU-Portugal	1599	1617	1703	903	773	777	732	735	766	1032	1320	900	949	778	747	898	1054	1203	882	1438	1241	1420	1460	1871	1691	2392	2070	2165	1750	1967
			El Salvador	0	0	0	0	0	0	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	10	3	36	48	0	82	48	17	90	1	0	18	3	0	0	0	0	0	0	0	78	0
			Great Britain	3	1	5	11	0	2	1	0	0	0	0	0	49	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Grenada	0	1	4	15	15	42	84	0	54	88	73	56	30	26	43	0	0	0	0	0	0	39	29	36	36	22	15	4	7	6
			Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Iceland	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Japan	933	1043	1494	1218	1391	1089	161	0	0	0	575	705	656	889	935	778	1062	523	639	300	545	430	379	456	325	355	406	311	491	607
			Korea Rep	16	16	19	15	0	0	0	0	0	0	0	51	65	175	157	3	0	0	0	64	35	0	9	19	9	9	14	13	17	20
			Liberia	26	28	28	28	28	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	95	5	7	3	8	0	1
			Maroc	36	79	462	267	292	119	114	523	223	329	335	339	341	237	430	724	968	782	770	1062	1062	850	900	900	950	950	936	955	1085	1145
			Mexico	14	10	22	14	28	24	37	27	34	32	44	41	31	35	34	32	35	38	40	33	32	31	36	64	44	30	21	25	22	26
			Norway	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Panama	0	0	0	0	0	17	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	1	4	44	5	0	8	0	22	28	0	17	37	9	14	0	0	0	0	0	0	0	0	0
			Russian Federation	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Senegal	0	0	0	0	0	0	0	0	0	0	0	0	0	38	41	87	113	148	44	43	49	78	146	112	89	121	33	6	0	54
			Sierra Leone	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	16	0	0	0	0	0	0	0	0	0	0	0	0
			St Vincent and Grenadines	0	4	3	1	0	1	0	22	22	7	7	7	7	51	7	34	13	11	8	4	40	102	33	46	26	12	7	0	2	4
			Trinidad and Tobago	180	150	158	110	130	138	41	75	92	78	83	91	19	29	48	30	21	16	14	16	26	17	13	36	3	6	8	6	6	1
			UK-Bermuda	0	1	1	5	5	3	3	2	0	0	1	1	0	3	4	3	3	3	1	1	1	1	2	1	2	2	6	5	3	4
			UK-British Virgin Islands	0	0	0	0	0	0	0	0	0	0	4	4	7	0	3	0	0	4	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	13	17	0	0	0	0	0	0	0	0	0
			USA	3366	4026	3559	2987	3058	2908	2863	2217	2384	2513	2380	2160	1873	2463	2387	2730	2274	2551	3393	2824	1809	1581	1408	1294	1135	1449	1351	1142	1281	954
			Venezuela	69	54	85	20	37	30	44	21	34	45	53	55	22	30	11	13	24	18	25	24	24	34	57	58	36	35	16	13	17	31
		NCC	Chinese Taipei	507	489	521	509	286	285	347	299	310	257	30	140	172	103	82	89	88	192	166	115	78	115	148	78	162	115	144	66	145	170
			Guyana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	10	5	2	5	3	0	0
		NCO	Cuba	50	86	7	7	7	7	0	0	10	3	3	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Dominica	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	
			Faroe Islands	0	0	0	0	0	5	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Saint Kitts and Nevis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0	
			Seychelles	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Sta Lucia	1	0	0	0	0	0	0	0	0	0	2	3	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
			Vanuatu	0	0	0	0	0	0	0	0	0	0	35	29	14	0	0	0	10	23	15	2	4	7	0	0	0	0	0	0	0	
	ATS	CP	Angola	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	18	0	0	13	0	0	0	34	74	9
			Belize	0	1	0	0	0	17	8	0	0	0	0	0	0	120	32	111	121	207	197	136	45	111	176	166	115	55	2	2	2	0
			Brazil	1571	1975	1892	4100	3847	4721	4579	4082	2910	2920	2998	3785	4430	4153	3407	3386	2926	3033	2833	2384	2892	2599	2938	2410	2798	2863	2110	2823	2197	1728
			China PR	0	0	0	0	29	534	344	200	423	353	278	91	300	473	470	291	296	248	316	196	206	328	222	302	355	211	89	37	188	109
			Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Côte d'Ivoire	20	19	26	18	25	26	20	19	19	43	29	31	39	17	24	145	156	58	89	133	68	48	58	41	57	123	19	14	24	4
			EU-España	7937	11290	9622	8461	5832	5758	6388	5789	5741	4527	5483	5402	5300	5284	4073	5183	5801	4700	4852	4184	4113	5059	4992	4656	4404	4224	4442	4470	3592	4092
			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	4	0	0	0	0	0
			EU-Lithuania	794	0	0	0	0	0	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	380	389	441	384	381	392	393	380	354	345	493	440	428	271	367	232	263	184	125	252	236	250	466	369	323	335	224	210	360
			El Salvador	0	0	0	0	0	0	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	9	2	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Ghana	51	103	140	44	106	121	117	531	372	734	343	55	32	65	177	132	116	60	54	37	26	56	36	55	6	32	31	19	16	21
			Great Britain	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Guinea Ecuatorial	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0
			Honduras	0	6	4	5	2	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Japan	4699	3619	2197	1494	1186	775	790	685	833	924	686	480	1090	2155	1600	1340	1314	1233	1162	684	976	659	637	915	640	647	552	478	631	489
			Korea Rep	164	164	7	18	7	5	10	0	2	24	70	36	94	176	223	10	0	0	42	47	53	5	19	11	18	9	15	6	6	5
			Namibia	22	0	0	0	0	730	469	751	504	191	549	832	1118	1038	518	25	417	414	85	129	395	225	466	600	881	811	789	623	1100	665
			Nigeria	0	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	0	0	0	0
			Panama	0	0	0	0	29	105	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	6	1	8	1	1	4	58	41	49	14	35	15	35	58	0	0	0	0	0	0	0	0	0
			S Tomé e Príncipe	190	178	166	148	135	129	120	120	120	120	126	147	138	138	183	188	193	60	84	60	94	145	77	65	1	12	4	14	11	20
			Senegal	0	0	0	0	0	0	0	0	0	0	0	0	0	77	97	137	78	117	162	178	143	97	90	112	65	116	38	0	0	0
			South Africa	1	4	1	1	240	143	328	547	649	293	295	199	186	207	142	170	145	97	50	171	152	218	164	189	189	251	149	179	161	291
			St Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	10	7	16	4	3	2	2	19	0	5	9	4	15	9	32	76	39
			UK-Sta Helena	0	0	0	0	0	0	0	20	4	2	2	0	0	0	0	0	0	0	0	5	6	2	0	0	0	0	0	0	0	0
			USA	0	0	171	396	160	179	142	43	200	21	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Uruguay	165	499	644	760	889	650	713	789	768	850	1105	843	620	464	370	501	222	179	40	103	0	0	0	0	0	0	0	0	0	0
		NCC	Chinese Taipei	2829	2876	2873	2562	1147	1168	1303	1149	1164	1254	745	744	377	671	727	612	410	424	379	582	406	511	478	416	446	346	296	406	335	269
		NCO	Argentina	24	0	0	0	0	38	0	5	10	8	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	
			Benin	25	24	24	10	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Cambodia	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

				1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
			Cuba	452	778	60	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Mixed flags (FR+ES)	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Seychelles	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Togo	14	14	64	0	0	0	0	0	0	0	9	10	2	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	11	26	6	3	0	3	1	3	0	1	1	0	0	0	0	0	0	0	
Discards	ATN	CP	Canada	0	0	0	5	52	35	50	26	33	79	45	106	38	61	39	9	15	8	111	59	12	8	11	21	5	2	2	3	2	3
			EU-España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
			EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			EU-Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	1
			Japan	0	0	0	0	0	0	598	567	319	263	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	5	4	2	3
			Korea Rep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	170	46	19	0	2	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	1	0	0	0	0	0	0	0	0	0	0	0	0
			UK-Bermuda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			USA	708	526	588	446	433	494	490	308	263	282	275	227	185	220	205	148	138	223	217	120	137	137	90	111	140	287	91	90	59	55
		NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27	0	7	18	4	18	7	7	14	2	5	13
	ATS	CP	Brazil	0	0	0	0	0	0	0	0	0	0	0	0	0	91	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			EU-España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	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	1	0	0	0	0	0
			Japan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
			Korea Rep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	147	70	23	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	0	0	0	0	0
			USA	0	0	1	21	10	6	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	117	0	45	43	2	111	26	49	57	126	85	110

SWO-AT-Table 2. Joint probabilities of the North Atlantic swordfish stock being below F_{MSY} (top, overfishing not occurring), above B_{MSY} (middle, not overfished) as well as the joint probability of being above B_{MSY} and below F_{MSY} (bottom, green zone) in a given year for a given catch level based on 30,000 iterations of the MVLN approximation for Stock Synthesis and JABBA MCMC iterations.

Probaility $F<F_{MSY}$

TAC (t)	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
0t	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
9000t	94%	94%	94%	94%	94%	94%	94%	94%	94%	94%	94%
10000t	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
11000t	85%	85%	85%	85%	85%	85%	85%	85%	85%	85%	85%
12000t	79%	79%	79%	79%	79%	80%	80%	80%	79%	79%	79%
12500t	76%	76%	76%	76%	76%	76%	76%	76%	76%	76%	76%
12600t	75%	75%	75%	75%	75%	75%	75%	76%	75%	75%	75%
12700t	74%	74%	74%	74%	74%	74%	74%	74%	74%	74%	74%
12800t	74%	73%	73%	73%	73%	73%	73%	73%	73%	73%	73%
12900t	73%	72%	72%	72%	72%	72%	72%	72%	71%	71%	71%
13000t	72%	71%	71%	71%	71%	70%	70%	70%	69%	69%	68%
13100t	71%	70%	70%	69%	69%	68%	68%	67%	66%	66%	65%
13200t	70%	69%	69%	68%	67%	66%	65%	64%	63%	62%	61%
13300t	69%	68%	67%	66%	65%	63%	62%	61%	59%	58%	56%
13400t	68%	66%	65%	64%	62%	60%	59%	57%	55%	53%	51%
13500t	66%	65%	63%	61%	59%	57%	55%	53%	51%	48%	46%
13600t	65%	63%	61%	59%	56%	54%	51%	49%	46%	43%	41%
13700t	63%	61%	59%	56%	53%	50%	47%	44%	41%	38%	36%
13800t	62%	59%	56%	53%	50%	46%	43%	40%	37%	34%	32%
14000t	58%	55%	51%	47%	43%	39%	35%	32%	29%	27%	25%
15000t	38%	31%	25%	21%	25%	32%	32%	31%	31%	30%	29%
16000t	20%	15%	12%	11%	10%	10%	10%	9%	9%	9%	9%

Probability $B>B_{MSY}$

TAC (t)	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
0t	75%	84%	90%	94%	96%	97%	98%	98%	99%	99%	99%
9000t	75%	78%	80%	82%	83%	84%	85%	86%	86%	87%	87%
10000t	75%	77%	79%	80%	81%	82%	83%	83%	83%	84%	84%
11000t	75%	76%	77%	78%	79%	79%	80%	80%	81%	81%	81%
12000t	75%	75%	76%	76%	77%	77%	77%	77%	77%	77%	77%
12500t	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%
12600t	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%
12700t	75%	75%	74%	74%	74%	74%	74%	74%	74%	74%	74%
12800t	75%	74%	74%	74%	74%	74%	74%	74%	74%	73%	73%
12900t	75%	74%	74%	74%	73%	73%	73%	73%	73%	72%	72%
13000t	75%	74%	74%	73%	73%	73%	72%	72%	72%	71%	71%
13100t	75%	74%	73%	73%	72%	72%	72%	71%	70%	70%	69%
13200t	75%	74%	73%	72%	72%	71%	71%	70%	69%	68%	67%
13300t	75%	74%	73%	72%	71%	70%	69%	68%	67%	66%	65%
13400t	75%	74%	73%	72%	70%	70%	68%	67%	65%	64%	62%
13500t	75%	74%	72%	71%	70%	68%	67%	65%	63%	61%	59%
13600t	74%	74%	72%	71%	69%	67%	65%	63%	61%	58%	55%
13700t	74%	73%	72%	70%	68%	66%	64%	61%	58%	55%	52%
13800t	74%	73%	71%	70%	67%	65%	62%	59%	55%	52%	48%
14000t	74%	73%	71%	68%	65%	62%	58%	54%	50%	45%	41%
15000t	74%	71%	66%	59%	47%	44%	42%	41%	39%	38%	36%
16000t	74%	69%	59%	48%	36%	27%	21%	18%	16%	15%	14%

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

TAC (t)	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
0t	75%	84%	90%	94%	96%	97%	98%	98%	99%	99%	99%
9000t	75%	78%	80%	82%	83%	84%	85%	86%	86%	87%	87%
10000t	75%	77%	79%	80%	81%	82%	83%	83%	83%	84%	84%
11000t	75%	76%	77%	78%	79%	79%	80%	80%	80%	81%	81%
12000t	74%	75%	75%	76%	76%	76%	77%	77%	77%	77%	77%
12500t	73%	73%	74%	74%	74%	74%	74%	75%	75%	75%	75%
12600t	73%	73%	73%	73%	74%	74%	74%	74%	74%	74%	74%
12700t	72%	72%	73%	73%	73%	73%	73%	73%	73%	73%	73%
12800t	72%	72%	72%	72%	72%	72%	72%	72%	72%	72%	72%
12900t	71%	71%	71%	71%	71%	71%	71%	71%	70%	70%	70%
13000t	70%	70%	70%	70%	70%	69%	69%	69%	68%	68%	67%
13100t	70%	69%	69%	69%	68%	67%	67%	66%	66%	65%	64%
13200t	69%	68%	68%	67%	66%	65%	64%	63%	62%	61%	60%
13300t	68%	67%	66%	65%	64%	63%	61%	60%	59%	57%	56%
13400t	67%	66%	64%	63%	61%	60%	58%	56%	54%	53%	51%
13500t	66%	64%	62%	61%	59%	57%	55%	53%	50%	48%	46%
13600t	64%	62%	60%	58%	56%	53%	51%	48%	46%	43%	40%
13700t	63%	61%	58%	55%	53%	50%	47%	44%	41%	38%	36%
13800t	61%	59%	56%	53%	49%	46%	43%	40%	37%	34%	32%
14000t	58%	55%	51%	47%	43%	39%	35%	32%	29%	27%	25%
15000t	38%	31%	25%	21%	22%	32%	30%	29%	27%	26%	25%
16000t	20%	15%	12%	11%	10%	10%	10%	9%	9%	9%	9%

SWO-AT-Table 3. Estimated projection probabilities (%) for the reference case model for South Atlantic swordfish. Projection probabilities are provided for $F<=F_{MSY}$ (top); $B>=B_{MSY}$ (middle); $F<=F_{MSY}$ and $B>=B_{MSY}$ (bottom). Stochastic projections were conducted over the period 2023-2033 with a range of fixed TACs (6,000 – 15,000 t), including a zero catch-scenario. The 2021 and 2022 catches are assumed to be 9,826 t, which is the mean of the 2018-2020 reported catch.

Probability $F<=F_{MSY}$

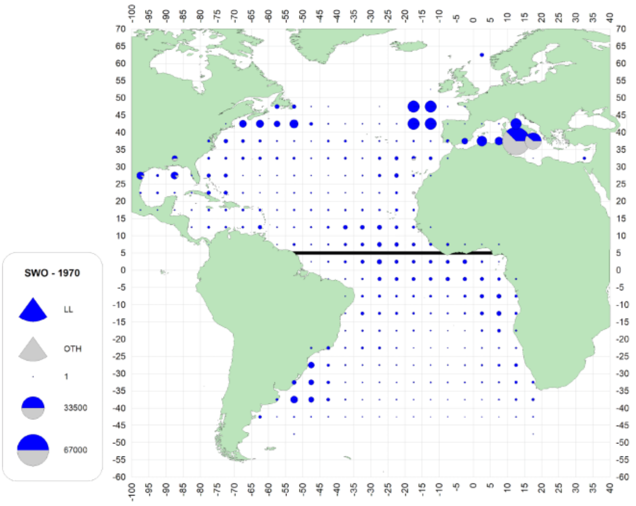
TAC (t)	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
6000	95%	97%	98%	98%	99%	99%	99%	99%	100%	100%	100%
6500	92%	94%	96%	97%	98%	98%	99%	99%	99%	99%	99%
7000	88%	91%	93%	95%	96%	97%	97%	98%	98%	98%	98%
7500	82%	86%	89%	91%	93%	94%	95%	96%	96%	97%	97%
8000	75%	80%	83%	86%	88%	90%	91%	92%	93%	94%	95%
8500	68%	72%	76%	79%	82%	84%	85%	87%	88%	89%	90%
9000	59%	64%	68%	71%	74%	76%	78%	80%	81%	83%	84%
9500	51%	55%	59%	62%	65%	67%	69%	71%	72%	74%	75%
9826	46%	50%	53%	56%	58%	60%	62%	64%	65%	67%	68%
10000	43%	47%	49%	52%	54%	57%	59%	60%	62%	64%	65%
10500	35%	38%	40%	42%	44%	46%	48%	49%	50%	52%	53%
11000	29%	31%	32%	33%	35%	36%	37%	38%	39%	40%	40%
11500	23%	24%	25%	25%	26%	27%	27%	28%	28%	29%	29%
12000	18%	18%	19%	19%	19%	19%	19%	20%	20%	20%	20%
12500	13%	14%	14%	14%	14%	14%	14%	13%	13%	13%	13%
13000	11%	10%	10%	10%	10%	10%	9%	9%	9%	9%	9%
13500	8%	8%	7%	7%	7%	6%	6%	6%	6%	6%	5%
14000	6%	6%	5%	5%	5%	4%	4%	4%	4%	3%	3%
14500	5%	4%	4%	3%	3%	3%	3%	2%	2%	2%	2%
15000	4%	3%	3%	2%	2%	2%	2%	2%	1%	1%	1%

Probability $B>=B_{MSY}$

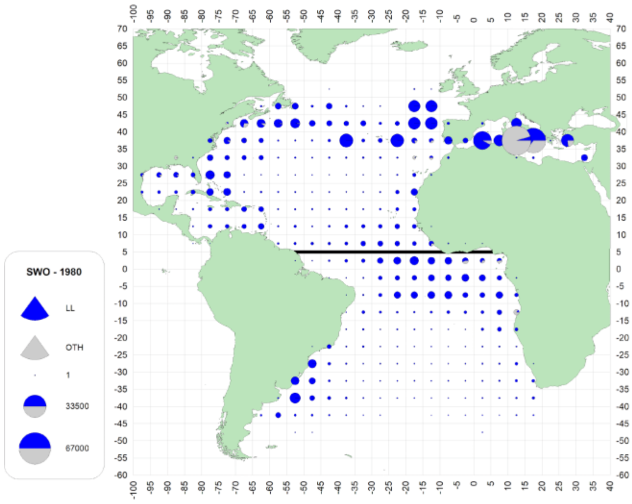
TAC (t)	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
0	21%	48%	74%	90%	96%	99%	99%	100%	100%	100%	100%
6000	21%	33%	46%	59%	70%	77%	83%	88%	92%	94%	95%
6500	21%	32%	44%	56%	66%	74%	80%	85%	88%	91%	93%
7000	21%	31%	41%	52%	62%	70%	75%	80%	85%	88%	90%
7500	21%	30%	39%	48%	57%	65%	70%	76%	80%	83%	86%
8000	21%	29%	37%	45%	53%	60%	65%	70%	74%	78%	81%
8500	21%	28%	34%	41%	48%	54%	59%	64%	68%	72%	75%
9000	21%	27%	32%	38%	44%	49%	53%	58%	61%	65%	68%
9500	21%	26%	31%	35%	39%	44%	48%	51%	55%	58%	60%
9826	21%	25%	29%	33%	36%	40%	43%	47%	50%	52%	55%
10000	21%	25%	29%	32%	35%	39%	41%	45%	47%	49%	52%
10500	21%	24%	27%	29%	31%	34%	36%	38%	40%	41%	43%
11000	21%	23%	25%	26%	28%	29%	30%	32%	33%	34%	35%
11500	21%	22%	23%	24%	24%	25%	25%	26%	26%	27%	27%
12000	21%	21%	21%	21%	21%	21%	21%	21%	21%	21%	21%
12500	21%	20%	19%	19%	18%	18%	17%	17%	16%	16%	16%
13000	21%	19%	18%	17%	16%	15%	14%	13%	13%	12%	12%
13500	21%	18%	17%	15%	14%	12%	11%	10%	10%	9%	9%
14000	21%	18%	15%	13%	12%	10%	9%	8%	7%	7%	6%
14500	21%	17%	14%	12%	10%	8%	7%	6%	6%	5%	4%
15000	21%	16%	13%	10%	8%	7%	6%	5%	4%	3%	3%

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

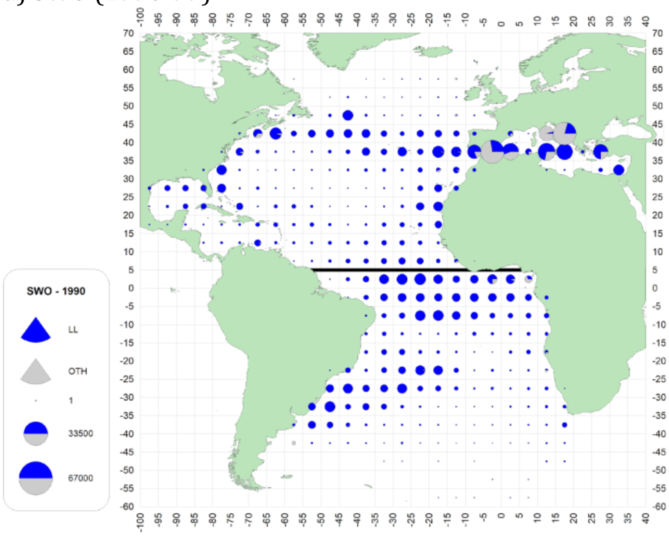
TAC (t)	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
0	21%	48%	74%	90%	96%	99%	99%	100%	100%	100%	100%
6000	21%	33%	46%	59%	70%	77%	83%	88%	92%	94%	95%
6500	21%	32%	44%	56%	66%	74%	80%	85%	88%	91%	93%
7000	21%	31%	41%	52%	62%	70%	75%	80%	85%	88%	90%
7500	21%	30%	39%	48%	57%	65%	70%	76%	80%	83%	86%
8000	21%	29%	37%	45%	53%	60%	65%	70%	74%	78%	81%
8500	21%	28%	34%	41%	48%	54%	59%	64%	68%	72%	75%
9000	21%	27%	32%	38%	44%	49%	53%	58%	61%	65%	68%
9500	21%	26%	31%	35%	39%	44%	48%	51%	55%	58%	60%
9826	21%	25%	29%	33%	36%	40%	43%	47%	50%	52%	55%
10000	20%	25%	28%	32%	35%	39%	41%	45%	47%	49%	52%
10500	20%	23%	26%	29%	31%	33%	35%	38%	40%	41%	43%
11000	20%	22%	24%	25%	27%	28%	30%	31%	32%	33%	35%
11500	18%	19%	21%	22%	23%	23%	24%	24%	25%	26%	26%
12000	16%	16%	17%	18%	18%	18%	18%	18%	19%	19%	19%
12500	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%
13000	10%	10%	10%	10%	9%	9%	9%	9%	9%	9%	8%
13500	8%	8%	7%	7%	7%	6%	6%	6%	6%	5%	5%
14000	6%	6%	5%	5%	5%	4%	4%	4%	4%	3%	3%
14500	5%	4%	4%	3%	3%	3%	3%	2%	2%	2%	2%
15000	4%	3%	3%	2%	2%	2%	2%	2%	1%	1%	1%



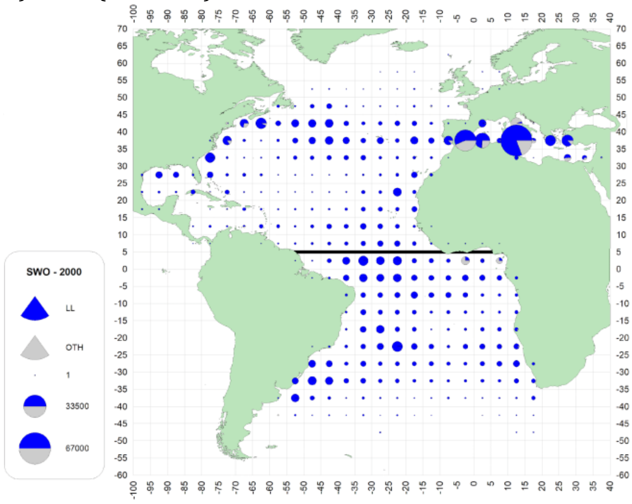
a) SWO (1970-79)



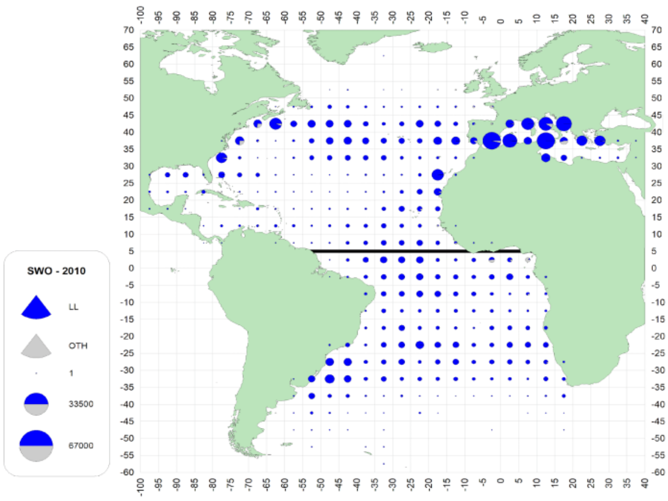
b) SWO (1980-89)



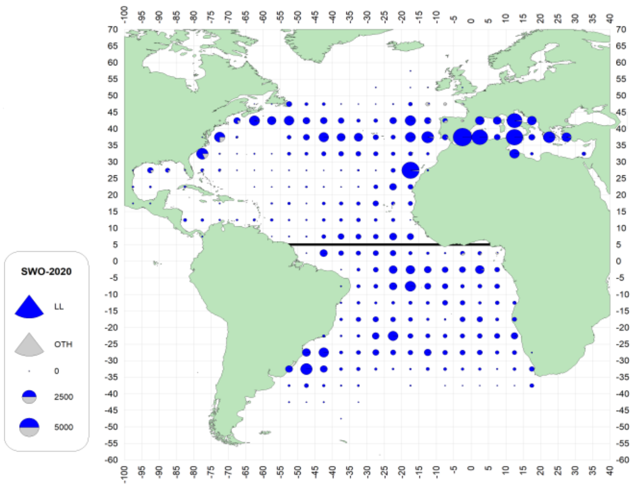
c) SWO (1990-99)



d) SWO (2000-09)

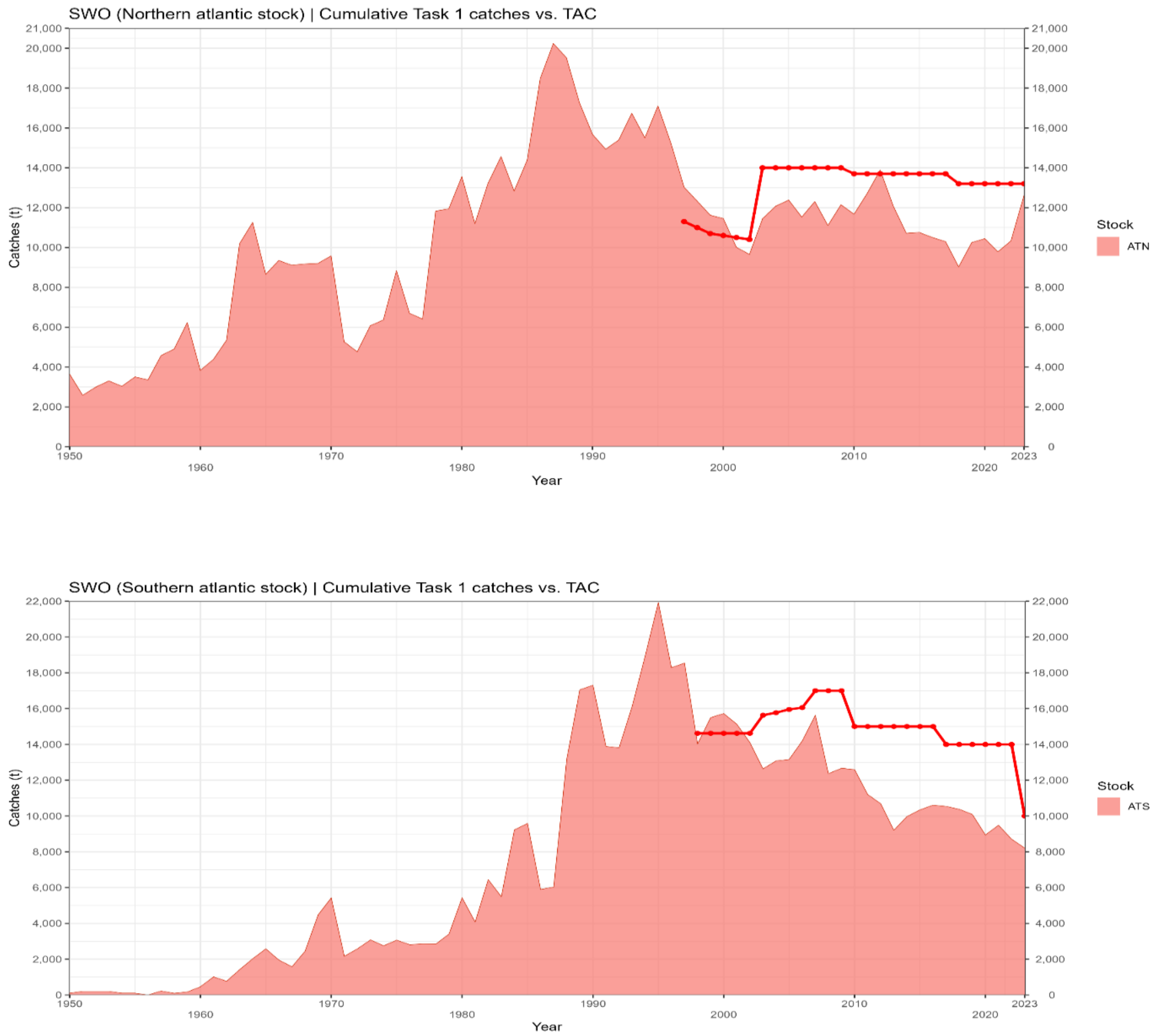


e) SWO (2010-19)

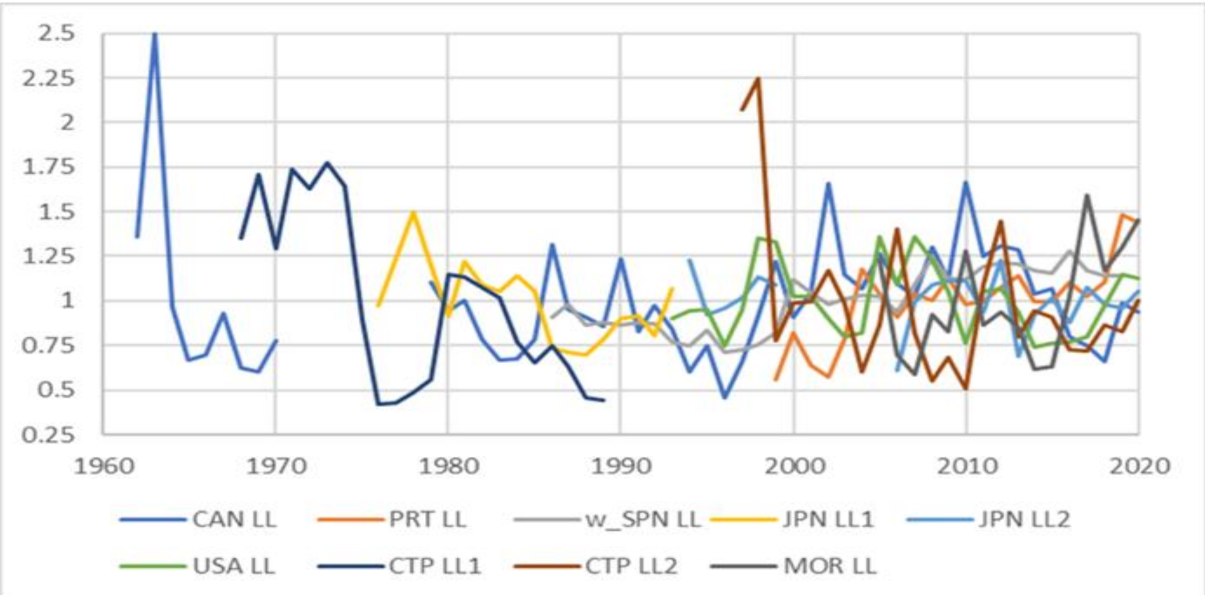


f) SWO (2020-22)

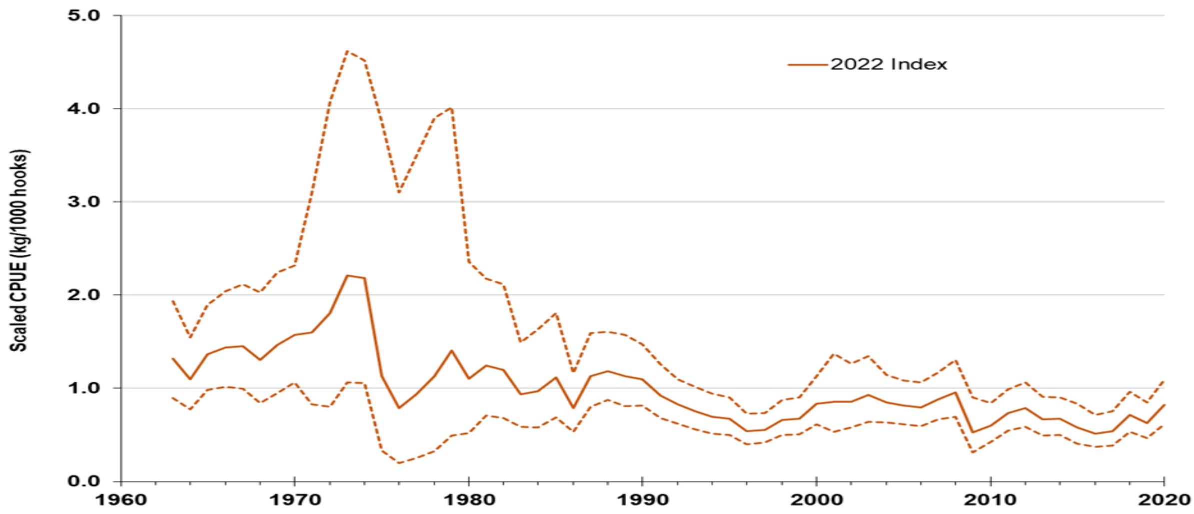
SWO-AT-Figure 1. Geographic distribution of swordfish cumulative catch (t) by gear, in the Convention area, shown on a decadal scale. The maps are scaled to the maximum catch observed during 1970-2022 (the last decade only covers 3 years).



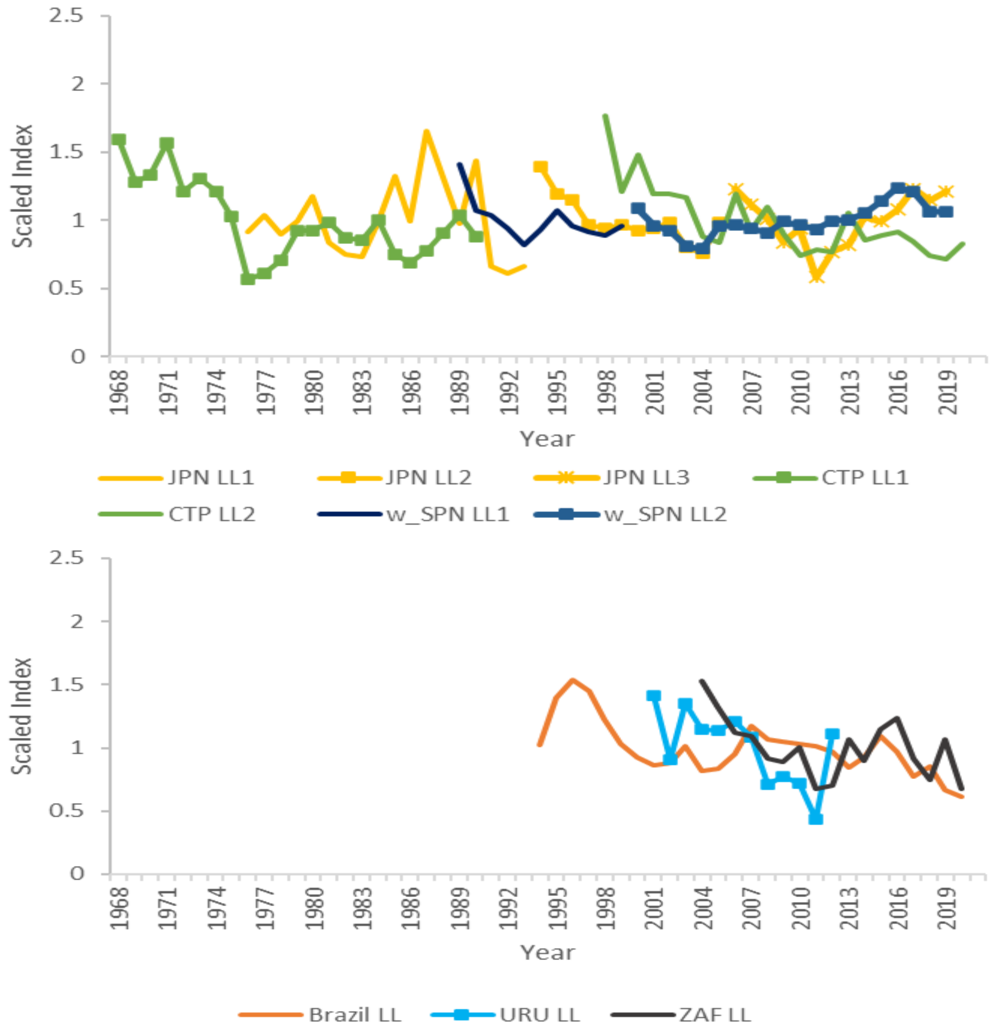
SWO-AT-Figure 2. North (top) and South (bottom) Atlantic swordfish catches (t, landings and dead discards) and TAC (t), for the period 1950-2023. The dotted red lines indicate the TAC.



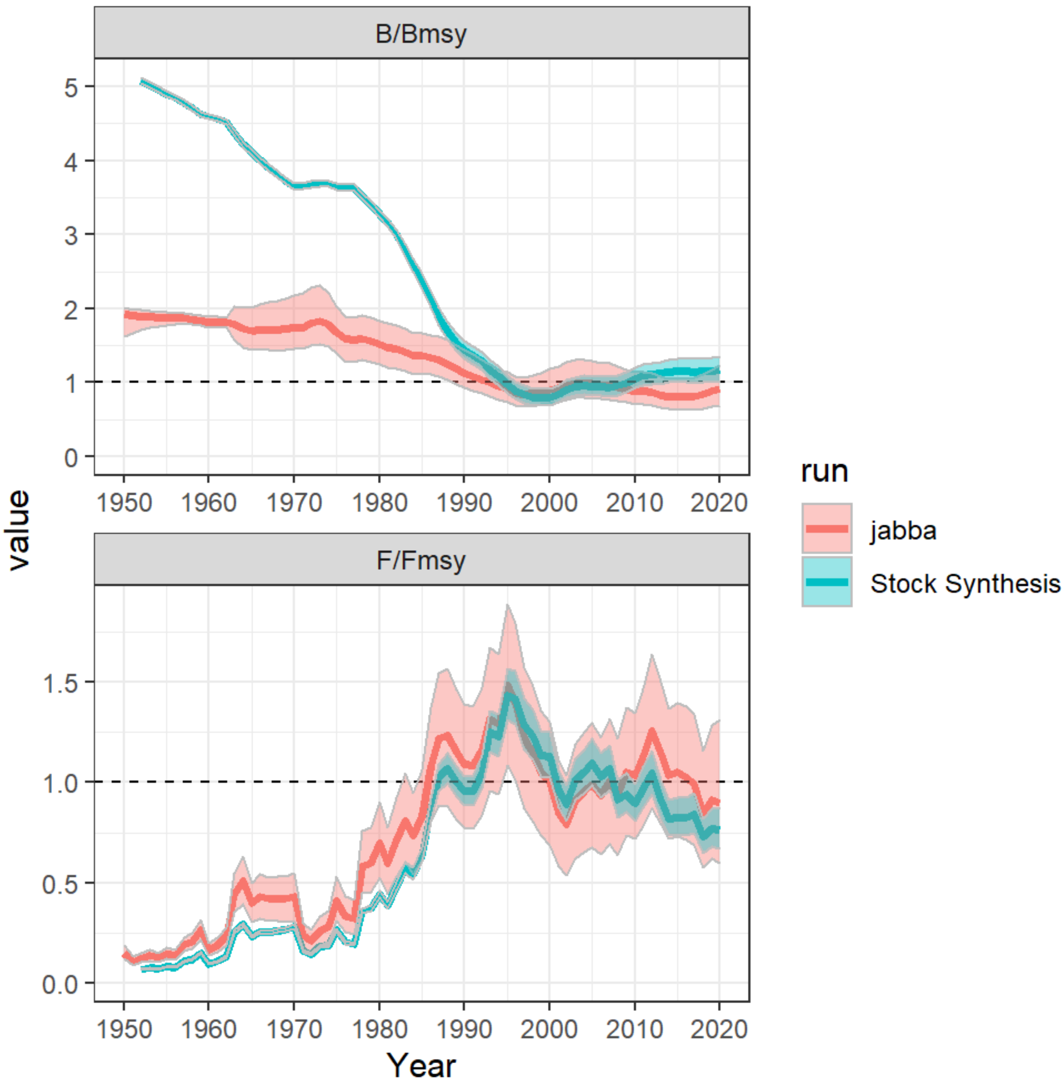
SWO-AT-Figure 3. Standardized CPUEs series provided by CPCs for the North Atlantic swordfish for the base continuity production model. The CPUE series were scaled to their mean for comparison purposes.



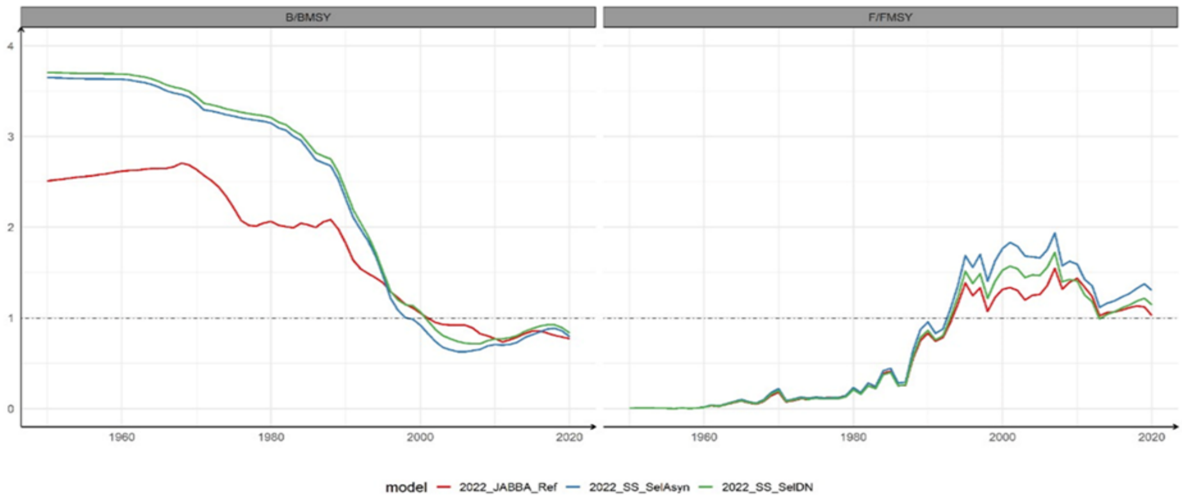
SWO-AT-Figure 4. Standardized combined biomass CPUE index for North Atlantic and 95% confidence intervals, used in the 2022 stock assessment as the continuity run for the production models.



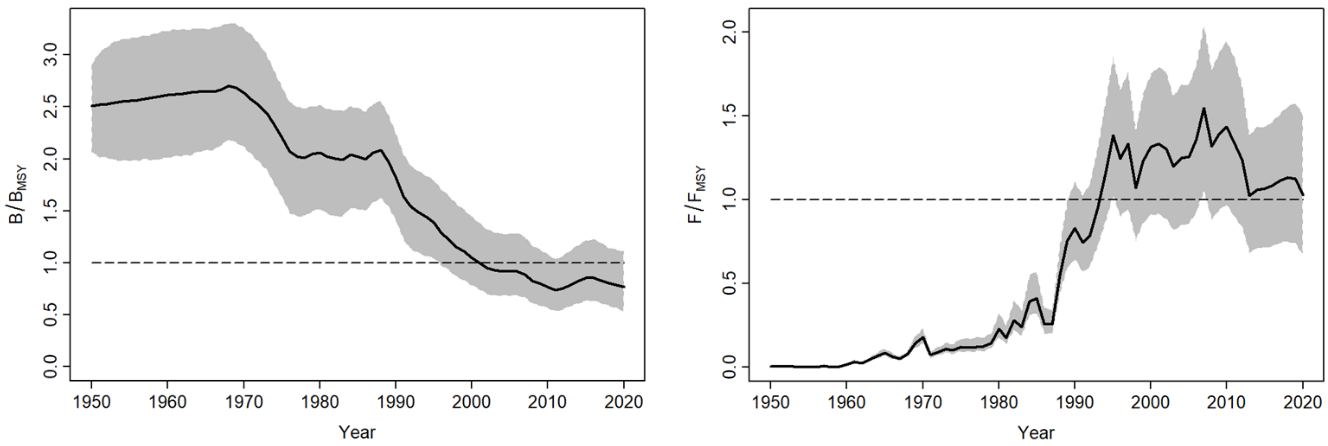
SWO-AT-Figure 5. Standardized CPUEs series that were used in the 2022 assessment of South Atlantic swordfish. Indices that were split (JPN, EU-SPN and CTP) are shown on the top, and the rest (BRA, URU and ZAF) are shown at the bottom. The CPUE series were scaled to their mean for comparison purposes.



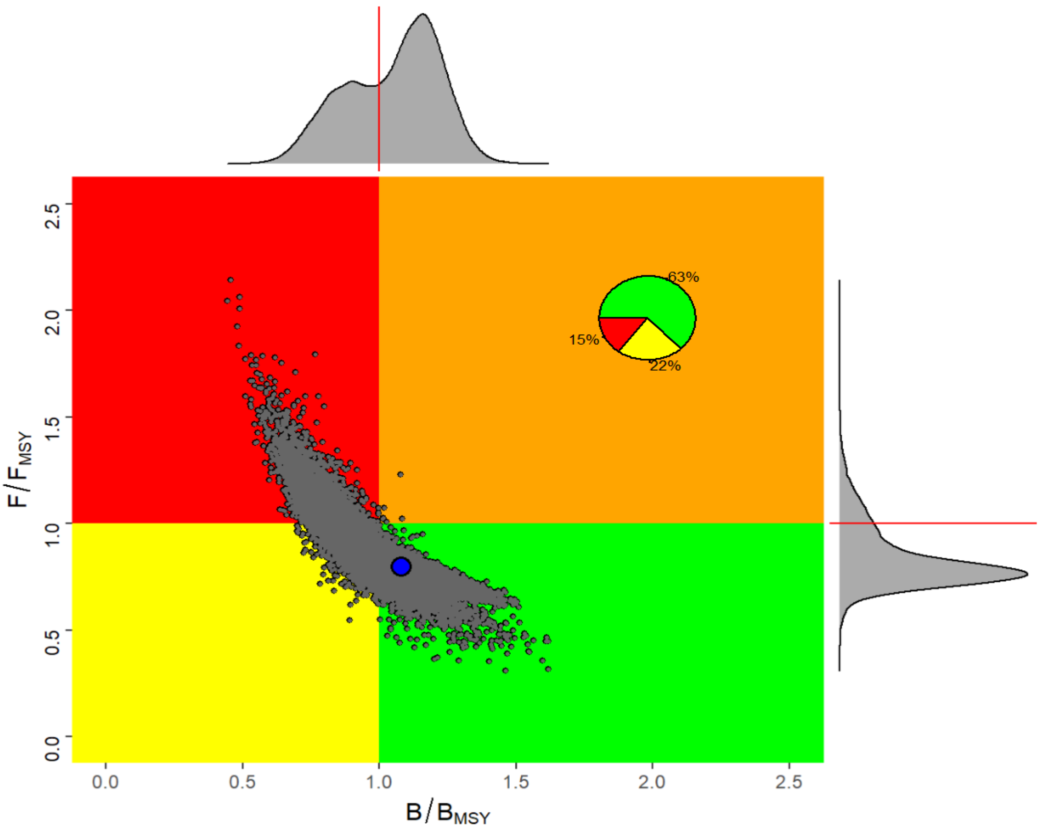
SWO-AT-Figure 6. Results from the two models used for management advice in the North Atlantic swordfish assessment: JABBA and Stock Synthesis. Trends in relative biomass (top) and fishing mortality (bottom). Uncertainty intervals are approximations of 95% credibility intervals.



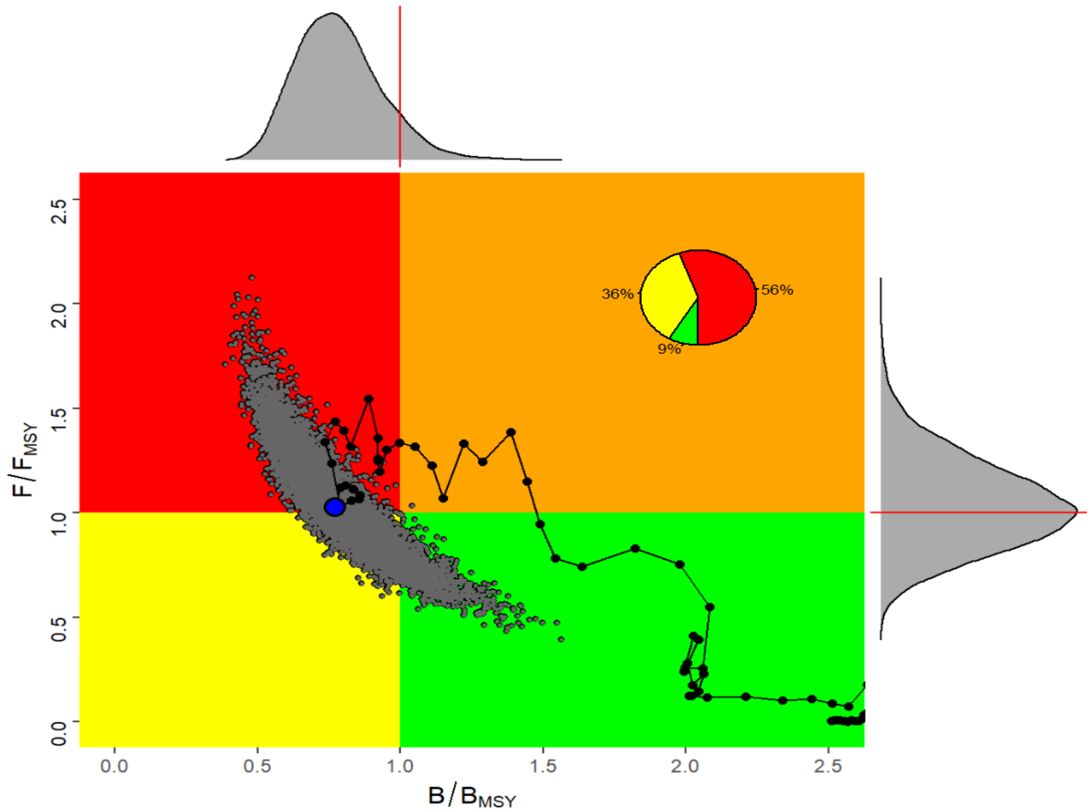
SWO-AT-Figure 7. Comparisons of B/B_{MSY} and F/F_{MSY} between JABBA base case and two SS runs for the South Atlantic swordfish stock.



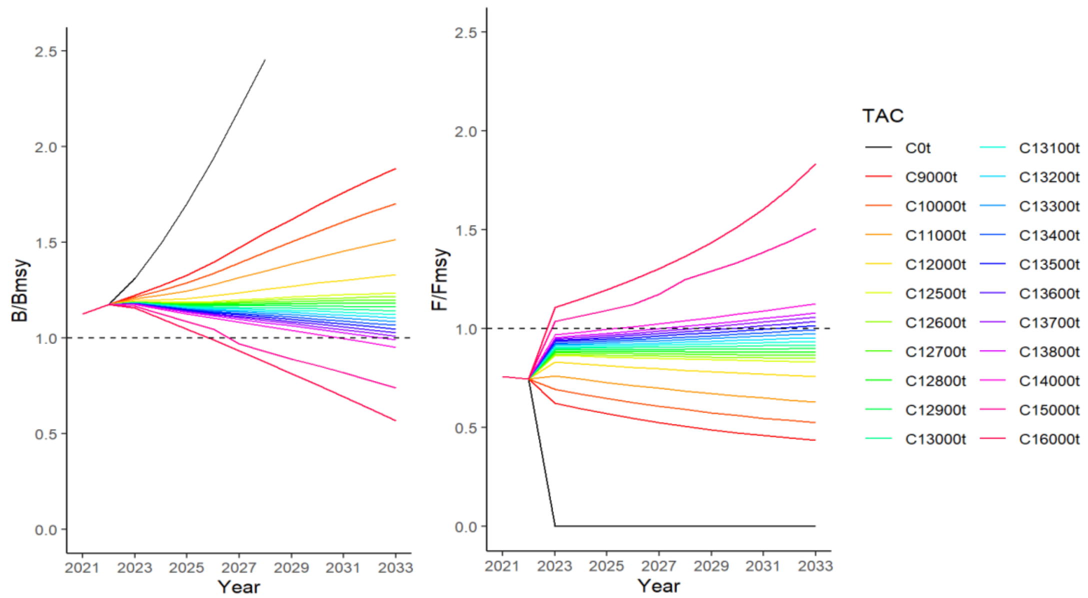
SWO-AT-Figure 8. South Atlantic swordfish biomass and fishing mortality rates relative to MSY levels, from the JABBA base case model. Grey areas represent 95% credibility intervals.



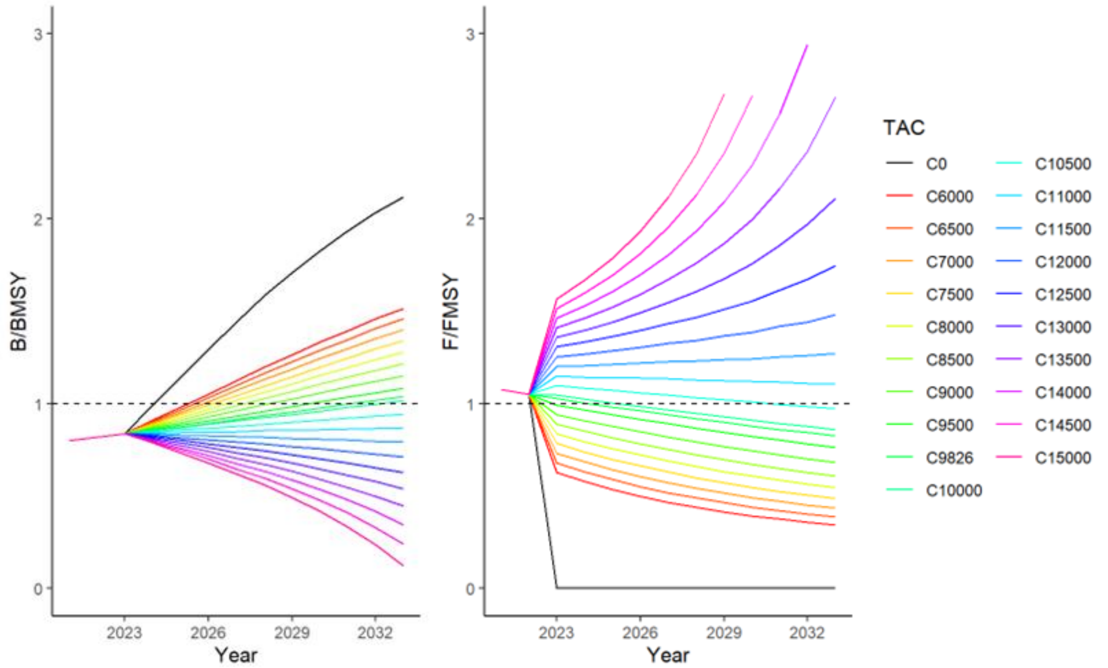
SWO-AT-Figure 9. Joint Kobe plot for the Stock Synthesis and the JABBA reference case models for the North Atlantic swordfish stock. For the Stock Synthesis run, the benchmark is calculated from the year-specific selectivity and fleet allocations and based on 15000 MVLN iterations for Stock Synthesis and 15000 Markov chain Monte Carlo (MCMC) iterations for JABBA. The blue point shows the median of 30,000 iterations for SSB_{2020}/SSB_{MSY} or B_{2020}/B_{MSY} and F_{2020}/F_{MSY} for the entire iterations from Stock Synthesis and JABBA. Grey points represent the 2020 estimates of relative fishing mortality and relative spawning stock biomass for 2020 for each of the 30,000 iterations. The upper graph represents the smoothed frequency distribution of SSB_{2020}/SSB_{MSY} or B_{2020}/B_{MSY} estimates. The right graph represents the smoothed frequency distribution of F_{2020}/F_{MSY} estimates. The inserted pie graph represents the percentage of each 2020 estimate that fall in each quadrant of the Kobe plot. All SSB for Stock Synthesis showed the values at the end of years. The blue dot is the median of the 2020 stock status.



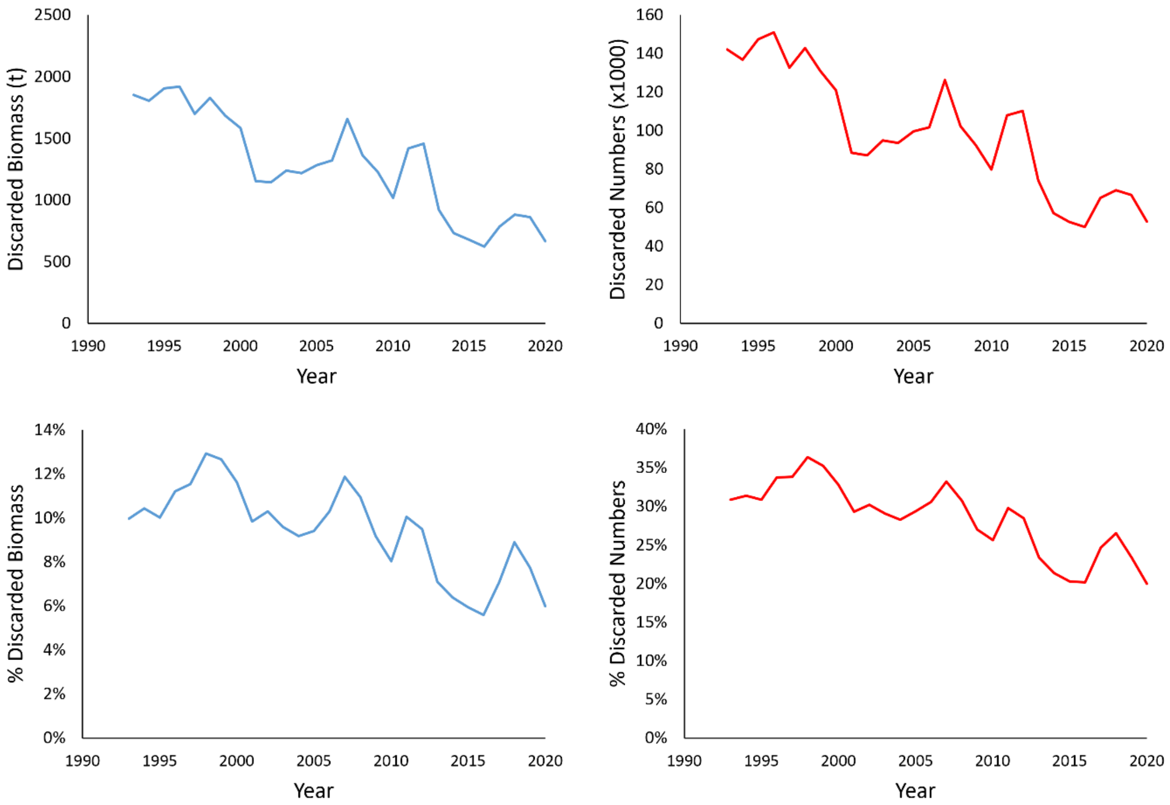
SWO-AT-Figure 10. Kobe plot for the JABBA reference base case model for South Atlantic swordfish. The solid blue circle is the estimated median point with the respective uncertainties in the terminal year (2020). The pie chart represents the probabilities of stock being in the different colour quadrants (red 56%, yellow 36%, green 9%). The blue dot represents the 2020 stock status.



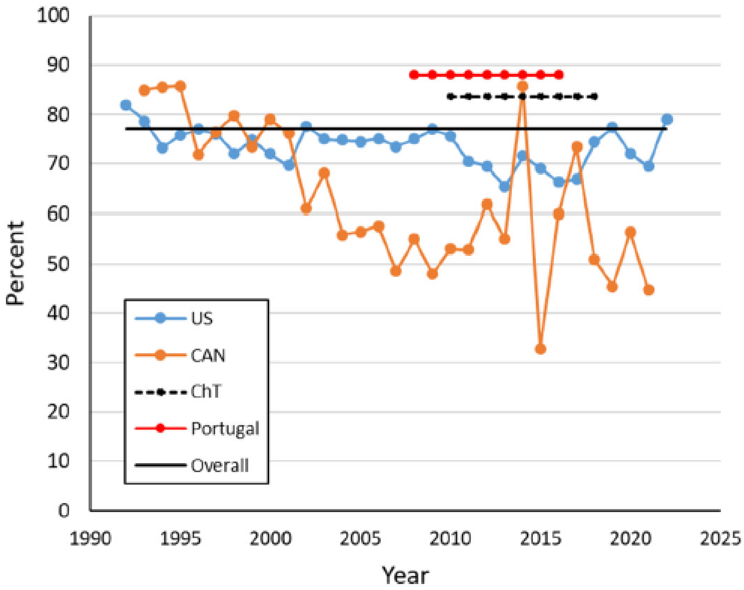
SWO-AT-Figure 11. Joint projections from Stock Synthesis and JABBA of biomass (or spawning stock biomass) at 0, 9-16 thousand t constant TACs for the North Atlantic swordfish stock for the period 2023-2033.



SWO-AT-Figure 12. Median trends of relative biomass (B/B_{MSY}) for the projected South Atlantic swordfish stock derived from the JABBA base case model at 0, 6-15 thousand t constant TACs for the period 2023-2033.



SWO-AT-Figure 13. Estimated total discards due to the minimum size regulation in absolute biomass and numbers (top row) and in biomass and numbers as a proportion of the catch (bottom row) for years 1992 to 2020, as estimated by Stock Synthesis.



SWO-AT-Figure 14. Direct observations of at-haulback mortality of fish below the minimum size limit in four longline fleets operating in the North Atlantic.

9.13 SWO-MD - Mediterranean swordfish

In 2019 the Mediterranean swordfish landings were the lowest observed since the full development of the fisheries in the mid-1980s. The most recent assessment of the stock was conducted in 2020, making use of the available catch, effort and size information through 2018. 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 2020 Mediterranean Swordfish Stock Assessment (ICCAT, 2020c).

SWO-MD-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, past biological, genetic and tagging studies have suggested the possible occurrence of mixing between the Mediterranean and North Atlantic stocks, but further studies need to identify the degree of mixing. A brief review of past tagging experiments indicated that the existing results cannot provide robust information about mixing patterns and confirmed that further work is needed on this aspect.

According to previous knowledge, the Mediterranean swordfish have different biological characteristics compared to the Atlantic stocks. The growth parameters are different, and the sexual maturity is reached at younger ages than in the Atlantic.

In the western Mediterranean, mature females as small as 110 cm LJFL have been observed and the estimated size at which 50% (L50) of the female population is mature occurs at 142.2 cm. According to the growth curves used by the SCRS, these two sizes correspond to 2 and 3.5 year-old fish, respectively. An even lower L50 size for females has been estimated for the central Mediterranean, even though further confirmation is needed. Males reach sexual maturity at smaller sizes and mature specimens have been found at about 90 cm LJFL. Research on this aspect is ongoing in the frame of the ICCAT swordfish project.

SWO-MD-2. Fishery indicators

Mediterranean swordfish landings showed an upward trend from 1965-1988, reaching a peak of 20,365 t (**SWO-MD-Table 1**, **SWO-MD-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 1 (**SWO-MD-Table 1**). Since 1989 and up to 2011, the reported landings of swordfish in the Mediterranean Sea have declined fluctuating mostly between 12,000 to 17,000 t. Since 2012 and up to 2022, following the implementation of the three-month fishery closure and the establishment of the list of authorized vessels, overall nominal fishing effort has been decreasing with catches below 10,000 t since 2018. In general, these catch levels are relatively high and similar to those of bigger areas such as the North Atlantic. Updated information on Mediterranean swordfish catch by gear type is provided in **SWO-MD-Table 1** and **SWO-MD-Figure 1**.

The Task 1 removals, including estimates of dead discards for 2018 that was used in the assessment was 8,677 t, which is the lowest annual catches since 1972. The biggest producers in the recent years of the assessment (2008-2018) are EU-Italy (40%), EU-Spain (15%), Morocco (11%), Tunisia (11%), EU-Greece (9%) and Algeria (5%). Also, EU-Cyprus, EU-Malta and Türkiye have fisheries targeting swordfish in the Mediterranean. Minor catches of swordfish have also been reported by EU-Croatia, EU-France, Japan, and Libya.

In recent years (2008-2023), the main fishing gears used are longlines (on average, representing around 97% of the annual catches) and gillnets. Since 2003, gillnets have been gradually 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 1999 a deep longline (100-600 m depth; mesopelagic longline) gear has been gradually introduced and nowadays has partially replaced the surface longline gears in several Italian, French and Spanish 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.

Standardised CPUE series from different longline fisheries targeting swordfish that were used in the 2020 stock assessment session do not show a consistent pattern but most of them indicate declining trends in the most recent years. It should be noted that CPUE series did not cover the earlier years of the reported landings. No trend over the past 30 years was identified regarding the mean fish weight in the catches, but it should be noted that the volume of undersized discards in the Task 1 data may be underestimated in the last decade (**SWO-MD-Figure 2**).

SWO-MD-3. State of the stocks

Since the 2016 assessment (ICCAT, 2017c), there have been several changes both in fisheries operations and in the data available as input to the assessment models, which have undergone substantial revisions and the integration of new information. In addition, in 2020 stock assessment a Bayesian surplus production model, using a long series of data (1950-2018), was examined and was chosen for providing the scientific advice for the Mediterranean swordfish stock. Until 2016, advice was based on age structured models which were re-examined again. However, due to lack of indices of abundance for the earlier period, the input data for the age-structured models started in 1985, when the stock was already under high exploitation. From the age-structured models it was estimated that the stock was already overfished in 1985, although total catches had never exceeded MSY estimates from either age-structured or surplus production models prior to 1985. This was considered biologically implausible and it was deduced that these models were unable to properly estimate stock productivity due to data limitations (insufficient data series).

Under different assumptions about reporting levels of undersized fish in the catch, age-structured analysis including data from 1985-2018 indicated that current SSB levels are much lower than those in the 80s, while recruitment shows a declining trend in the last decade. Due to limited data for the earlier period of the fishery (See data catalogue in the Report of the 2020 Mediterranean Swordfish Stock Assessment, Table 2 (ICCAT, 2020c)), the age structured analysis failed to provide reliable estimates of stock productivity, and conclusions on the state of the stock were based on the surplus production model approach.

Results of the Bayesian surplus production model that used the whole catch series from 1950 to 2018, assuming also discard under-reporting in the last decade, indicated that stock biomass started declining from 1970 onwards, while fishing mortality starting exceeding F_{MSY} in the late 1980s when catches peaked (**SWO-MD-Figure 3**). The stock became overfished in the early 1990s following the full development of the fishery and the relatively high catches observed in middle-late 1980s. The analysis concluded that there is a 41.1% probability that the stock is overfished and overfishing is still occurring (red) and a 45.6% probability that the stock is overfished but overfishing is not occurring (yellow) (**SWO-MD-Figure 4**).

The Committee again noted the large catches of swordfish less than 4 years old and the relatively low number of large individuals in the catches. Fish less than four years old usually represent more than 70% of the total yearly catches in terms of numbers.

SWO-MD-4. Outlook

The assessment of Mediterranean swordfish indicates that the stock is most likely overfished and current fishing mortality is just below F_{MSY} levels. The stock has been in an overfished state since the early 1990s because of the large catches in the 1980s and the selection pattern which captures many immature fish. Current catches are dominated, in terms of number, by fish less than 4 years old and the highest fishing mortality is corresponding to fish of age 3. Additionally, estimated recruitment has been declining for the last 10 years.

Projections of different catch levels, based on the output of the production model assessment indicate that TAC equal to 10,000 t would result in stock rebuilding with a 60% probability by the end of the projections period (2028). Projections were not carried out beyond 2028 due to uncertainty with the models. Probabilities increase if lower TACs are adopted. Projection results are summarized in **SWO-MD-Figure 5** and **SWO-MD-Table 2.** It should be noted, however, that these projection estimates are based on the assumption that future stock productivity will be around the average of the whole studied period. The declining recruitment in the most recent years, may indicate that stock productivity has decreased and in that case stock projections may be optimistic and should be interpreted with caution.

SWO-MD-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 Rec. 11-03 and Rec. 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 catching size regulations, a list of authorized vessels, specifications on the technical characteristics of the longline gear, and onboard domestic observers on a given percentage of longline vessels. Recently, through Rec. 16-05, which replaced Rec. 13-04, a 15-year recovery plan has been adopted. In addition, increased catching size, and fishing capacity limitations were established, accompanied by TACs (10,500 t in 2017 Rec. 16-05, with a 3% annual reduction over the period 2018-2022) and a seasonal closure of the albacore fishery to reduce juvenile swordfish bycatches. The European Union introduced a driftnet ban for highly migratory species 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 ICCAT Recommendations, reported catches have decreased significantly from the 2000s' level, making the catches of the period 2012-2023 among the lowest of the last three decades. In addition, reported catches of undersized swordfish have also decreased more than 50%, compared with the levels of the decade of 2000s. Importantly, based on observations onboard, the recent increase of the minimum catching size from 90 to 100 cm has resulted in discard increases (up to 600%) in some fisheries. Both hooking and post-release mortality are unknown for this stock but scientific work is ongoing on this issue. However, for the Atlantic very high values of hooking mortality (ranging between 78-88%) have been reported for swordfish less than 125 cm LJFL, and it is possible that similar high values also occur in the Mediterranean. The Committee showed concern that such discards are not being fully reported and reiterated that all dead discards should be reported in Task 1 nominal catches for all fisheries. Additionally, they should be included in the analysis of CPUE data trends. The additional measures foreseen under Rec. 16-05 have only recently been adopted and their effects cannot be fully evaluated.

The Committee assumes that the TAC in 2023 and afterwards remains the same as that of 2022 under Rec. 16-05 and requests the Commission's confirmation.

SWO-MD-6. Management recommendations

Over the last 50 years stock biomass shows declining trends, starting with the period around 1970-1990, when the fishery was in a strong developing phase. In the following period until about 2010, declining trends were rather modest accompanied by small-scale fluctuations. In the most recent period, the stock biomass has continued to decline. As expected, fishing mortality followed an opposite trend with sharper increases during the 1980s. Current stock biomass is about 30% lower than that corresponding to MSY, while fishing mortality is around F_{MSY}. According to the Commission objectives the stock requires rebuilding and relevant scenarios were simulated assuming different levels of TACs. Analysis indicated that the probability of stock rebuilding by the end of the projection period (2028) is 60% if a TAC equal to 10,000 t is implemented. The probability increases if lower TACs levels are selected. As there are uncertainties on stock productivity, these estimates may be optimistic and should be interpreted with caution.

The Committee noted that since the establishment of minimum catching sizes, particularly after the recent size increase imposed through Rec. 16-05 the discard levels of undersized swordfish are increasing at least for certain fisheries and are largely dead. However, discards are not being reported for all fleets. Though an attempt has been made to statistically estimate discard levels and consider them in stock assessment models, the real volume of total discards is unknown due to this under-reporting. Such under-reporting leads to false estimates of the overall catch volume and consequently bias stock status estimates and projections of future stock size under different management measures.

MEDITERRANEAN SWORDFISH SUMMARY

Maximum Sustainable Yield	13,325 t (10,899 – 17,346 t)[1]
Current (2023) Yield	7,314 t
B_{MSY}	71,319 t (42,562 – 113,758)[1]
F_{MSY}	0.19 (0.12 - 0.34)[1]
Relative Biomass (B_{2018}/B_{MSY})	0.72 (0.38 - 1.29)[1]
Relative Fishing Mortality (F_{2018}/F_{MSY})	0.93 (0.42 - 1.68)[1]
Stock Status (2018)	Overfished: YES Overfishing: NO
Management Measures in Effect:	Driftnet ban, Rec. 03-04: Three-month fishery closure, gear specifications (number and size of hooks and length of gear), minimum catching size regulations, list of authorized vessels, fishing capacity restrictions, domestic observers onboard on longlines. TAC, Rec. 16-05: 10,500 t in 2017, 10,185 t in 2018, 9,879 t in 2019, 9,583 t in 2020, 9,296 t in 2021 and 9,017 t in 2022 and 2023.

[1] 95% credibility intervals of 30,000 Markov chain Monte Carlo (MCMC) iterations from Bayesian surplus production models.

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

			1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
TOTAL	MED		16082	13015	12053	14693	14369	13699	15569	15006	12814	15694	14405	14622	14915	14227	13683
Landings		Longline	8985	6319	5884	5389	6674	6223	7129	7498	8042	10748	10877	10954	11323	11113	11479
		Other surf.	7097	6696	6169	9304	7695	7476	8440	7508	4772	4945	3519	3555	3576	3094	658
Discards		Longline	0	0	0	0	0	0	0	0	0	0	9	113	16	19	1546
		Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Landings	CP	Albania	0	0	13	13	13	13	0	0	0	0	0	0	0	0	0
		Algerie	600	807	807	807	825	709	816	1081	814	665	564	635	702	601	802
		EU-Croatia	0	0	0	0	10	20	0	0	0	0	0	0	0	0	4
		EU-Cyprus	159	89	40	51	61	92	82	135	104	47	49	53	43	67	67
		EU-España	1503	1379	1186	1264	1443	906	1436	1484	1498	1226	951	910	1462	1697	2095
		EU-France	0	0	0	0	0	0	0	12	27	20	19	22	20	14	14
		EU-Greece	2520	974	1237	750	1650	1520	1960	1730	1680	1230	1120	1311	1358	1887	962
		EU-Italy	7765	7310	5286	6104	6104	6312	7515	6388	3539	8395	6942	7460	7626	6518	4549
		EU-Malta	47	72	72	100	153	187	175	102	257	163	195	362	239	213	260
		EU-Portugal	0	0	0	0	0	0	13	115	8	1	120	14	16	0	0
		Egypt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Japan	2	4	5	5	7	4	2	1	1	0	2	4	0	3	2
		Korea Rep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Libya	0	0	0	0	11	0	8	6	0	10	2	0	16	0	0
		Maroc	2654	1696	2734	4900	3228	3238	2708	3026	3379	3300	3253	2523	2058	1722	1957
		Syria	0	0	0	0	0	0	0	0	0	0	0	0	0	37	28
		Tunisie	298	378	352	346	414	468	483	567	1138	288	791	791	949	1024	1011
		Türkiye	533	306	320	350	450	230	370	360	370	350	386	425	410	423	386
	NCC	Chinese Taipei	1	1	1	3	0	0	0	0	0	0	0	0	0	0	0
Discards	CP	Algerie	0	0	0	0	0	0	0	0	0	0	0	0	0	0	175
		EU-Croatia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		EU-Cyprus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		EU-España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		EU-France	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	9	113	16	19	27
		EU-Italy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	724
		Maroc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	343
		Tunisie	0	0	0	0	0	0	0	0	0	0	0	0	0	0	221
		Türkiye	0	0	0	0	0	0	0	0	0	0	0	0	0	0	55

			2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
TOTAL	MED		13235	14754	12640	11046	10070	10969	11983	12300	10390	8681	8176	7664	7512	7169	7314
Landings		Longline	11020	11918	10288	9131	9047	9718	10675	10878	8345	6938	8041	7603	7258	6946	7126
		Other surf.	819	1347	1162	782	49	83	78	53	57	61	45	60	66	133	79
Discards		Longline	1396	1488	1191	1133	973	1168	1230	1369	1988	1682	89	0	188	90	109
		Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Landings	CP	Albania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		Algerie	468	459	216	387	403	557	568	671	550	528	517	501	447	472	472
		EU-Croatia	3	6	6	4	10	16	10	25	20	28	33	23	25	39	40
		EU-Cyprus	38	31	35	35	51	59	54	53	50	45	24	30	56	36	57
		EU-España	2000	1792	1744	1591	1607	2073	2283	1733	1487	1387	1460	1434	1372	1462	1340
		EU-France	16	78	81	12	66	127	182	179	113	86	71	110	96	66	69
		EU-Greece	1132	1494	1306	877	1731	1344	761	761	392	350	745	657	686	371	444
		EU-Italy	5016	6022	5274	4574	2862	3393	4272	3946	2987	1779	2473	2250	2016	2079	2327
		EU-Malta	266	423	532	503	460	376	489	410	330	308	407	361	391	380	360
		EU-Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		Egypt	0	0	0	0	1	0	0	0	0	4	0	4	12	26	73
		Japan	1	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		Korea Rep	1	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		Libya	0	0	0	0	0	0	585	960	30	70	26	22	19	21	13
		Maroc	1587	1610	1027	802	770	770	480	1110	1000	1013	982	951	924	891	896
		Syria	0	0	0	9	4	0	0	0	0	0	0	0	0	0	**0**
		Tunisie	1012	1016	1040	1038	1036	1030	1034	1007	1003	974	934	918	891	857	733
		Türkiye	301	334	190	80	97	56	35	77	441	427	414	402	390	379	382
	NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Discards	CP	Algerie	102	100	42	78	84	145	147	176	205	197	0	0	0	0	**0**
		EU-Croatia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
		EU-Cyprus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		EU-España	0	0	0	0	0	0	7	0	0	84	89	0	188	90	107
		EU-France	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**
		EU-Italy	751	817	734	618	456	538	670	623	907	535	0	0	0	0	**0**
		Maroc	278	301	160	201	193	198	123	285	350	355	0	0	0	0	**0**
		Tunisie	221	222	227	227	226	272	273	266	374	364	0	0	0	0	**0**
		Türkiye	43	48	27	10	14	16	10	20	151	148	0	0	0	0	**0**

SWO-MD-Table 2. Estimated probabilities of the Mediterranean swordfish stock a) being below F_{MSY} (overfishing not occurring), b) above B_{MSY} (not overfished) and c) above B_{MSY} and below F_{MSY} (green zone) for a range of fixed total catches (0-15,000 t) over the projection horizon 2021-2028 based on joint projection MCMC posteriors of JABBA model runs ('Reference' and 'ASEM' models).

a) Probability that $F \leq F_{MSY}$

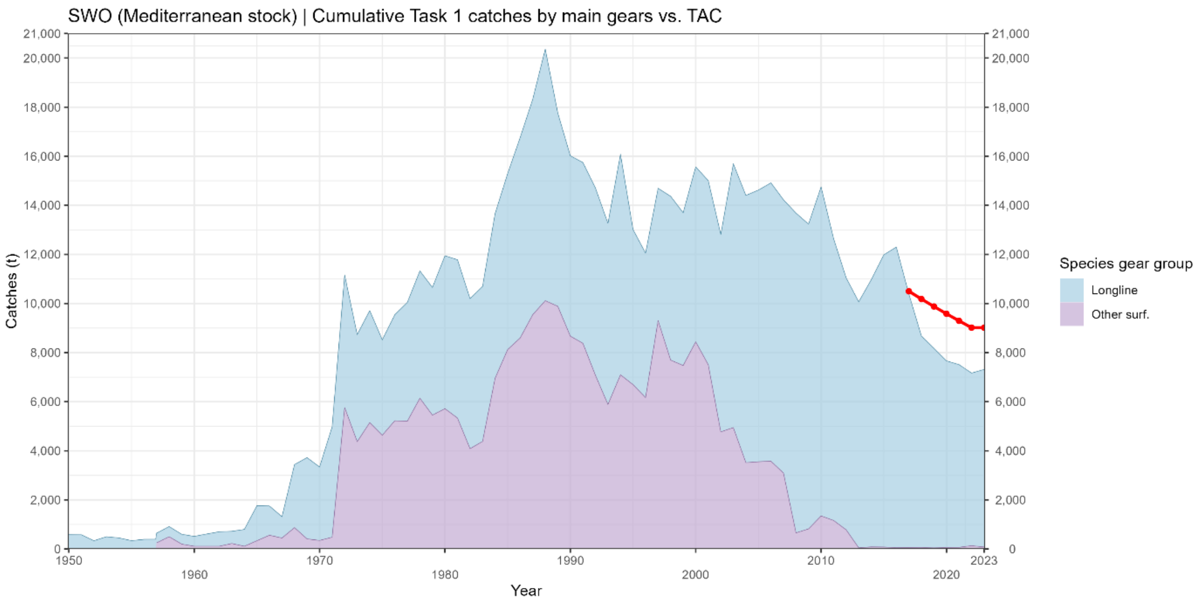
TAC | Year	2021	2022	2023	2024	2025	2026	2027	2028
0	100	100	100	100	100	100	100	100
7000	84	87	90	91	93	94	94	95
8000	76	80	83	85	87	88	90	90
9000	68	72	75	77	80	81	82	84
10000	58	62	65	68	70	72	73	74
10250	56	60	62	65	67	69	71	72
10500	54	57	60	62	64	66	68	69
10750	51	54	57	59	61	63	64	66
11000	49	52	55	57	59	60	61	63
11250	47	50	52	54	56	57	58	59
11500	45	47	49	51	53	54	55	56
11750	43	45	47	48	50	51	52	53
12000	41	43	44	46	47	48	49	50
12250	39	40	42	43	44	45	45	46
12500	37	38	39	40	41	42	42	43
12750	35	36	37	38	38	39	39	40
13000	33	34	35	35	36	36	36	36
14000	27	27	27	26	26	26	26	25
15000	22	21	20	20	19	18	18	17

b) Probability that $B \geq B_{MSY}$

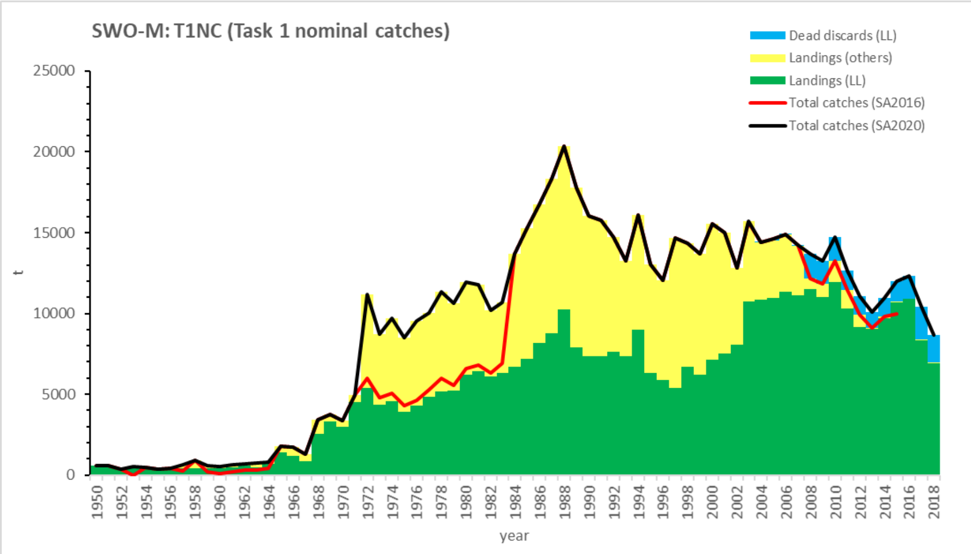
TAC | Year	2021	2022	2023	2024	2025	2026	2027	2028
0	31	52	71	84	92	96	98	99
7000	31	41	51	59	67	72	77	81
8000	31	39	47	55	61	67	71	75
9000	31	38	44	50	56	60	64	68
10000	31	36	41	46	50	53	57	60
10250	31	36	40	45	49	52	55	58
10500	31	35	39	43	47	50	53	56
10750	31	35	39	42	45	48	51	53
11000	31	35	38	41	44	47	49	51
11250	31	34	37	40	43	45	47	50
11500	31	34	37	39	42	44	45	47
11750	31	34	36	38	40	42	43	45
12000	31	33	35	37	39	41	42	43
12250	31	33	35	36	37	38	39	40
12500	31	32	33	35	36	37	38	38
12750	31	32	33	34	35	35	36	36
13000	31	32	33	33	34	34	34	34
14000	31	30	30	29	29	28	28	27
15000	31	29	27	26	24	23	22	21

c) Probability that $F \leq F_{MSY}$ and $B \geq B_{MSY}$

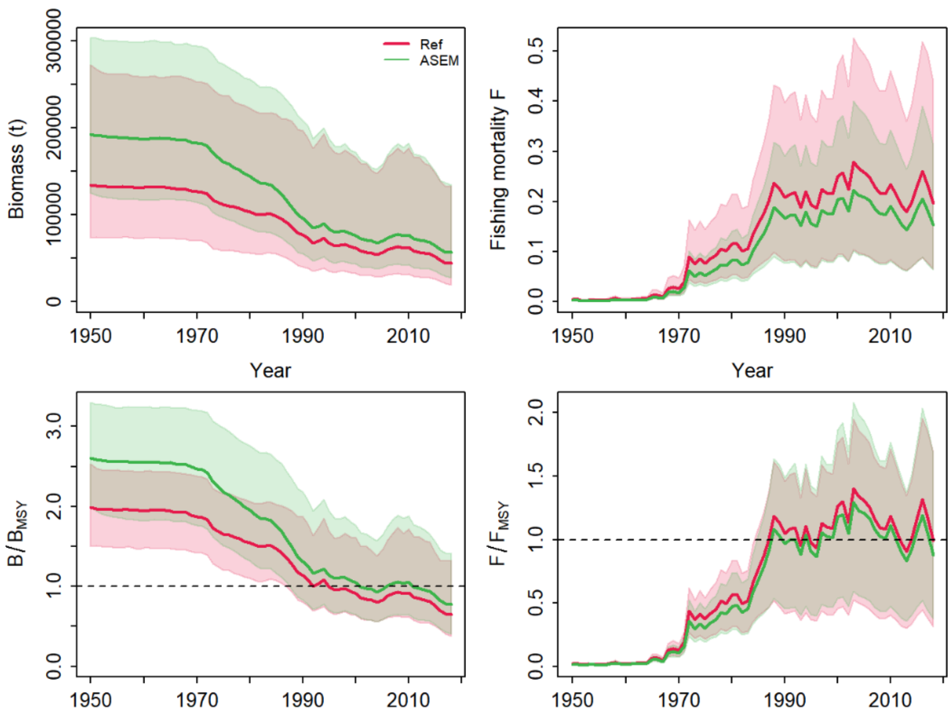
TAC | Year	2021	2022	2023	2024	2025	2026	2027	2028
0	31	52	71	84	92	96	98	99
7000	31	41	51	59	67	72	77	81
8000	31	39	47	55	61	67	71	75
9000	31	38	44	50	56	60	64	68
10000	31	36	41	46	50	53	57	60
10250	31	36	40	45	49	52	55	58
10500	31	35	39	43	47	50	53	56
10750	31	35	39	42	45	48	51	53
11000	31	34	38	41	44	47	49	51
11250	31	34	37	40	43	45	47	49
11500	30	34	37	39	41	44	45	47
11750	31	33	36	38	40	42	43	45
12000	30	33	35	37	38	40	41	43
12250	30	32	34	35	37	38	39	40
12500	30	31	32	34	35	36	37	38
12750	29	31	32	33	33	34	35	35
13000	29	30	31	31	32	32	33	33
14000	25	25	25	25	25	25	25	24
15000	21	20	20	19	18	18	17	17



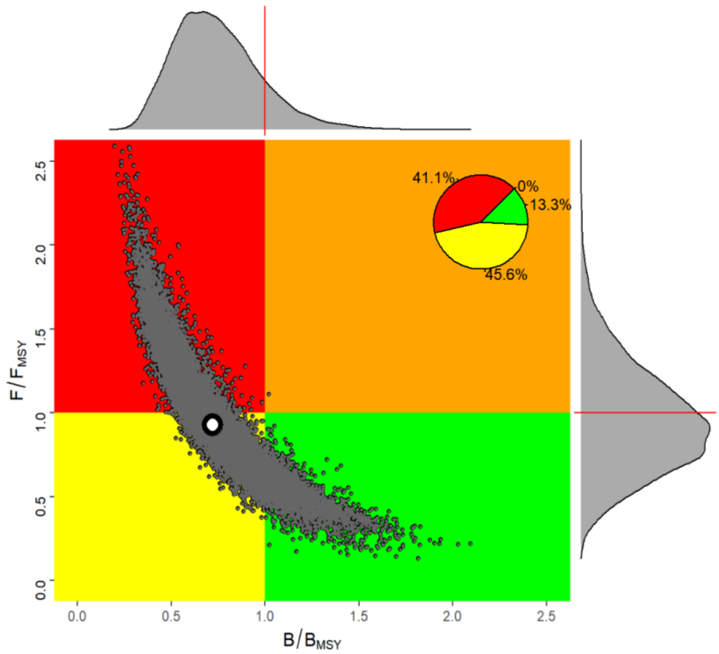
SWO-MD-Figure 1. Estimates of Task 1 swordfish catches (t) in the Mediterranean by major gear types, for the period 1950-2023, and corresponding annual TACs since 2017 (Rec. 16-05). The red dotted line represents the TAC.



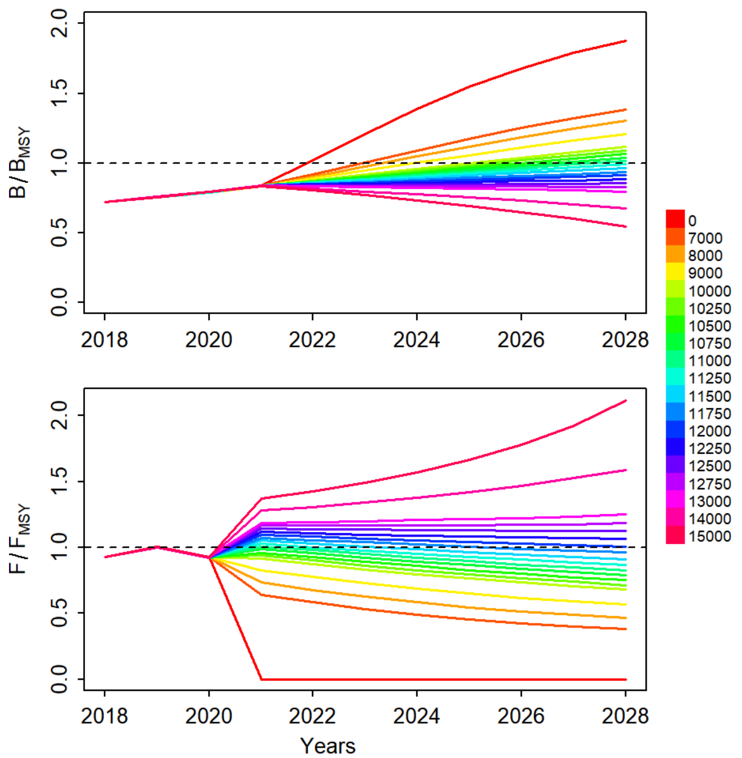
SWO-MD-Figure 2. SWO-M total nominal catches (T1NC, t) by year, showing total landings (LL and other gears) and dead discards (reported and estimated in Ortiz, 2020) as prepared for the 2020 assessment. The total catches used in the 2016 stocks assessment (ICCAT, 2017c) is shown for comparative purposes.



SWO-MD-Figure 3. Trends in biomass and fishing mortality (upper panels) and biomass relative to B_{MSY} (B/B_{MSY}) and fishing mortality relative to F_{MSY} (F/F_{MSY}) (bottom panels) for each scenario from the Bayesian state-space surplus production model fits to Mediterranean swordfish.



SWO-MD-Figure 4. Kobe phase plot showing the combined posteriors of B_{2018}/B_{MSY} and F_{2018}/F_{MSY} presented in the form of joint MCMC posteriors of JABBA model runs for Mediterranean swordfish. The probability of posterior points falling within each quadrant is indicated in the pie chart.



SWO-MD-Figure 5. Trends of projected relative stock biomass (at begin of year, upper panel, B/B_{MSY}) and fishing mortality (at end of year, bottom panel, F/F_{MSY}) of Mediterranean swordfish under different TAC scenarios (0-15,000 t), based upon the combined projections of JABBA model runs. Each line represents the median of 30000 MCMC iterations by projected year.

9.14 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*)
- COM Narrow-barred Spanish mackerel (*Scomberomorus commerson*)
- FRI Frigate tuna (*Auxis thazard*)
- KGM King mackerel (*Scomberomorus cavalla*)
- LTA Little tunny (*Euthynnus alletteratus*)
- MAW West African Spanish mackerel (*Scomberomorus tritor*)
- SSM Atlantic Spanish mackerel (*Scomberomorus maculatus*)
- WAH Wahoo (*Acanthocybium solandri*)

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 are often 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 bycatches, especially in Africa. The amount caught is rarely reported in logbooks; however, observer program from purse seine fleets have recently provided estimates of catches of small tunas.

Small tuna species can reach high levels of catch 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.

Additional genetic analysis for a number of small tunas was done in 2024 under the Small Tunas Year Programme (SMTYP). Samples from Brazil, Côte d'Ivoire, EU-Spain, Gabon and Morocco all showed a lack of genetic differentiation for wahoo (WAH). For bonito (BON), new samples from Côte d'Ivoire were added to the existing data set, and their analysis confirmed the genetic separation between two populations: one in the North Atlantic Mediterranean and another in the Tropical Atlantic. Finally for little tunny (LTA), new samples from Tunisia and São Tomé e Príncipe show deep genetic differentiation at species level.

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. 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 study conducted on the eastern coast of Tunisia has shown that the spawning area of the bullet tuna is offshore at the limit of the continental shelf and related to the high abundance of the zooplankton. A study recently carried out along the Gulf of Gabes (Ionian Sea-Mediterranean) indicated that the larvae of the bullet tuna were mainly concentrated between the isobaths 50 and 200 m, and the spawning grounds of this species were mainly offshore.

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. Most small tuna species matures at small sizes, mostly between 30 and 50 cm, except wahoo for which size at first maturity varies between 92 and 110 cm. Information on the migration patterns of small tuna species is very limited, due to low tagging levels of these species. However, a new genetic study showed that there is a clear genetic heterogeneity for the bullet tuna among different geographical locations in the Mediterranean, suggesting that the population structure of this species in the Mediterranean is more complex than initially expected. In a recent preliminary genetic study conducted within the SMTYP for little tunny, it was observed a strong population structure, separating into two clades the individuals from EU-Portugal and Tunisia, and those from Senegal and Côte d'Ivoire. Also, recent studies of the population structure of Atlantic bonito in three areas - MD (Tunisia and EU-Spain); AT-NE (EU-Portugal and Morocco) and AT-SE (Côte d'Ivoire, Gabon and Senegal) - showed clear differential structure, being the location of Côte d'Ivoire the most genetically differentiated location.

Within the ICCAT Atlantic Ocean Tropical Tuna Tagging Programme (AOTTP), a total of nearly 8,000 little tunny were tagged off West Africa and western Atlantic between August 2016 and April 2019, with nearly 600 tags being recovered. This converts to a 7% tag recovery rate. Both tag releases and recoveries of little tunny have occurred in "coastal" waters between Mauritania and Côte d'Ivoire. The longest "time at liberty" observed (700 days) and migrated 929 nautical miles (NM). Little tunny have been tagged on both sides of the tropical Atlantic; however no cross-Atlantic movement has yet been reported, indicating rather coastal associated movements.

In 2018 and 2019, the open database provided in the 2016 Intersessional Meeting of the Small Tunas Species Group (ICCAT, 2017d) (Juan-Jordá *et al*., 2016) with a thorough review of the Scombridae life history parameters was considered as a starting point for a meta-database of the Atlantic small tunas species, and the Group considered this proposal for updating and sharing parameters and useful references. The Group determined the main life history parameters to be compiled (for example, L_{INF}, k, t0, L50, A50, L_{MAX}, a (L-W), b (L-W), batch fecundity) and, that the areas defined by ICCAT previously (ICCAT Statistical Areas Map 4) were adequate for SMT and studies should be carried based on such spatial unities.

The updated database, available for all participants and stored in the ICCAT Owncloud, allowed for data mining, based on the most reliable parameters by region for each species and, spatial visualization of current status and data gaps in the life history parameters of SMT species were provided (**SMT-Table 2**). This information will be used to assess future research needs and for running Data Limit Models, when applicable.

SMT-3. Fisheries indicators

Small tunas are exploited mainly by coastal and artisanal fisheries, substantial catches are also made as target species and as bycatch by purse seine, mid-water trawl (i.e., pelagic fisheries of Mauritania), handline and small-scale gillnets. Unknown quantities of small tuna also comprise the incidental catches of some longline fisheries. The increasing importance of fish aggregating device (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.

SMT-Table 1 shows historical landings of small tunas for the 1990 to 2023 (current as of 21 September 2024). 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. Of the total 13 species included in the Small Tunas Species Group, the seven most important represent about 91% of Task 1 nominal catches between 1950 and 2023. These are: BON (31%), LTA (18%), FRI (13%) KGM (12%), SSM (9%), BLT (5%), and WAH (4%). In 1980, there was a marked increase in the reported landings compared to previous years, reaching a first peak of 145,492 t in 1988 (**SMT-Figure 1**). Reported landings for the 1989-1995 period decreased to about 95,900 t in 1995, and then an oscillation in the values in the following years, with a minimum of 69,117 t in 2008 and a maximum of 175,042 t in 2022. The annual trend in the total catches by species are shown in **SMT-Figure 2**. Overall trends in the small tuna catch may mask declining trends for individual species because annual landings are often dominated by the landings of single species. These fluctuations seem to be related to unreported catches, as these species generally comprise part of the bycatch and are often discarded, and therefore do not reflect the real catch.

Current estimate of total nominal landings of small tunas in 2023 is 129,931 t. The Committee pointed out the relative importance of small tuna fisheries in the Mediterranean and the Black Sea, which account for about 30% of the total small tuna catches (1950 to 2023) in the ICCAT area.

Despite the recent improvements in the statistical information provided to ICCAT by several countries, the Committee 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 bycatch.

However, after the adoption of the SMTYP in 2012, significant historical catches, catch and effort and size data from the artisanal fisheries in the west of Africa (Côte d’Ivoire, Morocco and Senegal) and from the Mediterranean Sea (EU-Italy and EU-Spain) were recovered and made available to the Secretariat.

SMT-4. State of the stocks

In 2017, a Productivity and Susceptibility Analysis (PSA) was carried out for the small tuna caught by longline and purse seine fisheries in the Atlantic. The study found that the top 3 stocks at risk in the Atlantic Ocean that should deserve most of the managers’ attention were *E. alleteratus*, *A. solandri* and *S. cavalla*. This first analysis was very important in order to define priority species for stock assessment and biological data collection. However, this analysis will be improved by considering the five statistical ICCAT areas and the relevant fishing gears for each stock.

Also, as an initial attempt to provide stock status of the SMT, the lengths distributions and the reference points obtained from length frequencies for the small tuna species in the Task 2 database, pooled by species, year and considering the South and North Atlantic are plotted in **SMT-Figure 3**. To avoid growth overfishing, catch length compositions should consist of fish at a size at which the highest yield from a cohort occurs (L_{OPT}). While to avoid recruitment overfishing, catches should comprise almost exclusively mature individuals (i.e., fish be >L50, the length at which 50% of fish are mature). Two reference points were used, i.e., P_{OPT} and P50, the proportion of individuals in the catch size data that are greater than L_{OPT} and L50, respectively. However, L_{OPT} is based on a per recruit analysis which ignores recruitment dynamics, for example the age/size structure and the distribution of a population which all determine productivity and hence sustainability and the formulation of robust management advice.

These data are re-plotted in **SMT-Figure 4** as an example of how they could be used as indicators of growth and recruitment overfishing. For example, if L_{OPT} is used as a target with a probability of 0.5 and a tolerance of ±0.25 to allow limited fluctuations around the target; then in **SMT-Figure 4a** green indicated that length compositions meet this target and red when exceeded. For recruitment overfishing, if 0.6 is used as a limit for P50, then any catches where less than 40% are mature fish are colored red (**SMT-Figure 4b**).

The plots show that in most cases poor yield optimization is occurring, but that recruitment overfishing is not. Although in two cases (WAH in the southern Atlantic and LTA in the North Atlantic) recruitment overfishing has increased in the recent period.

In 2018, preliminary results on the implementation of data-limited approaches for small tunas using simulation testing were provided and improved in 2019, when different approaches for the stock assessment of Atlantic and Mediterranean small tunas were carried out. Catch-based assessment models (Depletion Based Stock Reduction Analysis – DBSRA – and Simple Stock Synthesis – SSS) and Length based models (Length-based Spawning potential ratio – LSPR and Length-based integrated mixed effects model – LIME) were applied for 10 and 6 stocks, respectively. Also, the integrated assessment LIME, which used catch and length data, was applied for 6 small tuna stocks. Only LTA in the Southeast and WAH in the North West would show signs of overfishing for most of the models applied, deserving special attention in the future (**SMT-Table 3**).

Catch data are still incomplete for some species, regions and fleets, hampering the use of catch-based methods. At the moment, length-based methods show a more promising applicability for small tunas, although representative length distributions are still limited for some stocks. The use of length-based methods depends on how representative is the length data distribution by stock, since the size data available in T2SZ comes from different fleets with different gear selectivity. To deal with this issue, the Group recommended using length-data from all gears combined in order to get a better representation of the length distribution of the population, assigning equal weight to each fishing gear. It is important for all CPCs to report size data from all gears in order to get a representation of the length distribution of the entire population. Other length data, ideally from fishery independent surveys, could complement this information and improve the assessments.

A data-limited Management Strategy Evaluation (MSE) was also performed as preliminary exercise for WAH in the Northwest only. The MSE pointed out that management procedures based on catch-based methods are the most acceptable with respect a variety of performance metrics, while simulations for the length-based and fishing effort control methods did not present as satisfactory results (**SMT-Table 4**). The results from this initial exercise must be interpreted with caution because of considerable uncertainty in the parametrization of the operating model, which might strongly influence the performance of management procedures (MP)s.

The Group noted that PSA, Length-based model and, mainly MSE are good options in a data limited framework and that these approaches should be applied for the stocks which the assessment was not carried out yet and improve those already conducted when better data is available.

SMT-5. Outlook

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, stock identification and biological parameters, which are necessary for their assessment.

The Committee notes that the Atlantic Ocean Tropical Tuna Tagging Programme adopted by ICCAT was successfully tagging LTA, but more WAH should be tagged given that only one individual was recovered. The Committee also notes the need for an increase in the collection of information on recaptures of tagged fish by enhancement awareness campaigns, focusing on artisanal fisheries, particularly gillnet, small purse seine, longline and handline.

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 robust management advice by the SCRS relies on accurate reporting of Task 1 and 2 data and life history parameters. 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, however proper monitoring programs should be implemented by the CPCs. Therefore, although the Group has improved in applying a range of Data-limited models, the robustness still needs to be evaluated before they can be used to provide management advice to the Commission. Also, although the Group recognize that the use of Data-Limit models are important for small tunas as the first step for stock assessment, given the importance of some of species in terms of catches, more robust methods, such as those used for data rich species, should be applied in a near future, when more complete data are available.

SMT-Table 1. Estimated catches (t) of small tuna species by area, gear, and flag.

					1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
BLF	TOTAL	ATL			2719	4051	4488	3258	3395	3203	2483	4034	4756	1303	1926	1031	1937	1927	1669	1442	1837	2083	2849	2134	1152	1306	1920	1368	1557	1472	2653	2859	4838	7529
	Landings			All gears	2719	4051	4488	3258	3395	3203	2483	4034	4756	1303	1926	1031	1937	1927	1669	1442	1837	2083	2849	2134	1152	1306	1920	1368	1557	1472	2653	2859	4838	7529
	Discards				0	0	0	0	0	0	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		CP	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	0	0	0	0	0
				Brazil	38	153	649	418	55	55	38	149	1669	1	118	91	242	233	266	10	9	46	124	110	299	325	228	192	392	410	820	1691	2273	5345
				Canada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Curaçao	60	50	45	45	45	45	45	45	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				EU-France	1330	1370	1040	1040	1040	1040	1040	1040	1040	0	0	0	0	0	0	0	32	19	26	0	14	12	14	14	6	28	15	17	30	35
				Grenada	189	123	164	126	233	94	164	223	255	335	268	306	371	291	290	291	291	291	291	291	0	0	0	0	0	94	73	0	36	40
				Mexico	0	0	0	0	0	0	0	12	0	10	9	10	10	12	6	7	6	9	5	4	4	4	5	4	4	3	3	2	3	3
				St Vincent and Grenadines	19	20	18	22	17	15	23	24	24	0	0	0	0	0	0	0	0	0	0	11	0	0	0	5	0	9	6	0	0	3
				Trinidad and Tobago	0	0	0	0	0	0	0	0	0	5	5	5	5	5	5	5	5	5	5	5	5	0	5	5	5	5	5	5	5	5
				UK-Bermuda	7	4	5	4	6	6	5	4	5	9	4	5	8	7	6	7	9	8	11	11	15	20	17	17	16	10	7	12	9	9
				UK-British Virgin Islands	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	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	0	0	0	0	0
				USA	492	582	447	547	707	617	326	474	334	414	675	225	831	422	649	619	911	967	1919	1326	585	761	1265	946	1074	756	1628	1054	2403	2027
				Venezuela	21	624	758	498	1034	1192	696	1902	1211	319	732	225	237	777	231	293	331	473	237	191	88	81	197	33	42	4	2	5	3	2
			NCO	Cuba	223	156	287	287	0	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	19	30	0	0	0	79	83	54	78	42	20	38	47	29	37	45	41	37	39	37	39	24	34	34	17	24	8	0	0	
				Dominican Republic	239	892	892	231	158	18	19	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	148	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
				Saint Kitts and Nevis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
				Sta Lucia	82	47	35	40	100	41	45	108	96	169	96	126	182	151	179	165	203	229	192	147	104	80	156	119	0	127	84	74	75	60
	Discards		CP	Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BLT	TOTAL				5300	4301	5909	3070	2309	2646	3912	5796	6041	3794	6223	4231	4233	5617	6825	5557	7952	9484	6234	7653	3916	5571	5720	3348	4083	3432	3530	3683	5018	4469
		ATL			100	0	0	0	28	263	902	1236	626	353	401	719	889	602	334	484	746	507	515	1158	367	755	467	232	228	215	184	209	40	126
		MED			5200	4301	5909	3070	2281	2383	3010	4559	5416	3441	5823	3513	3344	5015	6491	5072	7206	8977	5719	6494	3549	4816	5253	3116	3855	3218	3347	3475	4978	4343
	Landings	ATL		All gears	100	0	0	0	28	263	902	1236	626	353	401	719	889	602	334	484	746	507	515	1158	367	750	467	223	216	215	184	208	40	126
		MED			5200	4301	5909	3070	2281	2383	3010	4559	5416	3441	5823	3513	3344	5015	6491	5072	7206	8977	5719	6494	3549	4816	5253	3116	3855	3218	3347	3474	4978	4343
	Discards	ATL			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	9	12	0	0	0	0	
		MED			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
	Landings	ATL	CP	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	0	0	0	0	0
				Brazil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	94	406	0	133	131	34	72	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	222	0	1	0	0	20	0	0	0
				EU-España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	0	1	0	14	50	0	5	5	0	1	0	0	0
				EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				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	121	14	0	0	0	0	3
				EU-Lithuania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	76	0	6	14	27
				EU-Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0
				EU-Portugal	0	0	0	0	28	263	494	208	166	231	299	580	867	602	311	436	654	387	55	38	0	0	0	0	0	64	29	130	7	55
				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	0	0	0	2	0	8
				Mauritania	0	0	0	0	0	0	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	100	0	0	0	0	0	408	1028	460	122	102	139	22	0	23	48	67	119	366	703	352	345	336	62	125	75	134	64	19	32
				Venezuela	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0
			NCO	Sta Lucia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		MED	CP	Algerie	306	230	237	179	299	173	225	230	481	0	391	547	586	477	1134	806	970	1119	1236	577	1025	1984	1592	231	799	905	732	1802	3229	2251
				EU-Croatia	22	28	26	26	26	26	0	0	0	0	0	0	0	0	0	0	8	13	9	10	12	15	15	25	37	27	15	17	54	51
				EU-España	1124	1472	2296	604	487	669	1024	861	493	495	1009	845	1101	3083	3389	726	3787	3227	1620	2654	735	1191	1081	2170	774	1026	986	511	266	981
				EU-France	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
				EU-Greece	1400	1400	1426	1426	0	0	196	125	120	246	226	180	274	157	620	506	169	129	118	155	108	311	207	181	294	513	262	139	273	309
				EU-Italy	531	531	229	229	229	462	462	462	2452	1463	1819	866	143	158	342	732	574	653	613	892	0	0	1717	0	966	25	6	16	15	14
				EU-Malta	1	2	3	6	1	3	1	1	0	2	8	4	11	14	12	7	11	23	3	85	14	14	11	9	12	12	7	1	28	2
				Maroc	1726	621	1673	562	1140	682	763	256	621	246	326	50	199	35	83	336	525	237	194	237	171	811	200	0	442	50	96	91	52	43
				Syria	0	0	0	0	0	0	0	0	0	0	0	0	0	99	75	87	81	84	83	83	0	0	0	0	0	0	0	0	0	
				Tunisie	13	14	13	32	93	45	15	2300	932	989	1760	0	0	0	0	0	0	940	935	938	920	13	23	26	136	67	91	139	147	162
				Türkiye	77	0	0	0	0	316	316	316	316	0	284	1020	1031	993	836	1873	1081	2552	907	863	562	476	407	474	367	462	1070	737	809	482
			NCO	Palestine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28	130	81	21	104	48
				Serbia & Montenegro	0	2	6	6	6	7	8	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Discards	ATL	CP	EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	9	12	0	0	0	0	0
		MED		EU-Croatia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
BON	TOTAL				21719	21219	25134	24417	45253	37312	27151	27637	23925	14424	15832	78767	41951	15628	16814	23710	28921	36783	48280	24847	27993	15706	54868	22757	46584	29676	44619	28546	92230	39912
		ATL			6037	6030	7939	10340	15523	9143	5179	5400	8208	3307	4584	4391	9648	6381	6772	13691	16338	22341	8959	6482	4640	6712	10930	10959	11093	23931	17458	21817	36026	32538
		MED			15682	15189	17195	14078	29730	28170	21972	22237	15717	11117	11248	74376	32303	9247	10042	10019	12584	14442	39321	18365	23352	8993	43938	11798	35491	5745	27160	6728	56204	7374
	Landings	ATL		All gears	6037	6030	7939	10340	15523	9143	5179	5400	8208	3307	4584	4391	9648	6381	6772	13691	16338	22341	8959	6482	4640	6712	10930	10959	11093	23929	17458	21817	36021	32531
		MED			15682	15189	17195	14078	29730	28170	21972	22237	15717	11117	11248	74376	32303	9247	10042	10019	12584	14442	39321	18365	23352	8993	43938	11798	35491	5745	27160	6728	56204	7374
	Discards	ATL			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	5	7
		MED			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Landings	ATL	CP	Angola	20	9	39	32	0	2	118	118	118	0	0	138	0	931	0	1962	1997	131	267	1134	2	3	3	2	0	0	5	5	0	11
				Barbados	0	0	0	0	0	0	0	1	2	2	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	2	0	10	0	0	0	0	0
				Brazil	142	137	0	0	0	0	0	0	0	0	0	90	0	0	0	0	0	171	0	38	0	1	2	1	23	15	0	0	0	5
				Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	539	539	539	539	0	0	0	0	0	0	0	0	0	0
				Côte d'Ivoire	0	0	0	0	0	0	0	0	0	0	3	0	3	0	3	13	755	3	0	26	3	16	6	3510	42	2725	1757	6244	687	590
				EU-Denmark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				EU-España	3	2	2	1	0	12	12	10	5	23	9	2	15	14	13	36	45	57	7	44	28	10	31	18	16	20	3	8	10	5
				EU-France	990	990	610	610	610	24	32	0	18	0	0	0	0	122	59	25	208	241	102	245	288	333	422	290	195	115	62	60	43	56
				EU-Germany	0	0	714	0	0	0	0	0	38	0	0	0	0	0	0	0	0	0	0	0	6	0	4	89	14	0	13	1	25	25
				EU-Ireland	0	0	0	0	0	0	0	0	0	0	48	0	0	0	0	56	125	91	108	100	0	0	0	0	0	0	0	0	0	0
				EU-Latvia	3	19	301	887	318	0	416	396	639	0	0	0	0	0	0	0	1019	2231	34	48	29	0	0	0	0	6604	518	522	1414	712
				EU-Lithuania	0	0	0	0	0	0	0	0	793	0	0	0	0	0	0	0	0	0	0	0	0	0	0	78	686	385	596	138	903	313
				EU-Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	344	539	539	0	2047	104	1075	54	11	124	79	39	91	71	82	141	72
				EU-Poland	0	0	225	0	0	0	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	56	78	83	49	98	98	162	47	61	40	50	38	318	439	212	124	476	461	321	184	22	25	570	368	257	382	168	248	148	757
				Gabon	0	0	0	0	0	0	0	0	58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
				Gambia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	724	724
				Great Britain	0	0	287	0	0	0	0	0	0	0	0	0	35	0	0	30	71	113	4	0	0	0	0	0	0	0	0	0	0	0
				Grenada	0	0	24	6	14	16	7	10	10	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	1	0	1	1	0	0
				Guinea Ecuatorial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	59	32	0	3	4	5	6	4	35
				Maroc	584	699	894	1259	1557	1390	2163	1700	2019	928	989	1411	1655	1053	1419	2523	109	145	235	89	90	174	850	1417	4081	5679	5470	4516	10512	19533
				Mauritania	0	0	0	0	0	0	0	0	0	0	0	0	1303	839	1850	2384	6890	9463	3193	514	1052	2543	4951	1546	1801	1927	5008	5386	10843	5619
				Mexico	674	1144	1312	1312	1632	1861	1293	1113	1032	1238	1066	654	1303	1188	1113	1063	1046	1080	1447	1534	1115	1110	1188	1361	1440	1258	954	693	430	692
				Norway	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0
				Panama	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Russian Federation	0	0	0	0	4960	0	0	574	1441	461	16	79	316	259	52	368	1042	2293	848	125	416	308	850	666	573	617	1281	908	6969	732

					1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
				S Tomé e Príncipe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	145	147	149	153	158	162	267	207	211	2	0	0	0	0	0
				Senegal	814	732	1012	1289	2213	2558	286	545	621	195	183	484	2304	1020	1380	4029	1677	2876	1453	514	1217	1711	1581	1226	1696	3982	1380	2915	2975	2460
				Sierra Leone	0	0	0	0	0	0	11	245	44	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	0	0	0	0	0
				St Vincent and Grenadines	0	0	0	0	0	0	0	0	0	15	18	0	16	23	27	15	6	20	0	0	0	0	0	0	0	0	0	0	0	0
				Trinidad and Tobago	703	169	266	220	30	117	117	56	452	188	280	81	7	16	38	68	68	14	9	16	16	0	16	16	16	16	16	16	16	16
				UK-British Virgin Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2	2
				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	0	0	0	0	0
				USA	128	116	156	182	76	83	142	120	139	44	70	68	40	97	47	50	47	189	94	73	101	96	61	62	197	107	140	66	176	168
				Venezuela	1661	1651	1359	1379	1659	1602	2	0	61	13	0	16	18	19	12	38	10	21	7	4	9	0	0	0	0	0	0	0	0	0
			NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	29	40	20	12	0	0	0	0	0	0
			NCO	Argentina	4	138	108	130	12	68	19	235	1	129	269	110	0	0	0	220	59	6	33	0	0	0	0	0	0	0	0	0	0	
				Cuba	0	0	0	0	230	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
				Dominica	0	0	0	0	0	0	0	0	0	0	0	6	16	16	9	4	0	0	0	0	1	2	7	1	0	2	6	0	0	
				Jamaica	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
				Saint Kitts and Nevis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	2	0	1	0	0	
				Sta Lucia	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Togo	254	145	197	197	197	197	0	0	0	0	1583	1215	2298	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
				Ukraine	0	0	342	2786	1918	1114	399	231	656	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		MED	CP	Albania	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Algerie	418	506	277	357	511	475	405	350	597	0	609	575	684	910	1042	976	1009	355	353	614	504	716	452	593	811	302	369	485	1216	841
				EU-Bulgaria	0	25	33	16	51	20	35	35	35	0	0	0	0	0	0	0	16	8	96	6	5	8	68	13	23	4	32	1	45	1
				EU-Croatia	70	0	0	0	25	120	0	0	0	0	0	0	0	0	0	0	59	41	31	56	56	34	20	22	28	42	31	24	13	22
				EU-Cyprus	0	0	0	0	0	0	14	0	10	10	6	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				EU-España	344	632	690	628	333	433	342	349	461	544	272	215	429	531	458	247	518	574	442	881	585	519	358	314	321	483	330	253	1967	317
				EU-France	0	0	0	0	0	0	0	0	27	0	0	0	0	15	34	20	23	13	12	30	25	103	60	217	52	86	57	45	51	60
				EU-Greece	1581	2116	1752	1559	945	2135	1914	1550	1420	1538	1321	1390	845	1123	587	476	531	798	733	960	678	691	700	399	641	422	342	269	659	213
				EU-Italy	1828	1512	2233	2233	2233	4159	4159	4159	4579	2091	2009	1356	552	610	1323	1131	964	1197	472	1245	1053	750	697	540	605	616	570	499	480	456
				EU-Malta	0	0	2	7	2	2	1	0	1	0	1	1	11	7	7	3	6	1	3	2	0	2	3	0	2	1	1	0	2	0
				Egypt	648	697	985	725	724	1442	1442	1128	1128	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Libya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	705	780	82	75	71	65	45	35	29
				Maroc	93	37	67	45	39	120	115	5	61	85	78	38	89	87	142	131	57	12	1	0	8	26	50	46	28	60	8	13	11	2
				Tunisie	305	413	560	611	855	1350	1528	1183	1112	848	1251	0	0	0	0	0	0	1425	1415	1413	1407	867	1290	1993	1986	2079	2612	2498	1832	3350
				Türkiye	10093	8944	10284	7810	24000	17900	12000	13460	6286	6000	5701	70797	29690	5965	6448	7036	9401	10019	35764	13158	19032	4573	39460	7578	30920	1578	22743	2595	49892	2083
			NCO	NEI (MED)	300	300	300	75	0	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	2	6	10	12	12	14	17	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Discards	ATL	CP	EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
				EU-Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5
				Gabon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
				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	0	0	0	0	0
			NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		MED	CP	EU-Croatia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				EU-España	0	0	0	0	0	0	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-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BOP	TOTAL				791	703	2196	481	177	868	1207	1012	923	736	581	217	32	1047	533	449	287	377	681	662	952	2239	805	560	126	171	105	220	146	262
		ATL			615	588	2064	254	47	651	1062	858	786	713	573	215	32	875	426	442	273	335	657	641	939	1161	743	522	104	119	63	193	99	124
		MED			176	115	132	227	130	217	145	154	137	23	8	2	0	172	107	6	14	42	24	21	13	1078	62	38	22	52	43	27	47	138
	Landings	ATL		All gears	615	588	2064	254	47	651	1062	858	786	713	573	215	32	875	426	442	273	335	657	641	939	1161	743	522	104	119	63	193	99	124
		MED			176	115	132	227	130	217	145	154	137	23	8	2	0	172	107	6	14	42	24	21	13	1078	62	38	22	52	43	27	47	138
		ATL	CP	EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				EU-Portugal	0	0	0	0	0	0	0	0	0	0	0	5	3	1	2	11	21	7	1	2	0	0	0	0	0	1	1	1	0	1
				Maroc	598	524	2003	246	28	626	1048	830	780	706	503	132	0	634	391	273	199	213	642	555	867	1113	665	450	38	53	62	169	91	107
				Senegal	16	63	60	5	18	24	14	28	6	7	70	78	29	240	33	158	53	115	14	84	72	48	78	72	66	66	0	23	8	15
			NCO	Benin	1	1	1	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		MED	CP	Algerie	153	92	119	224	128	216	135	145	128	0	0	0	0	0	0	0	0	9	7	3	3	2	2	1	0	1	0	0	4	5
				EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
				EU-Portugal	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
				Maroc	23	23	13	3	2	1	10	9	9	20	7	1	0	172	107	6	14	30	15	16	8	8	33	3	8	6	35	11	1	
				Tunisie	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	0	2	2	2	2	1068	27	33	14	45	7	17	43	133
BRS	TOTAL	ATL			7161	7006	8435	8004	7923	5754	4785	4553	7750	5137	3410	3712	3587	2253	3305	2681	1590	1055	613	853	698	389	1124	1032	1010	1118	773	707	991	1013
	Landings			All gears	7161	7006	8435	8004	7923	5754	4785	4553	7750	5137	3410	3712	3587	2253	3305	2681	1590	1055	613	853	698	389	1124	1032	1010	1118	773	707	991	1013
			CP	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	1	0	0	0	0	0
				Brazil	1149	1308	3047	2125	1516	1516	988	251	3071	2881	814	471	1432	563	1521	1042	0	3	0	6	2	1	1	1	1	135	0	0	3	8
				EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Grenada	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Trinidad and Tobago	2130	1816	1568	1699	2130	1328	1722	2207	2472	1867	2103	2720	1778	1414	1472	1498	1498	936	489	695	695	0	695	695	695	695	695	695	695	695
				Venezuela	3882	3882	3609	3609	3651	1766	1766	1766	1766	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	29	29	0	0	0	0	0	0
				Guyana	0	0	211	571	625	1143	308	329	441	389	494	521	377	277	312	141	92	116	124	151	0	387	399	308	313	0	0	0	0	0
				Suriname	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	288	78	12	293	310
CER	TOTAL				490	429	280	251	251	1	4	6	1	2	1	1	1	0	0	0	0	2	0	0	1	1	0	1	1	1	0	0	0	0
	Landings			All gears	490	429	280	251	251	1	4	6	1	2	1	1	1	0	0	0	0	2	0	0	1	1	0	1	1	1	0	0	0	0
			CP	EU-France	400	400	250	250	250	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Grenada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				St Vincent and Grenadines	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
			NCO	Dominica	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
				Dominican Republic	90	29	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
				Jamaica	0	0	0	0	0	0	0	0	0	0	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	3	5	1	2	0	1	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0
FRI	TOTAL				13332	11816	13871	13980	14332	10589	8680	10151	5742	6096	8832	6154	8429	9789	7861	12384	14215	15471	18287	17597	17149	17074	21814	15703	17755	18397	18119	20669	18542	16217
	Landings			All gears	5300	5617	6631	9004	9531	4992	3054	4506	3893	3095	5086	2933	5918	6019	5296	8237	8633	10515	9735	11829	10941	11088	13263	10431	11410	12267	13235	16482	13971	12415
	Landings(FP)				8031	6200	7240	4976	4801	5597	5627	5646	1849	3001	3746	3221	2511	3770	2565	4147	5582	4956	8552	5768	6208	5845	8551	5194	6285	6103	4881	4178	4557	3795
	Discards				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	141	0	78	60	27	3	9	14	7
	Landings		CP	Angola	6	21	29	12	31	2	38	38	38	0	0	0	0	95	0	63	19	59	39	22	47	2	1	0	0	0	0	0	0	1
				Belize	0	0	0	0	33	0	115	87	0	0	0	0	0	0	0	0	0	0	0	0	36	266	824	586	552	655	585	144	87	281
				Brazil	906	558	527	215	162	166	106	98	1117	860	414	532	603	202	149	313	204	347	259	227	293	308	271	445	282	109	272	100	69	151
				Cape Verde	86	13	6	22	191	154	81	171	278	264	344	300	318	378	574	1312	711	853	1811	2461	5418	3556	2324	1795	4988	2236	2282	3649	1276	1302
				Curaçao	0	0	590	1157	1030	1159	1134	1006	713	507	497	0	150	106	485	364	0	235	238	481	1456	1151	1124	1576	1414	750	1071	1263	249	163
				Côte d'Ivoire	0	0	0	0	3	0	1	821	2	31	1356	4	354	541	14	813	161	297	38	2837	261	141	311	81	2	89	178	105	2	38
				EU-España	297	386	947	581	570	23	17	722	438	635	34	166	73	278	631	1094	950	877	1708	1234	1200	1682	2537	1608	1033	1129	926	1275	1381	1337
				EU-France	105	126	161	159	146	0	91	128	95	160	168	47	6	98	24	24	91	147	249	233	147	247	410	773	715	637	296	319	726	319
				EU-Germany	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	8	8
				EU-Latvia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	169	528	0	0	3529	272	253	163	422
				EU-Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	9	150	90	0	164	5	85	119	6	90	45	233	13	6	0	8	88
				EU-Portugal	0	0	0	1	31	5	9	28	5	4	7	212	3	250	13	0	0	0	0	0	0	1	2	3	1	3	0	1	1	1

					1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
				El Salvador	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	44	0	960	0	0	0
				Gabon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0
				Gambia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2254	2254
				Ghana	0	0	0	0	33	221	118	39	31	0	3	0	2577	2134	1496	2786	3604	2295	2469	2382	0	0	0	0	0	0	0	0	0	0
				Great Britain	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	26	0	0	0	0	0	0	0	0	0	0	0	0
				Grenada	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	98	74	81	78	48	63	0	26	0	71	63	311	249	155	178	0	0
				Guinea Ecuatorial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	1	3	2	2	1	505
				Guinée Rep	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	96	94	332	503	236	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	0	12	0	1	0	0
				Maroc	190	707	716	2717	2315	764	629	486	591	236	696	227	52	135	179	9	19	862	554	55	21	90	125	200	3	93	492	209	166	518
				Mauritania	0	0	0	0	0	0	0	0	0	0	0	0	269	169	377	492	1420	1953	661	101	211	806	996	311	362	394	1025	1005	2223	1018
				Panama	341	328	240	91	0	0	0	0	0	0	394	975	970	1349	411	439	425	339	463	504	905	292	1356	1572	707	743	941	849	0	0
				Russian Federation	405	456	46	500	2433	477	12	25	308	56	56	63	6	6	12	113	270	912	113	217	139	249	545	389	430	305	753	153	115	136
				S Tomé e Príncipe	37	48	79	223	197	209	200	200	200	200	234	215	290	0	275	149	153	298	307	315	324	636	536	467	14	482	521	546	461	981
				Senegal	319	309	0	101	0	7	0	4	0	13	288	151	83	119	383	15	217	201	341	16	22	1407	1133	391	249	807	2498	6337	4774	2860
				St Vincent and Grenadines	0	0	0	17	65	0	0	208	0	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Trinidad and Tobago	0	56	199	368	127	138	245	0	0	0	414	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				UK-Bermuda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0
				Venezuela	2609	2601	3083	2839	2164	1631	210	444	34	113	182	42	165	52	48	54	215	508	85	150	71	64	70	115	67	26	0	92	6	34
			NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	7	14	8	11	0	0	0	0	0	0
			NCO	NEI(ETRO)	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
				Sta Lucia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
				Ukraine	0	0	0	0	0	36	48	0	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Landings(FP)		CP	Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	154	71	86	78	107	0	0	0	0	0	0	0	0	0
				Cape Verde	0	0	0	0	0	0	0	0	0	0	0	144	84	200	189	188	428	130	271	256	268	745	537	164	238	183	191	0	0	0
				Curaçao	0	0	0	0	0	0	0	0	0	0	0	29	55	29	36	225	233	139	214	149	224	0	0	0	0	0	0	326	0	0
				Côte d'Ivoire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	177	81	236	0	0	0	0	0	0	0	0	0
				EU-España	3990	3903	4495	3449	3154	3762	3385	3580	1074	1942	2450	1327	1423	2585	1685	2636	3117	3023	5770	2792	3289	1533	1753	1351	1069	1192	900	1154	1522	1097
				EU-France	4041	2297	2745	1527	1648	1836	2242	2066	775	1059	1296	1138	644	612	222	684	1214	815	1183	1466	1486	855	1046	468	886	864	731	1301	1227	1052
				El Salvador	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	435	793	895	1113	1071	0	964	355	847
				Guatemala	0	0	0	0	0	0	0	0	0	0	0	142	75	69	99	53	105	25	150	42	65	0	0	0	0	0	0	131	804	449
				Guinée Rep	0	0	0	0	0	0	0	0	0	0	0	168	0	24	37	0	174	518	542	672	441	0	0	0	0	0	0	0	0	0
				Panama	0	0	0	0	0	0	0	0	0	0	0	274	230	251	297	261	157	230	158	234	92	0	0	0	0	0	0	303	648	349
			NCO	Mixed flags (EU tropical)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2277	4422	2317	2979	2793	3060	0	0	
	Discards		CP	EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	141	0	78	60	26	3	9	13	6
				EU-Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
				Gabon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
KOM	TOTAL				14777	14930	17782	19815	16394	17717	16342	15408	17258	15863	12830	11766	8252	17936	7344	7826	11697	10452	10151	9712	11039	9913	10838	11257	11844	10058	14660	8788	8731	17667
	Landings			All gears	14777	14930	17782	19815	16394	17717	16342	15408	17258	15863	12830	11766	8252	17936	7344	7826	11697	10452	10151	9712	11039	9913	10838	11257	11844	10058	14660	8788	8731	17667
	Discards				0	0	0	0	0	0	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		CP	Angola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	139	914	0	0	0	0	0	0	0	0	10157
				Brazil	1365	1328	2890	2398	3595	3595	2344	1251	2316	3311	247	202	316	33	0	0	1	1	0	0	0	0	0	0	0	190	305	550	56	59
				Grenada	0	0	2	4	28	14	9	4	5	0	0	0	0	0	0	0	0	0	0	0	0	13	4	5	4	18	11	2	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	2	8	0	0	0	0	0
				Mexico	3097	3214	4661	4661	3583	4121	3688	4200	4453	4369	4564	3447	4201	3526	3113	3186	3040	3130	3090	3335	3019	3281	3130	3233	3825	3231	2505	1821	1003	1776
				Namibia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	30
				St Vincent and Grenadines	0	0	0	0	0	0	137	0	0	0	0	0	67	0	0	7	9	0	0	0	0	0	0	0	0	0	0	0	0	0
				Trinidad and Tobago	0	471	1029	875	746	447	432	410	1457	802	578	747	661	567	1043	1001	1001	720	393	495	496	1	494	494	494	494	494	494	494	495
				UK-Bermuda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	1	0	0	0	0	0	1	4	1
				USA	7831	7360	7058	8720	7373	6453	6780	6603	6061	6991	7129	7123	2837	13482	3013	3541	7584	6523	6573	5641	6607	6257	6891	7325	7368	5910	10809	5618	6812	4990
				Venezuela	2484	2558	2141	2139	340	2424	2424	2424	2424	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	2	2	2	4	5	0	1	0	1	0	0
				Guyana	0	0	0	270	440	398	214	239	267	390	312	245	168	326	174	91	59	75	90	99	0	358	314	192	143	1	0	0	0	0
				Suriname	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	212	534	301	330	158
			NCO	Dominica	0	0	0	0	0	36	35	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
				Dominican Republic	0	0	0	589	288	230	226	226	226	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
				Jamaica	0	0	0	155	0	0	44	48	48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	
				Saint Kitts and Nevis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	
				Sta Lucia	0	0	1	4	0	0	9	1	1	0	1	1	1	2	0	1	3	4	1	1	0	0	0	0	0	0	0	0	1	1
	Discards		NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LTA	TOTAL				14399	12276	11569	14405	15719	12283	15319	16943	16723	17010	16357	11915	10128	18384	14213	17127	23080	25347	20865	21643	14224	24030	28885	29485	27020	25536	22340	18683	26842	24576
		ATL			13202	10381	9453	12804	12804	9407	11830	13955	14080	16327	14918	10873	8320	16472	11954	14170	20910	21679	16679	17011	10619	17456	19097	14338	19134	15793	14994	13390	17731	14766
		MED			1197	1894	2116	1601	2914	2876	3489	2988	2643	684	1439	1042	1808	1911	2259	2957	2170	3668	4186	4633	3605	6574	9788	15147	7886	9743	7346	5293	9111	9810
	Landings	ATL		All gears	10906	9655	8779	11910	11732	8672	10258	11566	13476	14961	13352	10172	7417	13962	10137	12137	17433	17511	13060	13260	7968	10965	12248	10753	15804	11984	12026	11508	16114	12315
		MED			1197	1894	2116	1601	2914	2876	3489	2988	2643	684	1439	1042	1808	1911	2259	2957	2170	3668	4186	4633	3605	6574	9788	15147	7886	9743	7346	5293	9110	9809
	Landings(FP)	ATL			2296	726	675	894	1073	735	1571	2389	604	1366	1566	702	903	2510	1817	2033	3477	4168	3619	3751	2651	6287	6849	3478	3266	3740	2967	1848	1608	2437
	Discards	ATL			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	204	0	107	64	69	1	35	8	15
		MED			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	Landings	ATL	CP	Angola	121	117	235	75	406	118	132	132	132	0	0	2	0	4365	0	128	1759	3455	1905	1085	10	6	1	4	3	0	6	7	0	0
				Brazil	1225	1059	834	507	920	930	615	615	615	0	320	280	0	0	0	0	0	22	581	0	0	0	0	0	34	0	113	38	1047	398
				Cape Verde	23	72	63	86	110	776	491	178	262	143	137	81	123	292	250	357	185	102	131	131	131	131	218	113	105	59	82	133	51	23
				Curaçao	0	0	0	0	0	0	0	0	5	9	0	0	0	0	0	0	38	38	76	57	0	0	0	0	0	4	2	105	20	5
				Côte d'Ivoire	251	253	250	155	136	9	123	1	0	0	153	287	427	2159	1791	1446	1631	50	1062	1433	152	102	111	1881	7583	2441	1815	1917	1293	742
				EU-España	0	10	55	27	110	6	2	22	8	1	489	50	16	0	38	35	136	168	71	52	112	381	477	185	148	89	10	11	255	330
				EU-France	54	59	22	215	21	698	631	610	613	14	10	27	12	0	1	50	35	5	30	27	6	36	73	359	268	263	156	492	962	471
				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	0	0	0	0	0	0
				EU-Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	14	69	8	0	18	1	9	0	0	0	0	0	0	0	0	0	0
				EU-Portugal	72	72	218	320	171	14	50	0	2	16	19	21	24	43	10	6	5	14	4	18	0	0	7	32	35	43	3	6	23	43
				El Salvador	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
				Gabon	0	0	182	0	18	159	301	213	57	173	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Ghana	994	513	113	2025	359	306	707	730	4768	8541	7060	5738	783	1335	745	1692	1465	1001	1274	1138	0	0	0	0	0	0	0	0	0	0
				Great Britain	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	15	23	38	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	1	0	0	0	0	0	0	0	0
				Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	120	15	45	88	38	50	0	0
				Guinea Ecuatorial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	10	11	10	11	1	1
				Guinée 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	0	0	0	631	907
				Liberia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	673	256	176	101	78	151	212	2	70	1	19	0	43
				Maroc	43	230	588	195	189	67	101	87	308	76	91	33	0	40	2	63	5	57	10	11	3	6	11	12	0	0	0	0	0	0
				Mauritania	0	0	0	0	0	0	0	0	0	0	0	0	670	423	943	1222	3549	4878	1634	252	529	1287	2478	774	901	984	2558	2462	5548	2479
				Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	10	0	0
				Russian Federation	189	96	49	0	88	0	0	0	74	13	0	0	0	0	0	0	268	11	208	399	255	136	547	433	698	478	1742	304	232	145
				S Tomé e Príncipe	40	43	40	50	39	37	33	33	33	33	178	182	179	0	183	188	193	198	203	209	214	182	122	249	11	87	6	71	35	74
				Senegal	4536	3613	1972	4174	4715	1607	3546	5176	2866	4394	3508	2699	3826	3885	5108	5683	6371	4910	2769	5912	3774	5065	4855	3841	3672	4757	3100	3718	791	3670
				South Africa	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

					1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
				St Vincent and Grenadines	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	27	33	0	0	0
				Trinidad and Tobago	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				UK-Bermuda	6	6	7	6	5	4	2	1	5	4	5	7	5	5	4	3	4	5	6	3	3	4	2	1	1	2	3	5	1	3
				UK-Sta Helena	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				USA	1142	1312	2230	2015	1546	1623	1209	1451	1366	1492	1382	765	1351	1401	963	1245	1772	1875	2797	2333	2661	3537	3019	2577	2286	2580	2346	2146	5225	2982
				Venezuela	2115	2115	1840	1840	2815	2247	2247	2247	2254	50	0	0	0	0	30	4	2	8	4	1	4	0	0	0	0	0	0	0	0	0
			NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	12	16	54	48	0	0	0	0	0	0
			NCO	Benin	60	58	58	196	83	69	69	69	69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
				Cuba	15	27	23	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
				Dominica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	
				NEI(ETRO)	20	0	0	0	0	0	0	0	28	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	2	2	2	0	1	10	1	0	0	1	0	0	0	0	0	0	1	0	2	0	1	0	1	0	0	0	0
		MED	CP	Algerie	459	552	554	448	384	562	494	407	148	0	158	116	187	96	142	119	131	98	6	157	341	204	268	444	298	242	233	195	792	312
				EU-Croatia	15	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	28	25	44	37	43	31	19	42	34	31	31	49	72
				EU-Cyprus	23	10	19	19	19	16	19	19	19	0	0	0	0	6	5	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				EU-España	0	15	18	9	15	0	8	82	32	0	41	262	116	202	212	86	299	488	441	235	300	456	384	486	289	640	493	413	578	456
				EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	42	0	0	0	1	0	0	0	4	7	9	12	20
				EU-Greece	0	0	0	0	0	0	195	125	132	0	0	112	69	72	183	148	165	301	276	363	289	271	501	299	489	635	955	408	644	554
				EU-Italy	0	0	0	0	0	0	0	0	16	24	38	34	203	224	486	1100	365	304	669	557	442	0	992	930	1032	1513	1204	803	767	1027
				EU-Malta	0	0	0	0	0	0	0	0	1	1	1	1	3	2	5	3	7	5	21	9	4	7	1	6	6	7	3	2	6	5
				Egypt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	849	712	0	0	0	1003	0	0	0	0	0
				Libya	0	0	0	45	52	0	5	4	4	0	0	0	0	0	0	0	0	0	0	0	0	102	1100	48	80	65	55	30	25	22
				Maroc	0	1	0	1	14	8	0	0	3	1	0	9	0	331	19	24	1	0	0	0	0	0	3	0	0	0	0	0	0	0
				Syria	156	155	270	350	417	390	370	370	330	0	0	0	0	193	133	163	148	155	304	230	0	0	0	0	0	0	0	0	0	0
				Tunisie	204	696	824	333	1113	752	1453	1036	960	657	633	0	0	0	0	0	0	810	800	803	798	5165	6323	12434	4032	6152	4024	2940	5827	6551
				Türkiye	0	0	0	0	500	750	750	750	750	0	568	507	1230	785	1074	1309	1046	1437	1645	1386	682	326	184	480	617	450	341	463	410	789
			NCO	Israel	119	215	119	119	119	119	119	119	119	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
				NEI(MED)	200	200	200	200	200	200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
				Palestine	0	0	90	59	61	60	60	60	129	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
				Serbia & Montenegro	21	35	22	18	20	18	16	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Landings(FP)	ATL	CP	Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	223	51	238	144	133	0	0	0	0	0	0	0	0	0
				Cape Verde	0	0	0	0	0	0	0	0	0	0	0	45	76	265	214	189	262	266	179	438	178	850	458	128	146	132	109	0	0	0
				Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	39	42	50	160	185	167	209	284	284	0	0	0	0	0	0	426	0	0
				Côte d'Ivoire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	162	56	12	0	0	0	0	0	0	0	0	0
				EU-España	1127	454	284	353	295	194	751	1197	209	656	508	206	213	1253	944	1181	1320	2067	1105	732	1182	1968	1885	1244	781	1102	831	329	752	560
				EU-France	1169	272	391	540	777	541	821	1192	396	710	1058	367	205	262	122	241	901	1061	675	693	565	870	732	296	470	493	273	510	399	365
				El Salvador	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	44	0	0	15	45	340
				Guatemala	0	0	0	0	0	0	0	0	0	0	0	35	178	92	118	17	121	43	126	145	64	0	0	0	0	0	0	171	213	489
				Guinée Rep	0	0	0	0	0	0	0	0	0	0	0	15	0	21	2	0	358	260	666	1186	202	0	0	0	0	0	0	0	0	0
				Panama	0	0	0	0	0	0	0	0	0	0	0	35	191	577	368	228	106	250	259	72	30	0	0	0	0	0	0	396	200	683
			NCO	Mixed flags (EU tropical)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2598	3774	1810	1825	2013	1753	0	0	
	Discards		CP	EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	204	0	107	64	69	1	35	8	15
				EU-Germany	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		MED	CP	EU-Croatia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				EU-España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
				EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MAW	TOTAL	ATL			1278	1953	2910	1475	1496	971	1321	881	1393	646	352	480	571	847	616	684	2384	1333	1128	3016	1460	1243	1489	1286	7066	1810	839	2823	1710	4518
	Landings			All gears	1278	1953	2910	1475	1496	971	1321	881	1393	646	352	480	571	847	616	684	2384	1333	1128	3016	1460	1243	1489	1286	7066	1804	839	2823	1710	4518
	Discards				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	
	Landings		CP	Angola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	86	1650	249	221	1247	0	3	1	2	1	0	1	2	0	3
				Côte d'Ivoire	0	0	0	0	0	0	0	0	0	0	2	0	66	0	0	1	0	0	0	90	35	47	76	122	5827	601	305	392	312	186
				EU-Ireland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
				EU-Lithuania	0	0	0	0	0	0	0	0	298	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	1	1	0	10	0	0	0	0	0	0	0	0	0	0	0	0
				Gabon	140	145	79	60	85	61	102	53	48	82	67	37	87	93	17	22	30	34	46	42	13	37	21	56	87	137	42	195	191	384
				Gambia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	724	724
				Mauritania	0	0	0	0	0	0	0	0	0	0	0	0	207	319	176	203	275	193	152	110	434	493	524	164	191	79	206	2042	381	2693
				Russian Federation	0	0	0	0	14	0	0	0	0	15	0	0	1	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
				S Tomé e Principe	6	6	8	7	8	5	6	0	6	6	21	12	13	0	91	93	96	98	100	102	105	13	11	72	0	26	107	38	34	94
				Senegal	938	1614	2635	1046	878	700	987	617	794	532	262	431	196	435	329	278	331	749	610	1426	870	649	856	870	961	961	178	154	68	434
			NCO	Benin	194	188	188	362	511	205	205	205	205	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	21	0	42	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Discards		CP	Gabon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0
SSM	TOTAL				14490	13697	16571	15403	8877	9837	8220	8383	9414	9793	8119	10472	6308	6118	5900	6199	11788	10916	10156	12684	7798	7741	8669	8332	4332	12651	16691	11763	11530	9572
	Landings			All gears	14490	13697	16571	15403	8877	9837	8220	8383	9414	9793	8119	10472	6308	6118	5900	6199	11788	10916	10156	12684	7798	7741	8669	8332	4332	12651	16691	11763	11530	9572
			CP	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	0	0	0	0	2
				Belize	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	0	0	0	0	0
				EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	3	14	18	11	16	6	4	0	0	0	0	0
				EU-Portugal	0	0	0	0	0	0	0	0	0	0	0	1	26	16	0	2	20	7	2	0	0	0	1	0	0	0	0	0	0	0
				Gabon	0	0	0	0	0	0	0	0	265	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Grenada	2	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0
				Mexico	8300	7673	11050	11050	5483	6431	4168	3701	4350	5242	3641	5723	3856	3955	4155	4251	4128	4026	3321	3581	3857	4077	3820	3701	4321	3870	2968	2157	1535	2220
				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	0	0	0	0	0
				USA	4380	3363	2866	3509	2968	3282	3893	4524	4613	4552	4477	4747	2425	2147	1746	1946	7639	6871	6829	9089	3922	3652	4825	4611	6	8778	13722	9605	9994	7350
			NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	11	0	0	0	0	0	0
			NCO	Colombia	69	69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
				Cuba	409	548	613	613	236	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
				Dominica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
				Dominican Republic	1330	2042	2042	231	191	125	158	158	158	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
				Jamaica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
				Saint Kitts and Nevis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
				Sta Lucia	0	0	0	0	0	0	0	1	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WAH	TOTAL				2143	2408	2516	3104	2497	2972	2035	2318	2226	2067	2613	2467	1829	2581	2176	2354	2381	2844	3729	5235	3526	2554	17320	6881	6482	4894	8542	3218	4392	4196
	Landings			All gears	2143	2408	2516	3104	2497	2972	2035	2318	2226	2067	2613	2110	1650	2296	1604	1883	2111	2367	3541	5128	3440	2548	17320	6866	6467	4887	8541	3217	4389	4191
	Landings(FP)				0	0	0	0	0	0	0	0	0	0	0	357	179	285	572	471	269	477	85	0	0	0	0	0	0	0	0	0	0	
	Discards				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	104	108	86	6	0	14	15	6	2	1	2	4
	Landings		CP	Barbados	82	42	35	52	52	41	41	0	0	34	45	26	41	36	27	17	30	29	22	21	17	10	11	10	7	9	7	5	11	12
				Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	29	27	34	23	33	59
				Brazil	26	1	16	58	41	0	0	0	0	405	519	449	111	75	76	70	19	357	213	477	153	312	404	322	150	23	57	21	30	77
				Canada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Cape Verde	361	408	503	603	429	587	487	578	500	343	458	449	555	524	351	472	470	470	445	445	445	445	490	228	298	293	196	151	117	44
				Costa Rica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2	5	4	2	3	1	1	0	2
				Curaçao	250	230	230	230	230	230	230	230	230	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	16	3	1	11	0	5	5	12	9	95	1	25	1	1	1	61	62	19	0	32
				EU-España	20	15	25	25	29	28	32	38	46	48	305	237	110	66	38	73	53	87	35	50	41	50	59	51	79	61	53	45	54	97

			1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
		EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	4	0	0	46	45	38	159	61	79	58	61	51	107
		EU-Portugal	0	0	0	0	0	0	0	0	0	0	1	0	3	0	4	3	9	8	10	2	0	0	0	0	0	0	3	0	0	3
		El Salvador	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Great Britain	0	0	0	0	0	0	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	46	49	56	56	59	82	51	71	59	44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32	18	15	16	16
		Guinea Ecuatorial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	14	21	9	0	11	13	9	8	5	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	2	6	6	14	12	9	13
		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	0	0	0	1	0	0
		Maroc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	76	0	0	0	0	0	0	0	0	0	0	0	0	0
		Mauritania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	54	263	48	1591	46	122	13678	4271	4975	2707	7035	2026	603	2039
		Mexico	0	0	0	0	0	0	0	0	0	0	35	0	0	0	0	0	0	0	0	0	16	12	18	15	12	14	15	11	9	14
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	91	240	120	86	111	99	210	373	228	0	109	0	77	123	111	50	107	192
		S Tomé e Príncipe	39	46	80	52	56	62	52	52	52	52	94	88	76	0	131	235	241	247	254	260	266	100	70	172	1	157	8	102	60	118
		Senegal	0	0	1	0	0	5	0	0	0	5	0	1	1	0	0	2	6	0	11	24	0	3	7	0	0	0	0	23	89	55
		South Africa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		St Vincent and Grenadines	28	16	23	10	65	52	46	311	17	40	60	0	241	29	24	31	40	31	5	32	24	9	11	126	82	27	30	0	16	21
		Trinidad and Tobago	0	0	0	1	1	1	2	1	9	7	6	6	7	6	6	5	5	7	9	9	9	9	10	8	7	6	6	5	7	8
		UK-Bermuda	50	93	99	105	108	104	61	56	91	87	88	83	86	124	117	101	81	100	88	75	76	86	95	92	68	82	60	67	76	68
		UK-British Virgin Islands	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	1	0	4	1	1	0	0	0	0	0	1	3	0
		UK-Sta Helena	26	25	23	19	10	15	15	22	25	18	17	11	20	13	18	29	19	31	12	16	16	10	15	16	9	5	5	6	5	13
		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	0	0	0	0	0
		USA	391	764	608	750	614	858	640	633	846	789	712	558	89	1123	495	522	653	584	999	460	1027	1153	2060	1204	530	974	633	455	2959	1037
		Venezuela	542	540	487	488	360	467	4	17	13	9	7	16	13	33	9	25	28	23	38	32	27	30	64	51	45	46	40	31	56	85
	NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1132	1012	810	0	0	0	0	0	0	0	0	0
		Guyana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
		Suriname	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22
	NCO	Aruba	125	40	50	50	50	50	50	50	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Dominica	59	58	58	58	58	50	46	11	37	10	6	8	15	14	16	10	13	13	0	0	20	10	10	6	3	10	5	0	0	
		Dominican Republic	0	0	0	325	112	31	35	35	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Jamaica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Saint Kitts and Nevis	0	0	0	0	0	0	0	0	0	7	6	7	0	0	0	0	0	0	0	0	0	6	9	14	13	0	9	0	0	
		Sta Lucia	98	80	221	223	223	310	243	213	217	169	238	169	187	0	171	195	199	0	0	148	156	87	147	110	0	127	70	77	71	58
Landings(FP)	CP	Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	40	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	92	9	55	60	22	29	25	4	0	0	0	0	0	0	0	0	0	0	0
		Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	13	7	31	57	23	78	9	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	3	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	92	63	44	224	262	136	240	56	0	0	0	0	0	0	0	0	0	0	0
		EU-France	0	0	0	0	0	0	0	0	0	0	0	28	10	3	16	26	26	17	0	0	0	0	0	0	0	0	0	0	0	0
		Guatemala	0	0	0	0	0	0	0	0	0	0	0	68	11	21	28	7	0	8	0	0	0	0	0	0	0	0	0	0	0	0
		Guinée Rep	0	0	0	0	0	0	0	0	0	0	0	10	0	8	15	7	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	39	44	104	102	65	13	66	15	0	0	0	0	0	0	0	0	0	0	0
	NCO	Mixed flags (EU tropical)	0	0	0	0	0	0	0	0	0	0	0	28	30	44	97	26	39	0	0	0	0	0	0	0	0	0	0	0	0	
Discards	CP	EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	14	15	6	2	1	2	4
		Korea Rep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
		Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		South Africa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		UK-British Virgin Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	104	108	86	0	0	0	0	0	0	0	0	0

SMT-Table 2. Three 3 colour classification indicating the missing parameters by species and areas. Grey squares represent the area where the species does not occur or is not exploited.

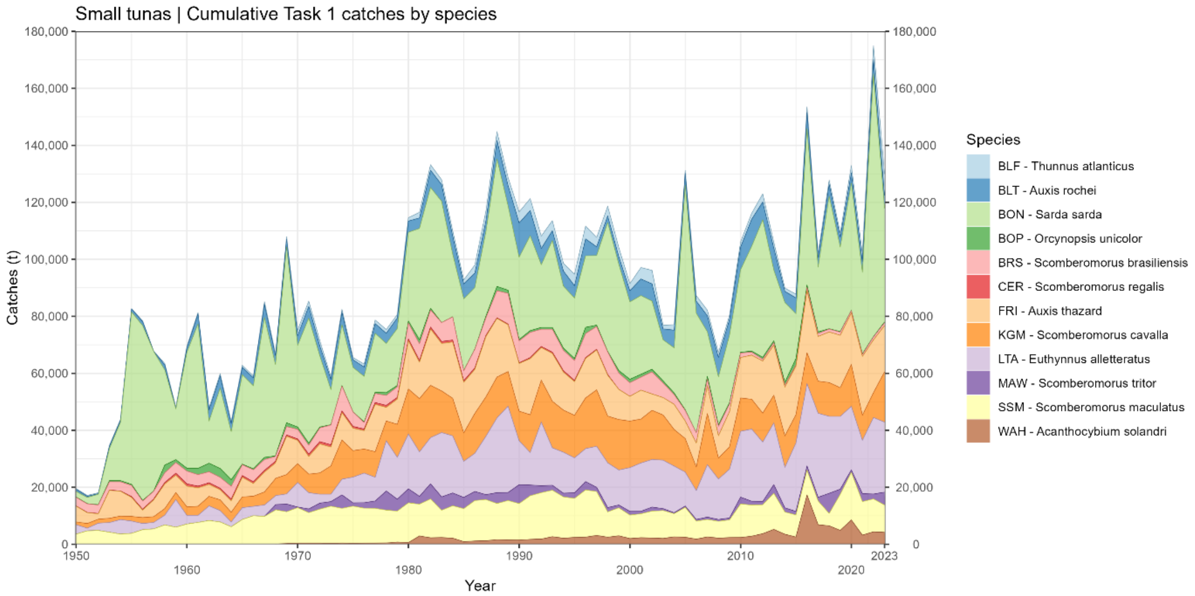
Species code	Areas				
	MEDI	**NE**	**SE**	**NW**	**SW**
BLF	out of range	out of range	out of range	Miss Tmax, T50 and Fmb	Miss Tmax, T50 and Fmb
BLT	Have all	miss L50, T50 and Fmb	miss a,b, Lmax Fmb	Miss all	Miss all
FRI	Miss all	Miss everything except Lmax and a,b,	Miss Lmax, L50, T50 and Fmb, a e b	Miss all	miss: Linf, K, t0, Tmax, T50, L50, Fmb
LTA	Have all	Miss T50, fmb	Miss all	Miss Fmb and T50	miss: Lmax, Linf, K, t0, Tmax, T50, L50, Fmb
BON	Have all	Miss T50, fmb	Miss all	Miss all	miss: Lmax, Linf, K, t0, Tmax, T50, L50, Fmb
BOP	Miss Fmb	miss: Linf, K, t0, Tmax, T50, L50, Fmb, a e b	Miss all	out of range	out of range
WAH	out of range	nf, K, t0, Tmax,	Miss all	Have all	miss: Linf, K, t0, Tmax, T50
BRS	out of range	out of range	out of range	Miss Fmb	Miss Fmb and T50
KGM	out of range	out of range	out of range	Have all	Miss Fmb
SSM	out of range	out of range	out of range	Miss Fmb	Miss all
CER	out of range	out of range	out of range	miss: Linf, K, t0, Tmax, T50, Fmb	Miss all
MAW	Miss all	miss: t0, Tmax, T50, Fmb	Miss all except Lmax	out of range	out of range
DOL	Miss Lmax, T50 and Fmb	Miss all except a and b	Miss all except Linf and k	Miss Lmax, T50 and Fmb	Miss L50, a,b, max, T50 and Fmb

SMT-Table 3. Summary of the current state of knowledge on the current stock status for small tunas in the Atlantic Ocean and the Mediterranean. Results taken from Pons *et al.*, 2019a. Red indicates values below reference levels (overfished) and green above reference values (not overfished).

Data limited Assessments							
	Last year assessed	Length based			Catch based		Catch+Length
		LBSPR	LIME	LBSPR	DBSRA	SSS	LIME
		Pons *et al.* (2019a)		Baibbat *et al.* (2019)	Pons *et al.* (2019b)		
		SPR	SPR		B/BMSY	B/BMSY	B/BMSY
LTA_SE	2014-2016	0.13	0.27	--	0.69	0.94	1.83
BON_NE	2014-2016	0.23	0.71	0.34	1.63	1.98	2.02
WAH_NW	2014-2016	0.37	0.29	--	1.02	1.34	0.86
WAH_NE	2014-2016	0.55	0.38	--	--	--	--
BON_Med	2014-2016	0.59	0.22	--	--	--	--
LTA_Med	2014-2016	0.66	0.62	--	1.88	2.33	1.08
LTA_NW	2014-2016	0.66	0.48	--	--	--	--
FRI_SE	2014-2016	0.79	0.53	--	1.79	2.65	1.10
FRI_NE	2014-2016	0.83	0.46	--	1.64	2.50	1.29
LTA_NE	2014-2016	0.90	1.00	--	--	--	--

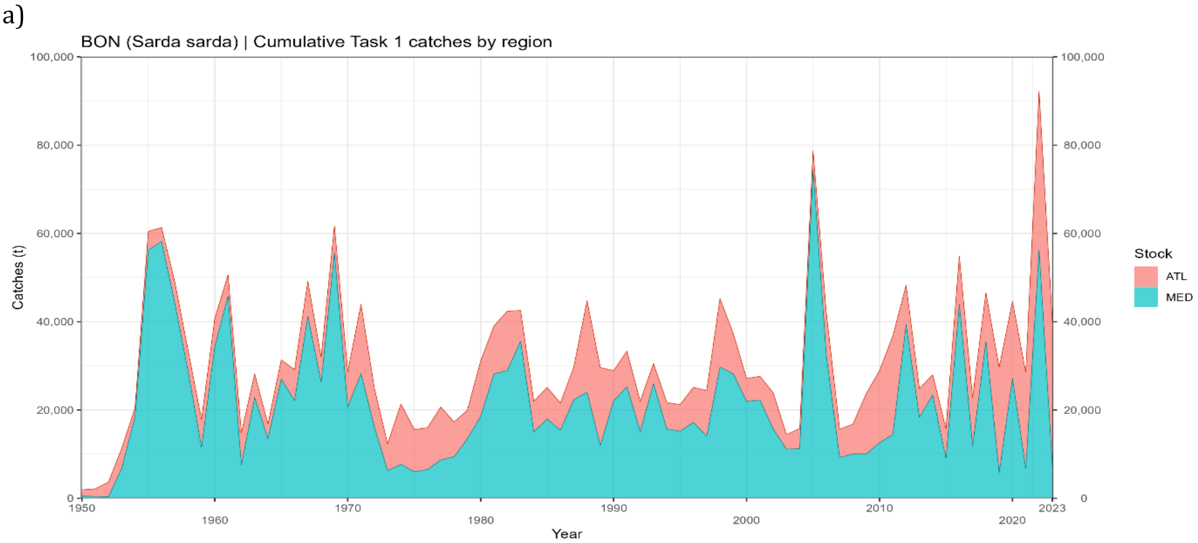
SMT-Table 4. Summary of the Northwest Atlantic wahoo management strategy evaluation results for selected MPs using the DLMtool package (Mourato *et al.*, 2019). Color cells coding is used to denote if the particular MP falls within acceptable performance metric criteria (green – acceptable and red – not satisfied). Probability of not overfishing (**PNOF**; $F<F_{MSY}$); probability of spawning biomass being higher than half of spawning biomass at maximum sustainable yield (**P50**; $SB>0.5\ SB_{MSY}$); probability of spawning biomass being higher than spawning biomass at maximum sustainable yield (**P100**; $SB>SB_{MSY}$); probability of average annual variability in yield being lower than 20% (**AAVY**; Prob. AAVY < 20%); probability of average yield being higher than half of reference yield (**LTY**; Prob. Yield > 0.5 Ref. yield). Acceptable management procedures were defined as those that supported **PNOF**>70%, **P50**>90%, **P100**>70%, **AAVY**>50% and **LTY**>50%.

Management Procedures	PNOF	P50	P100	AAVY	LTY
Length-based methods					
LBSPR	0.74	0.93	0.65	0.120	0.86
minlenLopt1	0.75	0.95	0.72	0.110	0.83
matlenlim	0.75	0.96	0.74	0.095	0.81
Catch-based methods					
AvC	0.70	0.95	0.76	0.630	0.78
CC1	0.71	0.95	0.76	0.640	0.76
SPMSY	0.81	0.98	0.86	0.110	0.43
DBSRA	0.61	0.98	0.81	0.450	0.74
Fishing effort control methods					
curE	0.75	0.93	0.66	0.130	0.85
curE75	0.87	0.97	0.78	0.150	0.80

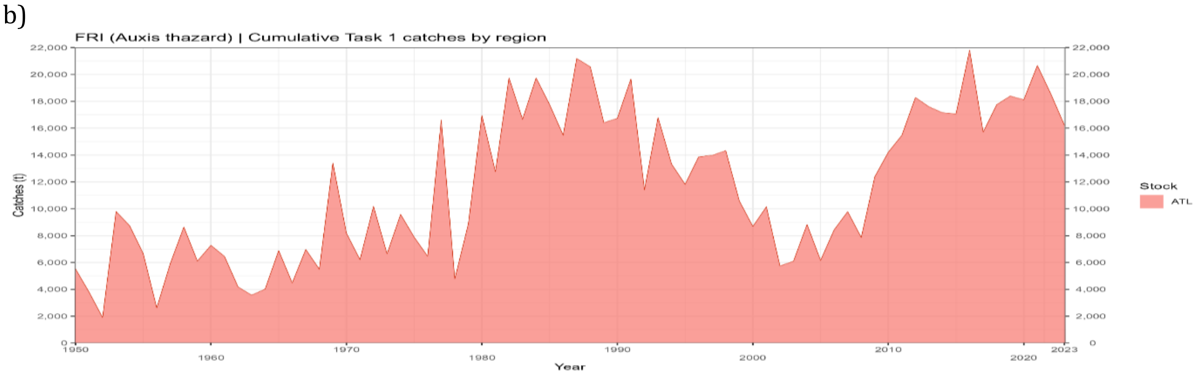


SMT-Figure 1. Estimated landings (t) of small tunas (combined) in the Atlantic and Mediterranean, 1950-2023. The data for the last three years are incomplete.

a)

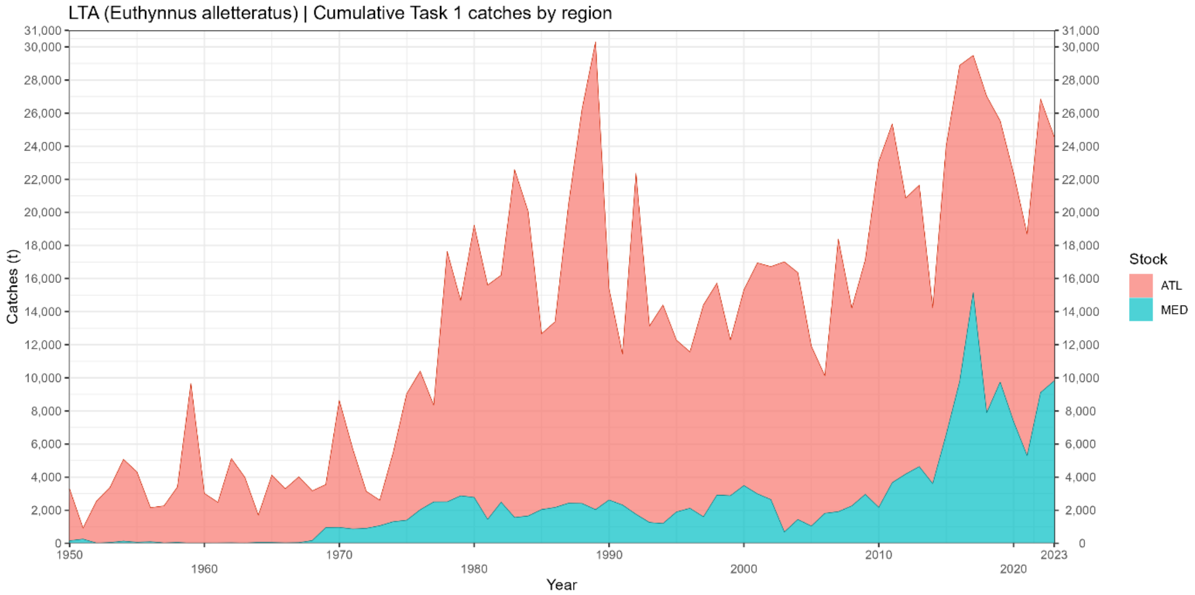


b)

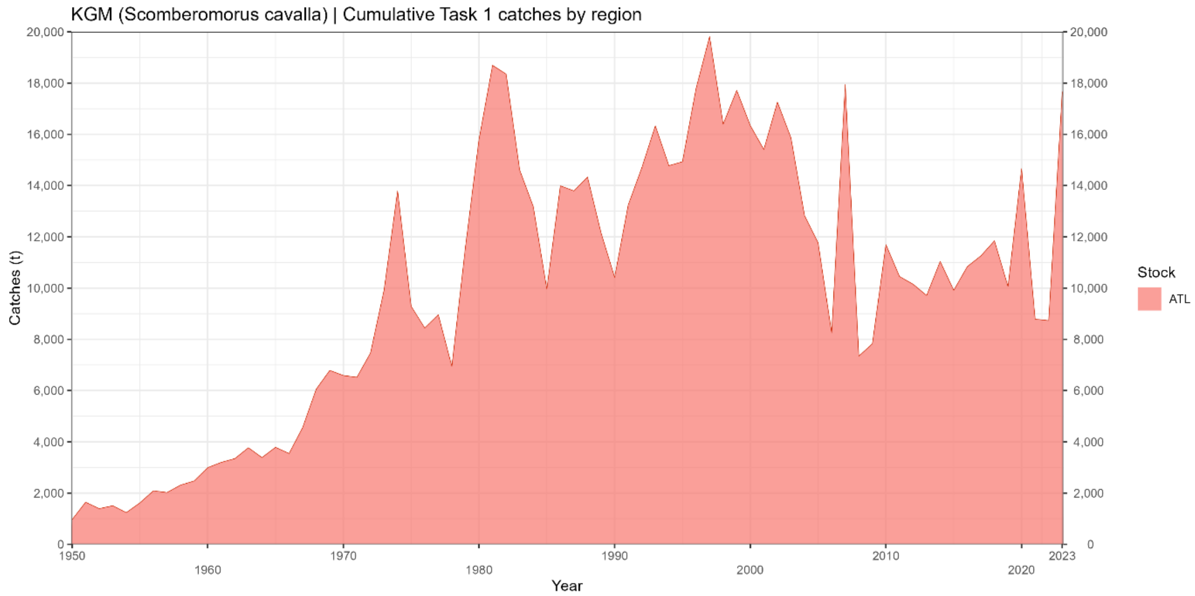


SMT-Figure 2. Estimated landings (t) of the major species of small tunas in the Atlantic and Mediterranean, 1950-2023. The data for the last years are incomplete.

c)

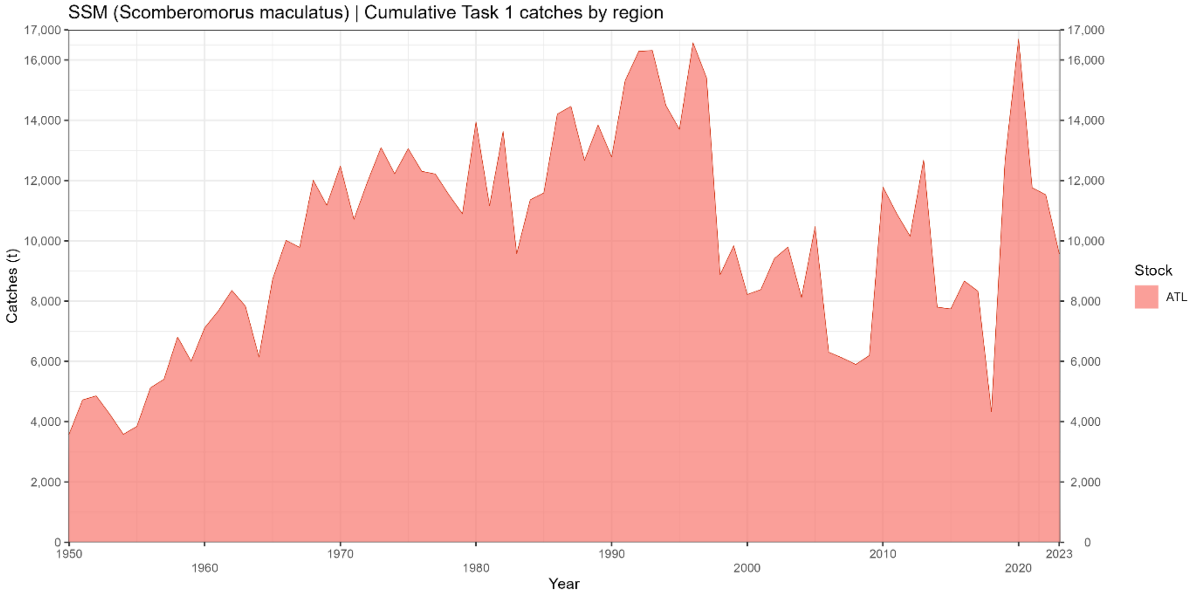


d)

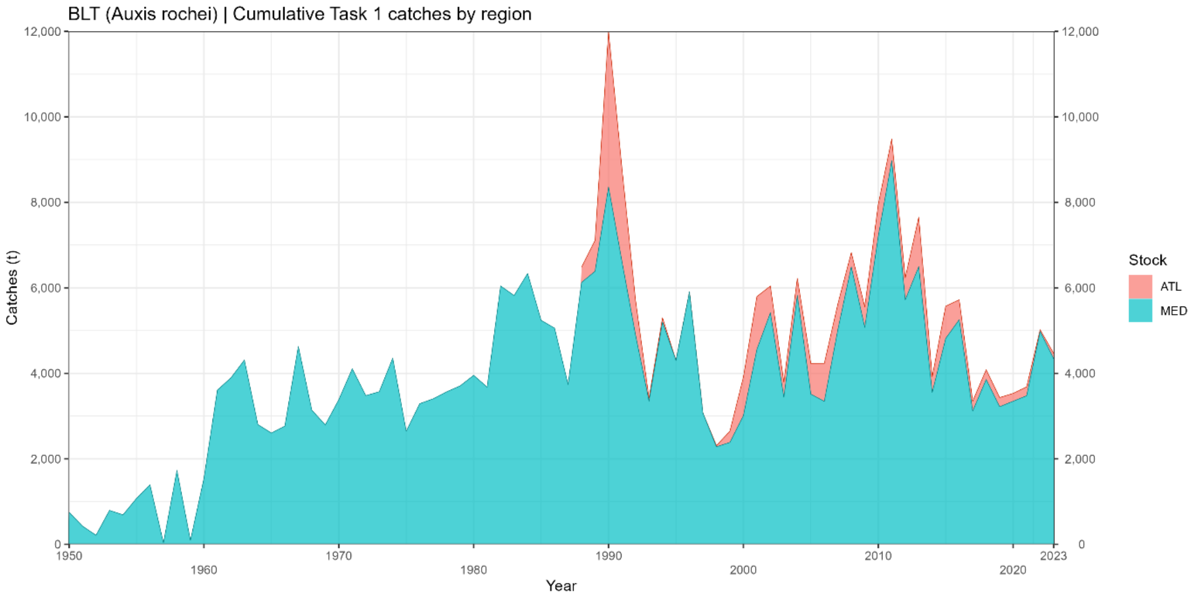


SMT-Figure 2. Estimated landings (t) of the major species of small tunas in the Atlantic and Mediterranean, 1950-2023. The data for the last years are incomplete.

e)

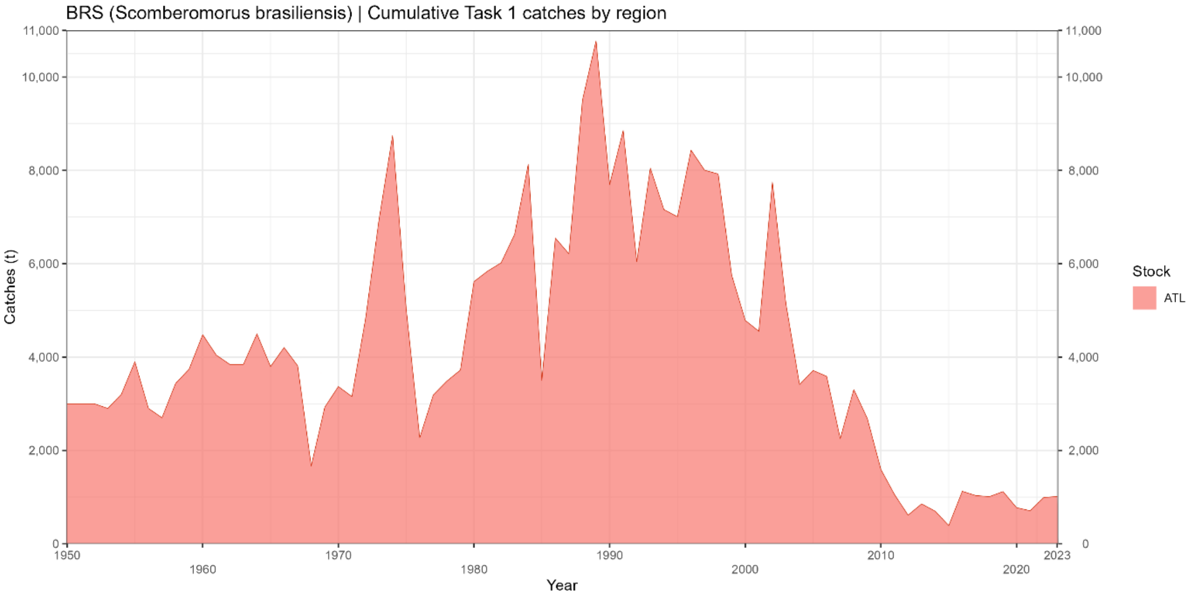


f)

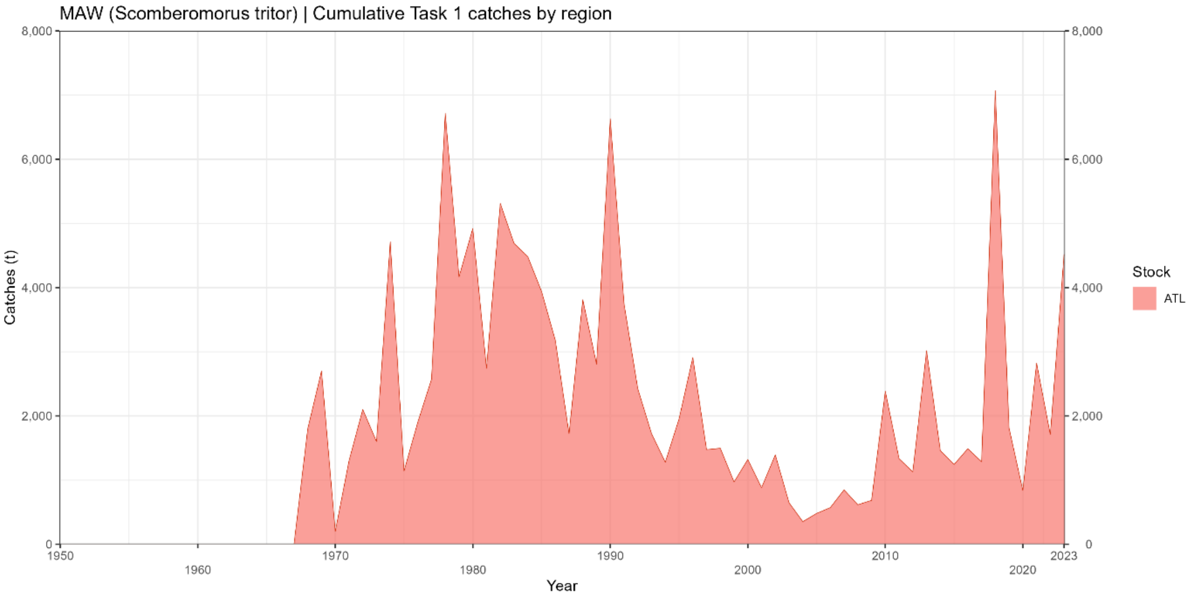


SMT-Figure 2. Estimated landings (t) of the major species of small tunas in the Atlantic and Mediterranean, 1950-2023. The data for the last years are incomplete.

g)

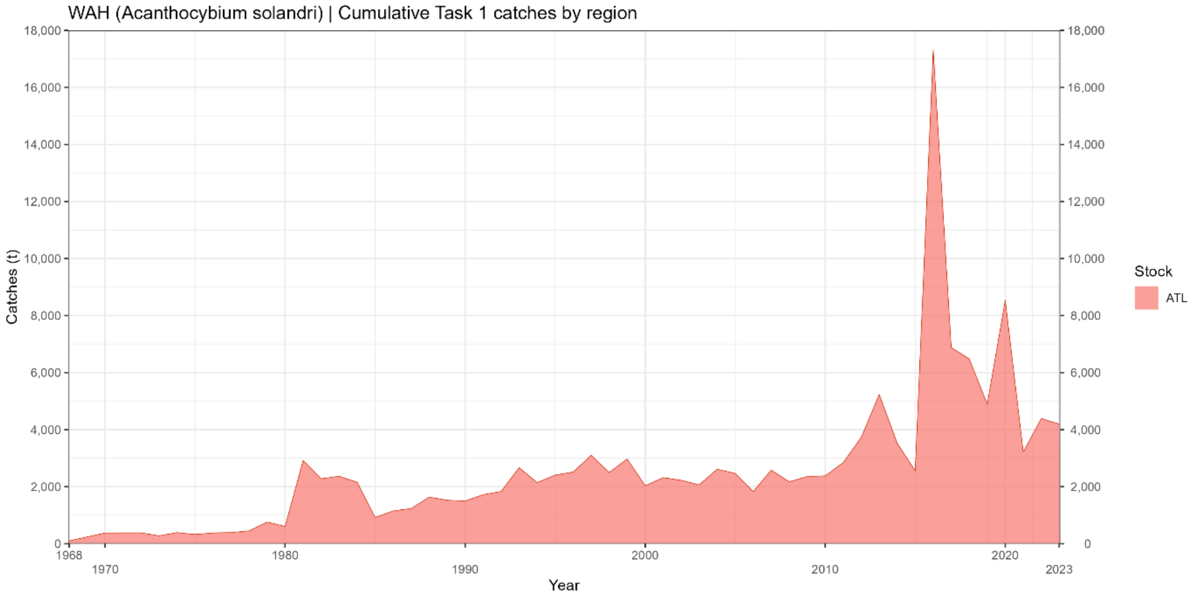


h)

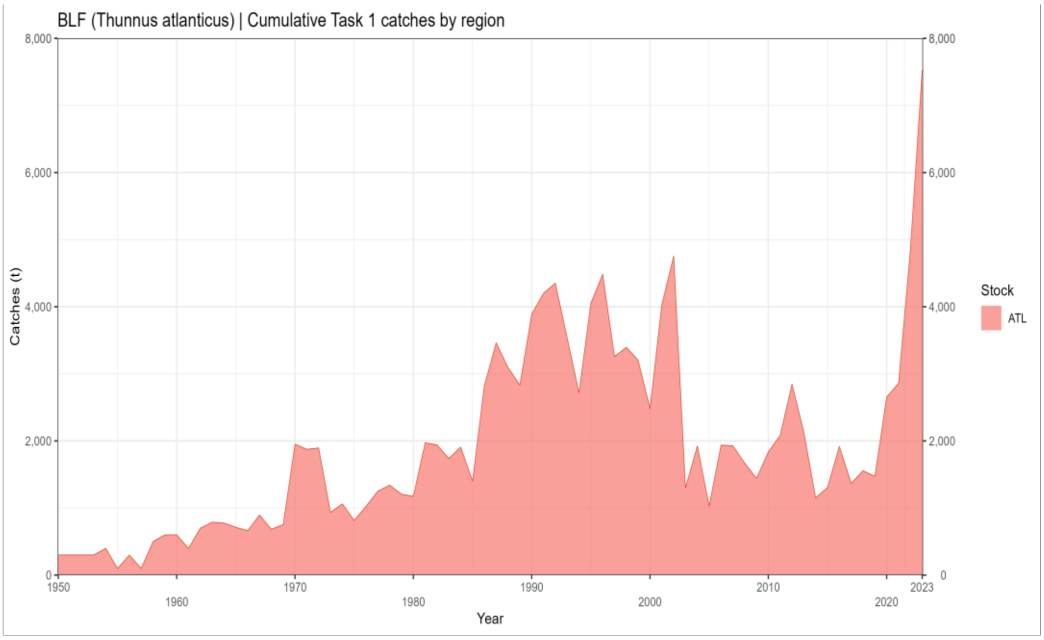


SMT-Figure 2. Estimated landings (t) of the major species of small tunas in the Atlantic and Mediterranean, 1950-2023. The data for the last years are incomplete.

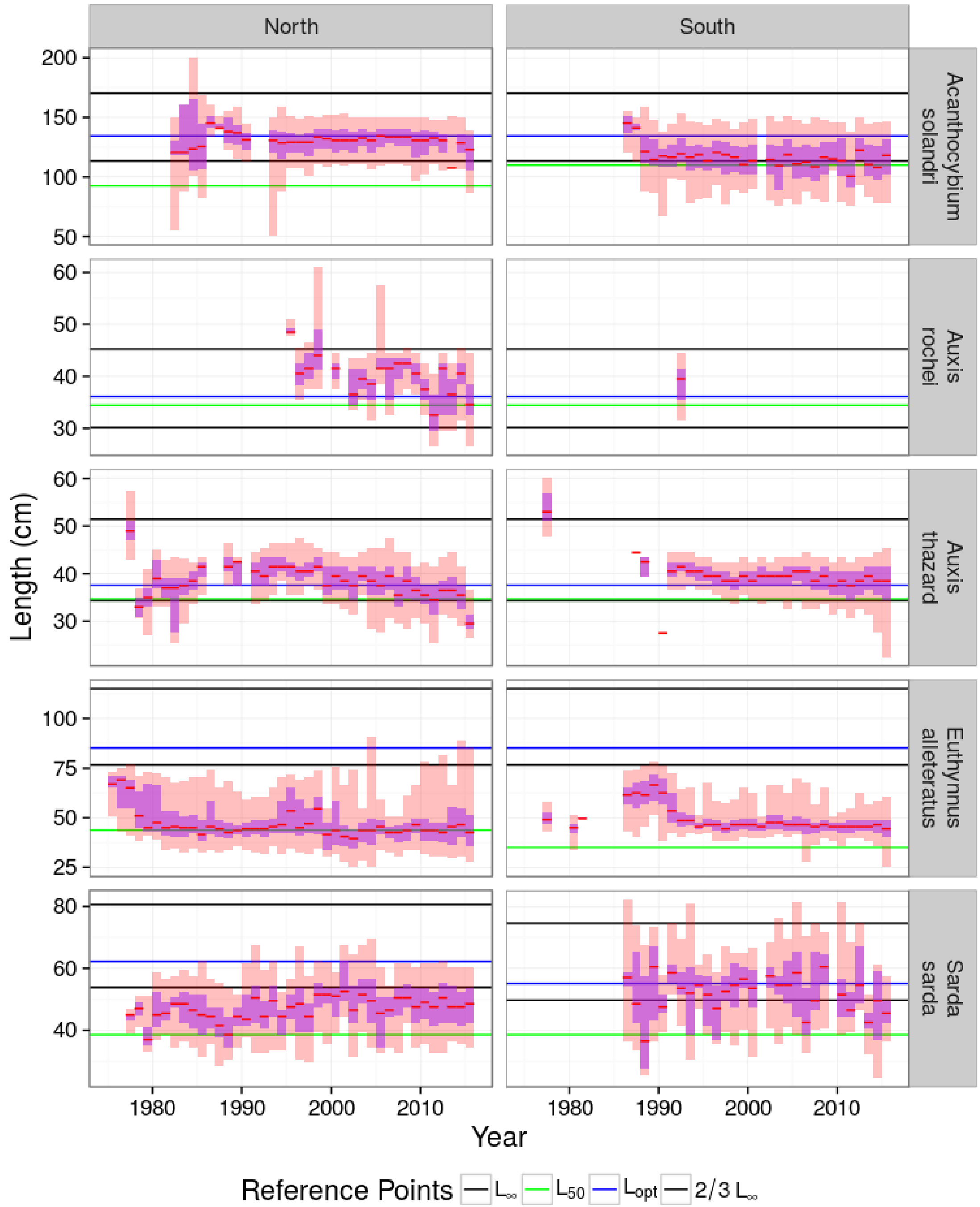
i)



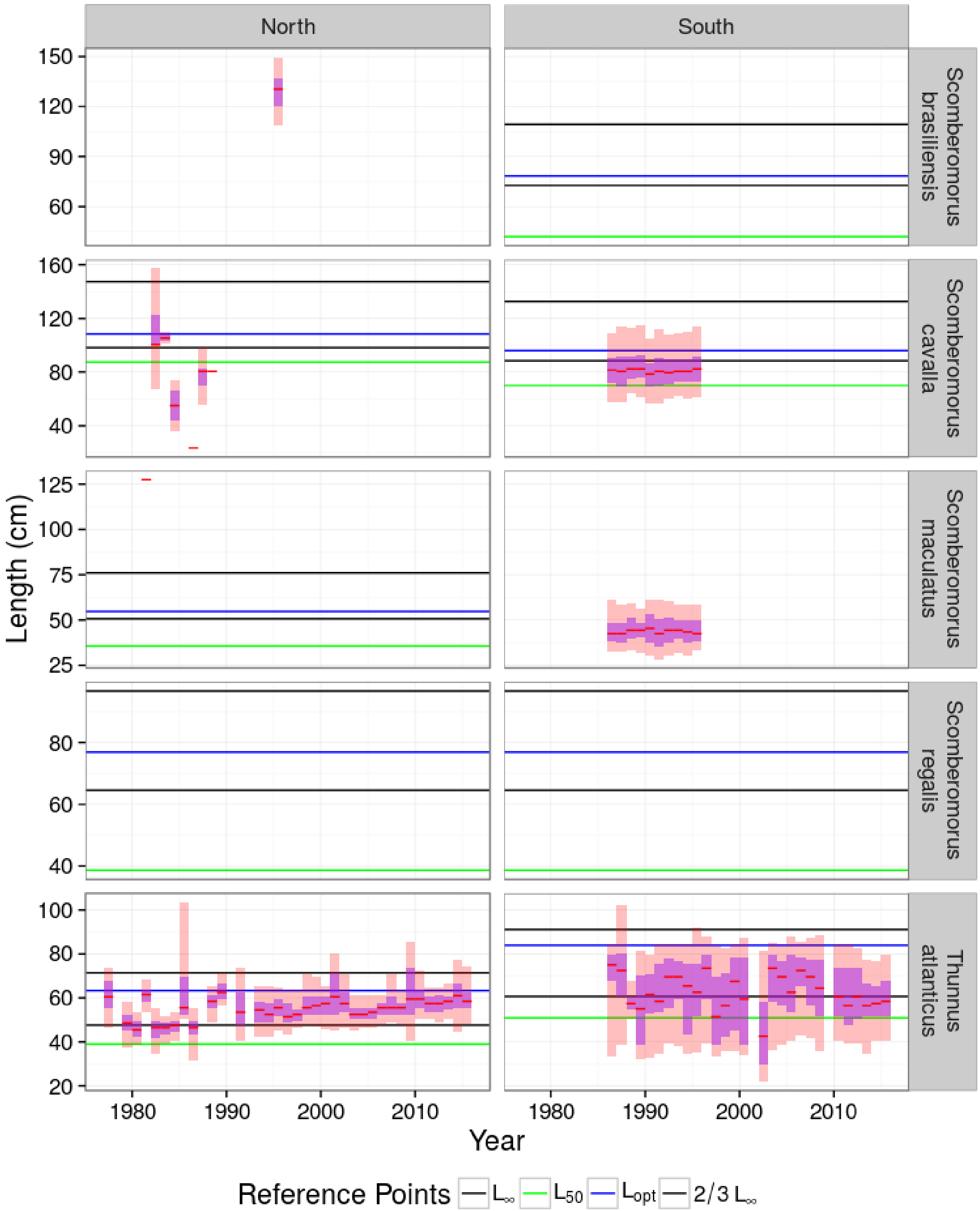
j)



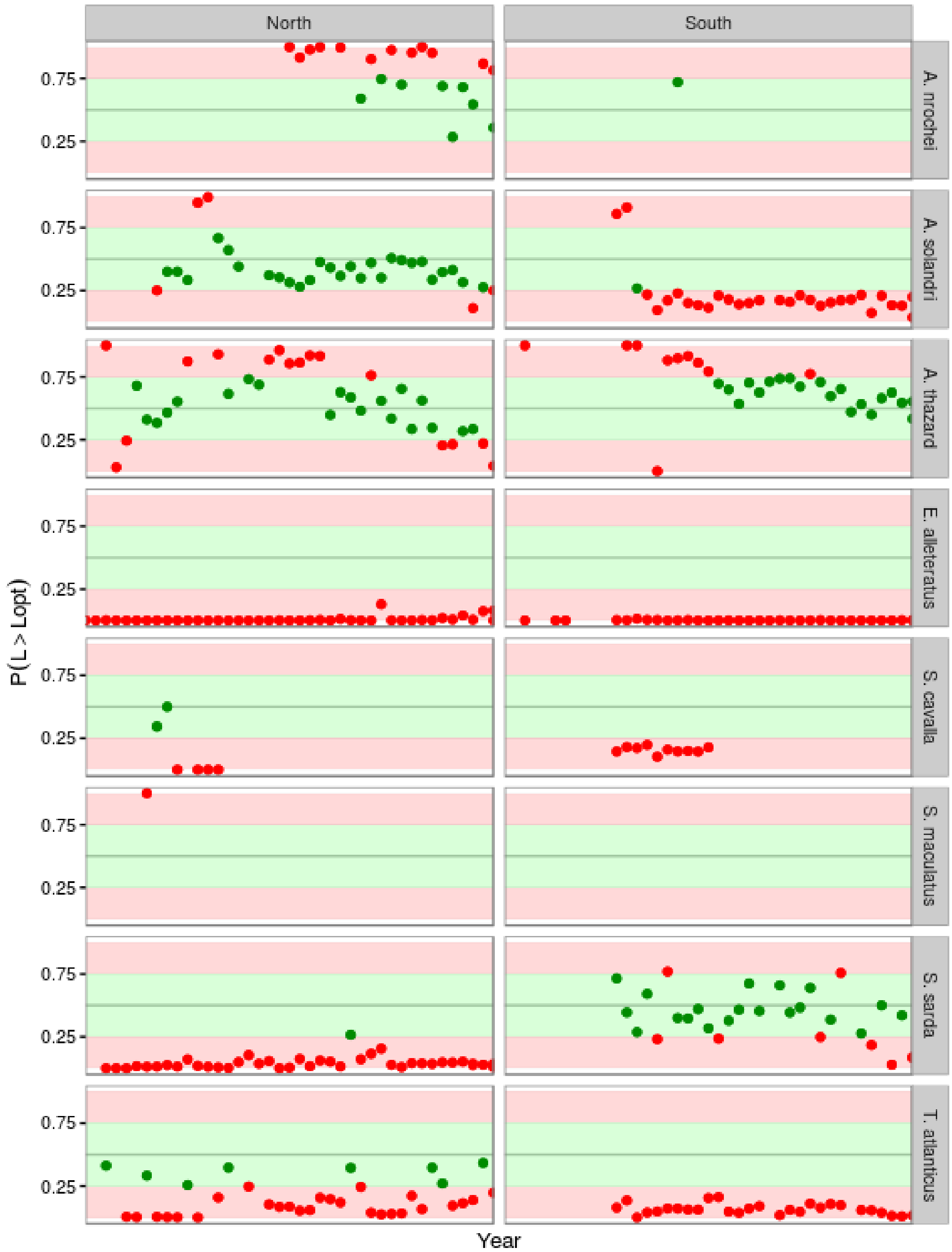
SMT-Figure 2. Estimated landings (t) of the major species of small tunas in the Atlantic and Mediterranean, 1950-2023. The data for the last years are incomplete.



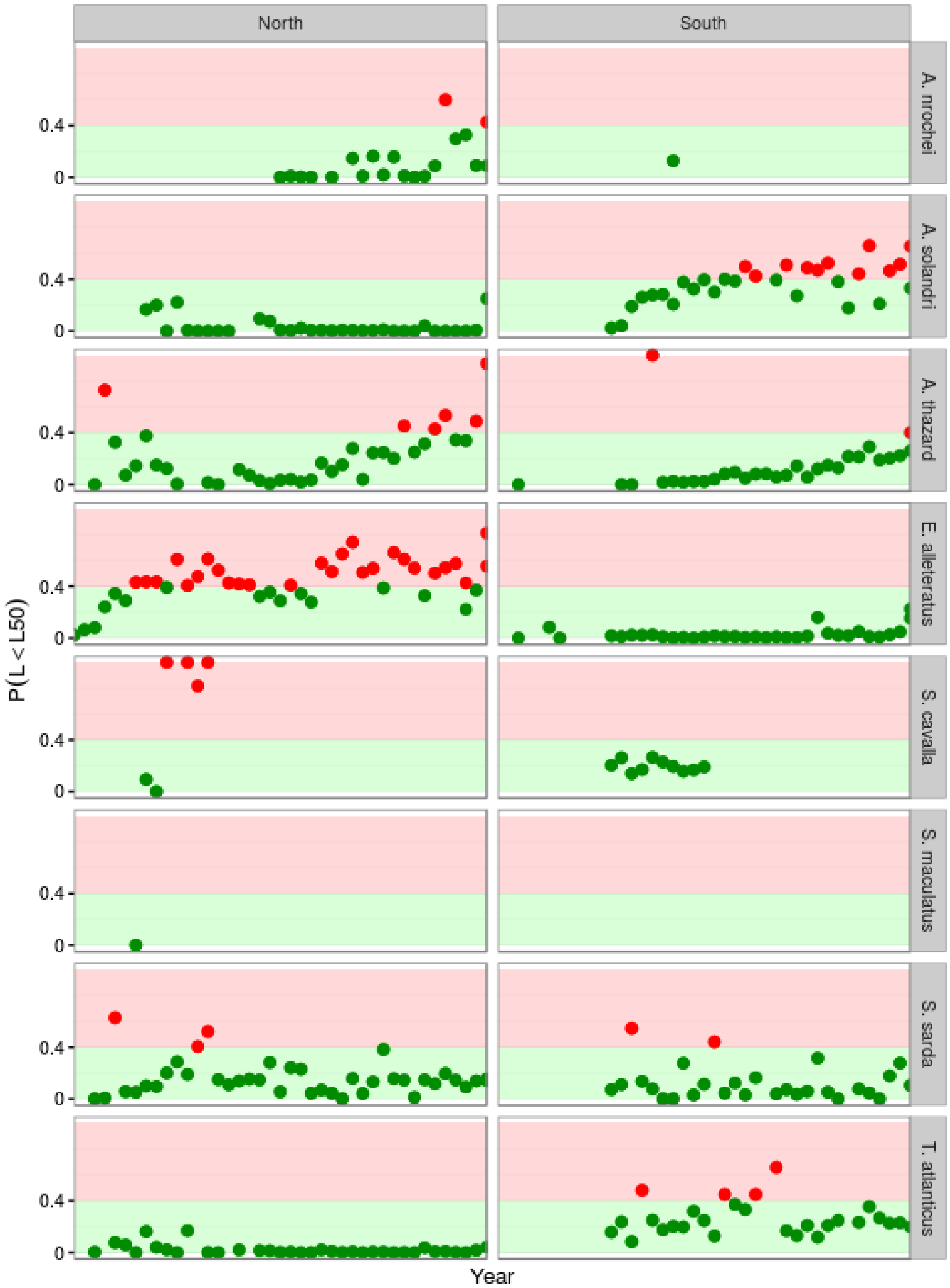
SMT-Figure 3a. Length distributions and reference points by species and Atlantic region for version 4 of Task 2 size data. The horizontal lines show the reference points i.e. asymptotic length (L_∞), length at 50% mature (L_{50}) and two estimates of the size at which a cohort reaches its maximum biomass (L_{OPT}) and its proxy (2/3~L_∞). The bars show the length distributions, i.e. median, interquartiles (5%, 95%).



SMT-Figure 3b. Length distributions and reference points by species and Atlantic region for version 4 of Task 2 size data. The horizontal lines show the reference points i.e. asymtopic length (L_∞)), length at 50% mature (L_{50}) and two estimates of the size at which a cohort reaches its maximum biomass (L_{OPT}) and its proxy (2/3~L_∞). The bars show the length distributions, i.e. median, interquartiles (5%, 95%).



SMT-Figure 4a. Proportion of length distributions greater than L_{OPT} by species and Atlantic region. 50% is used as a target reference point and so catches where the proportions of individuals greater than L_{OPT} is >25% and <75% are coloured green.



SMT-Figure 4b. Proportion of length distributions less than L_{50} by species and Atlantic region; 40% is used as a limit reference point and so when the proportion of individuals less than L_{50} is >40% is coloured red.

9.15 BSH - Blue shark

A stock assessment for blue shark (*Prionace glauca*) was conducted for both Atlantic stocks in 2023 through a process that included the Blue Shark Data Preparatory Meeting (hybrid/Olhão, Portugal, 17-21 April 2023) and the Blue Shark Stock Assessment Meeting (hybrid/Madrid, Spain, 17-21 July 2023). The complete description of the stock assessment process and the development of management advice is found in the Report of the 2023 Blue Shark Data Preparatory Meeting (ICCAT, 2023c) and the Report of the 2023 Blue Shark Stock Assessment Meeting (ICCAT, 2023d). The previous Blue Shark Stock Assessment Session was held in Lisbon, Portugal, 27-31 July 2015 (ICCAT, 2016).

BSH-1. Biology

Blue shark is a large pelagic shark that shows a wide geographic distribution in all oceans, from tropical to temperate waters worldwide, between 62º N and 54º S. It is distributed mainly in waters with temperatures ranging between 12ºC and 20ºC, although it can be found in a greater temperature range. Temperature preference is related to size and sex, and relative abundance decreases in equatorial waters and increases with latitude.

The blue shark is placental viviparous and has an average litter size of 35 individuals. Although high uncertainty regarding their biology remains, available life history traits (slow growth, late maturity and small litter size compared to teleosts) indicate that they are vulnerable to overfishing. A behavioral characteristic of this species is their tendency to segregate temporally and spatially by size and/or 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 stage and in some cases identifying their pupping/mating grounds. Although being one of the most well-know species, numerous aspects of its biology (such as natural mortality or steepness) are still poorly understood, particularly for some regions, which contributes to increased uncertainty in quantitative and qualitative assessments.

BSH-2. Fishery indicators

Reviews of the shark database resulted in recommendations to improve data reporting on shark catches. While reported and estimated catches for blue shark are still generally subject to higher levels of uncertainty than the major tuna stocks, they have been considered sufficiently complete for the purpose of stock assessment.

Due to the broad geographical distribution of blue shark in the Atlantic Ocean, in coastal and off-shore areas, this species is available to a large number of fisheries (mainly longline) and fishing countries. Total estimate catches of blue shark for the North and South Atlantic stocks are presented in **BSH-Table 1** and **BSH-Figure 1**. For the 2015 blue shark stock assessment, a reconstruction process of historical catches of blue shark was done by expert scientists from each CPC, using the most appropriate methodology for each case. Considerable differences between reported and reconstructed catches were noted for years prior to 2000 for the northern stock and prior to 2010 for the southern stock. After the years 2000 and 2010 for the northern and southern stocks, respectively, the reconstructed time series matches the reported Task 1 time series reasonably well. The reconstructed time series is still considered the best available estimations of catches for the northern and southern stocks. The Committee agreed during the 2023 blue shark stock assessment to submit those estimates for approval at the Subcommittee on Statistics for the inclusion in the official Task 1 nominal catch data.

Catches of both stocks of blue shark have had an increasing trend since early 1970s (**BSH-Figure 1**). Peak of reported catches for the North Atlantic corresponds to year 2016, with 44,085 t, and for the South Atlantic corresponds to year 2019, with 38,508 t (**BSH-Table 1**). The more recent reported catches in the North have decreased until 2022 (21,999 t) to increase slightly in 2023 (24,773 t), while captures in the South have increased steadily until 2019 (38,508 t) before decreasing every year until 2023 (30,602 t). Reported catches of blue shark in the Mediterranean still remain scarce, with a peak of 737 t in 2016 (**BSH-Table 1**). The Committee encourages CPCs fishing in the Mediterranean to submit their blue shark data.

Multiple standardized CPUE data series for blue shark were presented and evaluated during the 2023 Data Preparatory Meeting. For the North Atlantic stock eight indices of abundance were used (EU-Spain, EU-Portugal, Japan, Morocco, Venezuela, United States early and late, and Chinese Taipei), and six for the South (EU-Spain, Japan time blocks 1 and 2, a combined Brazil and Uruguay index, time blocks 1 and 2, and Chinese Taipei) (**BSH-Figure 2**).

BSH-3. State of the stocks

The 2023 Blue Shark Stock Assessment was conducted for the northern and southern Atlantic stocks only.

The 2023 Blue Shark Stock Assessment was conducted using two modeling approaches, Just Another Bayesian Biomass Assessment (JABBA), and integrated statistical assessment model, Stock Synthesis (SS3). Different model formulations considered to be plausible representations of the stock dynamics were used to characterize stock status. A more detailed description of the assessment is contained in the Report of the 2023 Blue Shark Stock Assessment Meeting (ICCAT, 2023d).

The Committee acknowledged the progress made for the 2023 blue shark assessment, with the improvements on the implementation of SS3 for the North stock, and the implementation for the first time for the South stock.

North Atlantic blue shark

Based on the combined results from the two stock assessment model platforms (SS3 and JABBA), the North Atlantic blue shark stock in 2021 was at the B_{MSY} level (B_{2021}/B_{MSY} = 1.00, with 95% confidence interval: 0.75-1.31) and was not experiencing overfishing (F_{2021}/F_{MSY} = 0.70, with a 95% confidence interval: 0.50-0.93) (**BSH-Figure 3**). The estimated joint MSY was 32,689 t (the geometric mean of both models, with a 95% confidence interval range of 30,403-36,465 t).

The joint Kobe phase plot indicates that there is a 49.6% probability that the stock currently falls within the yellow quadrant (overfished but not subject to overfishing), a 49.7% probability that the stock falls within the green quadrant (not overfished not subject to overfishing), and less than a 1% chance that it is in the red (overfished and subject to overfishing) or orange quadrants (not overfished but subject to overfishing) (**BSH-Figure 4**).

South Atlantic blue shark

Based on the combined results from the two stock assessment model platforms (SS3 and JABBA), the South Atlantic blue shark stock in 2021 was not overfished (B_{2021}/B_{MSY} = 1.29, with 95% confidence interval: 0.89-1.81) but is undergoing overfishing (F_{2021}/F_{MSY} = 1.03 with 95% confidence interval: 0.45 – 1.55) (**BSH-Figure 5**). The combined joint MSY was 27,711 t (geometric mean of both models, with 95% confidence interval range of 23,128 – 47,758 t).

The joint Kobe phase plot indicates that there is a 46.5% probability that the stock currently falls within the orange quadrant (not overfished but subject to overfishing), a 44.7% probability that the stock falls within the green quadrant (not overfished not subject to overfishing), and 8.02% probability of being in the red quadrant (overfished and subject to overfishing), with less than 1% chance that it is in the yellow quadrant (overfished but not subject to overfishing) (**BSH-Figure 6**).

BSH-4. Outlook

Based on the results obtained during the 2023 stock assessment, the Committee agreed to conduct stochastic stock status projections based on both the selected JABBA and SS3 Reference cases for both North and South Atlantic blue shark stocks, giving equal weighting to each model platform.

As the official reported blue shark Task 1 nominal catches for 2022 were not available at the time of the stock assessment meeting, the Committee agreed to use the average mean catch value of 2019-2021 in Task 1 nominal catches as the best estimate of the 2022 and 2023 expected catches. The estimated value for catches in 2022 and 2023 for the North Atlantic stock was 23,418 t and for the southern stock it was 34,983 t. These values were reviewed with the official catch reports at the species group meeting in September 2023 to evaluate if the catch assumptions for 2022 for both stock projections need further refinement. As estimated values for both stocks were above, but not much, the reported captures, the Committee considered that there was no need to modify projections.

North Atlantic blue shark

Projections were conducted for a range of fixed catches for the period 2024 to 2033. Eleven catch scenarios were applied, starting in a zero-catch scenario, and in intervals of 2,500 t from 20,000 t to 40,000 t, also including the estimated combined MSY level 32,689 t (**BSH-Table 2**). Additional information on projection settings is described in the Report of the 2023 Blue Shark Stock Assessment Meeting (ICCAT, 2023d).

The annual trends of the relative B/B_{MSY} and F/F_{MSY} stochastic projections of the current combined stock status for North Atlantic blue shark stock are presented in **BSH-Figure 7**. Projections indicated that future constant catches at or above 35,000 t would result in fishing mortality above F_{MSY}.

There is a transition period in the projections (2025-2029) where, the stock's probability of being in the green quadrant will decline and then will begin increasing (**BSH-Table 2**). This transition period may reflect the age structure and recent predicted average recruitment trends.

South Atlantic blue shark

Projections were conducted for a range of fixed catches for the period 2024 to 2033. Ten catch scenarios were applied, starting in a zero-catch scenario, and in intervals of 2,500 t from 15,000 t to 32,500 t, also including the estimated combined MSY level 27,711 t (**BSH-Table 3**). Additional information on projection settings is described in the Report of the 2023 Blue Shark Stock Assessment Meeting (ICCAT, 2023d).

The annual trends of the relative B/B_{MSY} and F/F_{MSY} stochastic projections of the current combined stock status for South Atlantic blue shark stock are presented in **BSH-Figure 8**. If current catch levels (average of 2019-2021) of about 35,000 t are maintained, the stock is expected to rapidly decline in biomass, with a risk of falling below 20% of the estimated B_{MSY} reference level in a few years (**BSH-Table 4**).

BSH-5. Effect of current regulations

For the northern stock, Rec. 23-10 was adopted in 2023 with an annual TAC of 30,000 t. It set annual catch limit for certain CPCs (EU 24,449 t, Japan 3,012 t, Morocco 1,644 t, United Kingdom 25 t). Other CPCs were requested to maintain their catches below the level of their highest annual catches over the last ten years. This Recommendation repeals and replaces Rec. 21-10, and Rec. 19-07.

For the South Atlantic stock of blue shark, the Commission adopted Rec. 23-11, which in paragraph 2 established a catch limit of 27,711 t. It set annual catch limit for certain CPCs (EU 17,405 t, Brazil 3,481 t, Namibia 3,238 t, Japan 1,520 t, Chinese Taipei 867 t). All other CPCs shall endeavour to maintain or reduce their catches. The Committee noted that it appears that since the implementation of a TAC for the North Atlantic stock, catches have increased in the South Atlantic (**BSH-Figure 1**). Since 2018, reported catches for the South Atlantic stock have been over the TAC set by Rec. 19-08, with average catches of 32,917 t for the period 2020-2022. However, trends in catches of the most recent years appear to be decreasing (30,602 t in 2023).

BSH-6. Management recommendations

The results from the 2023 stock assessment showed that while the 2022 realized catch (22,057 t) for the North Atlantic stock will maintain the stock in the green quadrant of the Kobe plot with a high probability, the Committee noted that the current TAC (39,102 t) would have a very low probability (3%) of maintaining the stock in the same quadrant by 2033. Therefore, the Committee recommends that the Commission reduces the current TAC to catch levels that will maintain the stock in the green quadrant of the Kobe plot with a high probability (see **BSH-Table 2**). The Commission established a TAC of 30,000 t for North Atlantic blue shark (Rec. 23-10).

The results from the 2023 stock assessment showed that the 2021 South Atlantic blue shark stock status was estimated not to be overfished but undergoing overfishing. Recent catches (2019-2021; 34,983 t mean catch) are above the highest catch scenario used in the Kobe II Strategy Matrix and are not sustainable in the long term. Constant catches of 32,500 t (the highest constant catch scenario in the Kobe matrix) only have a 28% probability of being in the green Kobe quadrant by 2033. The Committee indicates that catches of 27,711 t (the estimated 2021 MSY) or less will immediately stop overfishing and will keep in stock in the green quadrant of the Kobe plot with at least a 54% probability (**BSH-Table 3**). The Commission established a TAC of 27,711 t for the South Atlantic blue shark (Rec. 23-11).

NORTH ATLANTIC BLUE SHARK SUMMARY TABLE

Current Yield (2023)		24,773 t[1]
Maximum Sustainable Yield (MSY)		32,689 t (30,403 - 36,465 t)[2]
Relative Biomass	B_{2021}/B_{MSY}	1.00 (0.75 - 1.30)[3]
Relative Fishing Mortality	F_{2021}/F_{MSY}	0.70 (0.50 - 0.93)[4]
Stock Status (2021)	Overfished	No
	Overfishing[5]	No
Management measures in effect:		Rec. 23-10
		Rec. 04-10, Rec. 07-06

[1] Task 1 catch as of 22 September 2024.
[2] Geometric mean of both models, SS3 and JABBA, with a 95% confidence interval.
[3] Median from SS3 and JABBA, with a 95% confidence interval.
[4] Combined result of SS3 multi-variate lognormal iterations and JABBA posterior. Median and 95% confidence interval in brackets.
[5] The probability of being overfished is 50%.

SOUTH ATLANTIC BLUE SHARK SUMMARY TABLE

Current Yield (2023)		30,602 t[1]
Maximum Sustainable Yield (MSY)		27,711 t (23,128 - 47,758 t)[2]
Relative Biomass	B_{2021}/B_{MSY}	1.29 (0.89 - 1.81)[3]
Relative Fishing Mortality	F_{2021}/F_{MSY}	1.03 (0.45 - 1.55)[4]
Stock Status (2021)	Overfished	No
	Overfishing	Yes
Management measures in effect:		Rec. 23-11
		Rec. 04-10, Rec. 07-06

[1] Task 1 catch as of 22 September 2024.
[2] Geometric mean of both models, SS3 and JABBA, with a 95% confidence interval.
[3] Combined results from both models, SS3 and JABBA, with a 95% confidence interval.
[4] Combined result of SS3 multi-variate lognormal iterations and JABBA posterior. Median and 95% confidence interval in brackets.

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

				1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
TOTAL				11315	11588	10989	39566	36145	36972	40655	35243	34329	38161	37500	43778	45474	50607	54481	59146	66986	76230	65375	58585	64792	63355	70239	68662	68551	65784	54746	55101	53684	55410
	ATN			8605	8472	6740	29271	26668	26122	28161	21151	20458	23184	22054	22660	23517	27070	30882	35354	38929	40292	38912	37813	38131	40191	44085	40804	33979	27212	20963	21650	21999	24773
	ATS			2704	3108	4246	10145	9414	10828	12448	14044	13854	14966	15320	21046	21768	23487	23518	23607	27799	35898	26421	20672	26253	22498	25417	28555	34514	38508	33709	33392	31650	30602
	MED			6	8	2	150	63	22	45	47	17	11	125	72	189	50	81	185	259	40	42	100	408	665	737	103	58	64	73	59	36	36
Landings	ATN		Longline	7660	7551	6136	28820	26266	25650	27573	20856	19644	22926	21780	22385	23278	26811	30518	35035	38644	39983	38725	37604	37886	39335	42875	38831	32779	25994	19566	20180	20657	23432
			Other surf.	373	300	560	289	313	422	475	189	746	204	210	209	194	205	235	216	117	102	67	100	117	731	1123	1035	1087	1025	986	1087	673	728
	ATS		Longline	2704	3108	4246	10135	9405	10801	12448	14043	13849	14960	15320	21043	21762	23417	23503	23601	27785	35427	25878	20387	24308	21736	24643	27662	33561	37610	32630	32683	30029	29031
			Other surf.	0	0	0	6	4	27	0	1	4	6	0	3	6	10	0	6	14	468	411	152	1831	635	634	668	854	558	603	495	1329	1203
	MED		Longline	6	8	2	150	63	22	45	47	17	11	77	72	142	48	81	18	176	40	42	68	341	664	735	90	54	51	71	53	34	29
			Other surf.	0	0	0	0	0	0	0	0	0	0	48	0	47	2	0	167	83	0	0	32	67	1	2	13	4	13	3	6	1	1
Discards	ATN		Longline	572	621	45	161	88	49	113	105	68	55	63	66	45	53	129	102	167	205	119	109	128	124	88	138	112	193	411	383	667	611
			Other surf.	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	2	1	0	0	0	0	0	0	0	0	0	1	2
	ATS		Longline	0	0	0	5	5	0	0	0	0	0	0	0	0	60	14	0	0	4	132	132	114	122	139	218	99	340	477	213	291	368
			Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	7	0	0	0	0	0	0
	MED		Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
			Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Landings	ATN	CP	Barbados	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	6	7	4	2	2	2	3	2
			Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	114	461	1039	903	1216	392	4	6	201	317	369	301	349	311	567
			Brazil	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	274
			Canada	1260	1494	528	831	612	547	624	581	836	346	965	1134	977	843	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
			Cape Verde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			China PR	0	0	0	0	0	0	0	185	104	148	146	132	142	367	109	88	53	109	98	327	178	1	27	2	6	18	65	2	13	9
			Costa Rica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	6	14	8	5	3	2	0	0	0	0	0	0	1
			EU-Denmark	1	2	3	1	1	0	2	1	13	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			EU-España	0	0	0	24497	22504	21811	24112	17362	15666	15975	17314	15006	15464	17038	20788	24465	26094	27988	28666	28562	29041	30078	29019	27316	21685	16314	12325	13125	13057	14896
			EU-France	350	266	278	213	163	399	395	207	221	57	135	120	99	161	119	84	122	115	31	216	112	262	352	124	94	80	57	49	46	45
			EU-Ireland	0	0	0	0	0	66	31	66	11	2	0	0	0	0	0	0	0	1	3	2	1	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	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			EU-Portugal	4669	4722	4843	2630	2440	2227	2081	2110	2265	5643	2025	4027	4338	5283	6167	6252	8261	6509	3768	3694	3060	3859	7819	5664	5195	4507	3836	4300	4102	4026
			FR-St Pierre et Miquelon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	153	0
			Great Britain	0	12	0	0	1	0	12	9	6	4	6	5	3	6	6	96	8	10	8	10	10	12	17	11	6	3	3	4	5	4
			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	0	0	0	0	0
			Japan	1203	1145	618	489	340	357	273	350	386	558	1035	1729	1434	1921	2531	2007	1763	1227	2437	1808	3287	4011	4217	4444	4111	3740	2130	1608	1972	2396
			Korea Rep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	537	299	327	113	0	10	103	92	113	48	16	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	7	10	3	8	0	2
			Maroc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	661	975	1072	999	1389	873	1623	1475	1644	1524	1498	1636	1532	1644
			Mauritania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	93	0	0	0	0	0	0	
			Mexico	0	0	0	0	0	0	0	6	2	3	4	3	3	0	2	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0
			Panama	0	0	0	0	0	9	0	0	0	0	0	0	254	892	613	1575	1026	1071	1224	289	153	555	262	324	437	242	162	84	111	189
			Russian Federation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Senegal	0	0	0	0	0	0	0	0	456	0	0	0	0	43	134	255	56	148	5	12	17	13	17	19	15	14	14	14	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	119	0	0	0	2	0	0	
			Trinidad and Tobago	13	4	5	4	7	8	12	19	6	3	2	1	1	0	2	8	9	11	11	8	10	4	2	2	0	0	0	0	1	0
			UK-Bermuda	0	0	0	1	2	0	3	4	5	4	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			USA	31	24	284	214	256	217	292	40	182	172	137	163	156	150	164	158	69	73	61	61	44	32	31	24	19	17	8	10	1	7
			Venezuela	18	16	6	27	7	47	43	47	29	40	10	28	12	19	8	73	75	117	98	52	113	130	117	108	112	56	59	11	9	16
		NCC	Chinese Taipei	487	167	132	203	246	384	165	59	203	171	206	240	588	292	110	73	99	148	94	113	77	220	259	42	122	8	38	49	11	52
			Suriname	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30
	ATS	CP	Angola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	0	0	0	17	64	22
			Belize	0	0	0	0	0	0	0	0	0	0	37	259	99	236	109	148	273	243	483	234	171	105	167	200	222	165	15	21	0	
			Brazil	0	0	743	1103	616	179	1687	2173	1971	2166	2103	2523	3334	2258	2407	1274	1501	2808	1607	2013	2551	2420	1334	2177	3011	3784	3435	4629	3328	1848
			China PR	0	0	0	0	0	0	0	565	316	452	444	404	434	585	40	109	41	131	84	64	48	20	30	283	127	52	45	15	5	67
			Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	92	16	9	8	247	1202	8	0	15	15
			EU-España	0	0	0	5272	5574	7173	6951	7743	5368	6626	7366	6410	8724	8942	9615	13099	13953	16978	14348	10473	11447	10133	10107	11486	13515	18497	14717	16778	14061	14388
			EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			EU-Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			EU-Portugal	0	847	867	1336	876	1110	2134	2562	2324	1841	1863	3184	2751	4494	4866	5358	6338	7642	2424	1646	1622	2420	5609	6663	8015	6753	7350	5524	6092	5504
			El Salvador	0	0	0	0	0	0	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	1583	396	436	479	416	414	413	446	1287	1150
			Great Britain	0	0	0	0	0	0	0	0	0	0	0	0	239	0	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Guinea Ecuatorial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	6	0	0	0	0	0	0	1
			Japan	1388	437	425	506	510	536	221	182	343	331	209	236	525	896	1789	981	1161	1483	3060	2255	3232	2277	2127	3112	3495	2338	1795	1327	902	1182
			Korea Rep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	222	125	112	61	10	72	252	87	192	156	55	6	0	0
			Namibia	0	0	0	0	0	0	0	0	2213	2316	1906	6616	3536	3419	1829	207	2352	2957	1439	1147	2471	2137	2775	1357	3290	3665	4120	3237	4694	4483
			Panama	0	0	0	0	0	168	22	0	0	0	0	0	0	0	521	0	0	0	0	0	0	0	0	0	0	0	15	0	1	9
			Russian Federation	0	0	0	0	0	0	0	0	0	0	0	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			S Tomé e Príncipe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	143	147	152	156	206	183	182	190	94	11	50	25	54
			Senegal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	203	51	60	105	18	15	11	15	39	22	25	0	0
			South Africa	0	0	0	0	23	21	0	83	63	232	128	154	90	82	126	119	125	318	158	179	524	402	356	418	403	292	52	181	100	51
			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	17	0	0	0	0	0	0	
			USA	0	0	0	0	0	0	0	4	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Uruguay	84	57	259	180	248	118	81	66	85	480	462	376	232	337	359	942	208	725	433	130	0	0	0	0	0	0	0	0	0	0
		NCC	Chinese Taipei	1232	1767	1952	1737	1559	1496	1353	665	1172	521	800	866	1805	2177	1843	1356	1625	2138	1941	2125	2128	1731	1853	1852	1276	716	1179	922	785	1461
		NCO	Benin	0	0	0	6	4	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	MED	CP	Algerie	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	7	4	2	3	5	2
			EU-Cyprus	0	0	0	0	0	0	9	0	0	3	6	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			EU-España	0	0	0	146	59	20	31	6	3	3	4	8	61	3	2	7	48	38	39	37	53	65	59	40	19	18	34	14	8	5
			EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	4	5	15	7	0	2	2	2	2	1	1
			EU-Italy	0	0	0	0	0	0	0	0	0	0	113	1	106	46	75	176	208	0	0	57	347	0	18	59	17	33	26	33	13	16
			EU-Malta	1	1	1	2	2	2	1	1	1	0	0	0	0	1	1	2	1	1	2	2	4	5	3	4	2	2	2	1	3	1
			EU-Portugal	0	0	0	0	2	0	5	41	14	3	0	56	22	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
			Japan	5	7	1	1	0	0	0	0	0	1	1	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Libya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	580	650	0	10	6	6	5	6	4
Discards	ATN		Canada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	16	32	71	4	193	173	365	161
			EU-Denmark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	3
			EU-Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	115	157	180	212	372
			Korea Rep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	1	29	0	25	1	0	36	35
			Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

			1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
		Russian Federation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		UK-Bermuda	0	3	1	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		USA	572	618	44	161	88	41	113	106	68	55	65	66	45	54	130	103	167	206	106	99	122	82	43	42	11	20	24	25	36	19
	NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	10	6	19	27	34	31	30	36	4	14	23
ATS	CP	Brazil	0	0	0	0	0	0	0	0	0	0	0	0	0	60	14	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	0	0	0	2	0	0	0	0	0	**0**
		EU-España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	**0**
		EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	1	0	0	0	0	0	0
		El Salvador	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	**0**
		Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	**0**
		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	175	316	81	99	143
		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	17	2	19	2	2	55	34
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	**0**
		South Africa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
		USA	0	0	0	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
	NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	132	132	112	122	139	201	97	146	159	130	138	191
MED	CP	EU-España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
		EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

BSH-Table 2. Kobe II Strategic Matrices for the North Atlantic blue shark stock combined models: a) the probability that overfishing is not occurring ($F \leq F_{MSY}$); b) the probability that the stock is not overfished ($B \geq B_{MSY}$); and c) the joint probability of being in the green quadrant of the Kobe plot (i.e., $F \leq F_{MSY}$ and $B \geq B_{MSY}$). The constant catch scenario of 32,689 tons corresponds to the estimated MSY.

a) Probability $F \leq F_{MSY}$.

Catch (t)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
20000	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
22500	99%	99%	99%	100%	100%	100%	100%	100%	100%	100%
25000	95%	96%	96%	97%	98%	98%	99%	99%	99%	100%
27500	87%	87%	88%	89%	90%	92%	93%	94%	95%	95%
30000	75%	74%	74%	75%	76%	77%	78%	79%	80%	81%
32500	62%	60%	59%	59%	59%	59%	59%	59%	59%	59%
32689	61%	59%	58%	57%	58%	58%	58%	58%	58%	57%
35000	50%	47%	44%	43%	41%	39%	38%	37%	36%	35%
37500	40%	35%	31%	27%	24%	21%	19%	17%	15%	14%
40000	31%	24%	19%	14%	11%	8%	7%	5%	4%	4%

b) Probability $B \geq B_{MSY}$.

Catch (t)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
0	71%	83%	95%	100%	100%	100%	100%	100%	100%	100%
20000	59%	58%	62%	73%	84%	91%	95%	97%	98%	99%
22500	58%	56%	59%	68%	78%	85%	90%	93%	95%	97%
25000	56%	53%	55%	63%	71%	77%	82%	86%	88%	91%
27500	55%	51%	52%	58%	64%	69%	73%	76%	78%	81%
30000	54%	49%	50%	53%	58%	61%	63%	65%	67%	68%
32500	53%	48%	47%	49%	51%	53%	53%	54%	54%	54%
32689	53%	47%	46%	48%	50%	52%	53%	53%	53%	53%
35000	53%	46%	44%	43%	44%	43%	42%	41%	40%	38%
37500	52%	44%	40%	38%	35%	33%	30%	27%	24%	22%
40000	51%	42%	36%	32%	27%	22%	18%	15%	13%	10%

c) Probability $F \leq F_{MSY}$ and $B \geq B_{MSY}$.

Catch (t)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
0	71%	83%	95%	100%	100%	100%	100%	100%	100%	100%
20000	59%	58%	62%	73%	84%	91%	95%	97%	98%	99%
22500	58%	56%	59%	68%	78%	85%	90%	93%	95%	97%
25000	56%	53%	55%	63%	71%	77%	82%	86%	88%	91%
27500	55%	51%	52%	58%	64%	69%	73%	76%	78%	80%
30000	53%	49%	50%	53%	57%	60%	63%	65%	66%	67%
32500	51%	47%	46%	47%	49%	51%	51%	52%	52%	53%
32689	50%	46%	46%	47%	49%	50%	51%	51%	51%	51%
35000	46%	42%	40%	39%	38%	37%	36%	35%	34%	33%
37500	38%	33%	29%	26%	23%	21%	19%	17%	15%	14%
40000	30%	23%	18%	14%	11%	8%	7%	5%	4%	3%

BSH-Table 3. Kobe II Strategic Matrices for the South Atlantic blue shark stock combined models: a) the probability that overfishing is not occurring ($F<=F_{MSY}$); b) the probability that the stock is not overfished ($B>=B_{MSY}$); and c) the joint probability of being in the green quadrant of the Kobe plot (i.e., $F<= F_{MSY}$ and $B>= B_{MSY}$). The constant catch scenario of 27,711 t corresponds to the estimated MSY.

a) Probability $F \leq F_{MSY}$.

Catch (t)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
15000	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
17500	98%	99%	99%	99%	99%	99%	100%	100%	100%	100%
20000	95%	96%	97%	97%	97%	97%	98%	98%	98%	98%
22500	89%	90%	91%	91%	91%	91%	91%	92%	92%	92%
25000	80%	81%	80%	80%	79%	79%	78%	78%	78%	77%
27500	70%	69%	68%	66%	65%	64%	62%	61%	60%	59%
27711	69%	68%	67%	65%	63%	62%	61%	60%	59%	58%
30000	58%	57%	54%	52%	50%	48%	47%	45%	44%	43%
32500	47%	45%	42%	40%	37%	36%	34%	33%	32%	32%

b) Probability $B \geq B_{MSY}$.

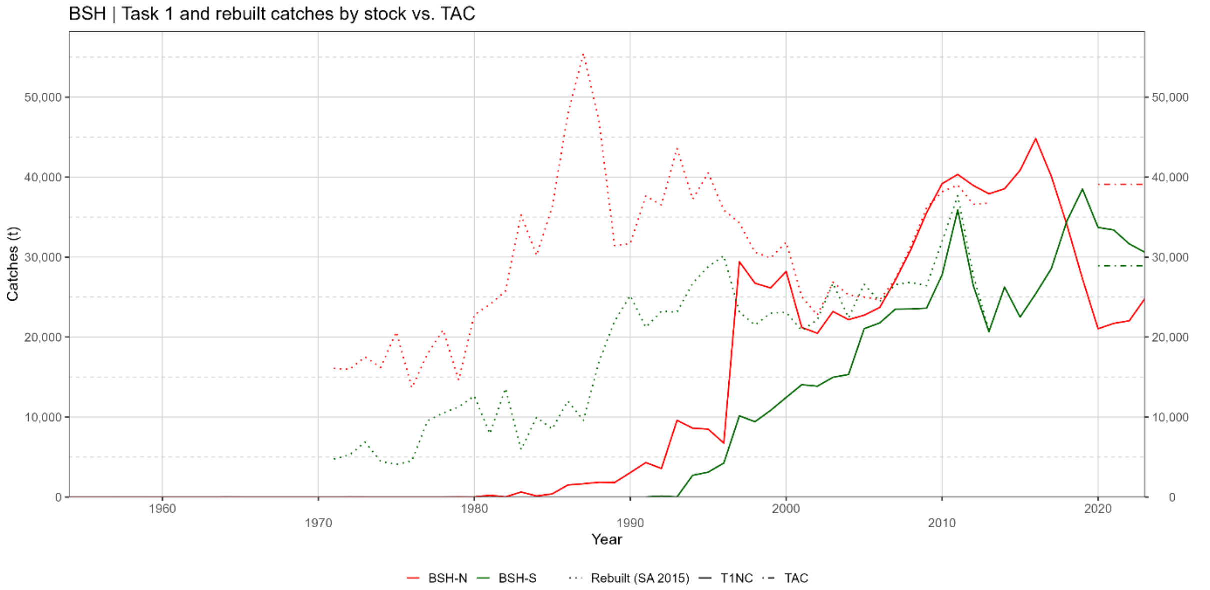
Catch (t)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
0	93%	99%	100%	100%	100%	100%	100%	100%	100%	100%
15000	83%	89%	93%	95%	97%	98%	99%	99%	99%	99%
17500	81%	86%	90%	92%	94%	95%	96%	97%	97%	98%
20000	79%	83%	86%	88%	89%	90%	91%	92%	93%	94%
22500	77%	79%	81%	82%	82%	83%	84%	84%	85%	86%
25000	75%	75%	75%	75%	75%	74%	74%	74%	74%	73%
27500	72%	71%	69%	68%	66%	64%	63%	61%	60%	60%
27711	72%	70%	69%	67%	65%	63%	62%	61%	60%	58%
30000	70%	67%	63%	60%	57%	54%	52%	50%	48%	47%
32500	68%	62%	57%	52%	48%	45%	42%	40%	39%	38%

c) Probability $F \leq F_{MSY}$ and $B \geq B_{MSY}$.

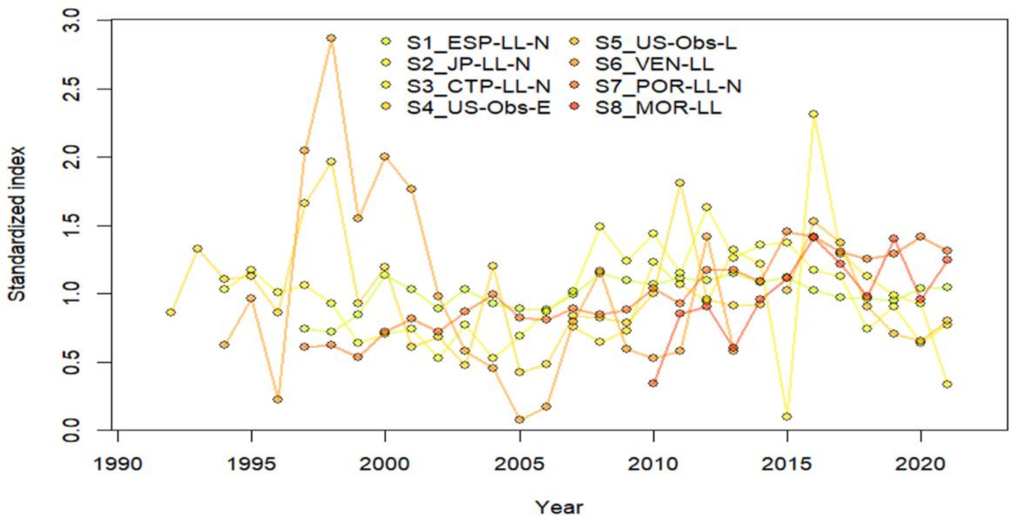
Catch (t)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
0	93%	99%	100%	100%	100%	100%	100%	100%	100%	100%
15000	83%	89%	93%	95%	97%	98%	99%	99%	99%	99%
17500	81%	86%	90%	92%	94%	95%	96%	97%	97%	98%
20000	79%	83%	86%	88%	89%	90%	91%	92%	93%	94%
22500	77%	79%	81%	82%	82%	83%	84%	84%	85%	86%
25000	74%	75%	75%	75%	74%	74%	73%	73%	73%	72%
27500	68%	68%	67%	65%	63%	61%	59%	59%	54%	53%
27711	67%	67%	66%	63%	61%	60%	58%	56%	55%	54%
30000	58%	57%	54%	51%	49%	47%	44%	43%	41%	40%
32500	47%	45%	42%	39%	37%	34%	32%	31%	29%	28%

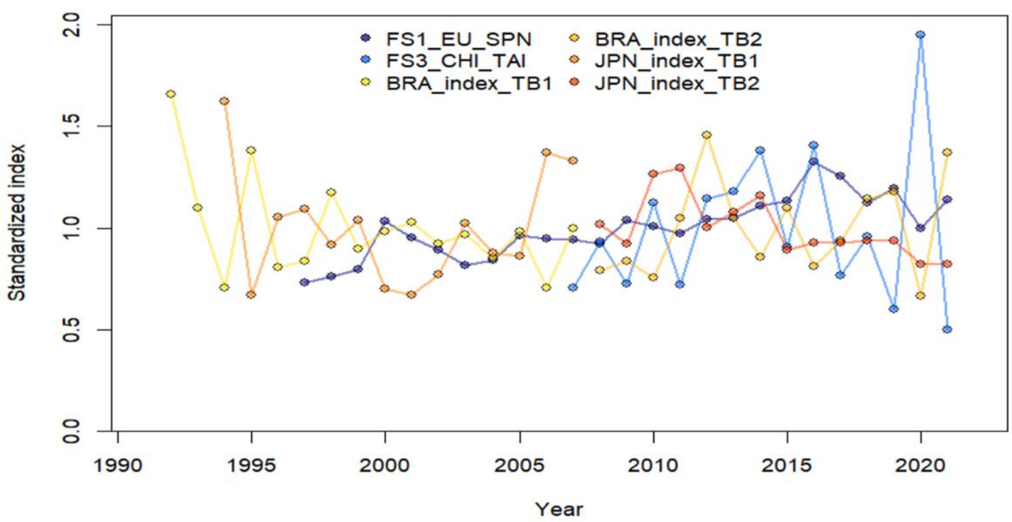
BSH-Table 4. Table Percent of the model runs that resulted in B levels ≤20% of B_{MSY} during the projection period for a given catch level for the South Atlantic blue shark stock.

Catch (t)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
15000	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
17500	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
20000	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
22500	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
25000	0%	0%	0%	0%	0%	0%	1%	1%	1%	1%
27500	0%	0%	0%	0%	1%	1%	1%	1%	2%	3%
27711	0%	0%	0%	0%	1%	1%	1%	2%	2%	3%
30000	0%	0%	0%	1%	1%	1%	2%	3%	5%	6%
32500	0%	0%	0%	1%	2%	3%	5%	8%	11%	16%

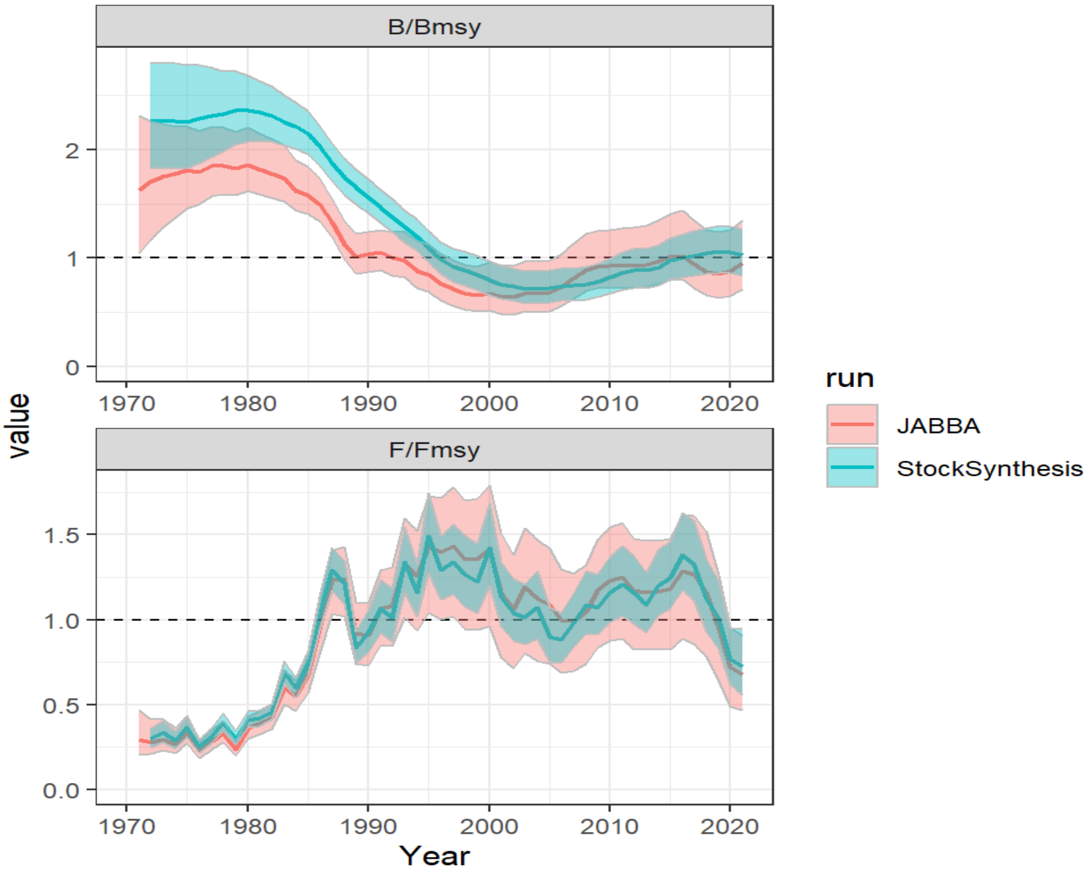


BSH-Figure 1. Blue shark (BSH) catches up to 2023 of both stocks (BSH-N in red, BSH-S in green) reported to ICCAT (Task 1) and the rebuilt catch series estimated by the Committee.

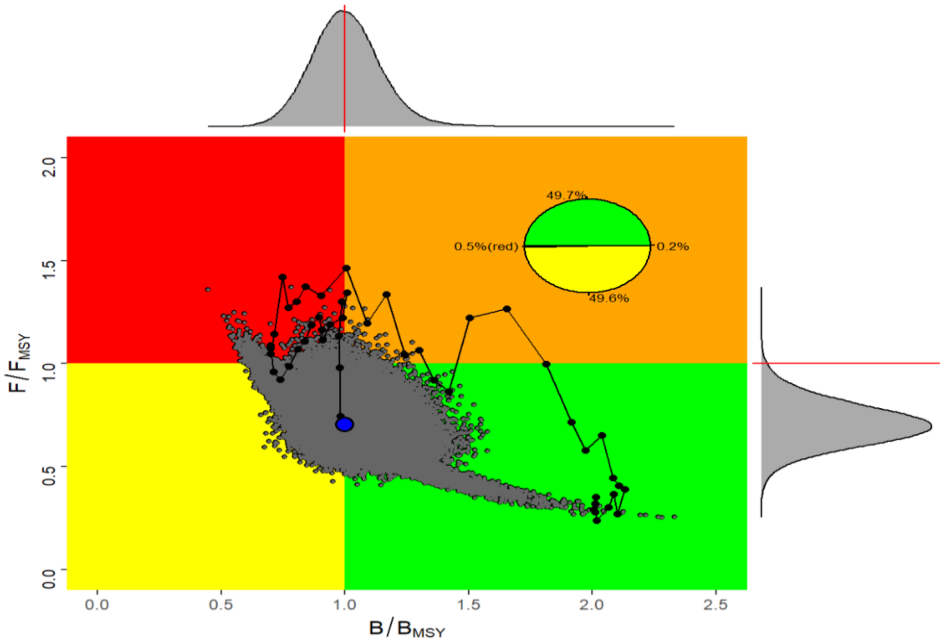




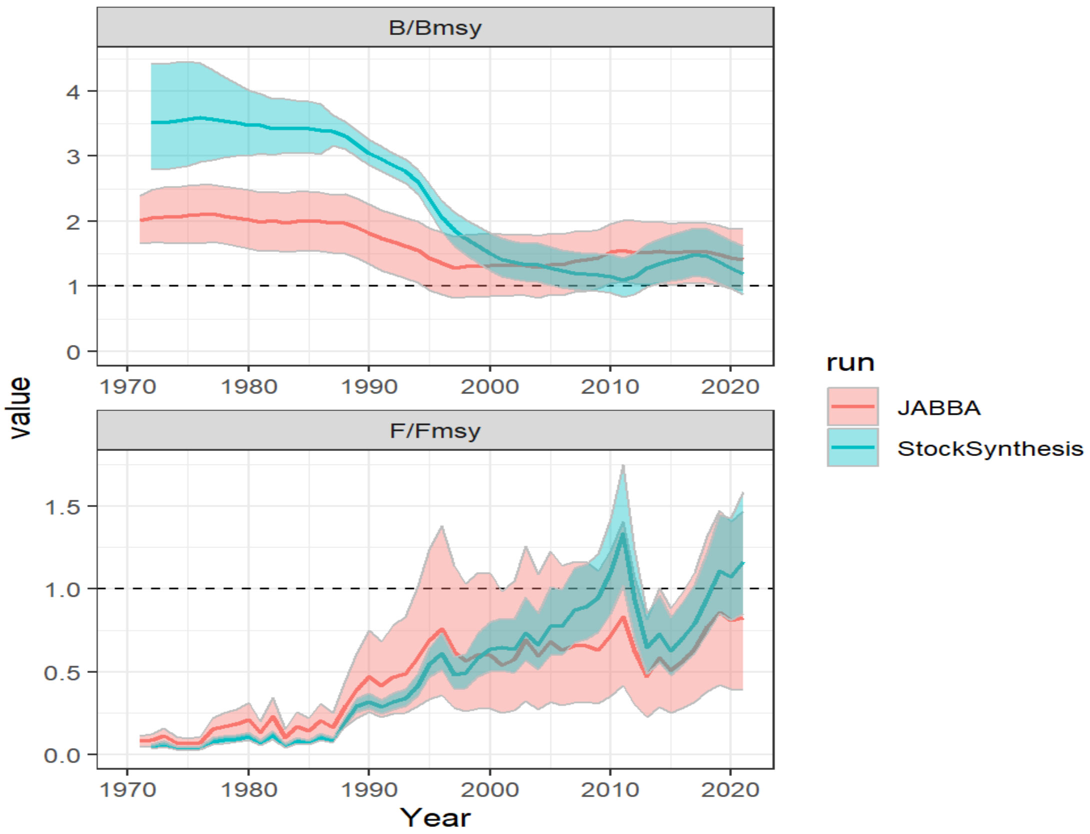
BSH-Figure 2. Standardized indices of abundance of blue shark for the northern stock (upper) and the southern stock (lower). All the indices shown were used in the 2023 stock assessments of North and South Atlantic blue shark (BSH) stocks.



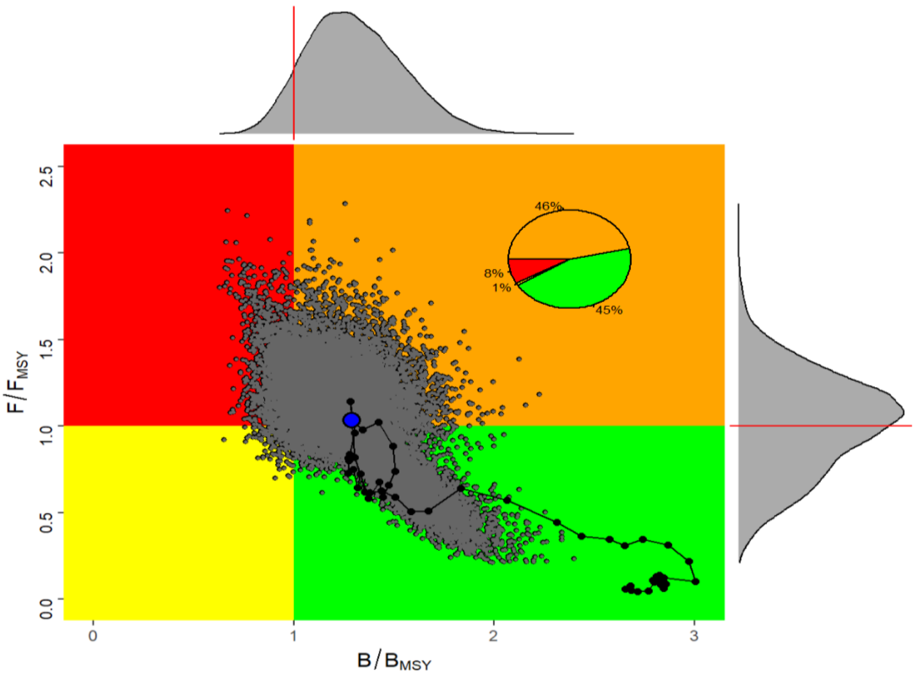
BSH-Figure 3. Estimated annual trends for the northern stock from JABBA (orange lines) and Stock Synthesis (green lines) for B/B_{MSY} (JABBA) or SSB/SSB_{MSY} (Stock Synthesis) (upper panel), and F/F_{MSY} (lower panel) with 95% confidence interval.



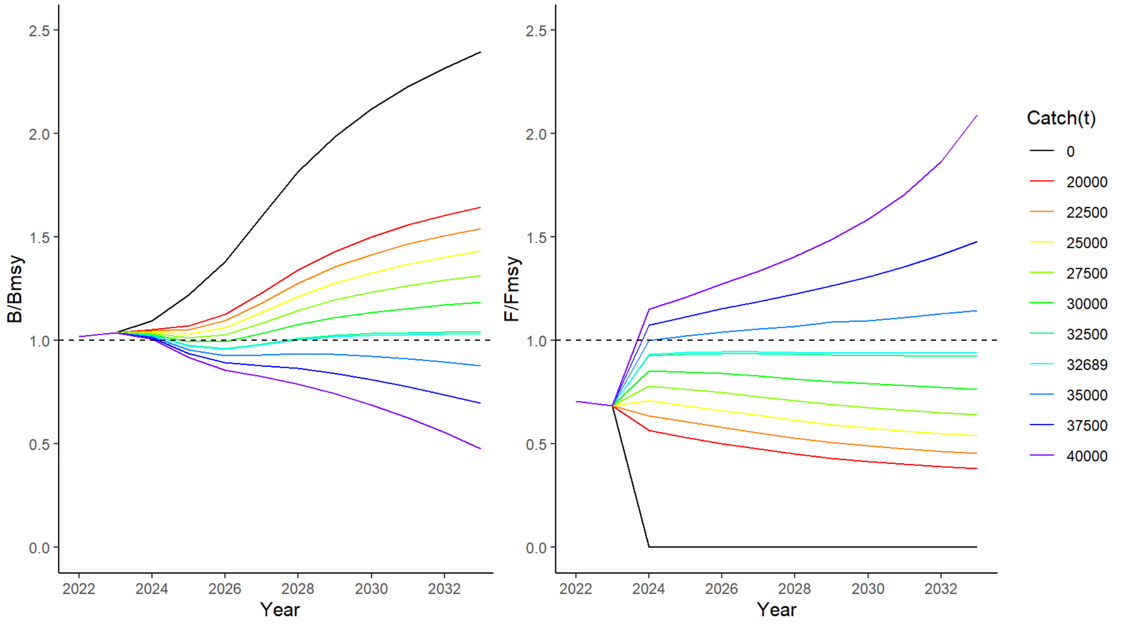
BSH-Figure 4. Joint Kobe phase plot from JABBA and Stock Synthesis for the North Atlantic blue shark stock. Solid black dots and solid line indicate the stock status trajectory, with the blue dot indicating the terminal year (2021), grey dots are the interactions from each model for the terminal year with the marginal distributions plotted in the lateral axis.



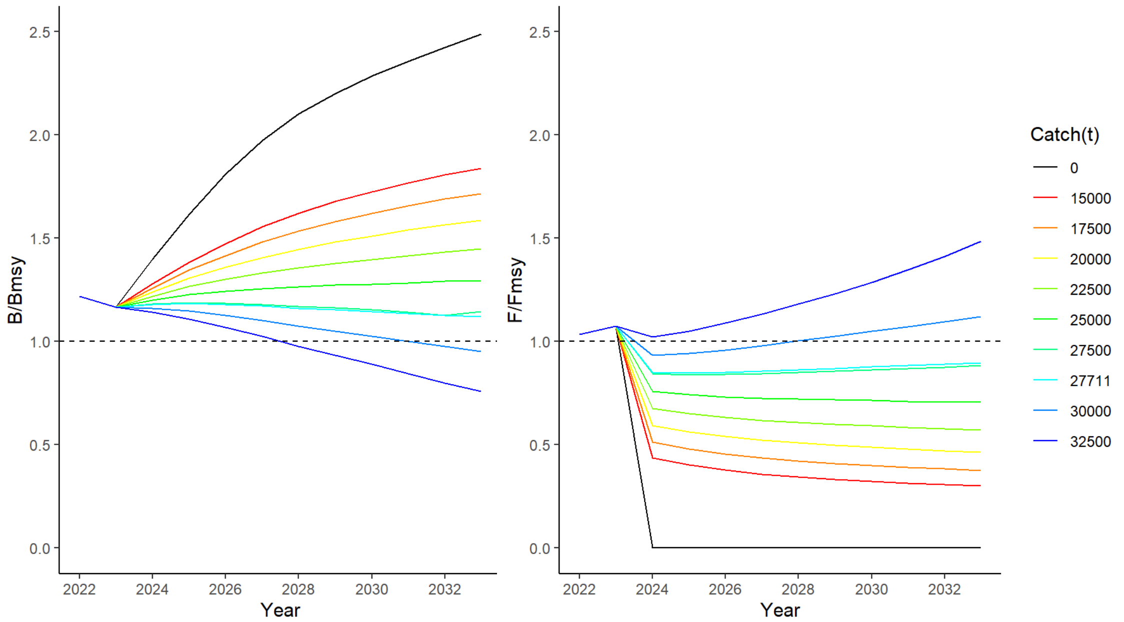
BSH-Figure 5. Estimated annual trends for the southern stock from JABBA (orange lines) and Stock Synthesis (green lines) for B/B_{MSY} (JABBA) or SSB/SSB_{MSY} (Stock Synthesis) (upper panel), and F/F_{MSY} (lower panel) with 95% confidence interval.



BSH-Figure 6. Joint Kobe phase plot from JABBA and Stock Synthesis for the South Atlantic blue shark stock. Solid black dots and solid line indicate the stock status trajectory, with the blue dot indicating the terminal year (2021), grey dots are the interactions from each model for the terminal year with the marginal distributions plotted in the lateral axis.



BSH-Figure 7. Projections for B/B_{MSY} and F/F_{MSY} based on both Stock Synthesis and JABBA reference cases for North Atlantic blue shark stock for various levels of future constant catch ranging from 20,000 – 40,000 t, including a zero-catch scenario starting in 2024. The initial catch for the years 2022-2023 was set to 23,418 t, which is the average catch of the recent three years (2019-2021). The projections were run until 2033 (10 years).



BSH-Figure 8. Projections for B/B_{MSY} and F/F_{MSY} based on both Stock Synthesis and JABBA reference cases for South Atlantic blue shark stock for various levels of future constant catch ranging from 15,000-32,500 t, including a zero-catch scenario starting in 2024. The initial catch for the years 2022-2023 was set to 34,983 t, which is the average catch of the recent three years (2019-2021). The projections were run until 2033 (10 years).

9.16 SMA - Shortfin mako

Both shortfin mako (*Isurus oxyrinchus*) stocks, North and South Atlantic, were assessed in 2017 (ICCAT, 2017e). In 2019, an intersessional meeting (ICCAT, 2020d) was held to update projections on the North Atlantic shortfin mako (*Isurus oxyrinchus*) stock based on the 2017 stock assessment.

SMA-1. Biology

Shortfin mako is a large pelagic shark that shows a wide geographic distribution, from tropical to temperate waters worldwide. Shortfin mako is an aplacental viviparous shark, with oofagy, which limits its fecundity to an average litter size of around 12 but increases the probability of survival of their young. Although there is still high uncertainty regarding its biology, available life history traits (slow growth, late maturity and small litter size) indicate that it is vulnerable to overfishing. A behavioral characteristic of this species is its tendency to segregate temporally and spatially by size and/or sex, during feeding, mating-reproduction, gestation and birth processes. Tagging studies have suggested that it exhibits large-scale migratory behaviour and periodic vertical movement, but the lack of information on some components of the populations precludes a complete understanding of its distribution/migration pattern by ontogenetic stage and in some cases identifying its pupping/mating grounds. Numerous aspects of the biology of this species are still poorly understood or completely unknown, particularly for some regions, which contributes to increased uncertainty in quantitative and qualitative assessments.

SMA-2. Fishery indicators

Earlier reviews of the shark database resulted in recommendations to improve data reporting on shark catches. Though global statistics on shortfin mako 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 shortfin mako 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 **SMA-Table 1** and **SMA Figure 1**.

The CPUE series available for the 2017 shortfin mako stock assessments showed decreasing trends since approximately 2010 for the North Atlantic stock and generally increasing trends since approximately 2008 for the South Atlantic stock (**SMA-Figures 2 and 3**).

SMA-3. State of the stocks

The 2017 assessment of the status of North and South Atlantic stocks of shortfin mako shark was conducted with updated time series of relative abundance and annual Task 1 catches (C1), life history, and with the inclusion of length composition data. An alternative series of catch data based on ratios of shark catches to catches of the main target species (C2) was also estimated and used in the assessments. The results obtained in this evaluation are not comparable to those obtained in the last assessment conducted in 2012 (ICCAT, 2013) because the input data and model structures have changed significantly: the catch time series are different (1950-2015 for the 2017 assessment and 1971-2010 for the 2012 assessment) and were derived using different assumptions; the catch per unit effort (CPUE) series in the North have been decreasing since 2010 (the last year in the 2012 assessment models); some of the biological inputs have changed (growth curve, natural mortality at age) and some are now sex specific for the North; with the new biological inputs the intrinsic rate of population growth (r_{MAX}) for the North Atlantic used to construct prior distributions is now about half that used in the 2012 assessment; and additional length composition data also became available for the North. Additionally, in 2012 only a Bayesian production model (BSP1) and a catch-free age structured production (CFASPM) model were used, whereas more modeling platforms that more fully use the data available were explored in the current assessment (BSP2JAGS (Just Another Gibbs Sampler emulating the Bayesian production model), JABBA (Just Another Bayesian Biomass Assessment), C_{MSY} (Catch at MSY), and SS3 (Stock Synthesis 3)). It is the Committee's view that the 2017 stock assessment represents a significant improvement in our understanding of current stock status, for North Atlantic shortfin mako in particular. In particular, the production models assuming both observation and process errors fit the indices of abundance considerably better than models assuming only observation errors as used in the 2012 stock assessment.

For the North Atlantic stock, results of nine stock assessment model runs were selected to provide stock status and management advice. Although all results indicated that stock abundance in 2015 was below B_{MSY}, results of the production models (BSP2JAGS and JABBA) were more pessimistic (B/B_{MSY} deterministic estimates ranged from 0.57 to 0.85) and those of the age-structured model (SS3), which indicated that stock abundance was near MSY (SSF/SSF_{MSY} = 0.95 where SSF is spawning stock fecundity), were less pessimistic. F was overwhelmingly above F_{MSY} (**SMA-Figure 4**), with a combined 90% probability from all the models of being in an overfished state and experiencing overfishing (**SMA-Figure 5**).

For the South Atlantic stock, 4 assessment model runs (2 BSP2JAGS runs and 2 C_{MSY} runs) were considered to provide stock status and management advice. The combined probability of the stock being overfished was 32.5% and that of experiencing overfishing was 41.9% (**SMA-Figure 6**). The combined probabilities from all the models of being in the red, yellow, and green quadrants of the Kobe plot are provided in **SMA-Figure 7**. Based on the diagnostics of model performance, the estimates of unsustainable harvest rates appear to be fairly robust at this stage whereas the biomass depletion and B/B_{MSY} estimates must be treated with caution. The Committee considers results for the South Atlantic to be highly uncertain owing to the conflict between catch and CPUE data. For both stocks, the CPUE series generally showed a trend similar to that of the catches, particularly the South Atlantic stock, which was problematic for the stock assessments based on production models.

SMA-4. Outlook

In 2017, projections could only be carried out with the BSP2JAGS production model for the North Atlantic and no projections could be conducted for the South Atlantic due to the uncertainty in stock status. The Committee noted that the Kobe II strategy matrices presented in 2017 may not reflect the full range of uncertainty in the outlook because projections were not carried out with SS3 due to technical reasons and because the model was still under development. In 2019, projections for the North Atlantic were carried out with Stock Synthesis only. The Committee noted that because the fishery mainly focuses on juvenile animals, the production models (BSP2JAGS and others) are only tracking juvenile abundance and thus the projections are not informative about trends in the mature population, which would lag behind the trends in the exploitable population by the number of years it takes new recruits to reach maturity.

The Committee combined the Stock Synthesis status results from two runs that were reflective of different productivity hypotheses (run 1 and run 3) for making projections (**SMA-Figure 8**). Projections were carried out to 2070 because they incorporate two generation times. Run 1 was added because the Committee recognized that it incorporates another hypothesis on the productivity of the stock (expressed through a different stock-recruit relationship) more in line with some of the production model estimates of productivity, but unlike production models, it can incorporate the necessary time lag effects caused by gear selectivity and the maturity of the stock. The projection results from the combined models showed that (**SMA-Table 2**): i) a zero total allowable catch (TAC) will allow the stock to be rebuilt and without overfishing (in the green quadrant of the Kobe plot) by 2045 with a 53% probability; ii) regardless of the TAC, the spawning stock fecundity will continue to decline until 2035 before any increases can occur owing to the time it takes juveniles to reach maturity; iii) to be in the green quadrant of the Kobe plot with at least 60% probability by 2070, the realized TAC has to be 300 t or less; and iv) a TAC of 700 t would end overfishing immediately with a 57% probability, but it would only have a 41% probability of rebuilding the stock by 2070. Although there is large uncertainty in the future productivity assumption for this stock, the projections show that there is a long lag time (ca. 20 years) between when management measures are implemented and when stock size starts to rebuild due to the biology of the species.

SMA-5. Effect of current regulations

The Commission adopted Rec. 17-08, which aims to reduce the fishing mortality to end overfishing of the northern stock of shortfin mako. It does this by strengthening data collection (including collection of statistics on discards, biological parameters, weight of landing products, etc.) and establishing regulatory options (including promoting fish releases in a manner that increases survival, establishing minimum sizes, etc.) for ICCAT CPCs. In response to this recommendation several CPCs have adopted national regulations. Rec. 17-08 was reviewed by the Commission in 2019.

The Committee conducted projections incorporating different hypotheses about stock productivity which suggested that the stock could rebuild to the biomass that supports MSY with a 60% probability if the TAC=0 by 2050. Additionally, the Committee also reviewed the probability of success of several of the measures contemplated in ICCAT Rec. 17-08 through additional projections for shortfin mako (using only the base run from Stock Synthesis – run 3). Specifically, alternative TAC, minimum size limit, and live release measures were explored with two tools: Stock Synthesis and the Decision Support Tool (DST). The Committee noted that fixed TACs with size regulations (210 cm fork length for females and 180 cm fork length for males) accelerated stock recovery. However, these projections implicitly assumed that fish released below the size limit had 100% post-release survival. The Committee also explored the effect of live release regulations (through reduction in fishing mortality but considering a post-release mortality rate of 25%) contemplated in Rec. 17-08 and found that all projection scenarios resulted in population declines until 2035 regardless of the fixed level of fishing mortality used and that the biomass that supports MSY was only reached by 2070 for the fishing mortality equal zero scenario.

Projections with the DST revealed that if fishers are unable to avoid catching shortfin makos and those discarded have a substantial mortality rate, then it is necessary to greatly decrease the retained catch to allow the stock to rebuild. Size limits and other strategies to release live sharks must be accompanied by a reduction in retained catch. The Committee thus concluded that a live release approach may be a way to reduce F if discard mortality rates are low, but other management measures such as reduction of soak time, time-area closures, and safe handling and best practices for the release of live specimens may also be required to further reduce incidental mortality. The Committee also noted that a slot limit that protects some mature age groups may be appropriate, although selectivity on those ages is low.

The Committee noted that North Atlantic catches increased from 3,282 t in 2015 to 3,357 t in 2016 and then decreased to 3,119 t in 2017, and that they further decreased to 1,461 t in 2018. It is not clear if the decrease can be attributed to Rec. 17-08 or to continued decrease in stock size. Projections (**SMA-Table 2**) indicate that this current catch will not allow the stock to rebuild by 2070 and overfishing will continue. 2019 is the first full year during which Rec. 17-08 applied.

The Committee had insufficient information to determine which ICCAT recommendations regarding possible conservation measures (Rec. 17-08) were implemented for which fleet, making it difficult to evaluate the effect of the possible conservation measures by fleet in the projections. Nevertheless, a general evaluation of the effect of the conservation measures was undertaken which showed that they are insufficient to rebuild the stock within the specified timeframe.

SMA-6. 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 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 and 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 shortfin mako shark catches in both ICCAT and non-ICCAT fisheries for species that are oceanic, pelagic, and highly migratory within the ICCAT Convention area. The magnitude of shark entanglements in fish aggregating devices (FADs) should be investigated. Methods for mitigating shark bycatch in fisheries also need to be investigated and applied.

The Committee conducted new projections using two Stock Synthesis model scenarios that incorporated important aspects of shortfin mako biology. This was a feature that was not possible with the production model projections developed in the 2017 assessment (ICCAT, 2017e) and, therefore, the Committee considers the new projections as a better representation of the stock dynamics. The stock synthesis projections indicated that: i) a zero TAC will allow the stock to be rebuilt and without overfishing (in the green quadrant of the Kobe plot) by 2045 with a 53% probability; ii) regardless of the TAC (including a TAC of 0 t), the stock will continue to decline until 2035 before any biomass increases can occur; iii) a TAC of 500 t, including dead discards has only a 52% probability of rebuilding the stock to the green quadrant in 2070; iv) to be in the green quadrant of the Kobe plot with at least 60% probability by 2070, the realized TAC has to be 300 t or less; v) lower TACs achieve rebuilding in shorter time frames; and vi) a TAC of 700 t would end overfishing immediately with a 57% probability, but this TAC would only have a 41% probability of rebuilding the stock by 2070.

The Committee agreed that the projections that addressed the exceptions in Rec. 17-08 indicated that any retention of shortfin makos will not permit the recovery of the stock by year 2070. A range of TAC options with a range of time frames and associated probabilities of rebuilding are included in **SMA-Table 2**. Given the vulnerable biological characteristics of this stock and the pessimistic projections, to accelerate the rate of recovery and to increase the probability of success the Committee recommends that the Commission adopt a non-retention policy without exception in the North Atlantic as it has already done with other shark species caught as bycatch in ICCAT fisheries.

Given that fishery development in the South predictably follows that in the North and that the biological characteristics of the stock are similar, there is a significant risk that this stock could follow a similar history to that of the North stock. If the stock declines it will, like the North stock, require a long time for rebuilding even after significant catch reductions. To avoid this situation and considering the uncertainty in the stock status, the Committee recommends that at a minimum, catches should not exceed the minimum catch in the last five years of the assessment (2011-2015; 2,001 t with catch scenario C1 (Task 1 catches)).

The Committee emphasized that reporting all sources of mortality is an essential element to decrease the uncertainty in stock assessment results, and particularly the report of estimated dead discards for all fisheries. Although the reporting of dead discards is already part of the ICCAT data reporting obligations (Rec. 17-08), the requirement has been ignored by many CPCs. The reporting of dead discards and live releases is of the utmost importance.

The Committee indicated that additional measures can potentially further reduce incidental mortality, including safe handling and best practices for the release of live specimens (since post release survival can reach 77%). These and other measures are documented in papers published on the Bycatch Management Information System webpage of the Western Central Pacific Fisheries Commission (WCPFC). Gear restrictions/modification and time area closures also have the potential to reduce mortality. However, gear restriction/modification would require dedicated field work (e.g. the deployment of hook timers to measure the time that sharks are on the line), while the level of catch and effort data currently submitted to the Secretariat makes it difficult to evaluate time/area closures.

The Committee emphasized that the Kobe II Strategy Matrix (K2SM) does not capture all the uncertainties associated with the fishery and the biology of the species. In addition, the length of the projection period (50 years) requested by the Commission implies that estimates at the end of the projection period are highly uncertain. Therefore, the Committee advised that the results of the K2SM should be interpreted with caution. In particular, if the decrease in mature females is related not only to the catch of immature females, but to other, unknown causes, the management measures above may not lead to the recovery of the stock.

The Committee emphasizes that there will be a need for CPCs to strengthen their monitoring and data collection efforts by species to monitor the future status of the stocks, including but not limited to total estimated dead discards and the estimation of CPUEs using observer data.

NORTH ATLANTIC SHORTFIN MAKO SUMMARY TABLE

Current Yield (2023)		1,108 t[1]
Yield (2015)		3,227 t[2]
Relative Biomass	B_{2015}/B_{MSY}	0.57-0.95[3]
	B_{2015}/B_0	0.34-0.57[4]
Relative Fishing Mortality	F_{MSY}	0.015-0.056[5]
	F_{2015}/F_{MSY}	1.93-4.38[6]
Stock Status (2015)	Overfished	YES
	Overfishing	YES
Management Measures in Effect:		Rec. 21-09, Rec. 04-10, Rec. 07-06

[1] Task 1 catch as of 22 September 2024.
[2] Task 1 catch used in the stock assessment.
[3] Range obtained from 8 Bayesian production and 1 SS3 model runs. Value from SS3 is SSF/SSF_{MSY}. Low value is lowest value from 4 production model (JABBA) runs and high value is from the SS3 base run.
[4] Range obtained from 8 Bayesian production and 1 SS3 model runs. Value from SS3 is SSF/SSF_0. Low value is lowest value from 4 production model (JABBA) runs and high value is highest value from 4 production model (BSP2JAGS) runs.
[5] Range obtained from 8 Bayesian production and 1 SS3 model runs. Value from SS3 is SSF_{MSY}. Low value is lowest value from 4 production model (JABBA and BSP2JAGS) runs and high value is from the SS3 base run.
[6] Range obtained from 8 Bayesian production and 1 SS3 model runs. Values from the production models are H (harvest rates). Low value is lowest value from 4 production model (BSP2JAGS) runs and high value is from the SS3 base run and highest value from 4 production model (JABBA) runs.

SOUTH ATLANTIC SHORTFIN MAKO SUMMARY TABLE

Current Yield (2023)		1,355 t[1]
Yield (2015)		2,686 t[2]
Relative Biomass	B_{2015}/B_{MSY}	0.65-1.75[3]
	B_{2015}/B_0	0.32-1.18[4]
Relative Fishing Mortality:	F_{MSY}	0.030-0.034[5]
	F_{2015}/F_{MSY}	0.86-3.67[6]
Stock status (2015)	Overfished	Possibly[7]
	Overfishing	Possibly[7]
Management Measures in Effect:		Rec. 22-11, Rec. 04-10, Rec. 07-06

[1] Task 1 catch as of 22 September 2024.
[2] Task 1 catch from the stock assessment.
[3] Range obtained from 2 Bayesian production (BSP2JAGS) and 2 catch-only (C_{MSY}) model runs. Low value is lowest value from the C_{MSY} model runs and high value is highest value from the BSP2JAGS model runs.
[4] Range obtained from 2 Bayesian production (BSP2JAGS) and 2 catch-only (C_{MSY}) model runs. Low value is lowest value from the C_{MSY} model runs and high value is highest value from the BSP2JAGS model runs.
[5] Range obtained from 2 Bayesian production (BSP2JAGS) and 2 catch-only (C_{MSY}) model runs. Low value is from the BSP2JAGS model runs and high value is from the C_{MSY} model runs.
[6] Range obtained from 2 Bayesian production (BSP2JAGS) and 2 catch-only (C_{MSY}) model runs. Low value is lowest value from the BSP2JAGS model runs and high value is highest value from the C_{MSY} model runs.
[7] The Committee considers that results have a high degree of uncertainty.

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

				1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
TOTAL				5844	8407	7702	5730	5863	4470	5190	4796	5531	7225	6528	6970	6620	6946	5684	6606	7270	6982	7347	5787	6743	6056	6122	5906	5552	4195	4597	3448	3313	2463
	ATN			3662	5307	5307	3537	3847	2859	2598	2682	3426	3987	4000	3695	3574	4158	3802	4542	4783	3722	4440	3604	3469	3282	3357	3119	2392	1886	1740	1194	829	1108
	ATS			2182	3100	2395	2187	2008	1606	2588	2107	2103	3235	2526	3259	3036	2786	1881	2063	2486	3258	2905	2183	3274	2774	2765	2786	3158	2309	2857	2254	2484	1355
	MED			0	0	0	6	8	5	4	7	2	2	2	17	10	2	1	1	2	2	2	0	0	0	0	0	1	0	0	0	1	0
Landings	ATN		Longline	3310	3829	5054	3352	3672	2756	2270	2451	3155	3970	3572	3387	3302	3976	3623	4345	4588	3499	4147	3313	2578	2639	3119	2714	1998	1622	1625	521	18	19
			Other surf.	331	1448	252	183	175	99	320	231	271	17	429	308	273	175	169	177	193	215	273	286	880	632	230	401	369	207	39	31	29	1
	ATS		Longline	2162	3085	2379	2163	1996	1596	2566	2090	2088	3204	2450	3245	2992	2745	1799	2057	2485	3196	2842	2149	3241	2760	2748	2620	3149	2291	2820	2234	2462	762
			Other surf.	21	15	16	25	12	10	22	18	15	31	76	14	43	30	82	7	1	62	55	34	31	12	13	162	7	8	29	9	3	1
	MED		Longline	0	0	0	6	8	5	4	7	2	2	2	17	10	2	1	1	2	2	2	0	0	0	0	0	0	0	0	0	0	0
			Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Discards	ATN		Longline	21	29	0	2	0	1	8	0	0	0	0	0	0	7	9	20	2	9	19	5	12	10	8	4	24	56	74	642	782	1087
			Other surf.	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	2	0	0	1
	ATS		Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0	8	0	2	2	3	3	2	9	7	12	19	591
			Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0
	MED		Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Landings	ATN	CP	Barbados	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	3	3	0	0	0	0	0	0
			Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	28	69	114	99	1	1	1	9	12	2	0	3	0	0
			Brazil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16
			Canada	0	111	67	110	69	70	78	69	78	73	80	91	71	72	43	53	41	37	29	35	55	85	82	109	53	63	1	0	0	0
			China PR	0	0	0	0	0	0	0	0	0	0	0	0	0	81	16	19	29	18	24	11	5	2	4	2	0	0	0	0	0	0
			Costa Rica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	2	2	1	2	1	1	0	1	0	0	0	0	0
			Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			EU-España	2164	2209	3294	2416	2223	2051	1561	1684	2047	2068	2088	1751	1918	1814	1895	2216	2091	1667	2308	1509	1481	1362	1574	1784	1165	866	870	0	0	0
			EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	2	0	0	0	1	1	2	1	0	1	0	1	1	0
			EU-Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			EU-Portugal	649	657	691	354	307	327	318	378	415	1249	473	1109	951	1540	1033	1169	1432	1045	1023	820	219	222	264	276	272	289	342	202	1	0
			FR-St Pierre et Miquelon	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0
			Great Britain	0	0	0	0	0	2	3	2	1	1	1	0	0	0	1	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Japan	214	592	790	258	892	120	138	105	438	267	572	0	0	82	131	98	116	53	56	33	69	45	74	89	20	4	0	0	0	0
			Korea Rep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27	27	15	8	2	1	3	5	4	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	0	0	10	0	0	0
			Maroc	0	0	0	0	0	0	0	0	0	147	169	215	220	151	283	476	636	420	406	667	624	947	1050	450	594	501	382	299	0	0
			Mauritania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	
			Mexico	0	10	0	0	0	0	10	16	0	10	6	9	5	8	6	7	8	8	8	4	4	4	3	5	2	2	2	2	3	2
			Panama	0	0	0	0	0	1	0	0	0	0	0	0	0	49	33	39	0	0	0	19	7	0	0	0	0	0	0	0	0	0
			Philippines	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Russian Federation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Senegal	0	0	0	0	0	0	0	0	0	0	0	0	0	8	17	21	0	0	2	0	2	2	2	68	68	26	0	0	0	0
			St Vincent and Grenadines	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	3	0	0	0	
			Trinidad and Tobago	3	1	1	1	2	1	3	6	2	3	1	2	1	1	1	1	1	0	2	1	1	1	1	2	2	1	1	1	1	0
			UK-Bermuda	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			USA	574	1658	400	345	297	198	414	350	372	106	477	422	353	319	296	314	350	332	371	363	961	572	271	302	165	57	48	39	41	0
			Venezuela	7	7	17	9	8	6	9	24	21	28	64	27	14	19	8	41	27	20	33	9	13	7	7	9	7	8	8	3	1	0
		NCC	Chinese Taipei	29	32	45	42	47	75	56	47	53	37	70	68	40	6	23	11	14	13	14	8	4	13	7	7	1	0	0	0	0	0
		NCO	Sta Lucia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	
	ATS	CP	Angola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	0	7	23	14
			Belize	0	0	0	0	0	0	0	0	0	0	0	38	0	17	2	0	32	59	78	88	1	15	14	34	15	7	2	1	0	0
			Brazil	95	119	83	190	233	27	219	409	226	283	238	426	210	145	203	99	128	192	196	276	268	173	124	275	399	739	542	477	557	106
			China PR	45	23	27	19	74	126	305	22	208	260	68	45	70	77	6	24	32	29	8	9	9	5	3	1	0	0	0	0	0	0
			Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Côte d'Ivoire	20	13	15	23	10	10	9	15	15	30	15	14	16	25	0	5	7	0	20	34	19	11	13	161	4	8	14	9	1	
			EU-España	552	1084	1482	1356	984	861	1090	1235	811	1158	703	584	664	654	628	922	1192	1535	1207	1083	1077	862	882	1049	1044	1090	799	650	657	0
			EU-Portugal	0	92	94	165	116	119	388	140	56	625	13	242	493	375	321	502	336	409	176	132	127	158	393	503	300	243	449	357	358	0
			El Salvador	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Great Britain	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Japan	1369	1617	514	244	267	151	264	56	133	118	398	0	0	72	115	108	103	132	291	114	182	109	77	96	93	53	1	0	0	0
			Korea Rep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29	13	7	7	4	4	18	8	9	1	0	0	0	0
			Namibia	0	0	0	0	0	1	0	0	459	375	509	1415	1244	1002	295	23	307	377	586	9	950	661	799	194	980	0	945	637	789	545
			Panama	0	0	0	0	0	24	1	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Philippines	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Russian Federation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Senegal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	34	23	0	11	6	39	4	7	0	0	0	0
			South Africa	24	49	37	31	171	67	116	70	12	116	101	111	86	224	137	146	152	218	108	250	476	613	339	305	244	110	46	70	66	96
			UK-Sta Helena	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Uruguay	12	17	26	20	23	21	35	40	38	188	249	146	68	36	41	106	23	76	36	1	0	0	0	0	0	0	0	0	0	0
		NCC	Chinese Taipei	65	87	117	139	130	198	162	120	146	83	180	226	166	147	124	117	144	203	150	157	158	152	92	85	64	42	52	35	13	2
		NCO	Vanuatu	0	0	0	0	0	0	0	0	0	0	52	12	13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	MED	CP	EU-Cyprus	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
			EU-España	0	0	0	6	7	5	3	2	2	2	2	2	4	1	0	0	1	2	2	0	0	0	0	0	0	0	0	0	0	0
			EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	1	0	0	0	0	0
			EU-Portugal	0	0	0	0	1	0	1	5	0	0	0	15	5	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	0	0	0	0	0
			Maroc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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	1	0	2	1	20	22	26	12
			China PR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	2	1	5	4
			Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			EU-España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	585	588	936
			EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
			EU-Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	14	141	87
			El Salvador	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	30	28	15	10	14
			Korea Rep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
			Mexico	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Russian Federation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			UK-Bermuda	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			USA	21	28	0	2	0	1	8	0	0	0	0	0	0	7	10	20	2	9	18	5	11	8	6	4	2	1	3	4	10	29
		NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	22	5	12	1	2	7

			1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
ATS	CP	Brazil	0	0	0	0	0	0	0	0	0	0	0	0	0	12	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	4	3
		Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		EU-España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	187
		EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0
		EU-Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	388
		El Salvador	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	2	5	9	3	3
		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	5	0	0	0	0
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		South Africa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	2	2	3	3	2	2	2	2	13	9
MED	CP	EU-España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0

SMA-Table 2. Stock Synthesis model runs 1 and 3 combined Markov Chain Monte Carlo (MCMC, long chain) Kobe II risk matrix for North Atlantic shortfin mako projection results: Probability that the fishing mortality (F) will be below the fishing mortality rate at MSY (F < F_{MSY}; top panel), probability that the spawning stock fecundity (SSF) will exceed the level that will produce MSY (SSF > SSF_{MSY}; middle panel), and the probability of both F < F_{MSY} and SSF > SSF_{MSY} (bottom panel).

Probability that F<$F_{MSY.}$

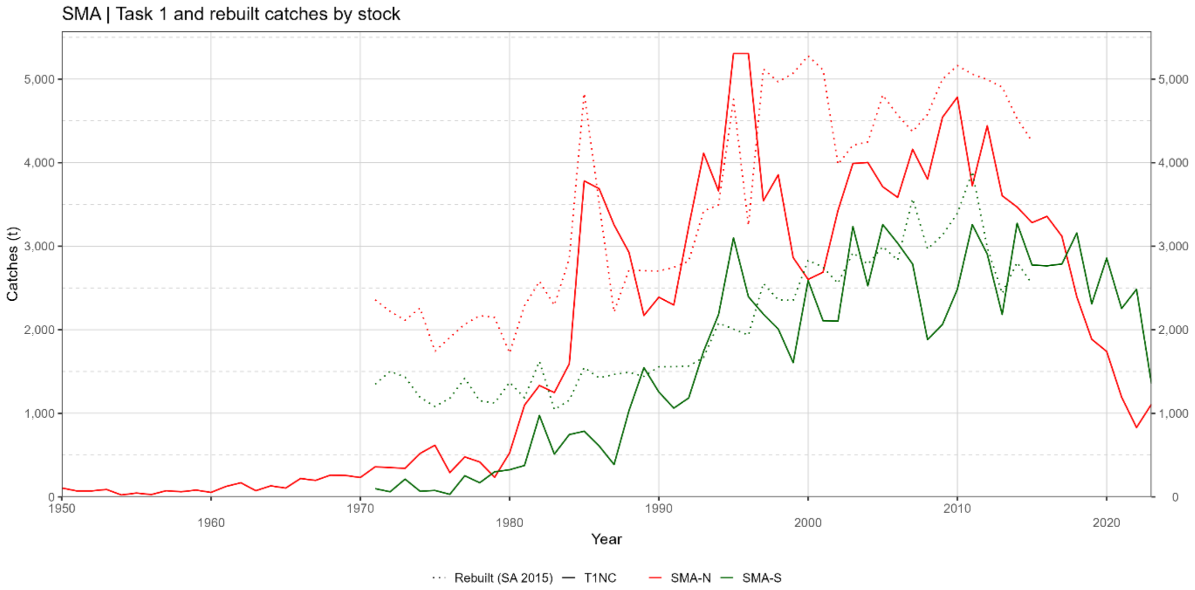
TAC (t)	2019	2020	2025	2030	2035	2040	2045	2050	2055	2060	2065	2070
0	100	100	100	100	100	100	100	100	100	100	100	100
100	100	100	100	100	100	100	100	100	100	100	100	100
200	100	100	100	100	100	100	100	100	100	100	100	100
300	100	100	100	100	100	100	100	100	100	100	100	100
400	100	100	100	100	100	100	100	100	100	100	100	100
500	96	99	100	100	100	100	100	100	100	100	100	100
600	81	89	99	99	98	96	95	97	97	97	96	95
700	57	69	93	92	88	82	80	83	84	85	82	82
800*	32	45	76	77	70	63	62	64	67	67	65	63
900	15	24	57	58	51	46	44	47	51	49	49	48
1000	5	11	37	38	31	27	26	28	30	31	30	30
1100	2	4	19	21	17	13	11	13	14	14	14	13

Probability that SSF>$SSF_{MSY.}$

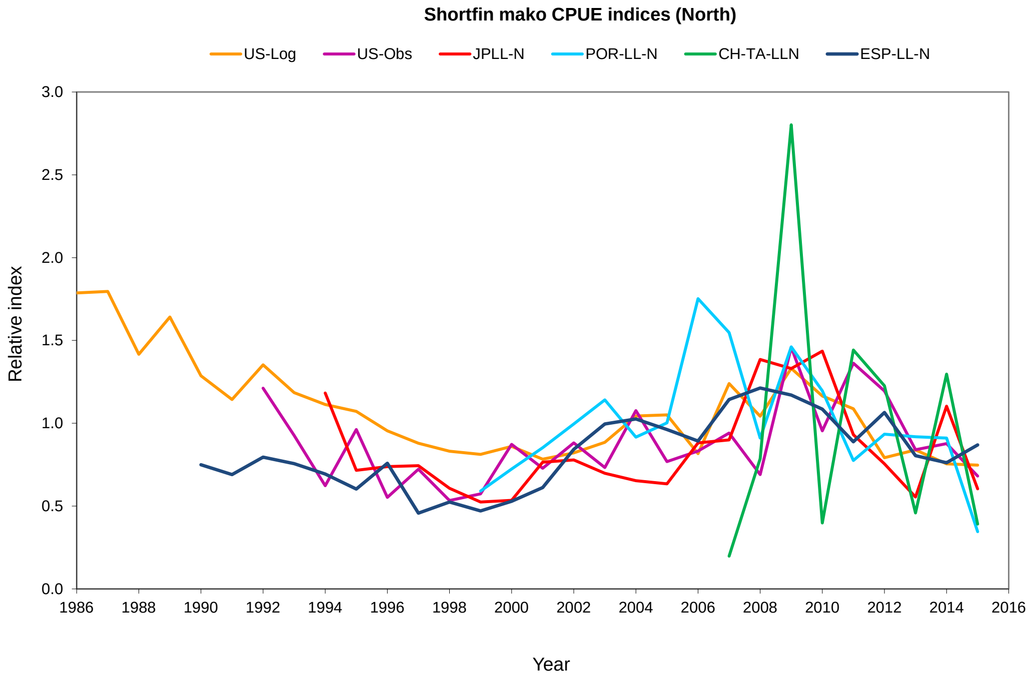
TAC (t)	2019	2020	2025	2030	2035	2040	2045	2050	2055	2060	2065	2070
0	46	42	24	14	11	33	53	60	63	67	72	81
100	46	42	24	13	10	29	49	56	59	61	66	73
200	46	42	24	13	9	26	47	54	55	57	61	66
300	46	42	24	12	9	22	42	50	52	53	56	60
400	46	42	24	12	8	19	39	47	49	50	52	55
500*	46	42	24	12	7	17	34	42	45	47	49	52
600	46	42	24	12	7	14	28	37	40	41	43	47
700	46	42	24	11	6	11	23	31	34	35	37	41
800	46	42	23	11	6	10	19	26	27	28	30	32
900	46	42	23	11	5	8	16	20	21	21	23	24
1000	46	42	23	11	5	7	12	16	16	15	15	17
1100	46	42	23	10	5	6	10	12	12	11	10	10

Probability of being in the green zone (F<F_{MSY} and SSF>SSF_{MSY}).

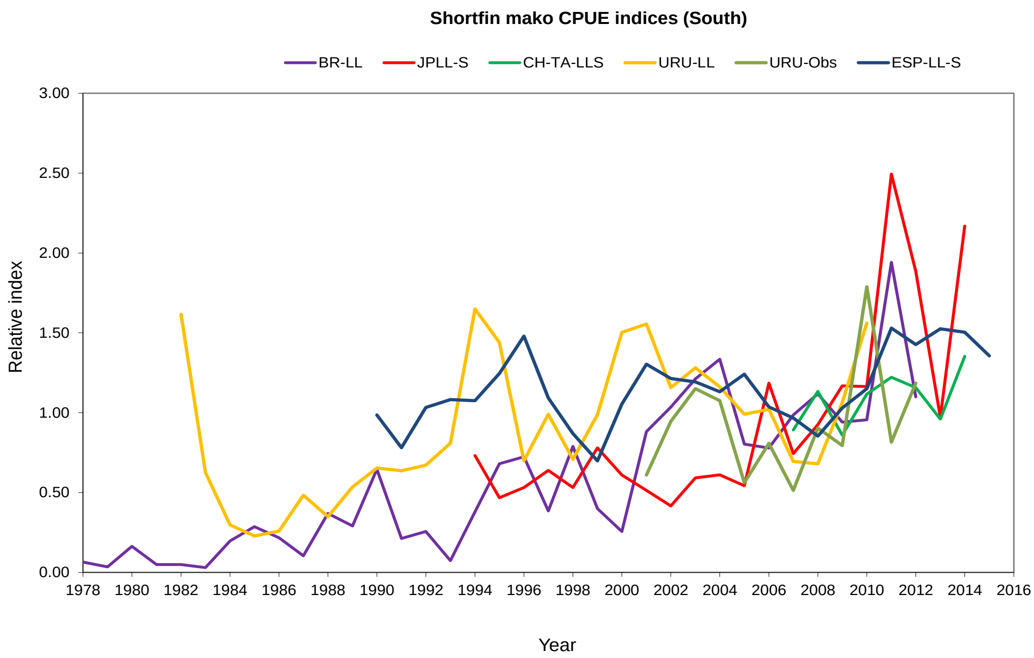
TAC (t)	2019	2020	2025	2030	2035	2040	2045	2050	2055	2060	2065	2070
0	46	42	24	14	11	33	53	60	63	67	72	81
100	46	42	24	13	10	29	49	56	59	61	66	73
200	46	42	24	13	9	26	47	54	55	57	61	66
300	46	42	24	12	9	22	42	50	52	53	56	60
400	46	42	24	12	8	19	39	47	49	50	52	55
500*	46	42	24	12	7	17	34	42	45	47	49	52
600	45	42	24	12	7	14	28	37	40	41	43	47
700	41	41	24	11	6	11	23	31	34	35	37	41
800	27	34	23	11	6	10	19	26	27	28	30	32
900	14	21	23	11	5	8	15	20	21	21	23	24
1000	5	10	20	10	5	7	12	15	15	14	14	16
1100	2	4	14	9	4	5	7	9	9	8	8	8



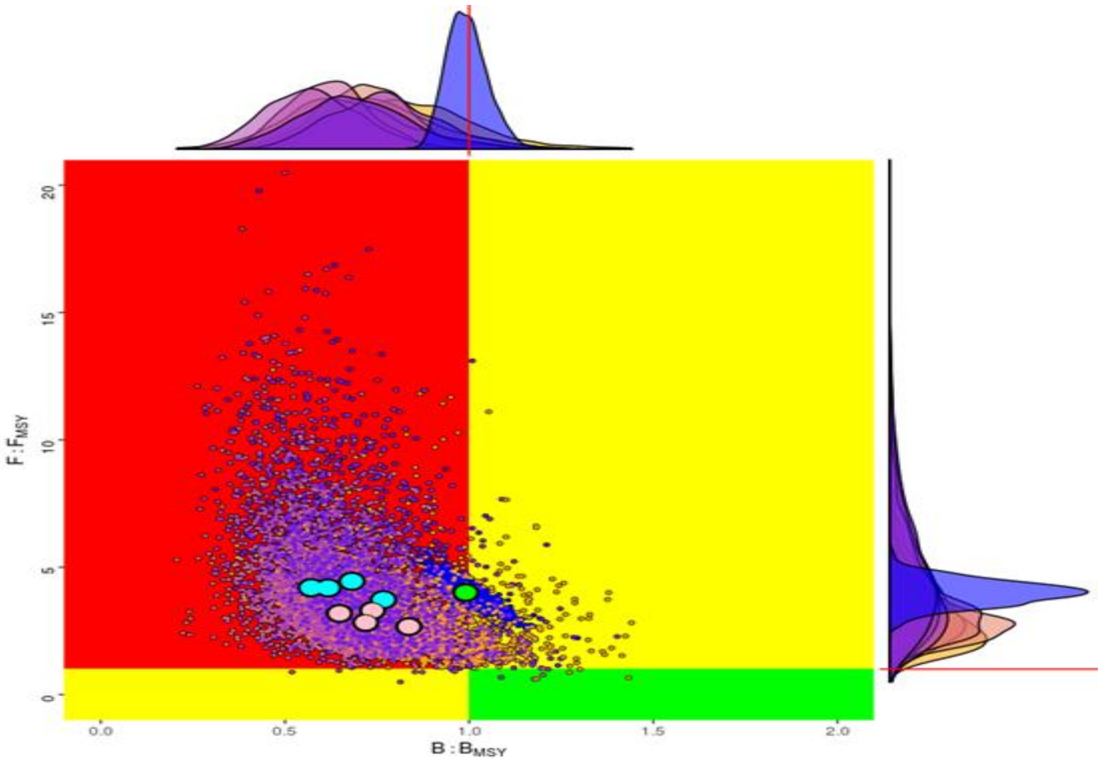
SMA-Figure 1. Shortfin mako (SMA) catches up to 2023 of both stocks (SMA-N in red, SMA-S in green) reported to ICCAT (Task 1) and estimated by the Committee.



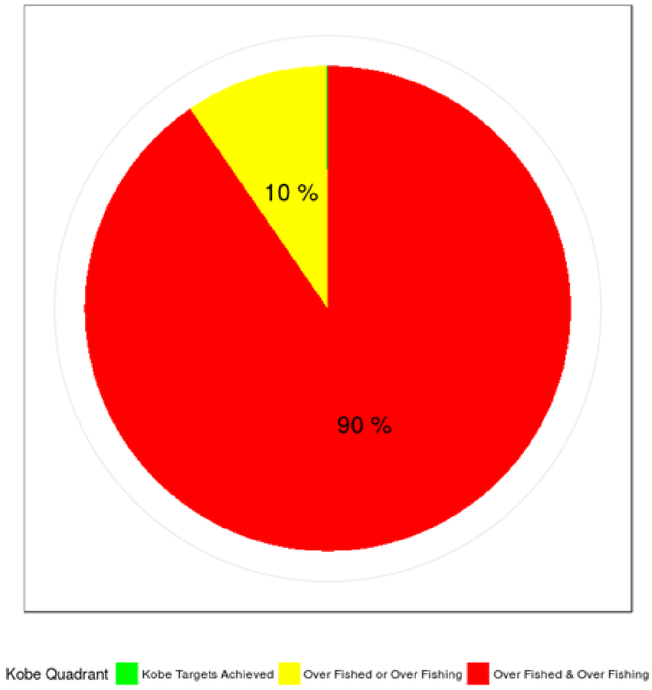
SMA-Figure 2. Indices of abundance for North Atlantic shortfin mako shark used in the 2017 Stock Assessment.



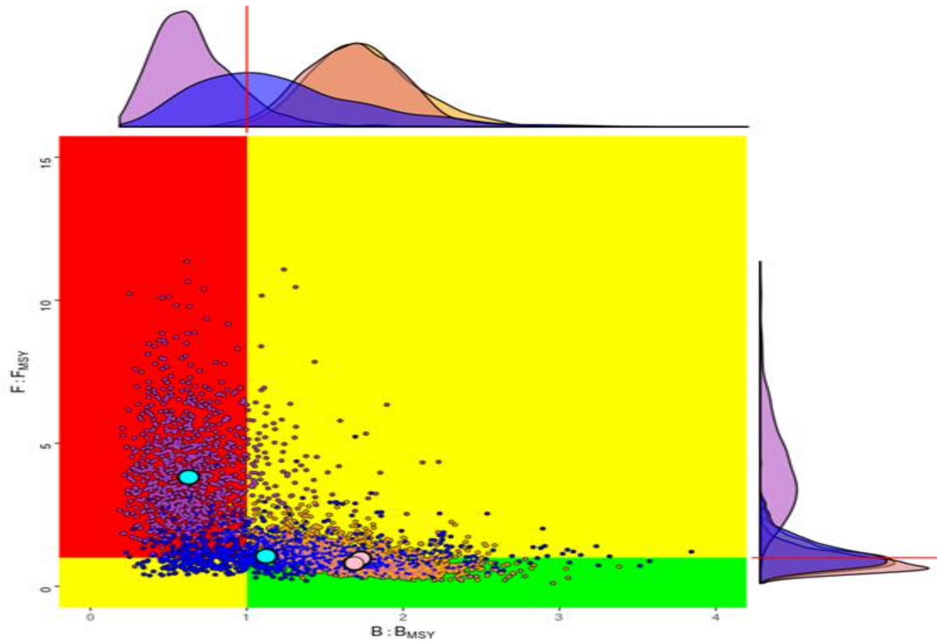
SMA-Figure 3. Indices of abundance for South Atlantic shortfin mako shark used in the 2017 Stock Assessment.



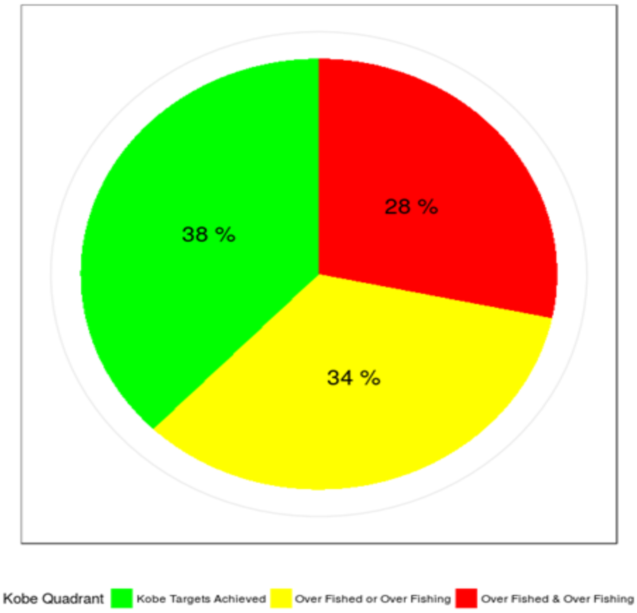
SMA-Figure 4. Stock status (2015) of North Atlantic shortfin makos based on Bayesian production models (4 BSP2JAGS and 4 JABBA runs) and 1 length-based, age-structured model (SS3). The clouds of points are the bootstrap estimates for all model runs showing uncertainty around the median point estimate for each of nine model formulations (BSP2JAGS: solid pink circles; JABBA: solid cyan circles; SS3: solid green circle). The marginal density plots shown are the frequency distributions of the bootstrap estimates for each model with respect to relative biomass (top) and relative fishing mortality (right). The red lines are the benchmark levels (ratios equal to 1).



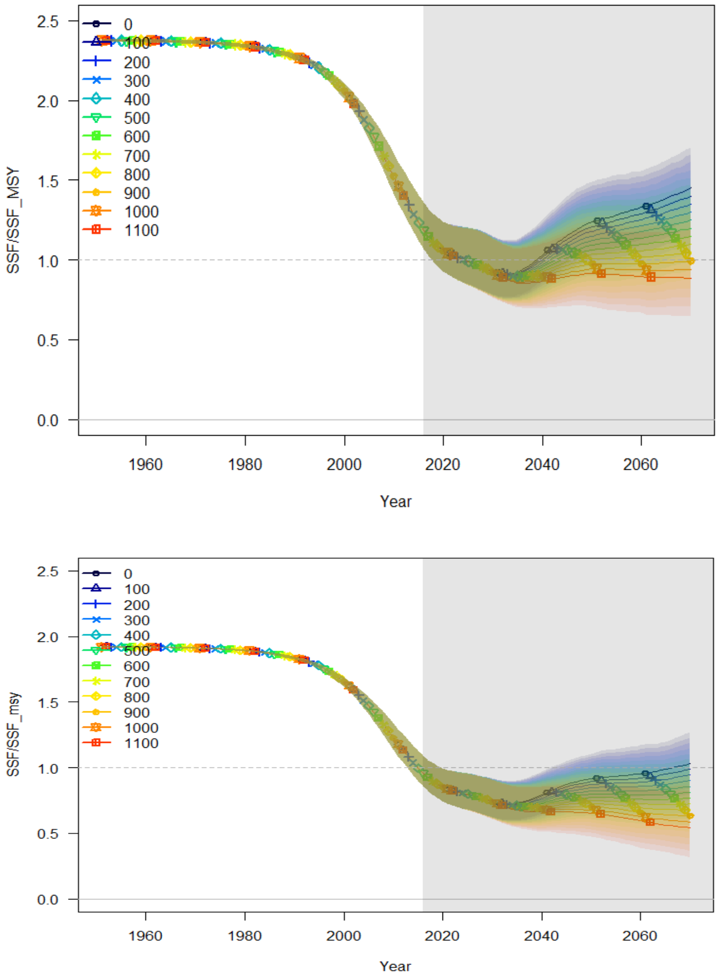
SMA-Figure 5. Kobe pie chart summarizing stock status (for 2015) for North Atlantic shortfin mako based on Bayesian production models (4 BSP2JAGS and 4 JABBA runs) and 1 length-based age-structured model (SS3). Probability of being in the green quadrant is less than 0.5%.



SMA-Figure 6. Stock status (2015) of South Atlantic shortfin makos based on a Bayesian production model (BSP2JAGS) and a catch-only model (CMSY). The clouds of points are the bootstrap estimates for all models combined showing uncertainty around the median point estimate for each of four model formulations (BSP2JAGS: solid pink circles; CMSY: solid cyan circles). The marginal density plots shown are the frequency distributions of the bootstrap estimates for each model with respect to relative biomass (top) and relative fishing mortality (right). The red lines are the benchmark levels (ratios equal to 1).



SMA-Figure 7. Kobe pie chart summarizing stock status (for 2015) for South Atlantic shortfin makos based on a Bayesian production model (2 BSP2JAGS runs) and a catch-only model (2 C_{MSY} runs).



SMA-Figure 8. Constant catch projections (0 – 1100 t) from Stock Synthesis model run 1 (top panel) and run 3 (bottom panel) for the North Atlantic shortfin mako (ICCAT, 2020d). Solid lines are medians and shaded areas are 95% credible intervals.

9.17 POR - Porbeagle

This document contains the information on stock assessments conducted in different years. Three of the porbeagle stocks (Northwest, Southwest and Southeast) were assessed by the ICCAT SCRS in 2020. The Northeast stock was assessed in 2022 in a joint process with the International Council on the Exploration of the Sea (ICES). The Porbeagle Executive Summary updated catch information from all stocks. However, stock status elements for the southern and western stocks use the information from the 2020 ICCAT Porbeagle Stock Assessment Meeting (ICCAT, 2020e). The Northeast stock information has been updated with both new information from the catch and new information from the 2022 assessment. The decision was to keep results for all porbeagle stock together because the information from the Northwest and southern stocks was not updated in the 2022 assessment.

The latest information on the status of the porbeagle (*Lamna nasus*) stock is available in the Report of the 2020 ICCAT Porbeagle Stock Assessment Meeting (ICCAT, 2020e). In 2022 a joint ICES/ICCAT stock assessment was conducted for the northeast stock of porbeagle, for which results are included herein.

POR-1. Biology

Porbeagle is a large pelagic shark that shows a wide geographic distribution associated with cold-temperate waters. Porbeagle is an aplacental viviparous shark, with oophagy, which limits their fecundity to an average litter size of around four but increases the probability of survival of their young. Gestation period is 8 to 9 months. Median size at maturity is about 174 cm FL (fork length) or 8 years for males and 218 cm FL or 13 years for females, with mating taking place between September and November in the North Atlantic. Breeding frequency was determined to be annual, but a recent study found that at least a portion of the Northwest Atlantic population is biennial or possibly even triennial based on the finding of a resting stage. Although uncertainty regarding their biology remains, available life history traits (slow growth, late maturity and small litter size) indicate that it is vulnerable to overfishing. A behavioral characteristic of this species is its tendency to segregate temporally and spatially by size and/or sex during feeding, mating-reproduction, gestation and birth processes. Tagging studies have suggested that the species exhibits 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 patterns by ontogenetic stage and in some cases identifying their pupping/mating grounds. Numerous aspects of the biology of this species are still poorly understood or completely unknown, particularly for some regions, which contributes to increased uncertainty in quantitative and qualitative assessments.

The stock structure for porbeagle shark was first addressed in 2009 at the Joint ICCAT/ICES Porbeagle Stock Assessment Meeting (Copenhagen, Denmark, June 22 to 27, 2009) (ICCAT, 2010). Data at that time supported the view of restricted movements between the NE and NW Atlantic individuals. Therefore, it was concluded that in the North Atlantic there were two stocks. Regarding the South Atlantic, it was understood that there were two stocks, SW and SE, although the possibility was raised that both southern stocks would extend to the bordering oceans (Pacific and Indian). Since 2009, a number of mark-recapture, pop-up archival satellite tag (PSAT) studies have further examined the movements of porbeagle particularly in the North Atlantic Ocean. Nearly all of the long-term satellite tagging, conventional tagging, and survival tagging supports that porbeagle stocks in the Northeast Atlantic are separate from the Northwest. There is little tagging information from the South Atlantic. In addition to tagging studies, a study of genomic DNA suggests there is strong genetic subdivision between the North Atlantic and Southern Hemisphere populations but found no differentiation within these hemispheres. New information derived from fishery and research data from the South Atlantic, Pacific and Indian Oceans indicates that there is a continuous distribution of the species in the three oceans and that it ranges from 20° to 60° South latitude. Overall, there is insufficient data to define the appropriate number of stocks in the Southern Hemisphere.

POR-2. Fishery indicators

The Committee considered that, based on the most recent and best available information, there are two stocks in the North Atlantic (NW, NE) and likely a single stock in the South Atlantic. However, two areas (SW and SE) are considered for catch data reporting purposes in the South Atlantic (**POR-Table 1** and **POR-Figure 1**).

Few CPUE series were presented during the 2020 porbeagle assessment as management measures led to changes in the fishery that resulted in lack of sufficient data on porbeagle catch rates or changes in management that could not be accounted for in the CPUE standardization procedure.

Two standardized CPUE series were presented for the NW Atlantic stock: a Canadian fishery-independent survey and a Japanese pelagic longline fishery series based on observer data. The Canadian survey showed a decline from 2007 to 2017 but was deemed not to reflect abundance; the Japanese series showed a stable trend during 2000-2014 and an increase from 2014 to 2018, which could be attributable to an increase in juvenile sharks. A standardized CPUE series was presented for the SW stock based on data from Uruguayan longliners from 1982 to 2012. The Uruguayan tuna fleet can be divided into two well-defined periods: 1982-1992 Japanese-style longline (deep sets), and 1993-2012 American-style longline (shallow sets). The first period had higher standardized CPUE values, suggesting that fishing method factors such as set depth or bait type may have an effect on porbeagle catch rates.

For the 2022 NE Atlantic porbeagle assessment, 3 standardized CPUE indices were considered: a Norwegian longline CPUE series from 1950 to 1972, that shows a downward trend in the second half of the 1950s, but this trend seems to have stabilized in the early 1960s, followed by a slight increase in the late 1960s and early 1970s; a French longline CPUE series from 1972 to 2009, that shows that the relative abundance index obtained decreases in the 1970s, but thereafter varies without trend; a Spanish longline CPUE series from 1986 to 2007, that presents higher values in the 2000s, with large interannual variations. This index was previously used in the 2009 ICCAT-ICES assessment. Also, it was considered in the assessment a composite survey CPUE series constructed by combining CPUEs of a French commercial vessel, from 2000 to 2009, with CPUEs of a survey carried out in 2018-2019.

POR-3. State of the stocks

Due to changes in management practices that would have affected the development of CPUE series and potentially length composition data, in 2020 the Committee was constrained to use non-traditional stock assessment methods. Overfished stock status could only be determined for the NW stock and overfishing stock status, for the combined stocks in the North Atlantic and the South Atlantic. The Committee formally assessed the NE stock together with the ICES Working Group of Elasmobranch Fishes (WGEF) in 2021-2022.

Two modelling approaches were used to assess the status of porbeagle shark in the Atlantic and two additional methods were also explored. The Sustainability Assessment for Fishing Effects (SAFE) was used to evaluate whether the combined North and combined South Atlantic stocks were experiencing overfishing. The Incidental Catch Model (ICM) was used to evaluate whether the NW Atlantic stock was currently overfished and to determine the stock's capacity for future removals. Exploratory analyses that were not used to derive advice for the current assessment included the ICM fit to the South Atlantic stock, length-based approaches fit to the NW, SW, and SE stocks, and input control management options explored in a preliminary MSE approach for the NW stock. All of the exploratory approaches showed promise and could be further explored in future assessments.

Results of the SAFE approach indicated that neither the North Atlantic nor the South Atlantic stocks are undergoing overfishing. It was noted that while this is a data-limited approach, the overfishing status results were robust to the selectivity curve assumed and the post-release mortality value used in the computation of post-capture mortality. The Committee noted that for the South Atlantic results are in line with those found in the 2017 Southern Hemisphere (SH) porbeagle Areas Beyond National Jurisdiction (ABNJ) stock status assessment, with F/F_{MSY} values from both studies being of relatively similar magnitude (annual mean=0.063, range: 0.046 to 0.083 for 2006-2014 in the SH assessment vs. annual mean=0.113, range: 0.107-0.119 for 2010-2018 in the SAFE analysis).

An equal mix of annual and biennial reproduction was considered the most likely scenario for the porbeagle population in the NW Atlantic, so these productivity assumptions were used for the base case formulation of the ICM. Two alternate parameterizations of the ICM were evaluated to determine the model's sensitivity to life history assumptions as well as to the assumed population size in 2018. The first sensitivity analysis assumed a reproductive periodicity of only one year (annual reproduction), consistent with productivity assumptions in the 2009 assessment. The second assumed larger population size in 2018, so that predicted abundance in 2009 matched the value of 200,000 animals from the Canadian Statistical-Catch-at-Age model presented at the 2009 assessment. In all formulations, the stock was predicted to be overfished in 2018 with > 70% probability, even though abundance has been increasing since 2001. The scenarios differed in how far 2018 abundance was below the MSY proxy for biomass, with both sensitivity analyses suggesting that the population was closer to the reference point. The base case formulation of the ICM estimated biomass in 2018 to be 57% of the MSY proxy reference point (353,000 animals), giving a 98% probability of the stock being overfished.

Due to a lack of reporting, the magnitude of dead discards remains uncertain and post-release mortalities are not incorporated in this assessment, so there remains considerable uncertainty in the assessment of status. If actual total removals (unreported landings, dead discards, and post-release mortalities) do not largely exceed what has been estimated, then with the large reduction in recent reported removals, the Committee considers it unlikely that the stock is undergoing overfishing, but it considers that the stock remains overfished.

The Northeast Atlantic porbeagle stock has the longest recorded history of commercial exploitation for ICCAT sharks. During the 2009 assessment, a lack of CPUE data for the peak of the fishery was considered to add uncertainty in identifying the status relative to virgin biomass. This issue has been resolved in the 2022 assessment with the availability of the Norwegian longline CPUE series which begins in 1950, thus when catches were still above 3,000 t. The 2022 stock assessment was carried out using the Surplus Production Model in Continuous Time (SPiCT) model with priors agreed for the final benchmark assessment. The exploited biomass decreases below B_{MSY} in the early 1950s. Despite an increase in the 2010s due to the fishing restriction in place since 2010, $B/B_{MSY} = 0.5$ in 2022. The stock remains overfished, but overfishing is not occurring, consistent with the low values of current F (**POR-Figure 2**).

POR-4. Outlook

Projections conducted with the ICM for the NW stock indicated that removals of less than 7,000 sharks (214 t) would allow rebuilding with a 60% probability by 2070 (a projection interval of 2.5 generations) and removals of less than 8,000 sharks (245 t) would allow rebuilding with a 50% probability by 2060 (**POR-Table 2** and **POR-Figure 3**). If removals remained similar to 2014-2018 (mean = 47 t), the stock was predicted to rebuild with at least a 50% probability between 2030 and 2035). However, the Committee emphasized that recent removals are very likely underestimated because few CPCs report dead discards, and post-release mortality of live discards was not taken into account.

During the 2022 porbeagle northeast stock assessment, long-term projections using constant catch were not presented because technical issues prevented projections from being carried out during the assessment. So, Kobe Strategy matrix was not created. Projections will be produced during the next porbeagle stock assessment.

POR-5. Effect of current regulations

In 2013 Uruguay prohibited retention of porbeagle sharks and Canadian directed fisheries for porbeagle have also been closed since 2013. From 2010–2014, successive EC Regulations had established a zero TAC for the Northeast porbeagle in EU waters of the ICES area and prohibited EU vessels to fish for, to retain on board, to transship and to land porbeagle in international waters. Since 2015 it has been prohibited for EU vessels to fish for, to retain on board, to transship or to land porbeagle, with this applying to all waters. Since 2021 porbeagle is also included on the list of prohibited species in UK waters. It has been forbidden to catch and land porbeagle in Sweden since 2004; and in 2007, Norway banned all direct fisheries for porbeagle. In 2017, a regulation was issued to ban all targeted fishing in Icelandic waters for spurdog, porbeagle and basking shark and stipulating that all viable catch in other fisheries must be released.

Estimated catches (based primarily on landings data) for the NE stock have steadily decreased since the species became prohibited in 2010 (21 t) to 15 t in 2022; for the NW stock catches of 284 t were estimated for 2013 but have decreased to 7 t in 2022; catches for the SE and SW stocks are insignificant, less than 4 t annually since 2015 for the SE and 0 t for the SW since 2013. Captures in the Mediterranean have historically been very low, less than 1 t since 1980 (**POR-Table 1**). However, the Committee noted that these catches likely underestimate total removals because they do not include dead discards in many cases and reporting of post-release mortality of live releases is not required. Furthermore, the magnitude of porbeagle removals in non-ICCAT coastal fisheries is unknown but likely high.

The proportion of catches released alive has increased since 2015 following the implementation of Rec. 15-06, which obligates that CPCs require their vessels to promptly release unharmed, to the extent practicable, porbeagle sharks caught in association with ICCAT fisheries when brought alive alongside for taking on board the vessel.

Porbeagle was listed under Appendix II of the Convention on International Trade in Endangered Species (CITES) in 2013. Among other things, CITES Appendix II carries a requirement that Parties issue export and import, as well as introduction from the sea, permits based on findings that the take is legal and sustainable. Development of these "non-detriment findings" and related permitting processes is underway.

Parties to the Convention on Migratory Species (CMS) have listed 29 elasmobranch species under its Appendices. Appendix II, which includes porbeagle, signals a commitment to international cooperation toward conservation.

Under current regulations, 2020 NW assessment and 2022 NE assessment indicate that both stocks have increased in the last 10 years, showing in the case of the NW a rebuilding trend since 2001.

POR-6. Management recommendations

The following management recommendations were agreed upon and included in the Executive Summary based on the 2020 ICCAT porbeagle stock assessment. During the 2022 SCRS meeting, section 1a was updated with the information reported by CPCs, and section 7 was discussed and agreed based on the results of the NE porbeagle stock assessment conducted during 2022 in a joint process between ICCAT and ICES.

The Committee recommends that the Commission work with countries catching porbeagle and relevant Regional Fisheries Management Organization (RFMOs) to ensure recovery of North Atlantic porbeagle stocks (e.g., ICES, Northwest Atlantic Fisheries Organisation (NAFO)). In particular, porbeagle fishing mortality should be kept at levels in line with scientific advice and with removals not exceeding the current level. New targeted porbeagle fisheries should be prevented, porbeagles retrieved alive should be released following best handling practices to increase survivorship, 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, and ICCAT should facilitate appropriate communication.

1. The SCRS needs cooperation from all CPCs to improve catch statistics, which is critical to advancing the assessments of all porbeagle stocks.

    a) Three CPCs have reported live discards of porbeagle for 2021. The Committee underlines that the reporting and quantification of live discards is critical, especially for a stock where all live animals must be released (Rec. 15-06); the Commission should find ways to encourage improved reporting of live discards.
    b) There is a need for CPCs to strengthen their monitoring and data collection efforts, including but not limited to improved estimates of dead discards and the estimation of CPUEs using observer data.
    c) The Committee requests CPCs revise their porbeagle catch series (landings, live discards, and dead discards) including incidental captures from their other non-ICCAT fisheries (gillnet, trawling, purse seiner, etc.) to allow the SCRS to incorporate all mortality sources into future assessments and reduce the uncertainty in stock status and projections.
    d) In addition, the Committee recommends that the ICCAT liaise with parties (e.g., other RFMOs) and engage in data mining to determine the total capture from non-ICCAT parties.

2. The Committee notes that management recommendations for porbeagle stocks under ICCAT responsibility are drafted for ICCAT fisheries. However, porbeagle stocks are subject to mortality from CPCs' coastal fisheries and countries that are not ICCAT Parties. Therefore, the Committee recommends that CPCs implement a live release requirement for all porbeagle caught in their waters and that ICCAT develop integrated management approaches (with other countries, other Regional Fisheries Bodies, United Nations Food and Agriculture Organization (FAO)) to assure the sustainability of Atlantic porbeagle stocks.

3. The Committee notes that some landings and the majority of discards go unreported, meaning that total mortality of porbeagle from all sources (i.e. landings, dead discards and live releases that subsequently die as a result of gear interactions) is underestimated. For the purposes of this assessment, the Committee estimated unreported landings and dead discards preliminarily that were 89% higher than reported but did not estimate mortality following live release. The Commission should be aware that actual removals are higher than what is being reported and Kobe matrices will be optimistic to the extent that removals are underreported.

4. Considering the underreporting of removals, and the current low stock status of the NW Atlantic stock (B_{2018}/B_{MSY}=0.57), the Committee recommends that total removals (i.e. the sum of landings, dead discards, and post-release mortality of live releases) do not exceed current levels (including unreported removals) to allow for stock recovery. Although the Kobe matrix might suggest that some increases in total removals could allow for potential recovery in the long term, the assessment suggests that the stock is productive enough to recover in a much shorter time frame if total removals are maintained at a lower level. This is consistent with Rec. 11-13 that overfished stocks be recovered in as short a period as possible. However, the Commission should be aware that actual removals (particularly dead discards and post-release mortalities of live releases) are higher than what is being reported and the Kobe matrix is overly optimistic to the extent that removals are underreported.

5. While there is large uncertainty in southern stock structure, new information suggests a single stock of porbeagle in the South Atlantic; the Committee had, until now, considered two stock units, SW and SE. Indeed, there may be a southern stock that extends across Indian and Pacific Ocean basins. More research on stock structure needs to be undertaken to determine an appropriate unit stock. Until this research is done, the Committee recommends leaving the management units as currently defined.

6. The Committee was not able to draw any conclusions on the overfished status of the southern stock(s). It noted that indeed, conventional data (e.g. landings, representative length compositions) cannot be collected for any northern or southern porbeagle stocks, so the Committee concluded that alternative (e.g. fishery independent) data collection methods that allow CPUE or length-frequency data (or other altogether different forms of data) to be collected are required to provide more reliable estimates of stock status in the North and in the South Atlantic.

7. Considering the underreporting of removals, the current stock status of the NE Atlantic stock B_{2022}/B_{MSY}=0.464 (0.15-1.43), and the lack of reliable projections to build Kobe II Strategy Matrix (K2SM), the Committee recommends that total removals (i.e., the sum of landings and estimated dead discards) at the very least shall not exceed the average reported ICCAT catch since the implementation of the zero TAC recommendation (i.e., 2010-2021 which current estimates would be 9.3 tons) to allow for stock recovery. Lower levels of removals will accelerate such recovery.

NORTHWEST ATLANTIC PORBEAGLE SUMMARY TABLE

Current Yield (2023)		6 t[1]
Relative Biomass	B_{2018}/B_{MSY}	0.57[2]
Fishing Mortality at MSY	F_{MSY}	0.049[3]
Relative fishing mortality	$F_{2010\text{-}2018}/F_{MSY}$	0.413[3]
Stock Status (2018)	Overfished Overfishing	Yes Not likely
Management Measures in Effect		Rec. 04-10, Rec. 07-06, Rec. 15-06

[1] Task 1 catch as of 22 September 2024.
[2] Value obtained with the ICM model. The reference point used (SPR_{MER}) is a proxy for B_{MSY}.
[3] Value obtained with the SAFE approach for the Northwest Atlantic.

NORTHEAST ATLANTIC PORBEAGLE SUMMARY TABLE

Current Yield (2023)		18 t[1]
ICES-ICCAT Yield in 2021		7.95 t[2]
Relative Biomass	B_{2021}/B_{MSY}	0.464 (0.15-1.43)[2]
Fishing mortality at MSY	F_{MSY}	0.051 (0.0217-0.120)[3]
Relative fishing mortality	F_{2021}/F_{MSY}	0.013 (0.0024-0.073)[3]
Stock Status (2021)	Overfished Overfishing	Yes No
Management Measures in Effect		Rec. 04-10, Rec. 07-06, Rec. 15-06

[1] Task 1 catch as of 22 September 2024.
[2] The value reported represents the total catches determined at the ICES-ICCAT Working Group on Elasmobranch Fishes (WGEF). While Task 1 reported catch for the Northeast stock was 15.4 t in 2021, the catch shown does not include all dead discards and includes no mortalities resulting from live releases.
[3]Range obtained from reference case SPiCT with 95% Bayesian credibility intervals.

SOUTH ATLANTIC PORBEAGLE SUMMARY TABLE

Current Yield (2023)		0 t[1]
Relative Biomass	B_{2018}/B_{MSY}	Unknown
Fishing mortality at MSY	F_{MSY}	0.062[2]
Relative fishing mortality	$F_{2010\text{-}2018}/F_{MSY}$	0.113[2]
Stock Status (2018)	Overfished Overfishing	Undetermined Not likely
Management Measures in Effect		Rec. 04-10, Rec. 07-06, Rec. 15-06

[1] Sum of Task 1 catches for the Southwest and Southeast Atlantic stock areas as of 22 September 2024.
[2] Value obtained with the SAFE approach for the South Atlantic.

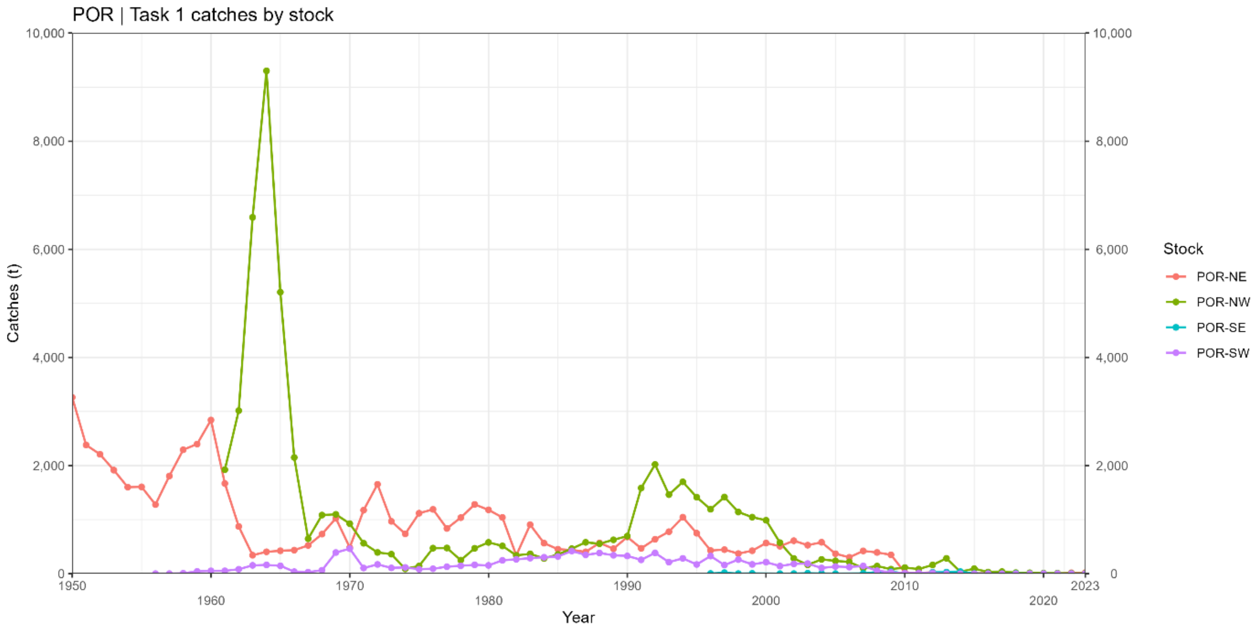
POR-Table 1. Estimated catches (t) of porbeagle (*Lamna nasus*) by area, gear, and flag.

				1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
TOTAL				3027	2334	1951	2041	1776	1648	1769	1223	1074	887	954	740	642	671	619	495	152	120	225	323	78	104	41	48	27	16	14	15	22	23
	ANE			1045	749	428	444	371	424	567	506	610	527	578	367	302	421	391	349	21	14	25	10	5	8	9	8	4	0	3	5	15	18
	ANW			1698	1415	1192	1418	1141	1046	988	574	282	164	264	237	217	101	141	84	114	85	162	284	35	93	30	39	19	16	11	10	7	6
	ASE			0	0	3	19	1	6	0	1	1	9	3	1	0	5	30	37	6	7	26	29	38	3	1	0	4	0	0	0	0	0
	ASW			284	170	327	159	261	172	214	141	181	187	105	133	122	143	55	26	10	14	12	0	0	0	0	0	0	0	0	0	0	0
	MED			0	0	1	0	1	0	1	1	0	0	3	2	1	0	2	1	1	0	2	0	0	0	1	1	0	0	0	0	0	0
Landings	ANE		Longline	101	64	55	39	33	28	33	41	83	142	275	63	62	301	229	143	9	2	1	1	0	5	3	1	0	0	0	0	0	0
			Other surf.	943	685	373	405	338	396	533	465	527	385	303	305	240	120	162	206	13	12	24	9	5	3	6	7	4	0	3	5	9	7
	ANW		Longline	1697	1413	1186	1406	1124	1034	985	566	269	151	252	226	208	91	131	67	83	68	134	248	14	15	10	10	6	0	0	0	0	0
			Other surf.	0	2	6	12	18	12	3	8	13	13	12	12	8	11	9	12	20	15	23	30	7	9	5	8	3	12	5	1	0	3
	ASE		Longline	0	0	3	15	1	2	0	1	1	9	3	1	0	5	30	36	6	7	25	29	13	3	1	0	4	0	0	0	0	0
			Other surf.	0	0	0	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	0	0	0	0	0	0	0	0	
	ASW		Longline	282	170	326	159	259	170	213	141	181	187	105	133	122	143	55	26	10	14	12	0	0	0	0	0	0	0	0	0	0	0
			Other surf.	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	MED		Longline	0	0	1	0	1	0	1	1	0	0	2	2	0	0	2	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0
			Other surf.	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	
Discards	ANE		Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
			Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	10
	ANW		Longline	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	11	2	5	6	14	67	13	19	7	0	1	2	4	3
			Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	3	4	6	3	0
	ASE		Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	ASW		Longline	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Landings	ANE	CP	EU-Denmark	93	86	72	69	85	107	73	76	42	21	20	4	3	2	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
			EU-España	52	19	41	25	25	18	13	24	54	27	11	14	34	8	41	77	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			EU-France	820	565	267	315	219	240	410	361	461	303	413	276	194	354	311	228	0	2	4	0	0	3	0	1	0	0	0	0	2	0
			EU-Germany	0	0	0	0	2	0	17	1	3	5	7	5	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	8	2	6	3	11	18	3	4	8	7	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			EU-Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			EU-Portugal	1	1	1	1	1	0	7	4	10	101	50	14	6	0	3	17	7	0	0	0	0	0	0	0	0	0	0	0	0	0
			EU-Sweden	2	2	1	1	1	1	1	1	0	0	5	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Great Britain	0	0	0	0	1	6	8	12	10	25	24	24	11	26	15	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Iceland	4	6	5	3	4	2	2	3	2	1	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
			Japan	0	0	5	4	0	0	0	0	0	0	0	0	0	12	0	3	2	1	1	0	0	0	2	0	0	0	0	0	0	0
			Korea Rep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	1	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	1	0	0	1	0	0	0	0	0	0	0
			Norway	24	26	28	17	27	32	22	11	14	19	24	8	27	10	12	10	12	11	17	9	5	4	6	6	3	0	3	5	8	7
			Russian Federation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		NCO	Faroe Islands	48	44	8	9	7	10	13	8	10	14	5	19	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	ANW	CP	Barbados	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	3	13	1	2	1	1	1	0	0	0	0	0
			Canada	1575	1353	1051	1334	1070	965	902	499	237	142	232	202	192	93	124	62	83	30	33	19	9	4	2	2	1	0	0	0	0	0
			FR-St Pierre et Miquelon	0	7	40	13	20	0	13	2	1	2	4	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Japan	29	15	10	9	19	41	47	52	21	7	20	27	18	5	10	10	11	13	48	98	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	1	1	1	13	20	3	0	0	0	0	0	0	0	0	0	0
			USA	79	26	58	41	9	2	1	1	1	0	0	0	0	0	0	0	2	9	19	27	6	8	4	8	3	12	5	1	0	3
			Venezuela	4	1	7	2	8	9	6	2	0	0	0	0	0	0	1	3	3	9	19	69	4	6	4	8	4	0	0	0	0	0
		NCC	Chinese Taipei	10	12	27	18	13	27	19	18	22	12	8	7	5	3	2	2	3	7	15	50	1	5	4	0	0	0	0	0	0	0
		NCO	Cuba	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	ASE	CP	EU-España	0	0	0	2	1	2	0	1	1	9	3	0	0	0	1	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			EU-Portugal	0	0	0	0	0	0	0	0	0	0	0	1	0	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	25	0	0	0	0	0	0	0	0	0
			Guinea Ecuatorial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Japan	0	0	3	13	0	0	0	0	0	0	0	0	0	5	29	25	6	7	25	15	13	3	1	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	14	0	0	0	0	4	0	0	0	0	0
		NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
		NCO	Benin	0	0	0	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	ASW	CP	Brazil	32	49	33	36	38	58	60	67	74	49	37	52	32	23	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
			China PR	1	0	0	0	0	13	36	4	0	5	4	2	2	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			EU-España	35	43	28	25	1	12	7	13	1	0	0	0	3	5	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			EU-Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			EU-Poland	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			EU-Portugal	0	0	0	1	0	0	0	1	1	1	4	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Japan	14	6	6	1	1	2	7	4	3	2	11	3	3	4	12	10	2	0	0	0	0	0	0	0	0	0	0	0	0	0
			Korea Rep	2	1	6	1	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Panama	24	4	21	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Philippines	0	0	0	0	0	0	0	0	0	0	1	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Uruguay	5	3	19	5	13	2	4	20	8	34	8	28	34	3	40	14	6	12	12	0	0	0	0	0	0	0	0	0	0	0
		NCC	Chinese Taipei	146	57	168	65	170	73	84	29	93	95	39	43	47	99	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
		NCO	Chile	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Falklands	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			NEI (Flagrelated)	22	8	46	23	37	11	15	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Seychelles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	MED	CP	EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			EU-Italy	0	0	0	0	0	0	0	0	0	0	2	1	1	0	2	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
			EU-Malta	0	0	1	0	1	0	1	1	0	0	0	1	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Discards	ANE		EU-Denmark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	10
			EU-Germany	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	ANW	CP	Barbados	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	1	1	1	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	1	2	3	2	3	3	5	8	6	3
			Japan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	0	1	1	1	5	1	1	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	1	0	0	0	0	0	0	0	0	0	0	0
			UK-Bermuda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			USA	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	1	1	2	7	34	1	9	1	0	0	0	0	0
			Venezuela	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	1	1	3	14	4	7	4	0	0	0	0	0
		NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	1	1	11	4	0	0	0	0	0	0	0
	ASE	CP	Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			EU-España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			El Salvador	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Korea Rep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

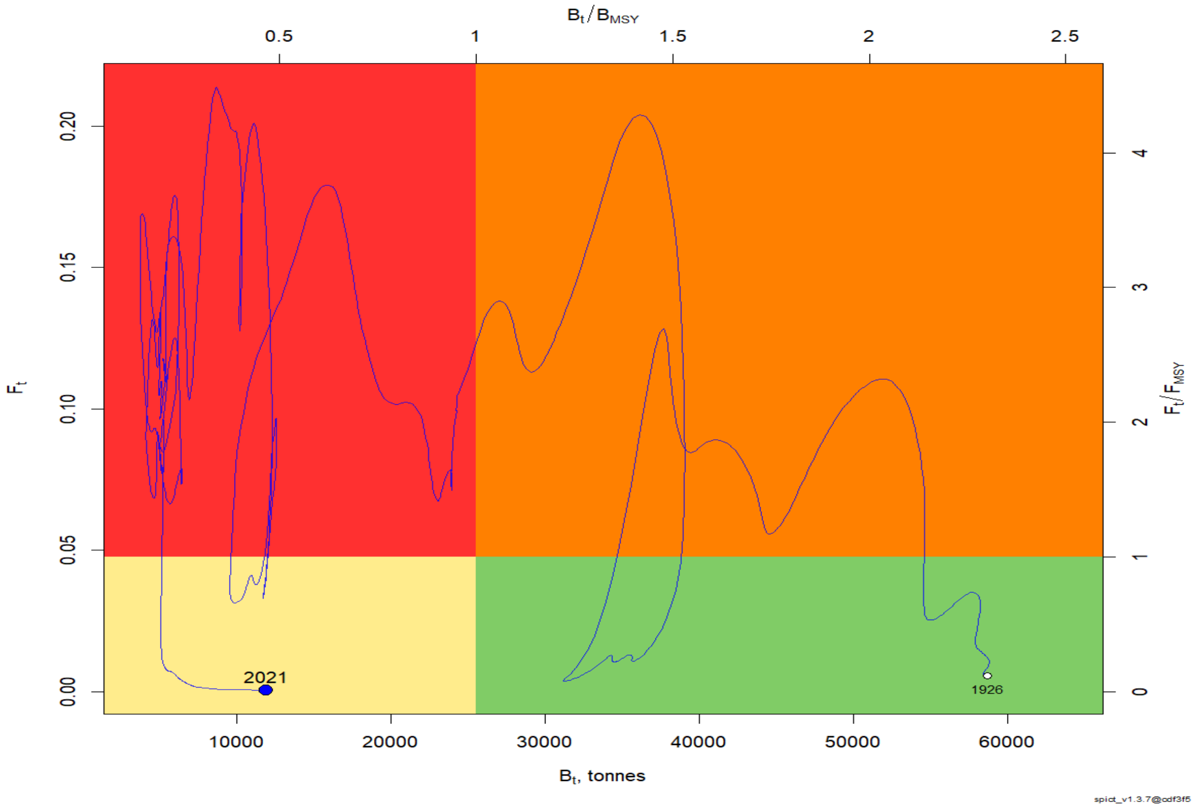
			1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
		Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		South Africa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ASW	CP	El Salvador	0	0	0	0	0	0	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	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

POR-Table 2. Kobe II strategy matrix showing the probability of being above the overfished reference point (a proxy for B_{MSY}) by 5-year time period for removals scenarios ranging from 0 to 24,000 individuals (0-734 t) for porbeagle in the Northwest Atlantic.

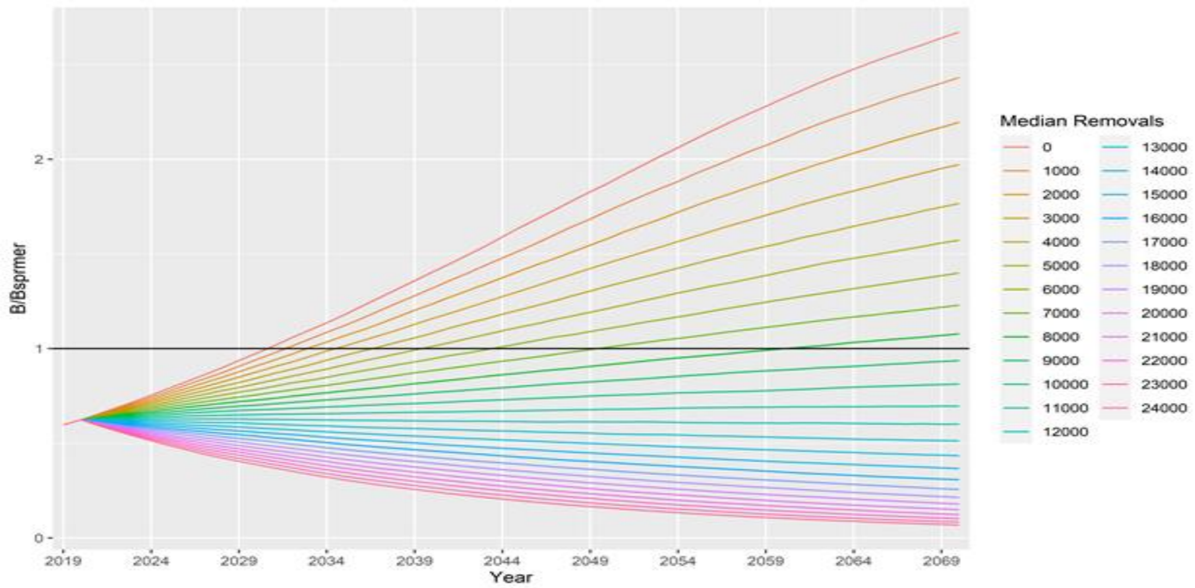
Animals (#)	Ton (mt)	2020	2025	2030	2035	2040	2045	2050	2055	2060	2065	2070
0	0	2%	21%	47%	68%	83%	92%	96%	98%	99%	99%	100%
1000	31	3%	21%	44%	63%	77%	87%	92%	95%	97%	98%	99%
2000	61	2%	19%	40%	57%	71%	81%	87%	91%	94%	95%	96%
3000	92	1%	16%	35%	50%	62%	72%	79%	85%	88%	90%	92%
4000	122	2%	15%	32%	47%	58%	66%	73%	78%	82%	84%	87%
5000	153	2%	13%	27%	41%	50%	58%	64%	68%	72%	76%	78%
6000	183	1%	12%	25%	37%	45%	52%	57%	62%	65%	67%	70%
7000	214	2%	10%	22%	32%	39%	46%	50%	54%	57%	60%	62%
8000	245	2%	10%	19%	27%	34%	39%	44%	47%	50%	53%	55%
9000	275	2%	8%	17%	23%	30%	34%	38%	41%	43%	45%	47%
10000	306	2%	8%	14%	20%	25%	29%	31%	34%	36%	38%	39%
11000	336	1%	6%	13%	17%	21%	25%	27%	29%	31%	32%	33%
12000	367	2%	7%	11%	15%	18%	21%	23%	24%	26%	27%	28%
13000	398	2%	5%	9%	12%	14%	16%	18%	19%	20%	21%	22%
14000	428	2%	5%	7%	9%	12%	13%	14%	15%	16%	17%	18%
15000	459	1%	3%	5%	6%	8%	9%	10%	11%	11%	12%	12%
16000	489	2%	3%	4%	5%	6%	7%	8%	9%	9%	10%	10%
17000	520	2%	2%	3%	4%	5%	5%	6%	6%	6%	7%	7%
18000	550	2%	2%	2%	3%	3%	4%	4%	4%	5%	5%	5%
19000	581	2%	1%	2%	2%	3%	3%	3%	3%	3%	3%	4%
20000	612	2%	1%	1%	2%	2%	2%	2%	2%	2%	3%	3%
21000	642	2%	1%	1%	1%	1%	1%	2%	2%	2%	2%	2%
22000	673	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
23000	703	2%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%
24000	734	2%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%



POR-Figure 1. Porbeagle (POR) catches up to 2023 for each of the four management units (POR-NE in red, POR-NW in green, POR-SE in blue, POR-SW in purple) reported to ICCAT (Task 1).



POR-Figure 2. NE Atlantic porbeagle - Plot showing current status of northeast Atlantic porbeagle for the base case Surplus Production model in Continuous Time (SPiCT) model. Note that the step for the model is 1/16th of a year (0.0625).



POR-Figure 3. NW Atlantic porbeagle - Predicted relative abundance for annual removals ranging from 0 to 24,000 animals for the northwest stock, expressed as the biomass/biomass at SPR_{MER} ratio (a proxy for B_t/B_{MSY}) for the base case of the ICM. The horizontal line shows the reference point, and the projections extend for 50 years. Average removals from 2016-2018 were assumed for 2019 and 2020 and the projection starts in 2021.

9.18 Ecosystem and Climate Change considerations

The Committee did not provide any additional considerations on ecosystem and bycatch matters, nor on climate changes related to the different stocks managed by ICCAT.

10. ICCAT Research Programmes

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

GBYP Phase 13 started on 1 May 2023, with an initial duration of 12 months, but it was extended until 31 July 2024, to allow for completion of some important studies, such as the bluefin tuna whole genome sequencing, the tagging campaign in the eastern Mediterranean and further development of Close-Kin Mark-Recapture (CKMR) related models. Phase 14 started on 1 February 2024, with a duration of 23 months.

The most relevant research activities completed or initiated during this reporting period (October 2023-September 2024) were:

a) Data recovery and management

This has been mainly an in-house activity, centered on providing further support to the implementation at the ICCAT Secretariat of new information systems for data related to biological and electronic tagging studies, to facilitate broad joint studies aiming improvement of parameterization of the models used for stock management.

b) Fishery independent indices: GBYP aerial surveys

The results from 2023 GBYP aerial surveys were analyzed, providing improved BFT-E stock abundance and biomass indices time series in the western and central Mediterranean, which will be used in the future for reconditioning the Management Strategy Evaluation (MSE). A strict update of the index value in the Balearic Sea area has also been carried out, to update the index currently used within the framework of the BFT MSE. In addition, new aerial surveys were carried out in the western and central Mediterranean in June 2024.

c) Tagging

The general support to BFT tagging activities has included: provision of conventional tags and advice to the CPCs teams; reward programme to enhance tag recovery; continuous updating of the ICCAT conventional tagging database; and active and direct support to electronic tagging campaigns developed by CPCs research teams through provision of ICCAT owned tags. Most of the 13 Memorandums of Understanding (MoUs) signed within Phase 13 have been successfully completed, which enabled deployment of 98 GBYP owned archival pop-up tags in different regions of the Mediterranean and both sides of the northern Atlantic, from Norwegian waters to the Canary Islands. Only in the case of the Ligurian Sea could the tags not be deployed due to reasons of force majeure. A new Call for Expressions of Interest to collaborate with the GBYP e-tagging programme was launched in July 2024 under GBYP Phase 14, and 10 new MoUs have been signed to deploy 51 pop-up tags, 18 internal archival tags and 40 acoustic tags throughout 2024 and 2025.

d) Biological studies

BFT biological sampling and analysis developed within Phase 13 has been completed. As a result, different types of biological samples from more than 700 adult and juvenile individuals and almost 3000 larvae, have been aggregated to the GBYP Tissue Bank. Analytical work has focused on genetics, including novel approaches (e.g. Whole Genome Sequencing), aimed at better characterizing the population structure and the mechanisms driving evolutionary divergence between bluefin tuna spawning populations. A new Call for Tenders has been launched within Phase 14, to determine the frequency of the different Atlantic bluefin tuna mitochondrial haplotypes, and to evaluate the sibship among bluefin tuna larvae sampled within the Balearic Sea (EU Data Collection Framework (DCF) ichthyoplankton survey), which are necessary for design and possible implementation of a CKMR study for the East Atlantic and Mediterranean stock.

e) Modelling

Further support has been provided to the implementation of the MSE process, namely by facilitating the attendance of key experts at relevant meetings. In addition, a spatially-explicit CKMR model, suitable for eastern Atlantic and Mediterranean bluefin tuna has been developed, to investigate some sampling options, and to check what kind of precision might be achievable for estimating total abundance of adults.

10.2 Small Tunas Year Programme (SMTYP)

Between 2018 and 2024, SMTYP continued collecting biological samples aimed at growth, maturity and stock structure studies on small tunas species (little tunny, LTA, *Euthynnus alletteratus*; Atlantic bonito, BON, *Sarda sarda*; and wahoo, WAH, *Acanthocybium solandri*). In that regard, a single contract was issued to a consortium of 12 institutions (11 CPCs) by the ICCAT Secretariat in 2018 that ended on 31 March 2019. In July 2019 a new contract was signed with the same consortium, while in 2024 a new consortium was set up involving 13 entities from 10 CPCs, and a new contract was signed.

The objective of the latter contract was to collect biological samples to:

i) fill specific size gaps for estimating the growth and maturity parameters for BON, LTA and WAH;

ii) determine the growth and reproduction parameters for BON, LTA, WAH, FRI and BLT;

iii) refine the stock structure analysis for WAH, BON, LTA FRI and BLT; and,

iv) investigate genetic species differentiation between FRI and BLT.

A number of documents and presentations which will be presented results of the research conducted since the SMTYP beginning, will be provided during 2025 Intersessional Meeting of the Small Tunas Species Group.

In addition, the Group identified the priorities that should be considered in terms of the species and areas to be sampled and revised the biological data to be collected under the SMTYP biological collection contract in 2024-2025.

These priorities are presented in the Small Tunas Workplan for 2025 (item 17.1.8), which also contains details on other relevant research activities to be developed throughout 2024-2025 including:

- updating the biological meta-database,
- estimation of length-weight relationships representative at the stocks/regional level,
- calibration and adopting internationally agreed maturity scales.
- further investigating and applying of data limited methods to be used for the provision of management advice for these stocks.

10.3 Shark Research and Data Collection Programme (SRDCP)

The Shark Species Group (SSG) continued the collaborative study on the age and growth of the South Atlantic shortfin mako (samples provided by EU-Portugal, Uruguay, Japan, Namibia and Brazil). In 2024 age readings and analysis have been taking place, and preliminary growth curves have been presented, which included the use of alternative growth modelling, such as Bayesian approaches. For additional details are contained in Marquez *et al.*, 2024, with the final result to be presented at the upcoming stock assessment scheduled for 2025.

In 2022, a study on genetic analysis of porbeagle in the Atlantic Ocean was initiated. First results of this study were presented in 2023 based on samples from three localities in the Atlantic Ocean (Northeast, Northwest, and Southeast). In 2024, the coverage of sampling localities analysed and resolution of analysis were greatly improved, including samples from the southwestern Atlantic, South Indian Ocean and southwestern Pacific Ocean. The results of genetic analyses support previous results and clearly demonstrated the existence of two distinct genetic groups as two sibling species, the North Atlantic and the Southern Hemisphere porbeagles. Also, results strongly support no genetic differentiation between samples collected from the Northeast and the Northwest Atlantic Oceans as well as among samples collected from oceans in the Southern Hemisphere. Next steps will include the incorporation to the analysis of new samples from the missing important areas (e.g. the Mediterranean Sea and the southeastern Pacific Ocean).

Studies on movements, stock boundaries, habitat use and post-release mortality of shortfin mako caught on pelagic longline fisheries continued. The study of post-release mortality assessment published by Miller *et al.* (2020) is being updated with information from the latest tags deployed, as well as information from other national tagging programmes. Results will be presented during the planned 2025 Shortfin Mako Data Preparatory Meeting. With regards to shortfin mako movements, a total of 52 satellite tags have been deployed, including 7 in the SW Indian Ocean to determine possible trans-oceanic movements.

The porbeagle electronic tagging has continued by teams from EU-France, EU-Portugal and Norway in the North Atlantic to better understand movements, stock boundary, and habitat use of this species. To date, a total of 9 tags have been deployed, with one of the sharks showing a long migration (~5,000 km) in the North Atlantic. The 2022/2023 batch of pop-up satellite archival (PSAT) tags that showed problems have now been replaced, and their deployment is planned to continue. Canada has also deployed satellite tags on porbeagle in the NW Atlantic, and a joint analysis for the NE and NW Atlantic combining all available tags is planned.

The movements, stock boundaries and habitat use of other shark species, considered as priority species by the SCRS, in the Atlantic Ocean are also part of the ICCAT e-tagging efforts. For those species, a total of 61 pop-up archival transmitting tag (miniPATs) have been deployed to date by EU-Portugal, USA, Uruguay, Brazil, EU-Spain and the UK. The species tagged to date included silky (33), oceanic whitetip (10), smooth hammerhead (6), scalloped hammerhead (1), blue shark (7) and bigeye thresher (4). A dedicated ICCAT tagging campaign was conducted in the first half of 2024 in the equatorial area, which resulted in the deployment of 15 shark tags, included in those listed above. In line with the objectives of the SRDCP, in 2024 the United States funded a project to gather information on the movements of blue sharks between the Mediterranean and the NE Atlantic. Regarding conventional tagging, ICCAT acquired in 2024 stainless steel dart tags, that have already been distributed for some observer programmes that have the opportunity to tag sharks.

In 2023 a new study on the reproductive biology of North Atlantic shortfin mako began, based on the quantification of reproductive hormones concentrations from muscle tissue samples collected from stored vertebrae. Preliminary results suggest, that like the porbeagle shark, muscle tissue can be used to assess reproductive characteristics (i.e. maturity, reproductive status) and can provide critical information regarding important reproductive habitats for North Atlantic shortfin mako. Next step in this study is trying to obtain samples from gravid females, likely in October 2024, to fill this gap.

During the 2023 SRDCP Workshop, discussions on the potential of using Close Kin Mark Recapture (CKMR) highlighted the importance of following up with the CKMR for shortfin mako as an attempt to have absolute abundance estimates independent from those obtained in stock assessments. US scientists were funded with a National Oceanic and Atmospheric Administration (NOAA) grant to develop appropriate genomic tools to be used in a future CKMR study of oceanic whitetip shark in the Northwest Atlantic. This study has the potential to be included in the SRDCP and to be used as a first experience, that can be followed by other species.

10.4 Enhanced Programme for Billfish Research (EPBR)

The EPBR continued its activities in 2024. The Secretariat coordinates the transfer of funds, information, and data. The overall programme coordinator and Eastern Atlantic Coordinator during 2024 was Dr Fambaye Ngom Sow (Senegal), and Ms Karina Ramírez López (Mexico) remained as the West Atlantic Coordinator. The original plan (established in 1986) for EPBR included the following objectives: 1) to provide more detailed catch and effort statistics, particularly for size frequency data; 2) to initiate an ICCAT tagging programme for billfish; and 3) to assist in collecting data for age and growth studies. These objectives have been expanded to evaluate adult billfish habitat use, study billfish spawning patterns, and billfish population genetics, as these are essential pieces of information for improving billfish assessments. The Billfish Species Group also revised the original plan in order to overcome the data gap issues, in particular in artisanal fisheries of developing CPCs, taking into account the findings of regional reviews.

The previously available specific funding for EPBR has now been combined with the general research fund (ICCAT Science Envelope). Project funding is now being allotted on a more competitive basis with other Species Groups. The United States Data Fund has been supporting the EPBR activities.

In June 2024 a new contract was awarded to Institut sénégalais de recherches agricoles (ISRA), Centre de Recherches Océanographiques de Dakar/Thiaroye (CRODT, Senegal) to continue the activities of the previous contract for a 6 month period (until December 2024). Over this period, EPBR engaged research teams from Senegal, Côte d'Ivoire and Gabon to sample billfishes from the artisanal fleet. An EU research team from Portugal was also engaged, which has significantly enhanced the collection of samples onboard industrial vessels operating in the eastern Atlantic area and supported the analysis of data on length and age for estimating the growth parameters of the main billfish species that occur in the eastern Atlantic (*Makaira nigricans*, BUM; *Kajikia albida*, WHM; and *Istiophorus albicans*, SAI). The team reported that obtaining the samples requested by the Billfish Species Group has been difficult. It is easier to get the spines rather than the otoliths. The Secretariat reported that contacts have been made with the scientists working on the EU purse seine fleet to help obtain such samples. Under this new contract, 4 samples were collected by the Centre de Recherches Océanologiques (Cote d'Ivoire) (CRO), 13 additional samples collected by CRODT and 27 by Instituto Português do Mar e da Atmosfera (IPMA) from June to August 2024. Overall, a total of 567 samples have now been collected from those three species. All otoliths collected until 2023 were sent to the Fish Ageing Services in Australia for age reading, and the data were made available to the Consortium and analysed. The preliminary results of a study to evaluate the use of otoliths to estimate the age and provide some preliminary otolith-based estimates of potential longevity of Atlantic blue marlin (*Makaira nigricans*) were provided and used for blue marlin during the 2024 Atlantic Blue Marlin Stock Assessment Meeting (ICCAT, 2024i).

Derived from the 2024 Atlantic Blue Marlin Stock Assessment Meeting (ICCAT, 2024i) and derived from the discussion on the EPBR and in view of the fact that the administrative problems before the Commission could not be resolved, in 2024 ICCAT Circular #07036/2024 was issued to carry out the Study of the reproductive biology of Atlantic blue marlin in the gulf of Mexico, in which the Mexican Institute for Research in Sustainable Fisheries and Aquaculture (IMIPAS) again attended, and whose offer was accepted. In accordance with the Reference Terms, a SCRS presentation was provided during the 2024 Billfish Species Group meeting (Madrid, Spain, September 2024). Such presentation described, in detail, the methodology and activities to be carried out during the study, to discuss the current knowledge, with the aim to highlight the knowledge contribution made by the study in the Gulf of Mexico.

In 2024, a new contract is signed with the IPMA to carry out a billfish tagging campaign in the northeastern Atlantic, within the EPBR. The campaign started on 8 August, with the operations carried out along the temperate NE Atlantic area, off the southern Portuguese coast. Until 3 September, a total of 9 fishing trips have been carried out devoted to billfishes satellite tagging, and one tournament was carried out for opportunistic deployment of conventional tags. A total of 2 WHM specimens were tagged with satellite tags, and 29 additional WHM specimens were tagged opportunistically with conventional tags. There are plans to carry out several more additional trips in September and October devoted to satellite tagging, so that a minimum of 3 billfishes, possibly even more, can be tagged this season as planned. Overall, the original campaign objectives are being fully achieved and the final results will be provided in the final report.

10.5 Albacore Year Programme (ALBYP)

Studies of albacore reproduction continued for both the North and South stocks.

In the North Atlantic, a consortium of scientists from EU-Spain, Canada, Venezuela, and Chinese Taipei collected and processed 272 gonads from Venezuelan and Chinese Taipei longliners. First dorsal fin spines (n=163 from albacore collected in Venezuelan longliners) were also collected and analyzed to assign age and interpret maturity data. All the female albacore collected in the tropical area by Venezuela longliners were mature but exhibited no sign of spawning. Fecundity parameters were estimated using a reduced number of gonads (n=21) collected in May and June of 2021 and from July to September in 2022 (n=39) in the Central North Atlantic by Chinese Taipei longline vessels. Collection of albacore gonad and spine samples by observers on board the Chinese Taipei longline fleet continued in this area. A summary of the results obtained with samples from 2022 was presented in 2023.

In the South Atlantic, the reproductive biology study is being conducted by a consortium of scientists from Brazil, Uruguay, South Africa, Namibia, and Chinese Taipei. Biological sampling is being carried out in the three main areas of abundance/fishing in the South Atlantic. So far gonads were collected by the Brazilian (39), Chinese Taipei (161), South African (80), and Namibian (60) tuna fleets. About 176 gonads of males (n=100) and females (n=60) have been histologically processed and analyzed together with additional historical samples provided by Brazil, Uruguay, and South Africa. Results suggest that southern albacore spawns in the tropical Southwest Atlantic between spring and summer. Estimated L_{50} values were 88.0 cm FL and 89.7 cm FL for males and females, respectively and batch fecundity ranged from 0.14 to 1.7 million oocytes. However, these results should be seen as preliminary, since the sample size and geographic range analyzed were limited.

Another component of the research programme relates to movements and habitat use of Atlantic albacore, which is being conducted by scientists from Brazil, EU, Japan, South Africa, Uruguay, and Chinese Taipei. In the North Atlantic, several tagging surveys targeting large individuals have been conducted off the Canary Islands, where 33 MiniPATs have been implanted. In addition, in the Bay of Biscay tagging has targeted small and medium size albacore, with 2 MiniPATs and 155 internal archival tags having already been deployed. Posters announcing €1,000 rewards were produced in Spanish, French, English, Portuguese, Chinese, and Japanese, and distributed through collaborating Albacore Species Group participants from different CPCs. To date, data from 47 tracks have been gathered, which includes >5,000 tracking days. It is worth noting that for the first time nine albacore have been tagged for more than a year. These juveniles visited shallow waters of the Bay of Biscay in subsequent summers, while inhabiting deeper waters in the central and western Atlantic during the winter as well as travelling south to the Canary Islands before returning to the Bay of Biscay. In the South Atlantic, attempts to deploy MiniPATs have not yet been successful. The teams will continue to deploy tags and an update of the results will be presented in 2025.

Finally, a short-term contract was issued to accomplish the technical tasks required to follow the albacore Management Strategy Evaluation (MSE) schedule adopted by the Commission. According to this schedule, after adoption of the first ICCAT Management Procedure (MP) in 2021 (following adoption of a harvest control rule in 2017), it is necessary to check for the existence of exceptional circumstances on a yearly basis. In addition, in 2023 a new benchmark stock assessment using SS3 was conducted, which served as a basis for conditioning new operating models for the second round of the MSE framework, expected to be delivered in 2026. The contractors started the elaboration of a grid of reference operating models (OMs) based on Stock Synthesis as part of the new MSE, and tested the currently adopted MP on this new reference grid. In addition, they developed a new Observation Error Model by incorporating statistical properties of catch per unit effort (CPUE) residuals in both the historical and future parts of the time series. They also produced the necessary plots for the Albacore Species Group to discuss the detection of exceptional circumstances, as requested by the Exceptional Circumstances Protocol contained in the *Recommendation by ICCAT on conservation and management measures, including a Management Procedure and Exceptional Circumstances Protocol, for North Atlantic albacore* (Rec. 21-04).

10.6 Swordfish Year Programme (SWOYP)

The Swordfish Year Programme was established in 2018 to address key uncertainties important for improving the scientific advice for management of the stocks. The three main research areas - ageing and growth, reproductive biology, and genetics - are each led by study coordinators who oversee work involving 23 institutions from 15 ICCAT CPCs/Cooperating Non-Contracting Parties. The work to date has been organized through a series of short-term contracts and in 2022 was formalized as an ICCAT research programme. Since project inception, 4,712 swordfish representing all three ICCAT managed stocks have been sampled for some combination of fin spines, otoliths, muscle tissue, gonads, and additional information has been collected on fish size, sex, maturity stage, and catch date, location and method. The SWOYP aims to improve knowledge of the stock distribution, age and sex of the catch, growth rates, age at maturation, maturation rate, spawning season and location, stock boundaries and mixing, thereby contributing to the next major advance in the assessment of swordfish status. In addition, tagging work supports studies on distribution, movement, and habitat use which are important for the development of a species distribution model.

In 2018 and 2019, emphasis was placed on sample collection and standardization of sampling methods and processing among member institutions. Samples were collected in the major fishing areas in the North and South Atlantic and Mediterranean. Through all phases of the project, 4,712 samples have been collected from mostly longline fisheries, covering all three stocks. The majority of samples collected consist of an anal fin spine for aging, a piece of tissue for genetic analysis, and include data on fish size, sex, location and catch date. Within this sample set are 3,535 fin spines, 1352 otoliths, and 768 gonads. Subsequent processing and analysis of samples since 2019, has led to ageing and maturity reading efforts and calibration exercises. The resulting data have contributed to preliminary work on revised growth models, and maturity ogives. The genetic analyses have resulted in sequencing of the swordfish genome, identification of single nucleotide polymorphisms (SNPs) important for stock differentiation, and preliminary estimates of stock boundaries and mixing areas. Work within each of the project areas will continue in 2025 with continued processing of samples, readings of otoliths/spines and gonads, genetic analysis of tissues and collection of samples in areas where there are sampling gaps.

In 2023, SWOYP project leaders shifted their focus toward processing and analysis of a backlog of samples obtained in earlier project phases. This work has led the Committee to reach significant project milestones. In February 2023, SWOYP age readers and external experts refined swordfish ageing protocols and made significant progress on an age reading calibration exercise. Given the challenges of ageing swordfish (small size of swordfish otoliths and vascularization within fin spines), there still remains a great deal of uncertainty in existing age readings, particularly with age rings close to the otolith nucleus. In 2023, an age validation exercise was initiated. Bomb radiocarbon analysis was applied to 30 samples collected under the SWOYP sampling programme and preliminary results indicate that there has been age overcounting for early growth rings and that otolith mass is poor predictor for age. Additional validation analysis is required for better coverage and sample size across the swordfish age-length spectrum. This work will be conducted in unison with analysis on epigenetic ageing. The first steps in this new project area have identified appropriate cytosine-phospho-guanine (CpG) sites for which methylation rates may be measured. Should the technique be successful, the SWOYP may be better able to monitor for shifts in growth and maturity while not exclusively relying on the difficult to obtain otoliths. Reproduction and maturity analysis also continues to progress. In the current project phase 289 gonad samples were processed and prepared for histological analysis. This increase in gonad sample sizes is an important step in refining maturity ogives. Additional samples are needed from hypothesized spawning areas in the Sargasso Sea and Gulf of Guinea. Samples from these fish will be important for genetic differentiation of stocks, understanding stock spawning period, and better estimating fecundity and recruitment. In 2024, during Phase 6, efforts were again largely focused on sample processing; however, more samples were added in the current phase. CPC scientists who regularly contribute samples were mostly focused on working through a backlog of sample processing and analysis of materials collected as part of SWOYP in previous years. Additional bomb radiocarbon sample processing was completed in this project phase.

Tagging studies aim to analyse the vertical habitat-use and migration patterns of swordfish, and help to delimit the stock boundaries and mixing rate of swordfish between the Mediterranean Sea and the North and South Atlantic. Forty-four ICCAT funded tags have been acquired since 2018, when the tagging programme was implemented. To date, a total of 40 miniPAT tags have been deployed in the Equatorial and NE Atlantic mixture areas (33), the South Atlantic (3) and the Mediterranean Sea (4). An in-kind contribution of 10 miniPAT tags from Canada resulted in deployment of tags in a high priority spatial zone for the Swordfish Species Group, on the SW Atlantic. These studies indicate considerable horizontal movements and patterns of vertical movement through depth and temperature layers. These findings are important for improvements to the swordfish species distribution model which the Committee uses to better understand SWO catch rates. In 2024, a dedicated tagging campaign resulted in the successful deployment of 10 tags in the stock mixture area of the NE Atlantic. Additionally, in 2024, a tagging and sampling trip was planned to respond to a possible swordfish northward shift, by targeting fishing activities off Newfoundland and Labrador. This tagging trip was also very successful, and biological samples were collected from 7 swordfish (full samples), in addition to the release of 11 tagged swordfish (10 satellite tags and one acoustic tag). The tagging data from these tagged swordfish in the upcoming year will improve the understanding of habitat use of swordfish in the North Atlantic and in the stock mixture areas. Currently the SWYOP has 5 satellite tags available to continue the work in later 2024, and expects to acquire some additional tags to deploy in the priority areas of stock mixture during 2025.

10.7 Tropical Tuna Research and Data Collection Program (TTRaD)

Summary and programme objectives

The ICCAT Tropical Tuna Research and Data Collection Program (TTRaD) began its activities in 2024. The Secretariat coordinates the transfer of funds and distribution of information, and data.

The original plan for the TTRaD included the following objectives: 1) to provide more detailed catch and effort statistics, particularly for size frequency data; 2) to initiate an ICCAT tagging programme for tropical tunas; and 3) to assist in collecting data for age and growth studies. During past Tropical Tunas Species Group meetings, the Tropical Tuna Species Group requested that the objectives of TTRaD be expanded to provide a more long-term and costed workplan. Efforts to meet these goals since 2024 are highlighted below.

In 2024, the TTRaD has prioritised Management Strategy Evaluation (MSE) developments, sample collection for age and growth, and the continuation of funds for tag recovery and maintenance of Atlantic Ocean Tropical tuna Tagging Programme (AOTTP) databases. MSE developments have been provided throughout the year at the 2024 Yellowfin Tuna Data Preparatory Meeting (ICCAT, 2024c) and the 2024 Yellowfin Tuna Stock Assessment Meeting (ICCAT, 2024k) and intersessional MSE subgroup meetings. For the Western Skipjack MSE, updates include development of Candidate Management Procedures (CMPs), incorporation of abundance indices and robustness tests to account for the effects of climate change. For the multi-stock MSE, technical work has been undertaken to explore uncertainties, develop conditioned operating models and observation error models, incorporation of climate change impacts, and multi-stock management procedures (harvest control rule development). To aid in building understanding of the developed MSEs, a workshop is also planned for October 2024 with a focus on building understanding of tropical tuna-specific MSEs. For the age and growth work, relatively limited samples have been collected to date due to closure of fishing in important areas, though further sampling is ongoing with sample collection from the Gulf of Guinea, Central and South Atlantic.

The TTRad is an important programme providing support for tropical tuna research in the Atlantic. The development of more long-term data collection and research objectives will enable the Tropical Tunas Species Group to improve assessments and advice to the Commission.

11. Report of the Meeting of the Subcommittee on Statistics

The Convenor of the Subcommittee on Statistics summarized the key activities of the Subcommittee in the last year as well as its workplan, and its recommendations.

The Committee acknowledged the work of the Subcommittee and congratulated the Chair on the progress made in such a short time. After addressing a few issues related to the Subcommittee report, a few points were raised. The Committee acknowledged the importance of holding a dedicated workshop to support CPCs in their task of reporting statistical data to the Secretariat, with China (P.R.) further requesting that this be delivered in hybrid / online format, if possible, and Canada suggesting that budget be set aside to ensure live interpretation in the three official ICCAT languages.

On the follow up of additional information provided by United States, under the data collection initiative, the Committee recommended to continue supporting phase II of the ICCAT regional Caribbean data collection project. The project aims to improve reporting and data analysis of fishery data of fleets capturing blue marlin and yellowfin tuna in the region. The U.S. has already committed to fully fund this activity.

The Committee confirmed their support in requesting additional funding for the hosting and further development of the new online data dissemination applications and acknowledged that the amount of this funding has yet to be determined.

A few changes were also made to the report section on recommendations without financial implications.

The Report of the 2024 Meeting of the Subcommittee on Statistics is provided here.

12. Report of the Meeting of the Subcommittee on Ecosystems and Bycatch (SC-ECO)

The Co-convenors of the Subcommittee on Ecosystems and Bycatch summarized the key activities of the Subcommittee in the last year as well as its Workplan, and its recommendations. The Co-convenors noted that to deal with the workload, some sort of rationalization might be required. Insofar as the activities of bycatch, the Bycatch Co-convenor noted that while Ecoregions were mentioned in the summary of the activities it was important to clarify that the usefulness of Ecoregions remains a matter that requires additional discussion. He further noted that it was important to emphasize the large number of participants (greater than 100) now participating on the Subcommittee meeting. Related to seabirds, The Agreement on the Conservation of Albatrosses and Petrels (ACAP) noted that it had met following the meeting of the SC-ECO during which it modified some of its best practice recommendations.

In relation to the large number of participants, the Subcommittee noted the enormous amount of work that the Subcommittee manages to complete. It noted that many of the activities listed in the Workplan were ongoing and that some of these could be considered complete so as to reduce the scope of the work undertaken. The Subcommittee enquired if there were any capacity building initiatives being considered to improve the quality of data submitted to ICCAT. In particular, to deal with seabirds it might be helpful to consider some initiatives that allow parties to improve their data collection initiatives for these species in particular. In response to this and other queries, the issue of data and data improvement etc. is addressed in the Workplan.

The Subcommittee noted that it was pleased to see Climate Change included among the activities of the Subcommittee of Ecosystems. Given its busy schedule, it noted that there might be a need for additional resources and coordination between the Subcommittee of Ecosystems and other Species Groups. The Subcommittee further noted that Climate Change was an issue that was too broad to be considered exclusively by a single group. In addition, the Subcommittee noted that it would be beneficial for the SC-ECO to collaborate with other organizations; in particular it noted that the Food and Agriculture Organization (FAO) has a comprehensive body of work done on Climate Change and that there could be some synergies to be taken advantage of on this front.

The General Fisheries Commission for the Mediterranean (GFCM) enquired if it was necessary to explicitly include a more formal mention of ICCAT's joint collaboration with GFCM in its workplan. In response, the Co-convenor noted that it might be necessary to include in the workplan some specific activities that are already part of the existing workplan e.g. the 2024 workshop on turtle. He further noted that the primary focus of ICCAT work on sea turtles is to understand the effect of ICCAT fisheries on sea turtles but that the effect of other fisheries, like those managed the GFCM were important to consider, although that was not included in the Subcommittee workplan.

The Report of the 2024 Meeting of the Subcommittee on Ecosystems and Bycatch is provided here.

13. Discussions at the intersessional meetings of the Commission relevant to the SCRS

13.1 Intersessional Meetings of Panel 1

The SCRS Chair informed the Committee of the discussions and decisions regarding the western skipjack management strategy evaluation (MSE) process during the First Intersessional Meeting of Panel 1 on Western Skipjack MSE (online, 20-21 February 2024) and the Second Intersessional Meeting of Panel 1 (hybrid/Natal, Brazil, 22-24 May 2024).

First Intersessional Meeting of Panel 1 on Western Skipjack MSE

The text below is consistent with the Report of the First Intersessional Meeting of Panel 1 on Western Skipjack MSE.

A detailed overview of the ongoing work developed by the SCRS regarding the western skipjack (SKJ-W) MSE process was provided, including the workplan for advancing the process during 2024.

During the meeting, the following decisions were taken regarding the SKJ-W MSE:

Management objectives

- Status: Use 10% as the reference for the probability of falling below B_{LIM}
- Stability:
  - set a maximum allowable percentage variation in the TAC at 20%
  - proposals by some CPCs included:
    - consider an exception to this limit being permissible if the biomass of the stock falls below B_{MSY}
    - consider a limit above 20%

Candidate Management Procedures (CMPs)

- Illustrative CMPs based on constant catches should no longer be included. Additionally, the Panel decided to keep open the opportunity for the SCRS to explore different CMPs during the development of the SKJ-W MSE throughout 2024.

Second Intersessional Meeting of Panel 1

During this meeting, there were no relevant decisions taken related to the SCRS.

13.2 Intersessional Meeting of Panel 2

The SCRS Chair informed the Committee of the discussions and decisions taken during the Intersessional Meeting of Panel 2 (hybrid/Madrid, Spain, 5-8 March 2024), namely those related to bluefin tuna growth on farms.

The text below is consistent with the Report of the Intersessional Meeting of Panel 2.

Bluefin tuna growth on farms

The SCRS presented the document "Bluefin tuna growth rates in farms: update on GBYP and CPCs studies" (PA2_26_REV_2/i2024). Some CPCs expressed concern that the 2022 growth table presented by the SCRS overestimates growth, and requested that the Committee update the 2022 growth table in accordance with paragraph 25 of *Recommendation by ICCAT amending the Recommendation 21-08 establishing a Multi-annual Management Plan for Bluefin Tuna in the Eastern Atlantic and the Mediterranean* (Rec. 22-08). The SCRS Chair stated that it would not be possible to conduct this work in the absence of new data. The Chair of Panel 2 urged CPCs to submit new data if they want to see the update of the 2022 growth table.

Japan presented "The report of growth rate analysis of farmed Atlantic bluefin tuna"on the work on growth rate analysis of farmed bluefin tuna imported into Japan (PA2_28/i2024), prepared in accordance with paragraph 26 of Rec. 22-08, in order to investigate possible discrepancies between the 2022 SCRS table and the observed growth rates. The results showed that the weight at harvest observed from 2019 to 2022 was, in most cases, lower than the average weight expected based on the 2022 SCRS growth table, while the observed weight at harvest in 2023 did not differ significantly from the 2022 SCRS growth table. The introduction in 2023 of a new template to collect the data might justify that improved and more complete data ("fit for purpose") are now being made available. The SCRS Chair requested that Japan's paper be submitted to the SCRS for review.

There were no other discussions relevant to the SCRS in this meeting.

13.3 Intersessional Meeting of Panel 4 on North Atlantic Swordfish MSE

The Intersessional Meeting of Panel 4 on Northern Atlantic Swordfish MSE, initially scheduled for July 2024, was postponed to 8 October 2024 upon a request from the SCRS.

13.4 Intersessional Meeting of the Electronic Monitoring Systems Working Group (EMS WG)

The SCRS Chair informed the Committee of the discussions and decisions taken during the Meeting of the Electronic Monitoring Systems Working Group (EMS WG) (hybrid/Porto, Portugal, 10 June 2024).

Meeting of the Electronic Monitoring Systems Working Group (EMS WG)

The text below is consistent with the Report of the Meeting of the Electronic Monitoring Systems Working Group (EMS WG).

The SCRS Chair informed the EMS WG that the SCRS continued to work in the Technical Sub-group on EM, which is now focusing on EMS for smaller vessels, and considered that some type of simplified EMS might be a good approach. This should help the SCRS formulate advice on any areas of collaboration needed between the SCRS and the EMS WG.

The EMS WG agreed with the importance of continued coordination with the SCRS. The EMS WG noted that the results of EMS should be evaluated by both the EMS WG and the SCRS, and that this should be further considered in the workplan.

There were no other discussions relevant to the SCRS in this meeting.

13.5 17th Intersessional Meeting of the Working Group on Integrated Monitoring Measures (IMM)

The SCRS Chair informed the Committee on the discussions and decisions taken during the 17th Meeting of the Working Group on Integrated Monitoring Measures (IMM) (12-14 June 2024).

The text below is consistent with the Report of the 17th Meeting of the Working Group on Integrated Monitoring Measures (IMM).

The Electronic Monitoring Systems Working Group (EMS WG) discussed timeframes for considering minimum standards and emphasized the need for further consultation with the SCRS. The IMM Chair noted that the Global Environment Facility (GEF)/FAO (Areas Beyond National Jurisdiction) ABNJ Tuna Project will inform on the harmonization of EMS across Regional Fisheries Management Organizations (RFMOs). An ABNJ Tuna Project event, tentatively in December 2024, will involve various RFMOs, and CPCs will aim to review resulting recommendations for potential ICCAT adoption.

There were no other discussions relevant to the SCRS in this meeting.

14. Progress related to work developed on MSE

Capacity building on Tropical Tunas MSE

There is a need to increase the capacity and understanding of scientists and managers of all CPCs, to fully engage and participate in developing and implementing MSEs, including participating in the process of decision-making on proposed CMPs. A larger group of scientists must participate in the development of MSEs to make sure that all CPCs have a chance to contribute their expertise to the MSE process. This will also help ensure that there is enough technical capacity within the SCRS to accomplish the MSE roadmap agreed upon by the ICCAT Commission.

In 2023, two training courses on the MSE topic were conducted with the participation of scientists and managers from different ICCAT signatory CPCs. The focus of the 2023 online courses was on basic MSE concepts, one for scientists on 13 June 2023 and one for managers on 13 October 2023. Details on workshop participation, materials presented, and evaluation of workshop effectiveness are presented in Die *et al.*, 2024. After the success of the 2023 workshops, an additional workshop is planned for late 2024. It is recommended that the programme of MSE capacity building will continue in the future and evolve to match the needs of the Tropical Tunas Species Group.

Since September 2023, the SCRS has further developed substantial work on the ongoing ICCAT MSE processes. Additional details are provided below (items 14.1 to 14.5).

14.1 Work conducted for northern albacore

In 2017, the Commission adopted an interim Harvest Control Rule (HCR) for North Atlantic albacore (Rec. 17-04), which represents the first HCR adopted in the history of ICCAT. In 2021, the Commission adopted the first full Management Procedure (MP) (*Recommendation by ICCAT on conservation and management measures, including a Management Procedure and Exceptional Circumstances Protocol, for North Atlantic albacore* (Rec. 21-04)), including the HCR, the specifications about how to determine stock status in the future, and an Exceptional Circumstances (EC) Protocol. The adopted HCR imposed an F_{TARGET}=0.8*F_{MSY}, a $B_{THRESHOLD}$=B_{MSY}, a B_{LIM}=0.4B_{MSY} and an F_{MIN}=0.1F_{MSY}, with a maximum Total Allowable Catch (TAC) of 50,000 t and a maximum TAC change of 25% in case of increase or 20% in case of decrease when B_{CURR}>$B_{THRESHOLD}$.

Since 2015, the SCRS has provided scientific advice and interacted with the Commission, to allow the Commission to adopt the recommendations mentioned above. This included testing several HCR variants, stability clauses, the effect of the carryover, scenarios about TAC implementation error, underreporting, number of available catches per unit effort (CPUEs), etc. In addition, an independent peer review was conducted during 2018, and a short-term contract has been issued to accomplish the technical tasks required to follow the albacore MSE schedule and Rec. 21-04 adopted by the Commission.

In 2023 a new benchmark stock assessment using Stock Synthesis 3 (SS3) was conducted. The contractors developed the SS3 model in collaboration with other participants of the Albacore Species Group. This model was used in the stock assessment as a reference case. After the assessment, the model was further revised to improve diagnostic performance and to serve as a basis for conditioning new operating models for the second round of the MSE framework.

During 2024, the contractor, in collaboration with the Albacore Species Group, started the development of the new MSE framework. The reference grid of operating models (OMs) was advanced, including new age-length-key data, and a proposal on the criteria to discard unrealistic simulation runs.

A new observation error model that considered both historical and future uncertainty in CPUEs, as well as autocorrelation, was proposed. The Albacore Species Group welcomed the proposal and made some recommendations to improve it, namely to incorporate autocorrelation in the historical part.

The contractors preliminarily tested the adopted Management Procedure (MP) on the new reference uncertainty grid, and the Albacore Species Group suggested to conduct a full test once the observation error model was finalized.

The Albacore Species Group made a literature review to document Climate Change impacts on albacore population dynamics that should be considered in the design of the robustness tests. It was found that there is little information about effects on productivity or recruitment that could be used to refine the robustness tests. The Albacore Species Group agreed to focus robustness tests on negative deviations in recruitment as a way to test alternative MPs under such circumstances and provide precautionary advice.

The EC Protocol in Rec. 21-04 requires determining, on a yearly basis, if ECs exist. In this regard, the contractors produced the necessary plots for the Albacore Species Group to discuss the detection of ECs according to the EC protocol contained in Rec. 21-04. The Committee evaluated the existence of exceptional circumstances using both catch and CPUE related indicators and found no evidence of exceptional circumstances that would prevent the application of the current TAC derived from the Management Procedure in place.

14.2 Work conducted for bluefin tuna

An Intersessional Meeting of the Bluefin Tuna Species Group (BFTSG) was held in Malta, from 15 to 18 April 2024 (ICCAT, 2024d). This meeting focused on the elaboration of a proposal for the implementation of the close-kin mark recapture (CKMR) methodology for the eastern bluefin tuna, in coordination with the ongoing CKMR study on the western bluefin tuna. The Group reviewed the progress on CKMR modelling, genetics studies, pilot study on epigenetic clock, sampling programs, funding resources, GBYP research, and the abundance indices used in the Management Procedure (MP). An external advisor for the GBYP Steering Committee for CKMR matters, Dr Daniel Ruzzante, provided an overview summary of the current status of the CKMR Atlantic bluefin tuna stock related initiatives. There is a consensus on a pan-Atlantic approach, e.g. eventual integration of BFT-W and BFT-E CKMR into a unified project, would be desirable both to support future MP development and Management Strategy Evaluation (MSE) reconditioning. The Bluefin Tuna Species Group focused on the steps necessary to have the feasibility BFT-E proposal in 2024.

The Bluefin Tuna Species Group met during three days at the SCRS Species Groups meeting where the primary task was to develop Executive Summaries, responses to the Commission, compile annual updates of the indices and draft Exceptional Circumstances (EC) Protocols. A comprehensive statistical design, genotyping approach and a feasibility study with the state of the art of the potential project for the application of CKMR in BFT-E were presented. The BFTSG reviewed the achievements and what remains to be completed to have a fully viable proposal. The BFTSG developed a 2-year proposal with a “basic” option to initiate sampling, tissue archiving and several pilot projects in 2025. It is essential to start this work in

2025 in order to inform the 2027 MSE reconditioning. The initial project design builds upon approximately 34,000 samples currently archived, extensive development of genetic methodology and proof of concept from the recently completed BFT-W CKMR pilot project. Hence, despite the large population size of BFT-E, the total number of additional samples to collect (~24,000) over the 2-year time frame is feasible particularly as the majority of fish come from the Balearic larval surveys. While current GBYP funding does not support genotyping of the samples, existing funding levels can support a basic version of this implementation plan by moving GBYP aerial survey to an alternate year schedule and conducting the survey for the Balearic region only. Additional funding for 2026 would be necessary to complete the genetic analysis of all available samples, including historical samples, and CKMR calculations.

14.3 Work conducted for northern swordfish

The Committee has been developing a management strategy evaluation (MSE) framework for North Atlantic swordfish (SWO-N) for a decade. The process is scheduled to culminate with selection of a management procedure in 2024. In 2009, ICCAT called for development of a limit reference point for swordfish (*Supplemental Recommendation by ICCAT to amend the Rebuilding Program for North Atlantic Swordfish* (Rec. 09-02)), and the Commission adopted $0.4*B_{MSY}$ as the interim limit reference point in 2013 (*Recommendation by ICCAT for the conservation of North Atlantic swordfish* (Rec. 13-02)). Recommendation 13-02 also tasked the SCRS with development of a Harvest Control Rule for SWO-N. In 2015, the Commission called for adoption of a management procedure (MP) based on an MSE for 8 priority stocks, including SWO-N (*Recommendation by ICCAT on the development of Harvest Control Rules and of Management Strategy Evaluation* (Rec. 15-07)). Technical work on the simulation framework began in 2018 through development of a factorial operating model (OM) grid constructed using the 2017 stock synthesis assessment model as a Base Case. The initial OM grid spanned a wide range of uncertainties and by 2020 the OM grid was composed of 216 Stock Synthesis III (SS3) models with uncertainty scenarios spanning a range of assumed values for natural mortality, variance in recruitment deviations, steepness of the stock-recruitment relationship, weight of catch per unit effort (CPUE) relative to length composition data and degree of observation error in the indices of abundance. The Committee examined which uncertainties were most important for driving SWO-N stock dynamics and by 2022 the OM grid was reduced to two uncertainties, steepness and natural mortality which formed the primary OM grid, with other parameters forming a set of robustness tests. The grid was conditioned with new data and model adjustments following the 2022 SWO-N stock assessment and work began in earnest on development of candidate management procedures (CMPs).

Following minor revisions to the OM grid values in 2023, the technical team consulted with ICCAT's Panel 4 on key elements of the MSE framework. Selection of a management procedure requires evaluation of CMPs against predetermined performance metrics. The Committee worked with Panel 4 to better define management objectives, acceptable probability values for those management objectives, and time spans over which those probabilities should be calculated. A variety of model based and empirical CMPs were developed, tuned, and then evaluated for performance. Interactive tools were developed to show tradeoffs among CMPs. A series of Panel 4 engagements, as well as ambassador communications sessions laid the groundwork for managers and stakeholders to understand MSE uncertainties and then provide guidance to the Committee on management priorities as well as priorities for robustness testing.

Based on guidance from Panel 4, in September of 2023, the Committee created a shortlist of CMPs for the Panel to consider for adoption. This list includes a variety of Harvest Control Rules, each spanning the performance tradeoff space. An Exceptional Circumstances Protocol will be developed in collaboration with Panel 4 once an MP has been selected.

In 2023, the Commission chose to defer adoption of an MP by one year and provided the Committee with a MSE workplan for 2024. In 2024, the Committee updated and improved the combined index of abundance, updated the data inputs in the OMs, and slightly modified some of the CMPs to achieve better performance. Final results for the remaining CMPs were reviewed and endorsed by the SCRS during its annual meeting.

An MSE-tested MP is a major shift in how the Committee and the Commission interact for the formulation of management advice. It should be expected that review of this process and the assumptions used to model stock dynamics be revisited on a regular basis. In 2023, Panel 4 and the technical team developed a schedule that defines when stock assessments and other checks will be used to evaluate the performance of the MSE. This collaborative process between ICCAT scientists and managers will require continued engagement between the Committee and the Commission in coming years.

The results of the CMP performance are summarized in **Appendix 9**.

14.4 Work conducted for SKJ-W

A management strategy evaluation (MSE) for western Atlantic skipjack tuna was developed in 2022 following reconditioning on outputs of the 2022 Skipjack Stock Assessment Meeting (ICCAT, 2022b). The full suite of uncertainties evaluated in the stock assessment was included in the MSE's uncertainty grid of reference operating models. In 2023, further analysis focused on the evaluation of the relative performance of Candidate Management Procedures (CMPs). The evaluation used a set of performance metrics regarding the safety, stock status, yield, and stability. During 2024, a series of meetings conducted within both the SCRS and the ICCAT Commission culminated in an update to the work plan and further development of the SKJ-W MSE. Changes to the workplan included:

- updates of catch data and abundance indices used in conditioning the operating models;
- a determination of which observational data should be used in candidate management procedures;
- updates of operational management objectives proposed by the ICCAT Commission.

The new results presented to the SCRS have changed significantly since May 2023, when Panel 1 provided guidance on operational management objectives. This shift is due to the fact that candidate management procedures now incorporate a combined index and use actual fishery data instead of relying solely on simulations. The earlier results had minimal observation error and were overly optimistic, whereas the new results are based on finalized operating models and a more comprehensive consideration of uncertainty. Consequently, achieving a probability of green Kobe (PGK) of 70% over the 30-year projection period is more challenging for all candidate management procedures, and leads to lower average yields. All CMPs maintain a 90% or higher likelihood of not breaching the limit reference point throughout the entire projection period, although some CMPs drop to 88% during years 21-30. The current MSE results can now be considered final, serving as the basis for the ICCAT Commission's adoption of final management objectives and an MP to set the Total Allowable Catch (TAC) for 2025 and beyond.

In October 2024 two ambassador meetings, led by SCRS scientists, will establish a dialogue with stakeholders and improve the ability of the SCRS to present MSE results to the Commission. Meetings will be conducted online, one in English and one in Spanish. All interested stakeholders are invited to participate.

14.5 Work conducted for Tropical Tunas Multi-stock MSE

The Tropical Tunas Management Strategy Evaluation (MSE) has progressed in 2024. Advances have consisted in proposing alternative options for operational management objectives for tropical tunas (Merino *et al*., 2024), evaluating options to incorporate climate change impacts on the Tropical Tunas MSE (Correa *et al*., 2024) and a first document with alternative multi-stock candidate management procedures (Urtizberea *et al*., 2024).

A new contract to continue this works was presented to the Tropical Tunas Species Group (Merino *et al*., 2024). The workplan of this contract, to be completed by the end of 2024, includes the followings tasks: 1) developing options for operational management objectives for tropical tunas; 2) to develop new operating models (OMs) conditioned from the last yellowfin assessment (completed in 2024) and incorporating climate change impacts in the OMs; 3) design of multi-stock management procedures suitable for tropical tunas; 4) to develop visualization tools to help understand the impediments to achieve Maximum Sustainable Yield (MSY) for the three tropical tunas stocks simultaneously and highlight the need of the multi-stock approach. Finally, the new contract foresees the collaboration with external experts with experience in MSEs to provide guidance for the finalization of this MSE and to communicate results to the Commission. By the end of 2024, each of the components of the MSE simulation framework should be completed and preliminary evaluations of Candidate Management Procedures (CMPs) will be carried out in 2025. The Terms of Reference of 2025-2026 contracts for the multi-stock MSE should help finalize the simulation works. A detailed description of further developments of the Multi-stock MSE is included in the MSE roadmap (see **Appendix 7** of this report).

14.6 Review of the Roadmap for the ICCAT MSE processes adopted by the Commission in 2023

The rapporteurs of the relevant species groups with ongoing MSEs presented an update to the roadmap for the ICCAT MSE processes, based on the Commission comments in 2023 and the workplans of the Bluefin Tuna, Albacore, Swordfish and Tropical Tunas Species Groups (**Appendix 7**).

15. SCRS Science Strategic Plan

The SCRS Chair presented a workplan for development of a new SCRS Science Strategic Plan, which is similar to that followed by the SCRS in 2013-2014.

Discussion

The Committee agreed in general terms to the proposal from the Chair but highlighted that the development of the new SCRS Strategic Plan has been an objective over the past two years and little advances were achieved. Therefore, the Committee stressed the need for a strong commitment by the SCRS Chair and the Committee to achieve the goal in line with the proposed schedule. The proposed workplan is contained in **Appendix 11**.

16. Update of the stock assessment software catalogue

The Secretariat has been maintaining the ICCAT software catalogue and the GitHub site. Following the recommendation by the Committee in 2024, Github FLBEIA repository and openMSE webpage will be incorporated in the ICCAT software catalogue within the next few months.

17. Consideration of plans for future activities

17.1 Annual workplans and research programmes

17.1.1 Subcommittee on Ecosystems and Bycatch Workplan

Consistent with the ongoing exercise of developing an EcoCard and implementing an Ecosystem Approach to Fisheries Management (EAFM) framework for ICCAT a workplan was drafted considerate of the limited capacity of the Subcommittee and the highest priority items. Where there is limited capacity to progress on a task, it is identified as being a low priority.

1. Pertaining to the work of the Sub-group on the Ecosystem Report Card (active, high priority)

The Sub-group will meet twice prior to the 2025 Meeting of the Subcommittee on Ecosystems and Bycatch in order to facilitate the development of indicators for selecting components of the EcoCard. The first meeting will allow EcoCard teams to review their objectives, data sources and plan. A consideration for all components is how the proposed indicator informs science advice and management advice. The second meeting is intended to allow teams to meet and review their progress on indicator development in the weeks prior to the 2025 Meeting of the Subcommittee on Ecosystems and Bycatch.

2. Pertaining to Ecoregion delineation process (low priority)

3. Pertaining to the development of a Risk Screening Tool (high priority)

Given that risk scores were estimated for marine fish species vulnerable to ICCAT fishery impacts and that little time was available to validate the scores and incorporate estimates of uncertainty, work will continue exploring the relationship of the scores to the supporting data. To facilitate this process a small group will meet to develop a plan for the work.

4. Pertaining to the progress on case studies (low priority)

It was recognized that the case studies are providing valuable support to the development of the EcoCard, however review of their progress must be postponed. Participation in the teams working on the EcoCard indicators was encouraged.

5. Pertaining to Ecosystems Report Card development (high priority, active)

It was agreed that advancing the work on the EAFM framework and the EcoCard would be the top priority for the coming years. However, it was also recognized that the Subcommittee may not have the capacity to advance the development on all the components. Consequently, development of some components, while welcome, would not be a priority for the coming year.

State	*Component*	*Task*
on hold	Retained species: assessed	Update B_{RATIO} and/or F_{RATIO} values from recent assessments and deal with $F_{0.1}$ issue.
on hold	Retained species: not assessed	Perform Productivity Susceptibility Assessment (PSA) for select retained unassessed species.
on hold	Non retained sharks	Increase the scope of the data used in the analysis. Include other gear types.
active	Turtles	Perform risk assessment for loggerhead and leatherback turtles and indicator development and identify impediments to advancing the work.
active	Seabirds	Create indicator based on the total interactions, total mortality or alternatives and identify impediments to advancing the work.
on hold	Mammals	Discuss collaborations with the International Whaling Commission (IWC) and the International Council for the Exploration of the Sea (ICES).
active	Trophic structure, community and diversity	Continue work developing indicators to monitor the biomass structure, size structure and trophodynamics of the ecological communities in response to fishing pressure and environment (detailed workplan in Andonegi *et al*., 2020).
active	Habitat	Create indicators to monitor climate-induced and fishing-induced habitat changes in ICCAT species.
active	Socio economic	Develop a process to extract the socio-economic data and update previous work.
active	Fishing pressure	Develop an indicator based on fishing effort or capacity. Develop indicator based on marine debris. Develop indicator based on tropical tunas fishing pressure and capacity.
active	Environmental pressure	Develop indicators that are generic.
active	Marine debris, Food webs and Trophic relationship	Informal discussion of the elements of the plans and potential indicators.

6. Pertaining to other ecosystem items (active, high priority)

a. Support EcoTest development

- In order to progress on the development of the EcoTest framework a technical team composed of Subcommittee participants will be formed to support the work of the contractor.

- Dialogue with Commission at Climate Change Meeting.

- Support was given to provide guidance on the implications of providing climate conditioned advice in order to illicit Commission feedback.

b. Review contract on providing climate conditioned advice

c. Respond to ICCAT requests

7. Bycatch

a. Conduct a five-day workshop focused on bycatch of sea turtles in the Mediterranean Sea. The workshop will allow determination of activities developed during the 2024-2025 intersessional period related to the impact of ICCAT fisheries on Mediterranean sea turtles.

b. Continue with the review process of the new mitigation measures for seabird bycatch.

c. Continue collaborative work on bycatch with the Shark Species Group. The bycatch species of sharks are integral to both groups and therefore there is a need for coordination.

d. Continue work in the Sub-group on Technical Gear Changes. Within the objectives of this Sub-group, activities of interest for bycatch can be framed.

e. Continue to review and refine the list of bycatch species. The ICCAT databases contain a list of different taxa that must be reviewed by specialists.

f. Develop a research programme. During the intersessional period, in consultation with the members of the Subcommittee, an agenda for a virtual meeting will be proposed to lay the foundations of a Research Programme for the Subcommittee on the bycatch component.

17.1.2 Subcommittee on Statistics Workplan

The Secretariat has been working since 2017 on the ICCAT Integrated Online Managements System (IOMS). After being adopted by the SCRS and the Commission, the Commission's Online Reporting Technical Working Group (WG-ORT) has overseen the specifications and the governance of all the development process. The Meeting of the Online Reporting Technology Working Group (WG-ORT) held on 7-8 February 2023 (see Report of the Meeting of the Online Reporting Technology Working Group (WG-ORT)) delineated the content of the future work to be presented at the 28th Regular Meeting of the Commission for revision and approval. The IOMS went into production on 1 August 2021, and currently manages the ICCAT CPCs Annual Reports. The IOMS is a crucial long-term ICCAT project that requires the full involvement/commitment of the Secretariat.

Additionally, the following tasks represent ongoing database improvements and maintenance that will continue throughout 2024 and beyond. Priority tasks for 2024 include:

- Finalize the upgrade of all ICCAT-DB systems from MS-SQL server 2016 to MS-SQL server 2022;
- Improve the client applications used to manage the databases of the ICCAT-DB system;
- Continue the development of the statistical/tagging dashboards (dynamic querying);
- Continue the development of the tagging database for both conventional and electronic tagging;
- Continue the development of the biological sampling database (to include data recovery/integration);
- Continue the standardization of the electronic forms (TG: tagging forms, CP: compliance forms);
- Extend the automatic data integration tools to cover all standard electronic forms;
- Continue the development of the geographic information system (GIS) project to standardize all pertinent geo-reference data available in the ICCAT-DB;
- Continue the adaptation/migration of all ICCAT-DB system databases to the new ICCAT IOMS system;
- Continue the development of software libraries (in R, and possibly Python) to standardize access and management of ICCAT public datasets;
- Continue the development of interactive applications to improve the dissemination of and simplify access to the core ICCAT public datasets through the web (T1 and T2 datasets, CATDIS, etc.);
- Study options to normalise in a single format (CSV) the existing agreed flat-form formats to provide Task 2 datasets (T2CE, T2SZ and T2CS).

The Convener of the Subcommittee proposes holding an online workshop with interpretation in 2025 to address issues related to data reporting. This workshop will be for statistical and tagging correspondents and would take place around one month before the data submission deadline. Regarding the possibility of repeating this workshop annually, the Subcommittee on Statistics agrees to hold this initial workshop and evaluate its usefulness for potential future workshops.

17.1.3 Working Group on Stock Assessment Methods (WGSAM) Workplan

1. Conduct a debriefing of the 2024 ICCAT Workshop on the Use of the Bycatch Estimation Tool (BYET) with the BYET contractor to identify further development and potential future upgrades to the BYET.

2. Develop Terms of Reference for a contract to develop further the BYET in 2025.

3. Conduct a BYET Workshop in 2025 that furthers capacity building and use of the BYET with the possibility of language interpretation.

4. Form a Study Group and determine how Management Strategy Evaluation (MSE) results and Shiny apps are maintained and published.

5. Address Species Groups requests to the extent possible

17.1.4 Albacore Workplan

The Mediterranean, South Atlantic, and North Atlantic albacore stocks were assessed in 2024, 2020, and 2023, respectively. In the case of North Atlantic albacore, a Management Procedure (MP) was adopted in 2021.

The main objectives for 2025 are to continue developing the management strategy evaluation (MSE) for the northern stock, to apply the exceptional circumstances protocol, and to continue with the research as defined in the Albacore Year Programme (ALBYP).

No intersessional meeting is envisaged but ad hoc online meetings will be used to advance different tasks.

North Atlantic stock proposed workplan

a) MSE development:

- Finalize the reference and robustness set of OMs using the SS3 model following the advice of the Albacore Species Group (ALB SG) and including climate change scenarios.

- Finalize the observation error model considering the statistical properties of each index in the projections.

- Test the adopted MP on the new reference uncertainty grid.

- Start testing alternative MPs (model based or empirical).

- Document the new MSE in a consolidated document. *Deadline:* 1 week before the species groups meetings. *Deliverable:* SCRS Document. *Responsibility:* MSE contractor.

b) Exceptional Circumstances Protocol:

- Prepare T1 dataset up to and including 2024. *Responsibility:* Secretariat. *Deadline:* 1 month before the Species Group meeting.

- Update (up to 2023, and if possible 2024) the following yearly standardized catch per unit effort (CPUEs), in weight (if possible). *Deadline:* one month before the species group meeting. Deliverable: SCRS documents, following the standards provided by the Working Group on Stock Assessment Methods (WGSAM). *Responsibility:* CPCs.

  - Japanese longline (single area)
  - Chinese Taipei longline (single area)
  - US longline
  - Spanish baitboat

- Determine whether exceptional circumstances occur, according to the indicators in the Exceptional Circumstances Protocol (*Recommendation by ICCAT on conservation and management measures, including a management procedure and exceptional circumstances protocol, for North Atlantic albacore* (Rec. 21-04)). *Deadline:* 1 week before the Species Group meeting. *Deliverable:* SCRS Document. *Responsibility:* MSE contractor.

c) Research:

- The Committee reiterated the need to continue research activities within the Albacore Year Programme (ALBYP). For 2025, the priority is to continue the electronic tagging studies and finalize the reproduction study. *Deadline:* 1 week before the species group meeting. *Deliverable:* SCRS documents. *Responsibility:* EU-Spain and Albacore Species Group.

South Atlantic stock proposed workplan

a) Stock assessment

- The Committee supported the initiative of starting development of a stock synthesis model for South albacore stock, that could be the basis of a future MSE. The Committee requested the Secretariat to provide necessary input files for Stock Synthesis up to 2022 based on the fleet structure used in the Surplus-Production Models Incorporating Covariates (ASPICs) for South Atlantic albacore (ICCAT, 2020a). *Deadline*: end of April 2025 *Responsibility*: Secretariat.

b) Research:

- The Committee reiterated the need to continue research activities within the ALBYP. The priority for 2025 is to continue the reproductive biology and electronic tagging studies. D*eadline:* 1 week before the species group meeting. *Deliverable:* SCRS documents. *Responsibility:* Brazil, with the support of partner CPCs South Africa, Uruguay, Chinese Taipei, and Namibia.

Mediterranean albacore stock proposed workplan

a) Research:

The Committee reiterated the need to continue research activities within the ALBYP. For 2025, the priorities are:

- To continue recovery of Task 1 and Task 2 data to allow building of alternative catch scenarios.

- To assess the reliability of the historical part of the larval index. In the 2024 Mediterranean Albacore Data Preparatory and Stock Assessment Meeting (ICCAT, 2024f), the Group identified that the calibration of gears (B60 and B90) for the sampling of larvae in the MED-W is a high research priority. The larval index in this area has strong influence on the assessment and the Albacore Species Group needs to ensure that the abundances obtained from the different fishing methods are comparable, and that the gear calibration method is adequate, since this method was originally designed and parameterized for BFT. To address this key question, the team will assess the adequacy of gear calibration methods in the MED-W. The team will present results from processing experimental fishing samples (B90 and B60 samples collected in same locations) from the 2013 campaign, evaluate the options for processing historical samples from the 2019 experimental fishing campaign, analyse the larval abundance distribution from current available data and propose alternatives for the calibration procedures to be discussed by the Albacore Species Group. This task will be conducted in cooperation with the BFT Technical Sub-group on Early Life History.

- To develop a growth model for the Mediterranean stock that integrates the different studies on the matter available to date.

17.1.5 Billfishes Workplan

Considering the recommendations from the SCRS, the Billfish Species Group will continue working on developing a long-term research work plan (6 years) in 2025.

The last white marlin stock assessment was conducted in 2019 (ICCAT, 2020b). The next white marlin stock assessment is proposed for 2025.

For the upcoming white marlin stock assessment in 2025, two intersessional meetings will be held. The first meeting will be a data preparatory (DP) meeting to compile and analyze all existing information required for the stock assessment, and the second meeting will be the stock assessment (SA) meeting.

Several high priority tasks have been identified that require increased effort, including, but not limited to:

a) An intersessional hybrid data preparatory meeting in 2025 (5 days) to collect and analyze all the existing information required for stock assessment, using data through 2023.
b) A hybrid stock assessment meeting in 2025 (5 days), using data through 2023.

Work tasks for the data preparatory and stock assessment:

a) Review of the catch statistics including landings and dead discards.
b) Identify and select catch per unit effort (CPUE) indices of abundance through 2023/24.
c) Explore the estimation of a combined CPUE index for the longline gear with high resolution input data.
d) Review and update length by gender data through 2023.
e) Review and update fleet composition.
f) Review and update biological parameters for use in the stock assessment.
g) Review models to be used for stock evaluation.
h) Implement the diagnostics and validation of stock assessment model(s) as recommended by the Working Group on Stock Assessment Methods (WGSAM).

Catch (Task 1), catch and effort, and size data (Task 2)

CPCs catching billfishes (directed or bycatch) should report species-specific catches, catch and effort, and size information by the required spatial and temporal scale.

Discards

The WGSAM has developed a generalized tool for the estimation of bycatch. The Bycatch Estimator (BYET) uses observer data combined with either total effort data from logbooks or with landings to estimate total bycatch. CPCs should make every effort to take advantage of this tool and participate in any future workshop(s) in an effort to improve the estimation and reporting of billfish discards.

Life history parameters

Continue the EPBR activities including:

- The sampling of hard parts for the growth studies on billfish caught off West Africa mainly:

  - Start the research and biological sampling of blue marlin from the Gulf of Mexico Mexican longline fisheries.
  - Advance in direct validation of aging protocols through bomb radiocarbon, genetics, and other latest scientific techniques.
  - Continue building a reference set for both spines and otoliths in 2025.

Tagging

To continue the satellite tagging of blue and white marlin on the South Portugal coast in the recreational fishery.

17.1.6 Bluefin Tuna Workplan

The focus of the Committee for 2025 and beyond is to implement several strategic initiatives as follows, with some of these being coordinated by a Technical Sub-group operating as a subsidiary body of the Bluefin Tuna Species Group (BFTSG):

- Coordination of farm operations research (BFT Technical Sub-group on Farm Operations).
- Coordination on early life history (BFT Technical Sub-group on Early Life History).
- Advanced genomic approaches to population size estimation (Close-Kin Mark-Recapture (CKMR)/Gene tagging) (BFT Technical Sub-group on CKMR).
- Coordination of BFT biological sampling.
- Coordination of BFT tagging including joint use of a global ICCAT e-tag database.
- Coordination of BFT stock mixing data.
- Further refinement of the method of strict-updates for indices to be input into Management Procedures (MPs) ideally in coordination with the Working Group on Stock Assessment Methods (WGSAM).
- Further improvement of indices for consideration in future rounds of management strategy evaluation (MSE) conditioning (habitat/spatio-temporal modelling).
- Evaluate the models to be used for future assessments.

The workplan for 2025 is as follows:

1. Hold one intersessional meeting in 2025 to review the BFT-W CKMR study, to evaluate new information that may be consequential for the MSE (**Table 17.1.6**, below and see detail roadmap of BFT MSE in **Appendix 7**), and to refine the plans for the 2026-2027 stock health check and MSE review.

2. Tasks for Technical Sub-groups. The purpose of the Technical Sub-groups is to create focused research teams to address specific issues. The teams can operate under their own timing and meeting schedules, but will need to report back to the meetings of the BFTSG with their findings and are free to report electronically at any time deemed appropriate. The various BFT technical sub-groups will be tasked with the following topics:

   a) BFT Technical Sub-group on Farm Operations: Focus on the plan for implementation of measurements at the time of first transfer from purse seines to transport cages and for implementation of an artificial intelligence (AI) measurement system.

   b) BFT Technical Sub-group on Early Life History: Continued coordination and standardization of BFT larval surveys and exploration of the possibilities for implementing new BFT larval index surveys together with habitat/spatial-temporal modelling.

   c) BFT Technical Sub-group on CKMR and BFTSG: In coordination with GBYP, support implementation of the first phase of BFT-E CKMR.

   d) BFT Technical Sub-group on Stock Mixing: Provide estimates of stock mixing in the western and eastern areas by year, season and size class using available data derived by genetic and other methods. For review at the 2025 Intersessional Meeting of the Bluefin Tuna Species Group.

3. Continue to support the Atlantic-Wide Bluefin Tuna Research Programme (GBYP) that will focus on the development of CKMR-related studies, the tagging and electronic tagging database, biological studies including biological database development, assessment modelling, and conducting the Balearic Aerial Survey.

4. Annual index provision up to 2024 by 1 September 2025, and determination of Exceptional Circumstances at the Bluefin Tuna Species Group meeting. Rerunning of the MP to provide TAC advice for 2026-2028.

5. Work on Responses to the Commission.

Table 17.1.6. 2025 evaluation of implications of new information regarding abundance, indices and stock mixing on the MSE.

1. Evaluate BFT-W CKMR results

   a) Test Butterworth-Rademayer Management Procedure with the BFT-W CKMR estimate in the MSE.

      i. Complete by **1 November 2024**
      ii. Send compiled results to BFT Species Group participants

   b) Provision of BFT-W CKMR paper as an SCRS document by BFT Species Group when available and prior to intersessional.

2. Evaluation of updated or revised indices

   a) Revised indices are those that may be new statistical treatments of existing datasets. These would be due **1 February 2025**.

   b) Consider whether such "revised" indices address concerns noted in lack of fit of indices in the Operating Models (OMs), address factors such as environmental variability or fleet operations that might improve their performance in the OMs and could avoid leading to unnecessary ECs determinations. To include:

      i. Refit French Aerial
      ii. Consider improvements in the modeling of Morocco-Portugal trap index
      iii. Other index revisions
      iv. Test impact of a 2-year cycle for GBYP aerial survey

3. Evaluation of stock mixing information

   a) Small sub-group to compile recent stock mixing information in the format that it can be used in the OMs.

      i. Genetics
      ii. Otolith Chemistry
      iii. Provide recommendation to BFT Species Group on how to address composition data focusing on MSE revisions (2027)

   b) Qualitatively compare inputs with outputs from OMs.

      i. See Carruthers (2023).

4. 'Lite'-reconditioning

   a) Consider a *de minimis* reconditioning to possibly include:

      i. BFT-W CKMR
      ii. Existing indices up to 2023
      iii. Revised indices up to 2023

17.1.7 Sharks Workplan

The Shark Species Group (SSG) and the SCRS had originally prioritized a shortfin mako (SMA) stock assessment for 2024, which was postponed by the Commission for 2025. In preparation for the planned stock assessment of SMA for 2025, the Group will conduct the following activities:

- Hold a 5-day long data preparatory meeting (in March/April) to collate and analyze all the existing information required for stock assessment, using data through 2023.

- Hold a 5-day stock assessment meeting (in June/July), using data through 2023.

The following tasks will be required for the shortfin mako assessment:

Data preparatory meeting

- Review and agree any new life history information in the Atlantic, by stock (including growth, maturity, natural mortality, and steepness). Definition of the parameters to be used in the stock assessment models.

- If possible, review the methods used to generate the intrinsic growth rate, steepness from life-history parameters.

- Compile the sex-specific length-composition data from CPCs (as was done for the previous 2017 shortfin mako stock assessment (ICCAT, 2017e) for all relevant CPCs by January/February 2025.

- To the extent possible, collect information to estimate geographic location, abundance and any other information relating to the adult segment of the stock, and in particular to mature females.

- One month before the data preparatory meeting, the Secretariat will provide a summary of available conventional tag mark-recapture data, the data themselves so that they can be examined before the data preparatory meeting.

- Review recent catch data focusing on landing, discard and live releases. If necessary, estimate discards and landings to fill the gaps.

- Define fleets based on spatial/selectivity considerations.

- CPCs provide standardized catch per unit effort (CPUE) series going through 2023 in the form of SCRS documents (at least one week before the data preparatory meeting).

- Identify appropriate CPUE indices for use in shortfin mako stock assessment models.

- National scientists and the ICCAT Secretariat to use observer data and other potential techniques to estimate historical catches of fleets with significant catches where that information is missing.

- Agree on the base case (if necessary) and consider the grid or sensitivity analysis for life history parameter, CPUE, catch. At least, make the table for the candidate parameter, index etc. for use of the stock assessment.

- If possible, consider (and agree) the scenario of future projection and/or Risk Matrix.

- If possible, review relevant diagnostics from 2017 shortfin mako stock assessment (ICCAT, 2017e) models.

Intersessional and assessment meeting

- If possible, generate the distribution of steepness, intrinsic rate of growth etc., using the life-history parameters by one month before the stock assessment meeting.

- Provide a set of model diagnostics according to the best practices for stock assessment models and recommendation from the WGSAM.

- Consider stock assessment model ensemble scenarios that take into consideration the main uncertainties identified by the SSG, and the respective model weighting schemes.

Continue the activities of the Sharks Research and Data Collection Programme (SRDCP).

Continue and/or expand participation in the SCRS Sub-group on Technical Gear Changes in order to participate in the tasks assigned to it (see the Second Report of the Sub-group on Technical Gear Changes, (ICCAT, 2022g).

Continue and/or expand participation in the SCRS Sub-group on Electronic Monitoring in order to participate in the tasks assigned to it (see the Report of the Subgroup on Electronic Monitoring Systems).

17.1.8 Small Tunas Workplan

This workplan foresees both short and long-term objectives (see specific timeframes below).

Intersessional Meeting of the Small Tunas Species Group in 2025

- Have an Intersessional Meeting of the Small Tunas Species Group in 2025 for three days. The objectives of the meeting are: to organize all the data and information that have been obtained to date, to organize the length and catch position information, to present new life-history information, to review data-limited assessments that might be applied to small tunas and to plan the Small Tunas Species Group for the next three years, considering the workshop in data-limited models and new priorities stocks.

Development of a long-term (6-yr) research plan:

- All SCRS research programmes have been asked to develop long-term research plans to facilitate strategic planning, coordination and budgeting. Intersessional work will be organized virtually and through correspondence, open to all interested scientists, in order develop this plan. Progress will be reviewed by the Small Tunas Species Group at its intersessional and species group meetings.

Progress on the biological studies of small tunas:

- *Background/objectives:* The Small Tuna Year Programme (SMTYP) started in 2016-2017 with the initial aim of recovering SMT historical data (statistical and biological data) from the main ICCAT fishing areas including a specific component of biological studies. A consortium led by the University of Girona (Spain) was established in 2018 for the collection of samples aiming at biological studies (reproduction and aging LTA, BON WAH) as well as stock (LTA, BON, WAH, FRI, BLT) and species (LTA, FRI, BLT) differentiation studies. In 2020, a new consortium led by Brazil (*Fundação Apolônio Salles de Desenvolvimento Educacional* - FADURPE) was established to continue these studies. A workshop on reproduction which will allow for calibration and adopting internationally agreed methodologies to advance on the new studied small tuna species, has been scheduled for 21-24 October 2024 (Workshop on small tunas maturity staging). In 2025 the age and growth and reproduction studies for BON, LTA and WAH shall be completed. In addition to the ongoing research activities with SMTYP (reproduction and aging, as well as stock and species differentiation studies), in 2025 a comparison on morphometric and morphological parameters between fresh/frozen specimens of *Euthynnus* spp. from the Northeast Temperate Atlantic and Mediterranean Sea and the Eastern Tropical Atlantic will be carried out to assess if physical characters can be used to discriminate the two genetically different stocks.

  Aiming to conclude the ongoing ageing studies, a workshop will be scheduled for 2025.

  - *Priority:* High (first priority with financial implication);
  - *Leader/Participation*: In 2025, the consortium led by Brazil (FADURPE) will coordinate the research activities developed within SMTYP;
  - *Timeframe*: Ongoing work with annual updates scheduled to be provided to the SMT Species Group.

Revision of small tunas length-weight (L/W) relationships at stock level:

The Group will undertake more work on this project in case more samples become available in 2025.

Updating the biological meta-database:

- *Background/objectives*: In 2016, the Small Tunas Species Group started a biological meta-database. The Committee recognized the importance of continuously updating this database as new biological information becomes available, also developing criteria for replacing existing parameters when available. Such information is then provided to update the SMT Executive Summaries and will eventually be used for both qualitative and quantitative assessments for the different species and stocks.
- *Priority*: High.
- *Leader/Participation*: EU-Portugal, with collaboration of CPCs willing to participate, will continue to update the meta-database and provide updated information (in the form of SCRS papers or presentation) to the species group. The next update is planned for the next meeting of the Small Tunas Species Group in 2025. Scientists that have access to recent literature on SMT biology that can inform this database are encouraged to send that information to the SMTYP Coordinator and the Small Tunas Species Group Rapporteur.
- *Leaders:* Dr Pedro G. Lino and Mr Rubén Muñoz-Lechuga (EU-Portugal).
- *Timeframe*: A SCRS paper will be presented to the 2025 Species Groups

17.1.9 Swordfish Workplan

North and South Atlantic

Assessments for North and South Atlantic swordfish were conducted in 2022 (ICCAT, 2022e). The Committee is not requesting an intersessional meeting of the Swordfish Species Group in 2025. Items in this workplan will be advanced in informal meetings throughout 2025 and will report on progress at the next annual meeting of the species group. Should Panel 4 require additional interaction on an exceptional circumstances protocol (ECP) and robustness testing, a half-day online meeting between the Committee and Panel 4 may be needed.

Life history Project:

- *Background/objectives:* An understanding of the species biology, including age, growth and reproductive parameters is crucial for the application of biologically realistic stock assessment models and, ultimately, for effective conservation and management. Given the current uncertainties that still exist in those biological parameters, the Committee recommends that more studies on swordfish life history are carried out. Those should be integrated with an ICCAT swordfish research plan that is provided in the recommendations with financial implications.
- *Priority:* High priority.
- *Leader/Participation:* A consortium led by Canada started this work in 2018. The work has progressed to date and is scheduled to continue in 2025.
- *Timeframe:* Started in 2018 and is currently ongoing; there is a request for funds to continue work throughout 2025.

Work related with northern Management Strategy Evaluation (MSE) work:

- *Background/objectives:* The initial focus specific for North Atlantic swordfish, which began in 2018 and involved some development of the framework to use in the OM development, was further developed in subsequent years. Consistent with the MSE implementation roadmap adopted by the Commission, various components of the MSE framework are ongoing and are outlined below and in the ICCAT MSE roadmap. Additional work is needed on an EC protocol and robustness testing (including analysis on effectiveness of minimum size limits and climate change effects on swordfish). In collaboration with the Working Group on Stock Assessment Methods (WGSAM), it is proposed to reflect on the lessons learned from the SWO-N and other ICCAT MSE processes to develop a guidance document to improve efficiency and communication for future MSE projects.
- *Priority:* High priority.
- *Leader/Participation:* MSE contractor; core MSE technical team.
- *Timeframe:* Ongoing (see ICCAT MSE Roadmap in **Appendix 7**).

Pop-up Satellite Archival Tag (PSAT) deployment and tag data request for joint analyses:

- *Background/objectives:* The Committee has identified priority locations for deployment of PSATs in the Atlantic. In 2025, these locations include the Equatorial area and Gulf of Guinea, the stock mixture are in the NE Atlantic, and the SW Atlantic. Deploying PSATs in these locations will support ongoing work on stock structure and mixing, identification of spawning areas, and work on habitat suitability which is incorporated into catch per unit effort (CPUE) standardization and Climate Change related advice. The Committee continues to encourage all CPCs to provide their swordfish PSAT tag data to an ad hoc study group. As a minimum the data should include the temperature and depth by hour, date and one-degree latitude*longitude square. This will contribute to support the improvement of CPUE standardization through the removal of environmental effects as well as the better definition of stock boundaries. This activity is linked with another from the WGSAM workplan.
- *Priority:* High priority.
- *Leader/Participation:* Led by the EU-Portugal and Canada, with the participation of CPCs with PSAT data.
- *Timeframe:* Started in 2018, ongoing to date; to continue in 2025.

Continuing work on environmental effects:

- *Background/objectives:* Given the possibility of spatial and environmental effects being partially responsible for the conflicting trends of some of the influential indices of abundance, the Committee should further study this hypothesis during the coming years, use existing PSAT data to compliment this work, and determine how best to formally include these environmental covariates into the overall assessment process. The United States has taken a lead role in this investigation and likely collaborators would include scientists from Canada, Japan, and the EU (Spain and Portugal) as their indices of abundance are the most appropriate for this work. 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 stock 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. This work should be expanded to include the Mediterranean. Given projected climate change effects, the Group will explore future scenarios with updated data sources. This will support MSE work on development of climate robust advice. Additionally, the species group intends to support the ongoing work of the Subcommittee on Ecosystems to trial the provision of climate conditioned risk equivalent management advice for North Atlantic swordfish.
- *Priority:* High priority.
- *Leader/Participation:* Lead by United States, with participation of SC-ECO, and other CPCs.
- *Timeframe:* Ongoing, to be considered at the next stock assessment.

Application of methods to estimate dead discarding of swordfish in ICCAT fisheries:

- *Background/objectives:* The Committee continues to note that dead discard reporting for all three swordfish stocks is poor. As such, the Committee notes the importance of applying dead discard estimation analyses (e.g. bycatch estimator tool (BYET) developed at the WGSAM) to swordfish stocks. The Committee will work with national scientists to implement discard estimation for major swordfish fleets in advance of the next stock assessment.
- *Priority:* High priority.
- *Leader/Participation:* WGSAM, CPC scientists.
- *Timeframe:* Ongoing, to continue in 2025.

Explore development of a combined CPUE index for the southern stock:

- *Background/objectives:* A small technical group will explore development of a combined index to improve the input data for the South Atlantic assessment models. To accomplish it, the ICCAT Task 2 catch and effort data will be the main data source, but also the detailed catch and effort data from different CPCs can ideally be used for this purpose, in case sharing data is possible.
- *Priority:* High priority.
- *Leader/Participation:* Collaborative work of CPCs scientists.
- *Timeframe:* Anticipated to start in 2025.

Continue development of a closed loop simulation study for South Atlantic swordfish stock:

- *Background/objectives:* In the 2024 Intersessional Meeting of the Swordfish Species Group (including MSE) (ICCAT, 2024e), Taylor (2024) was presented which documented recent progress on closed-loop simulations for southern Atlantic swordfish. The results showed that most of the CMPs met minimal satisficing criteria. However, further work is still required which may need input from Panel 4.
- *Priority:* Medium priority.
- *Leader/Participation:* Secretariat/Rapporteur/Consultant.
- *Timeframe:* Started in 2022 and ongoing.

Revise and update conversions for the swordfish stocks:

- *Background/objectives:* The Swordfish Species Group recognized the need to develop conversions for new dressed formats and that the conversions provided on the ICCAT website may be incomplete or out of date and need to be updated
- *Priority:* Medium priority.
- *Leader/Participation:* Secretariat/Rapporteur.
- *Timeframe:* 2025

Mediterranean

For the Mediterranean stock, the last assessment was conducted in 2020 (ICCAT, 2020c). The next assessment should be completed in 2026 for Mediterranean swordfish but, in order to monitor stock trends, essential fisheries indicators (e.g. catch, indices of abundance), should be reviewed and developed by a sub-group in advance of the next stock assessment.

Given the above needs and taking into account the questions raised during the latest assessment the workplan will include:

- Review relevant fisheries and biological data.
- Update estimates of standardized CPUE indexes for the most important fisheries, taking into account the new trap-line gear.
- Obtain estimates of discard misreporting.
- Estimates of undersized catch.

Additionally, the Committee encourages national scientists to identify the effects of the environment on swordfish biology, ecology and fisheries. Future CPUE analyses should evaluate the benefits of taking into account important climate and oceanographic changes that have occurred recently in the Mediterranean Sea (e.g. eastern Mediterranean transient) and may have impacted the availability of the stock to some fisheries, and/or the recruitment success of the population.

- *Timeframe:* by the next stock assessment (2026).
- *Priority:* Medium.
- *Participation*: all CPs.

17.1.10 Tropical Tunas Workplan for 2025

The Tropical Tunas Workplan for 2025 has the following main tasks:

Bigeye assessment

The most recent stock assessment for bigeye tuna (ICCAT, 2021b) was conducted in 2021 using catch and effort data through 2019. The Committee proposes holding a data preparatory and an assessment meeting for bigeye tuna in 2025 including data up to 2023 fishing year.

Basic fishery data will need to be updated and presented at the data preparatory meeting:

- Update and revise the historical catch (Task 1NC) and catch and effort (Task 2CE) for bigeye tuna with a deadline of two weeks before the BET data preparatory meeting for submission to the Secretariat.
- Size sample data for all major fleets and gears.
- Request to CPCs for submission of the catch-at-size (CAS) for all major fleets using the ST05-T2CS form.
- Any important changes in fishery operations need to be reported preferable as an SCRS document.

Scientists are encouraged to provide new information on biological data that can inform the assessment as SCRS documents for the BET data preparatory meeting. Population parameters will need to be reviewed and updated as appropriate:

- Conduct update analyses of Atlantic Ocean Tropical Tuna Tagging Programme (AOTTP) tagging data (conventional and electronic) aiming to reduce the uncertainty of natural mortality and growth estimate parameters;
- Compile any new information available on maturity at size or age;
- Revised estimates of natural mortality taking into consideration the guidelines from the Center for the Advancement of Population Assessment Methodology (CAPAM) Mortality Workshop on the estimation of natural mortality.

The 2025 assessment intends to use the same assessment model platform (SS3) and the fleet structure used in the 2021 assessment to be consistent with the Mixed Tropical MSE Operating Models. However, the evaluation would consider alternative assessment models and platforms.

Updates of relevant biological parameters and relative abundance indices not used during the 2021 assessment will be considered. However, at a minimum, the following relative abundance indices used during the 2021 assessment will need to be updated, and available for the data preparatory meeting:

- Joint longline index, ideally developed at the set-by-set level and provided well in advance of the data preparatory meeting. All countries with longline fleets with available set-by-set data are encouraged to participate in the development of this index.
- Purse seine acoustic index.
- Scientists are encouraged to develop additional indices for consideration as inputs to the models.

During the assessment, in addition to stock status and projections, the Committee will estimate historical patterns of fishing mortality by age and fleet to develop fleet-specific impact plots that can be used in responses to the Commission.

Continue the development, revision, and update for the common fishery indicators proposal

The Committee recognized the need to develop common fishery indicators for the major tropical tunas fisheries to assist in scientific discussions and in drafting Responses to the Commission (Pascual-Alayón *et al*., 2024).

The Committee recommends that all CPCs with purse seine fisheries targeting tropical tunas participate in the characterization and the definition of each fishing indicator to validate the list at the ICCAT level. All CPCs are recommended to participate in this process of homogenization and adoption of representative fishery indicators.

- The Committee proposes that interested CPCs work intersessionally to review and consolidate the fishery indicators in paper Die *et al.,* 2024 so they can be presented at the Subcommittee on Statistics and SCRS in 2025. Defining an action plan to reach a final resolution or declaration by the Commission on this issue.

- The Committee requests that the Secretariat examine the ICCAT databases for the availability of the data required to complete and or calculate the fishery indicators for the purse seine fishery and identifying missing data to be collected in the future.

- The Committee recommends that CPCs aim to develop and propose complementary fishery indicators for other important tropical tuna fisheries in the Atlantic including longline and baitboat. Due to the specificity of each gear and fishery, specific fishery indicators need to be developed or selected from those already available.

Improvement of basic fishery data

The Committee recommends the creation of an ad hoc group within the Tropical Tunas Species Group that will be charged with reviewing the quality of the basic data used in stock assessment (catch, effort and size data) contained in the ICCAT databases with the aim of:

- Reviewing the most important data gaps and sources of uncertainty in data reports provided to the SCRS;

- Provide guidance to CPCs on potential strategies for improving the quality of the data;

- Review work recently conducted on fishery indicators and presented during 2023 and 2024 to develop a set of standard methods for reporting and communicating fishery indicators.

Similar efforts conducted by this Committee in the past, suggest that such a review needs to be done with full cooperation, collaboration, and involvement of scientists from the CPC data providers. These scientists have the best knowledge about the challenges facing each country regarding data collection and reporting. They are also in the best position to implement guidance provided by the Committee.

Before the Bigeye Tuna Data Preparatory Meeting, the Tropical Tunas Species Group Coordinator will invite members of the SCRS and the ICCAT Secretariat to join this Tropical Tunas Species Group and will coordinate the development of the terms of reference and process used by the Tropical Tunas Species Group to reach the desired improvement in data quality. The terms of reference should clearly define the scope of the review and make sure that it focuses on data that are most important for the stock assessment and MSE processes as well as for providing responses to the Commission.

Improvement of biological parameters

The Committee will continue to support activities related to the AOTTP programme and the continuation of the analysis of the AOTTP data. These activities will provide data on recaptured tagged fish, and reporting rates of tagged fish through seeding experiments. The work will be focused on the monitoring of recaptured fish and tag seeding in West Africa.

Biological parameters of all tropical tunas stocks continue to have large associated uncertainty, and in particularly those related to growth models and ageing. Although tagging is providing valuable information on growth, it tends to be restricted to a narrow range of lengths and ages. The range is defined by the smallest fish that can be tagged, by the survival rate of those fish and reporting behaviour of different fleets. Growth of small fish and of large fish is therefore not well informed by tagging. The Committee has therefore been engaged in the collection of samples for ageing. This collection has been particularly fruitful in West Africa with the support initially of the AOTTP and currently of ICCAT.

The Committee request that there is continued effort to collect and age samples of bigeye tuna ahead of the bigeye tuna data preparatory meeting, working closely with complementary programmes including ITUNNES. These data will help to improve growth models for both species and estimates of maximum age for bigeye tuna.

MSE

The Committee will continue to support the development of the SKJ-W and Multi-stock MSE. Continued development of these MSEs is enhanced by the ability of all members of the Committee to have a basic understanding of the MSE process and to contribute to technical aspects of it. Members of the Committee will take advantage of training opportunities on MSE implemented by ICCAT and or the ABNJ project.

Multi-stock MSE

The Committee will adjust performance indicators for the multi-stock MSE based on feedback on operational Management Objectives obtained from the Commission. Feedback will be requested either at the Annual Meeting in 2024, or alternatively during the appropriate meeting of Panel 1. Such objectives are essential for a successful Multi-stock MSE process as they need to be linked to specific performance indicators used in selecting a Management Procedure (MP).

The Tropical Tunas Technical Sub-group on MSE of the Tropical Tunas Species Group will continue to support the contracted development team and advance the Multi-stock MSE process and to report periodically to the Tropical Tunas Species Group. Interim work and developments in the Multi-stock MSE are subject to review and adoption by the Tropical Tunas Species Group.

SKJ-W MSE

For SKJ-W, the current MSE results will serve as the basis for the ICCAT Commission's adoption of final management objectives and an MP in 2024. The Committee will develop guidelines for exceptional circumstances and Climate Change scenarios pending the adoption of the MP in 2024.

17.2 Intersessional meetings proposed for 2025

Given the current resources of the ICCAT Secretariat and existing levels of support from CPCs in terms of the participation of scientists, the Committee only has the capacity to carry out three stock assessment processes during a year. The calendar above reflects the priorities identified by the Committee for stock assessments to be carried out in 2025, including:

1) Tropical tunas: bigeye tuna (last assessed in 2021 (ICCAT, 2021b));

2) Billfish: white marlin (last assessed in 2019 (ICCAT, 2020b)); and

3) Sharks: North and South Atlantic shortfin mako (both last assessed in 2017 (ICCAT, 2017e)).

The Committee notes that, although in 2023 it recommended that a Mediterranean swordfish stock assessment be carried out in 2025, it no longer maintains this recommendation. This 2023 recommendation included a call for substantial improvements to the data. Although some new data have been received (e.g. new catch data for the most recent period 2019-2023), there remain important data gaps that would hamper the assessment. Therefore, the Swordfish Species Group has included in this workplan improvements to the data inputs and in its recommendations data reporting and analyses.

SCRS Calendar for 2025

	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	MON	TUE
January			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				
February						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				
															WGSAM																						
March						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	
															SMA Data Prep														WHM Data Prep								
April		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30						
									BFT Intersessional													BET Data Prep															
May				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31			
															SC- ECO																						
June							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	
															SMA Assessment							SMT							WHM Assessment								
July		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/Strategic plan					BET Assessment																						
August					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		
September	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							SCRS															
October			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				
November						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		
December	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						

Free day in ICCAT — Meeting of technical nature — Secretariat meeting preparation/holidays — Workshop

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 planned for 22 to 26 September 2025 and the Species Groups meetings from 15 to 20 September 2025. These meetings will be held in Madrid (Spain) and have a hybrid format.

18. General recommendations to the Commission

Priorities and cost to incorporate in the budget the interpreting costs of the SCRS intersessional meetings

Further to the 2022 SCRS request to the Commission for the provision of interpretation services during all the SCRS intersessional meetings, the Commission followed the SCRS advice and agreed to set the criteria to rank the priorities of the meetings that would benefit from interpretation services. The five highest categories set for the prioritization of the provision of interpretation during SCRS intersessional meetings were as follows:

Rank of priority	*Meeting*
Category 1	Tropical Tunas Species Group meetings
Category 2	Sharks Species Group meetings
Category 3	Subcommittee on Statistics meetings
Category 4	Small Tunas Species Group meetings
Category 5	Subcommittee on Ecosystems and Bycatch meetings

In 2023 the Commission included in the provisional regular budget for 2025, a total of €212,000 to cover the interpretation costs associated with the SCRS meetings up to Category 5.

Based on the above criteria, the SCRS Chair and the ICCAT Secretariat produced a draft table for the consideration of the Committee (**Table 1**), which took into consideration the tentative SCRS Calendar for 2025. In this instance, the Billfishes Species Group September meeting is recommended for interpretation due to strong need and the fact that management advice will be developed based on the white marlin stock assessment. Accordingly, the estimated costs for the provision of interpretation to the SCRS intersessional meetings in 2025 would are detailed below (**Table 1**).

Table 1. Estimated costs of interpretation for selected SCRS intersessional meetings in 2025.

Requested meetings	*Duration (No. days)*	*Category 1*	*Category 2*	*Category 3*	*Category 4*	*Category 5*
Tropical Tunas Species Group[1]	12.5	€80,625	-	-	-	-
Shark Species Group[2]	12	-	€77,400	-	-	-
Subcommittee on Statistics[3]	1.5	-	-	€9,675	-	-
Billfishes Species Group[4]	2	-	-	-	€12,900	-
Subcommittee on Ecosystems and Bycatch	5	-	-	-	-	€32,250
Cumulative cost		**€80,625**	**€158,025**	**€167,700**	**€180,600**	**€212,850**

[1] Including a data preparatory meeting, a stock assessment meeting and a 2.5 day Species Group meeting.
[2] Including a data preparatory meeting, a stock assessment meeting and a 2 day Species Group meeting.
[3] Including a 1.5 day meeting during the Species Group meetings of the week of September.
[4] Including a 2-day meeting during the September Species Group meetings week.

18.1 General recommendations to the Commission that have financial implications

18.1.1 Subcommittee on Ecosystems and Bycatch

Pertaining to bycatch

- The Committee recommends holding a Workshop to continue with the work to evaluate the impact of ICCAT fisheries on sea turtles in the MED in 2025. For this workshop, funds are requested to finance the participation of 6-7 scientists (€20,000).

- The Committee recommended that the Secretariat increase the supply of spaghetti tags aimed at tagging bycatch species, including *Mola mola*. Accordingly, different types of spaghetti tags should be purchased and made available (€3,000).

Pertaining to ecosystems

- Recognizing the need for climate and oceanographic indicators to expand the spatial extent of these indicators beyond the Mediterranean Sea to the Atlantic Ocean, it is recommended that the Commission provide funds to advance this work (€14,500).

Subcommittee on Ecosystems and Bycatch	***2025***
Tagging	
Purchase different types of spaghetti tags	€3,000
Other studies	
Expand the spatial extent of climate and oceanographic indicators beyond the Mediterranean Sea to the Atlantic Ocean	€14,500
Workshops/meetings	
Workshop on evaluation of impact of ICCAT fisheries on marine turtles in the Mediterranean Sea and funds to support the attendance of invited experts and the ICCAT Secretariat	€20,000
TOTAL	**€37,500**

18.1.2 Subcommittee on Statistics

Considering the need for further developments (following the feedback provided by CPCs and the SCRS), as well as the necessity to deploy the new public data dissemination applications on a dedicated cloud infrastructure (monthly renting of cloud servers with the required software, with potential to scale it up as required), the Subcommittee on Statistics recommends that additional funds are set aside specifically for these purposes.

The Committee recommends continuing supporting Phase II of the ICCAT regional Caribbean data collection project. The project aims to improve reporting and data analysis of fishery data of fleets capturing blue marlin and yellowfin tuna in the region. The U.S. has already committed to fully fund this activity.

Breakdown of the requested funds related to the Subcommittee on Statistics for the period 2025 is detailed in the table below:

Subcommittee on Statistics	***2025***
Tagging	
Biological studies:	
Sample collection and shipping	
Other fisheries related studies	
Regional Caribbean data collection project	€110,000
Renting of Cloud servers and required software	€11,000
Assessment/Evaluation	
MSE	
Workshops/meetings	
TOTAL	**€121,000**

18.1.3 Albacore

The Committee recommends continued funding of the Albacore Year Programme (ALBYP) for North and South Atlantic stocks. For 2025, research on the North and South albacore stocks will be focused on biology and ecology and management strategy evaluation (MSE).

- For 2025 the Committee recommends continuing electronic tagging and on reproductive biology studies (with the associated ageing of samples) in the North and South Atlantic, to progress on the North Atlantic albacore MSE (ALB-N MSE). These are all considered to be high priority tasks, with an estimated cost of:

i. €32,750 for tagging (€25,000 for North and €7,750 for South);

ii. €32,500 for reproductive biology, related ageing and sampling (€5,000 for North and €27,500 for South);

iii. Following the ICCAT MSE roadmap adopted by the Commission, the Committee recommends that the Commission provides the necessary financial means for the continuity of ALB-N MSE work. This high priority task requires €30,000 funding for 2025.

More details of the proposed research and economic plan are provided in the report of the ALBYP.

Breakdown of the requested funds related to albacore for the 2025 is detailed in the table below:

Albacore	***2025***
Tagging, rewards and awareness	€32,750
Biological studies:	
Reproduction	€20,000
Age and growth	€7,500
Genetic	
Others	
Sample collection and shipping	€5,000
MSE	
Progress of the ALB-N MSE	€30,000
TOTAL	**€95,250**

18.1.4 Billfishes

The Committee recommends continued funding of the Enhanced Programme for Billfish Research (EPBR). In 2025 research will be focused on the following areas by order of priority:

- Continue the growth study of the three priority billfish species in the eastern Atlantic including sampling collection and shipping;
- Advance in direct validation of aging protocols through bomb radiocarbon, genetics, and other latest scientific techniques. Age validation (bomb-radiocarbon) for blue marlin started in 2024 with a limited sample and with good results. Given the success of this new validation work, the Committee requests an increase in this budget line so that the full work can be developed. For 2025 this will use otoliths from the eastern Atlantic collected within the EPBR that are available;
- Continue the electronic tagging of marlins (BUM/WHM) in the North East Atlantic;
- Continue reproduction study of blue marlin (BUM) in the Gulf of Mexico.

Breakdown of the requested funds related to billfish for the period 2025 in the table below:

Billfish	***2025***
Tagging	
Electronic tagging, rewarding, and awareness (NE Atlantic)	€27,500
Biological studies:	
Reproduction	€10,000
Age and growth	€35,000
Genetic	
Other (if any, identify)	
Sample collection and shipping	€7,000
Stock assessment	
WHM assessment external review	€10,000
Workshops/meetings	
TOTAL	**€89,500**

18.1.5 Bluefin tuna

The Committee recommends continued funding of the Atlantic-Wide Bluefin Tuna Research Programme (GBYP). For the next year, research will be focused on the following areas by order of priority:

- Hold one hybrid intersessional meeting in 2025 (four days). This intersessional meeting in 2025 will discuss the results of the BFT-W Close-Kin Mark-Recapture (CKMR), implementation of the BFT-E CKMR, will evaluate new information that may be consequential for the Management Strategy Evaluation (MSE), and refine the plans for the 2026-2027 stock health check and MSE review;

- Contribute to the modelling tasks, sampling activities and genetic studies in relation to the CKMR study design and eventual implementation;

- Contribute to biological studies and biological database development required for stock assessment and CKMR;

- Contribute to tagging research including electronic database development;

- Contract experts to support BFT MSE;

- Conduct GBYP aerial survey in 2025 in the Balearic region only, move to an every other year survey for the immediate future.

The breakdown of the requested funds related to bluefin tuna for 2025 approved in the 2023 Commission meeting and the new proposal for the distribution of those funds is detailed in the table below:

Bluefin tuna	***2025 approved 2023 (GBYP Phase 14)***	***2025 revised* (GBYP Phase 14)***
Tagging	€50,000	€50,000
Biological studies		
CKMR development	€100,000	€280,000
Sample collection, shipping, handling and maintenance	€55,000	€55,000
Other studies		
Fisheries independent index, GBYP aerial survey	€365,000	€170,000**
Further development of assessment models & MSE	€10,000	€25,000
Workshops/meetings		
Program coordination	€235,000	€235,000
TOTAL	**€815,000**	**€815,000**

*A general outline of how funding could operate in 2026 is provided in the "Eastern Atlantic Bluefin Tuna CKMR Implementation Plan Proposal" [SCI_104A/2024].
** The cost-savings in the aerial survey will come from only conducting the Balearic survey in 2025 and allocating this funding to CKMR sampling and pilot projects.

18.1.6 Sharks

The Committee recommends continued funding of the Shark Research and Data Collection Programme (SRDCP). For the next two years, research will be focused on the following areas by order of priority:

- Provide funding for the SRDCP for Year 11 to:
  i) Continue with stock differentiation analysis for porbeagle (Next Generation Sequencing (NGS)) (€20,000).
  ii) Continue on prioritized study on movement, habitat characterization and post-release mortality for shortfin mako (*Isurus oxyrinchus*), porbeagle (*Lamna nasus*), silky (*Carcharhinus falciformis*), oceanic whitetip (*C. longimanus*), longfin mako (*I. paucus*), hammerhead sharks (*Sphyrna* sp.), blue shark (*Prionace glauca*) and bigeye thresher (*Alopias superciliosus*) through satellite tagging, including tag-return rewards. Given the high success of the tagging campaigns in 2024, the Group is requesting an increase on this line so that additional satellite tags can be acquired, including miniPATs and some SPOT tags (€55,000).

iii) Conduct electronic tagging campaigns. Given the success in the 2024 tagging campaigns, the Group is requesting an increase in this budget line so that the campaigns can continue and be expanded in 2025. Priority areas for 2025 are: 1) Equatorial and tropical Atlantic, 2) West African coast, 3) Southwest Atlantic (€110,000).

iv) Continue the study on the reproductive biology of North Atlantic shortfin mako quantifying reproductive hormone concentrations from muscle tissue samples to determine maturity and reproductive status (€7,500).

v) Continue the study on age and growth study of one of the following ICCAT species (BSH, POR, SPZ, OCS, FAL and BTH), including shipping of samples (€7,000).

- Consider hiring one or more external experts to assist constructing a clear and comprehensive methodological approach for the 2025 stock assessment of North and South Atlantic shortfin mako shark stocks. The expert(s) should also participate in-person at the data preparatory and stock assessment meetings (€20,000).

A breakdown of the requested funds related to sharks for 2025 is detailed in the table below:

Sharks	***2025***
Tagging	
Electronic tagging, rewarding and awareness	€55,000
Electronic tagging campaign	€110,000
Biological studies:	
Reproduction (SMA North)	€7,500
Age and growth (other species)	€7,000
Genetic (POR)	€20,000
Other (if any, identify)	
Sample collection and shipping	
Workshops/meetings	
Stock assessment	
SMA stock assessment expert	€ 20,000
Equipment	
TDRs and Hook-timers (long-term study, requested by Rec. 21-09)	€ 28,500
TOTAL	**€248,000**

18.1.7 Small tunas

The Committee recommends continued funding of the Small Tunas Year Programme (SMTYP). For the next two years, research will be focused on the following areas by order of priority:

- *Continuing support to the SMTYP:* The Committee recommended continuing with the ICCAT SMTYP research programme activities in 2025 to further improve the biological information (improving geographical coverage for growth, maturity and stock identification) to fill the remaining gaps of the three species (WAH, LTA, BON) and continue the sampling for *Auxis thazard* (FRI) and *A. rochei* (BLT). In addition, the Committee recommends doing a morphometric and morphological comparison between fresh/frozen specimens of *Euthynnus alleteratus* from the Northeast Temperate Atlantic, the Southwest, the Mediterranean Sea, and the eastern tropical Atlantic to assess if physical characters can be used to discriminate the two genetically different stocks. Costs for 2025: €32,500 (for sample processing and analysis, and to buy samples).

- *Workshop (in person, 5 days) on ageing in 2025 for small tuna species*: This workshop would allow for calibration and adopting internationally agreed methodologies to conclude the ongoing ageing studies on (BON, LTA and WAH) and further develop the ageing studies on FRA and BLT. The estimated cost to cover the attendance of 1 expert and up to 6 national scientists is of €16,850.

Breakdown of the requested funds related to small tunas for the period 2024 and 2026 is detailed in the table below:

Small Tunas	***2025***
Biological studies:	
Reproduction	€7,500
Age and growth	€7,500
Genetic	€7,500
Sample collection and shipping	€10,000
Workshops/meetings	
Capacity building on small tuna ageing	€16,850
TOTAL	**€49,350**

18.1.8 Swordfish

An ICCAT project on swordfish biology, genetics and satellite tagging started in 2018 and the Committee recommends that the project continue for 2024 given the current uncertainties and recommends continued funding of the Swordfish Year Programme (SWOYP). This recommendation applies to the North and South Atlantic and Mediterranean stocks for the next two years. An understanding of the species biology, including age, growth and reproductive parameters, as well as stock structure and mixing is crucial for the application of biologically realistic stock assessment models and, ultimately, for effective conservation and management. The Committee further recommends the use of a multi-stocks research cruise to fill spatial-temporal samples gaps that are common among ICCAT Species Groups.

Several of the following activities will be funded through the 2024 ICCAT science budget, however, there are cases where additional budget will be needed, detailed below:

- *Satellite tagging work*: To cover expenses with deployments of previously acquired tags and some tagging equipment (tagging poles, etc.), and fund dedicated trips for tagging. In 2025, these locations are: 1) the Equatorial area and Gulf of Guinea, 2) the stock mixture area in the NE Atlantic and, 3) the SW Atlantic. Given the high success in the tagging campaigns carried out in 2024, the Group request an increment in budget to €146,000 compared to what was approved last year (€116,500), so that additional tags can be acquired for the 2025 campaigns.

- *Reproduction*: Ongoing work processing and analysing gonads.

- *Age and growth*: Processing and analysis of spines and otoliths; continuation of a bomb-radiocarbon age validation study.

- *Genetics*: Continued population analysis of tissues samples for stock differentiation; continuation of a study on epigenetic ageing, to be completed in conjunction with the bomb radiocarbon study. The genetics study continued to identify stock differentiation, boundaries and mixing between North, South and Mediterranean swordfish. Using double digest restriction-site associated DNA (ddRAD) genetics techniques, samples will be analyzed from the central South Atlantic, Southwest Indian Ocean and eastern Mediterranean Sea in order to better define stock differentiation and boundaries. In addition, ddRAD analysis will be applied to new samples coming from areas of interest already studied in order to monitor for temporal trends in mixing among stocks. Samples from Northeast Atlantic will elucidate the rate of mixing of three stocks, if the mixing is constant or there are variations along the years and if there is genetic admixing among the three stocks. ddRAD analysis will also be applied to Mediterranean specimens caught in the Gibraltar Strait to confirm the absence of Atlantic specimens into the Mediterranean Sea. Epigenetic analysis will be mostly completed by analyzing an additional 30 samples by Reduced Representation Bisulfite Sequencing (RRBS-SEQ).

- *Sampling and shipping*: Sampling priority on missing areas/sizes as defined in the project summary and in greater detail in the SWOYP Phase 6 final report. Given the new possibilities to sample from high priority areas in 2025, the Swordfish Species Group requests a small increment in budget (from €0 to €10,000), so that those priority areas can be sampled in 2025.

- *Management Strategy Evaluation (MSE) for SWO-N*: (priority: high). As a result of work requested by the Commission (Rec. 23-04), some technical development tasks were deferred to 2025. The Swordfish Species Group is scheduled to continue development of an exceptional circumstances protocol and robustness tests in 2025 and provide a paper on recommendations and lessons learned from this process so as to improve future MSE work at ICCAT. As such, the Swordfish Species Group requests that the budget is increased accordingly (from €20,000 to €71,250), given the additional work now planned for 2025. The work on an Exceptional Circumstances (ECs) Protocol requires approximately 35% of the requested budget, and the work on the robustness tests approximately 65% of the budget.

Breakdown of the requested funds related to swordfish for the period 2025 is detailed in the table below:

Swordfish	*2025 approved 2023*	*2025 revised*
Tagging		
Electronic tagging, rewarding and awareness	€116,500	€146,000
Biological studies:		
Reproduction	€10,000	€10,000
Age and growth	€15,000	€15,000
Genetic	€60,000	€60,000
Other (close kin study)		
Other		
Sample collection and shipping	€0	€10,000
Workshops/meetings		
MSE		
Progress of the SWO-N MSE	€20,000	€71,250
TOTAL	**€221,500**	**€312,250**

18.1.9 Tropical tunas

The Committee recommends continued funding of the Tropical Tuna Research and Data Collection Programme (TTRaD). For 2025, research will be focused on the following areas by order of priority:

1. MSE developments and review for SKJ-W and Multi-stock Management Strategy Evaluation (MSE);

2. Update fishing and natural mortality for bigeye ahead of the scheduled bigeye stock assessment meeting;

3. Continuation of sample collection (including storage) for age and growth and preliminary analysis;

4. Atlantic Ocean Tropical Tuna Tagging Programme (AOTTP) tag recovery activities and offices;

5. Spatio-temporal model development to improve responses to Commission related to FAD management in the Atlantic Ocean;

6. Estimation of skipjack exploitation rates from AOTTP data to determine whether exploitation rates from tagging can be used to improve the performance of skipjack assessment models.

A draft Tropical Tuna Research and Data Collection (TTRaD) programme was adopted in 2023, and the Committee updated this plan with the inclusion of more detailed information on time frames, costs, and deliverables in 2024. Therefore, activities 2, 5, and 6 represent new activities requested by the Committee and linked to the priorities identified in the updated TTRaD.

A breakdown of the requested funds related to tropical tunas for 2025 is detailed in the table below:

Tropical Tunas	***2025***
Tagging, rewards, and awareness	
Tag recovery and maintenance of AOTTP database	€8,750
Biological studies:	
Age and growth	€15,000
Other studies	
Update fishing and natural mortality for BET	€50,000
Spatio-temporal model development	€100,000
Estimation of skipjack exploitation rates	€25,000
MSE	
Western SKJ	€75,000
Multi-stock MSE	
TOTAL	**€273,750**

18.1.10 Working Group on Stock Assessment Methods (WGSAM)

- The WGSAM recommended that besides the 2024 training workshop, an additional Bycatch Estimation Tool (BYET) training workshop be organized in 2025 with the expectation that this will increase the number of CPCs that will report (dead and live discards).

- The WGSAM recommended implementing the recommendations from the BYET workshops in 2023 and 2024, as well as the development of the Shiny App as an interface to run the R code of the BYET and to consider any further suggestions from the 2024 workshop.

Breakdown of the requested funds related to the WGSAM for the period 2025 is detailed in the **table** below:

Working Group on Stock Assessment Methods (WGSAM)	***2025***
Other (if any, identify)	
Implement recommendations from the 2023 and 2024 BYET workshops and development of the Shiny App as an interface to run the R code of the BYET	€26,000
Workshops/meetings	
Workshop on the use of the BYET	€20,000
TOTAL	**€46,000**

18.2 Other general recommendations

18.2.1 Subcommittee on Ecosystems and Bycatch

Pertaining to bycatch

- The Committee recognized the progress made by national scientists in characterizing the impact of ICCAT fisheries in the Mediterranean on sea turtles and recommended that such efforts continue.

Pertaining to ecosystems

- The Subcommittee recommended that the SCRS discuss the potential need for additional resources to address climate change.

18.2.2 Subcommittee on Statistics

For the Secretariat to work together with an ad hoc group to modify form ST09 to include the minimum feasible subset of additional information requested by Rec. 22-12, and to determine how to deal with potential discontinuities caused by changing the structure of form ST09. The result of the work of the ad hoc group will be presented at the 2025 meetings of the Subcommittee on Ecosystems and Bycatch and Subcommittee on Statistics.

The Subcommittee on Statistics recommends that scientists of all CPCs interested in participating in the ad hoc group to modify the ST09 form to address the data requirement Rec. 22-12 to contact the Secretariat before the end of 2024.

The Subcommittee on Statistics recommends that a one-day online workshop to address issues related to data reporting is held in 2025. This workshop will be held online and is aimed at statistical and tagging correspondents and would take place around one month before the data submission deadline.

18.2.3 Albacore

- The Group recommends that an ad hoc group focus on the Mediterranean albacore fisheries statistics with the objective of having an overall and comprehensive review of the historical catch Task 1 and catch and effort Task 2 CE series. It should focus on historical catches associated with gears like purse seines, gillnets, etc., and consider catches that may have not been reported historically before monitoring programmes were in place. This ad hoc group will report to the Albacore Species Group on research projects, progress, and general recommendations on the historical series for the next assessment(s) of Mediterranean albacore, including potential alternative catch scenarios to be considered in future assessments or MSE efforts.
- The Group recommends the integration of the Mediterranean stock into the ALBYP. In order to facilitate better management advice, the Mediterranean Research programme should focus on key points identified in the 2024 and other recent stock assessments: improvement of fishery statistics through data recovery, larval survey calibration to allow for a long fisheries independent survey, an integrated growth analysis, improvement of r and K priors, development of a joint longline catch per unit effort (CPUE), and environmental effects.

18.2.4 Billfishes

The Committee recommends that CPCs follow the SCRS general recommendation to replace as soon as possible the SCRS preliminary catch statistics (T1NC) with their official catches of all species (separating landings, dead discards, and live discards) in live weight equivalent.

18.2.5 Bluefin tuna

- The Committee recommends that CPC sampling programmes support the BFT-E CKMR programme through their national programmes in collaboration with the GBYP CKMR programme.
- The Committee reiterates its request that 100% of the stereo video camera footage be provided to Committee rather than a 20% sample. Recent advances in Artificial Intelligence technology allow for rapid and objective reading of the video footage. Having access to 100% of the footage would allow the Committee to evaluate whether the subsample provides a sufficiently reliable estimate of the size composition and number of fish.
- Considering the continued reduction in the budget available to the GBYP research programme and the requirement to improve the information feeding into the BFT MSE, it is considered essential that alternative sources of funding be found. Difficult choices are already being proposed as to which research activities are carried out, specifically reducing the GBYP aerial survey effort to enable CKMR to be developed and implemented. It is recommended that an additional funding mechanism be found as soon as possible, starting in 2025, with one suggestion being reserving a portion from within the Total Allowable Catch (TAC) (e.g. 100 t), for which a mechanism could be developed to provide funding to support GBYP research, although other suitable mechanisms could be proposed and explored.

18.2.6 Sharks

- Based on recent results presented on the study of genetic diversity of porbeagle shark (*Lamna nasus*) conducted in the framework of the Shark Research and Data Collection Programme (SRDCP), the Committee recommends that the four current stocks considered for the species (NWA, NEA, SWA, SEA) should be reviewed, considering other aspects such as information available on tagging and movements. Also, that the possible connectivity between the South East Atlantic and the South-West Indian Ocean on this species should continue to be studied, as well as for other main species such as blue shark and shortfin mako.

- Considering the need to improve stock assessments of pelagic shark species impacted by ICCAT fisheries and bearing in mind *Recommendation by ICCAT to replace Recommendation 16-13 on improvement of compliance review of conservation and management measures regarding sharks caught in association with ICCAT fisheries* (Rec. 18-06) as well as the various previous recommendations which made the submission of shark data mandatory, the Committee once again strongly urges the CPCs to provide the corresponding statistics, including discards (dead and 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.

18.2.7 Small tunas

- The Committee recommended that Statistical Correspondents and/or national scientists revise, update, complete, and submit their small tuna Task 1 nominal catches (T1NC) series to the ICCAT Secretariat. This revision should consider **Appendix 5** (SCRS catalogues), the split of "unclassified" gear catches to specific gear codes, and the completeness of Task 1 gaps identified. The Statistical Correspondent and/or national scientists of CPCs should correct inconsistencies identified in T2SZ series. For the 13 species of small tunas, the Task 2 size data (T2SZ) revision should have as reference, the stratification of the samples by gear, month, 1°x1°or 5°x5° squares, and straight fork length (SFL) size classes of 1 cm (lower limit). CPCs should further improve their estimates of total catches, as there are still important gaps in the basic data available. These data are required as inputs for most data-limited stock assessment methods. The ICCAT Secretariat should continue its work on the data recovery and making inventories of tagging data for small tuna species. This process will require active participation of the national scientists who hold such data (see **Table 18.2.7.1**).

- The Committee recommends that CPCs that have major catches of small tunas (see **Table 18.2.7.1**) should become actively involved in the sampling and in sharing data and information in their possession (including stock assessments, etc.).

Table 18.2.7.1. Sum of catch for all CPCs reporting small tuna for 2010-2023. Catches (t) are ordered in descending order. The "Percentage" column denotes to total share of catch, and "Cumulative" the cumulative proportion.

CPC	*Total (t)*	*Percentage*	*Cumulative*
Türkiye	266943	18%	18%
USA	245307	16%	34.17%
Mauritania	137082	9%	43.32%
Senegal	106671	7%	50.43%
EU-España	98027	7%	56.97%
Mexico	97838	7%	63.50%
Tunisie	76561	5%	68.60%
Côte d'Ivoire	50820	3%	71.99%
Cabo Verde	46048	3%	75.07%
Maroc	45175	3%	78.08%
EU-France	34489	2%	80.38%
Mixed flags (EU tropical)	31660	2%	82.49%
Russian Federation	29967	2%	84.49%
Algerie	27422	2%	86.32%
EU-Italy	24742	2%	87.97%
EU-Latvia	17333	1%	89.13%
Curaçao	16454	1%	90.22%
EU-Greece	16282	1%	91.31%
Trinidad and Tobago	16131	1%	92.39%
Ghana	15628	1%	93.43%
Panamá	13936	1%	94.36%
São Tomé e Príncipe	11038	1%	95.09%

18.2.8 Swordfish

The Swordfish Species Group recognized the expanding use of trap-line gear and recommends the following actions to address this issue:

- CPCs implement measures that allow the use of this new gear to be recorded in their logbooks and fishery databases.
- The Subcommittee on Statistics and the ICCAT Secretariat provide an identification code for this gear.
- CPCs and the SCRS to conduct work to understand the extent to which this gear is being used, specifically, the initial year in which the gear entered in the fishery and the associated historical catches; the area (Atlantic, Mediterranean or both); the fleets using the gear; the number of vessels using it; whether it is used alone or together with longline gear and, in such a case, in which proportion.
- CPCs and the SCRS, to conduct work on CPUE analysis specific to this gear, for both target and non-target species.

18.2.9 Tropical tunas

The Committee strongly supports the proposal for the list of Fishery Indicators developed for the purse seine tropical fisheries and encouraged CPCs to review and complete the information for all tropical purse seine fleets currently active. The Committee also discussed and recommended that this type of fishery indicator format be adapted for all other main fleets targeting tropical tunas, including longline and baitboat fleets. For this it is requested that the Secretariat present during 2025 a summary of available information that can complete the proposed fishery indicator information.

The Committee requests that the joint longline index be updated for bigeye tuna using high resolution catch and effort information from the main longline fleets operating in the Atlantic (e.g. Japan, Brazil, China, Japan, Korea (Rep.), United States, and Chinese Taipei). This index should ideally be developed at the set-by-set level and provided well in advance of the bigeye tuna data preparatory meeting.

18.2.10 Working Group on Stock Assessment Methods (WGSAM)

1. The Group recommended that a set of standardized graphics and tables which should be included in each of ICCAT Management Strategy Evaluation (MSE) products be established. These standardized graphics are intended to foster more consistent messaging between MSEs. The standard package of plots should include (e.g. boxplots of selected performance indicators with or without violin overlay, Kobe time-series plots, time series of relative biomass and fishing mortality, tradeoff plots, and a table of results, or "quilt plot"). Ideally, a standard set of performance indicators for the boxplots, tradeoff plots, and quilt plots should also be agreed, noting that different plots are better suited to display results for different types of performance indicators (e.g., boxplots and violin plots show variability across simulations, which does not work as well for performance indicators that are expressed as a probability). The Group further recommended that the standardized set of graphics be included in a graphical user-friendly App.

2. The Group recommended that a set of default climate change robustness tests related to impacts on recruitment or natural mortality parameters be included in all ICCAT MSEs. Further consideration should be placed on how those robustness Operating Model (OM) scenarios are developed and conditioned. These robustness tests could be revised to reflect stock-specific changes as relevant information becomes available.

19. Responses to the Commission's requests

19.1 Based on the results presented by CPCs on their research trials, the SCRS shall advise the Commission on potential sea turtle mitigation measures for these fisheries, Rec. 22-12, para 4

Background: *CPCs with deep-set longline, gillnet, and where appropriate, shallow-set longline fisheries are encouraged to undertake research trials aimed at mitigating bycatch and reducing bycatch mortality, and increasing post release survival of sea turtles. Research should also examine the effects of hook sizes and shapes, fishing depths, fishing areas, and seasons. CPCs shall report the results of this research (including the tradeoffs among catch rates of target and bycatch species) to the SCRS. Based on the results of such research, the SCRS shall advise the Commission on potential sea turtle mitigation measures for these fisheries.*

The Committee did not receive any information on this matter and will address it in 2025.

19.2 The SCRS is requested to review periodically the provisions of this measure related to the spatio-temporal ecology of sea turtles, including their interactions and mortality associated with these fisheries, Rec. 22-12, para 7

Background: *In light of the potential impacts of climate change on ICCAT fisheries, including target stocks and bycatch species, the SCRS is requested to review periodically the provisions of this measure related to the spatio-temporal ecology of sea turtles, including their interactions and mortality associated with these fisheries.*

The Committee has been developing in recent years collaborative work on the impact of ICCAT fisheries on marine turtles, which has been concluded for the Atlantic and is now focusing on the Mediterranean Sea (work started in 2023). However, such work has not included the potential impacts of climate change on ICCAT fisheries, namely on marine turtles. Therefore, the Committee is currently not in a position to review the provisions of this measure (*Recommendation by ICCAT on the bycatch of sea turtles caught in association with ICCAT fisheries (combine, streamline, and amend Recommendations 10-09 and 13-11*) (Rec. 22-12)) related to the spatio-temporal ecology of sea turtles, including their interactions and mortality associated with these fisheries.

19.3 The SCRS shall assess available information on the use of time-area fishing restrictions and closures in areas where there is a higher risk of interaction with sea turtles, Rec. 22-12, para 10

Background: *The SCRS shall assess available information on the use of time-area fishing restrictions and closures in areas where there is a higher risk of interaction with sea turtles, and advise the Commission, as appropriate.*

The Committee did not have time to discuss this response in 2024 but will address it in 2025.

19.4 Exemption from measures that increase post-release survival of threatened and endangered sea turtle populations within the Convention area, Rec. 22-12 amended by Rec. 23-13, para 1b)

Background: *b) Any CPC that achieves and maintains 10% scientific observer coverage and complies with the data reporting requirements of Recs. 11-10, 16-14, and paragraph 5 below, may request from paragraph 1 a) an exemption for one or more of its ICCAT fisheries above by submitting relevant scientific information to the SCRS. The SCRS will evaluate that information and advise the Commission on sea turtle interactions and mortality. The Commission shall make decisions on any requested exemption in light of the SCRS advice.*

No exemption requests were received.

19.5 The SCRS should investigate workable examples of how marine biodiversity can be conserved in a way that is compatible with the conduct of responsible and sustainable fisheries, including other effective area-based conservation measures (OECMs), either as complementary or alternative measures to other area-based approaches.

CPCs, the SCRS, and the Secretariat should report regularly to the Commission on progress on the above, Res. 23-23

Background: *The SCRS should investigate workable examples of how marine biodiversity can be conserved in a way that is compatible with the conduct of responsible and sustainable fisheries, including other effective area-based conservation measures (OECMs), either as complementary or alternative measures to other area-based approaches;*

CPCs, the SCRS, and the Secretariat should report regularly to the Commission on progress on the above.

The Committee discussed the *Resolution by ICCAT on the implementation of biodiversity conservation instruments* (Res. 23-23), on biodiversity conservation instruments in areas beyond national jurisdiction. It noted that the Resolution would require a considerable amount of the SCRS's (particularly of the Subcommittee on Ecosystems and Bycatch) time and capacity to address the request and that this would further impede progress on the development of the EcoCard. It was suggested that, given the Sargasso Sea Case Study´s current objectives align with the Commission request, they could provide some limited responses.

The Committee noted that the bycatch component of the Subcommittee on Ecosystems and Bycatch is making progress in the analysis of the impact of ICCAT fisheries on non-target species in all areas of the Convention and has plans to expand this work in the future, aiming generating inputs to provide a response to the Commission.

19.6 The SCRS will advise the Commission on the suitability of the alternative approach proposed by CPCs, Rec. 16-14 para 4b

Background: *4 b) Notwithstanding paragraph a), for vessels less than 15 meters, where an extraordinary safety concern may exist that precludes deployment of an onboard observer, a CPC may employ an alternative scientific monitoring approach that will collect data equivalent to that specified in this Recommendation in a manner that ensures comparable coverage. In any such cases, the CPC wishing to avail itself of an alternative approach must present the details of the approach to the SCRS for evaluation. The SCRS will advise the Commission on the suitability of the alternative approach for carrying out the data collection obligations set forth in this Recommendation. Alternative approaches implemented pursuant to this provision shall be subject to the approval of the Commission at the annual meeting prior to implementation.*

Morocco presented Serghini *et al.* (2024) with an updated methodology using fisherman self-reporting, complemented by a mobile phone application for data collection to report bycatch and discards.

During 2024, Morocco has made a significant effort in terms of data collection on artisanal fisheries and holding meetings and consultation with fishermen to ensure the success of this approach implementation.

This alternative approach aimed at estimating discards covers artisanal fisheries taking place in small boats, less than 7 meters in length where onboard observers cannot be deployed.

The Committee recognized that the new proposed methodology is at present the best possible alternative to an onboard observer program in the multi-species artisanal fisheries where observer coverage is not possible. Even though this approach is a clear enhancement on the portside enquiries the Committee pointed out that this is not a true replacement for an observer program since the bycatch and discards estimates are still self-reported.

19.7 The SCRS shall assess the occurrence of exceptional circumstances, Rec. 21-04 para 4

Background: *The SCRS shall assess the occurrence of exceptional circumstances (ECs) and the Commission shall act in accordance with the Exceptional Circumstances Protocol sets out in Annex 2.*

The Committee revised the North Atlantic albacore Exceptional Circumstances Protocol contained in the *Recommendation by ICCAT on conservation and management measures, including a management procedure and Exceptional Circumstances Protocol, for North Atlantic albacore* (Rec. 21-04), namely regarding the indicators related to catch and catch per unit effort (CPUE).

Catches have been lower than the Total Allowable Catch (TAC) adopted using the Harvest Control Rule (HCR) or Management Procedure (MP) for most years except for 2019, when it was exceeded by 3.5% (**Figure 19.7.1**).

Four CPUE indices were updated (the Japanese longline, Chinese Taipei Longline, and Spanish baitboat until 2023, and the U.S. Longline until 2022). The Committee discussed if the updated CPUE series fell outside the 2.5% to 97.5% percentile range of values in any year from the Operating Models (OMs) used in the Management Strategy Evaluation (MSE) when the accepted MP was tested. Overall, all the CPUE series fell within the 2.5% and 97.5% percentiles of the simulated values except for the Spanish baitboat, where the CPUE exceeded marginally the range in 2018 (**Figure 19.7.2**). While the updated CPUE data indicate a larger value than the simulated relative abundance, the Committee agreed that this is not a source of concern.

In summary, the Committee concluded that no exceptional circumstance(s) were identified that preclude the application of the MP.

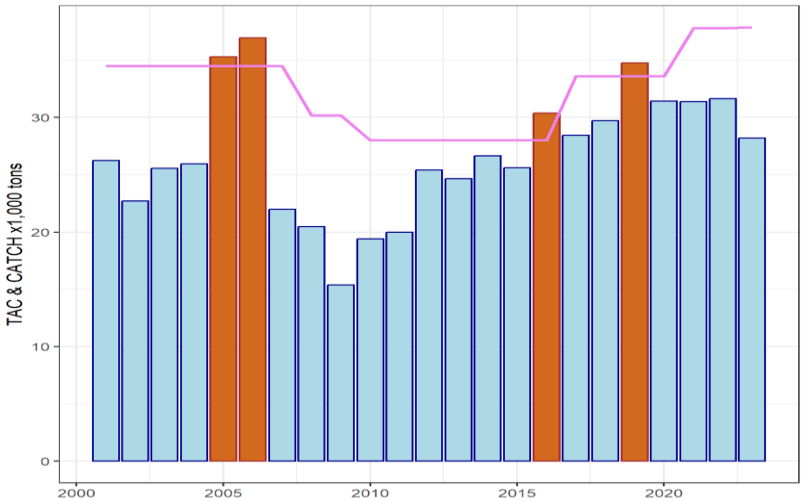


Figure 19.7.1. ALB-N reported catch (Task 1NC, bars) and TAC (solid line). Orange bars indicate years when the catch exceeded the TAC. Note that TAC established with the ALB-N harvest control rule or the MP started in 2018.

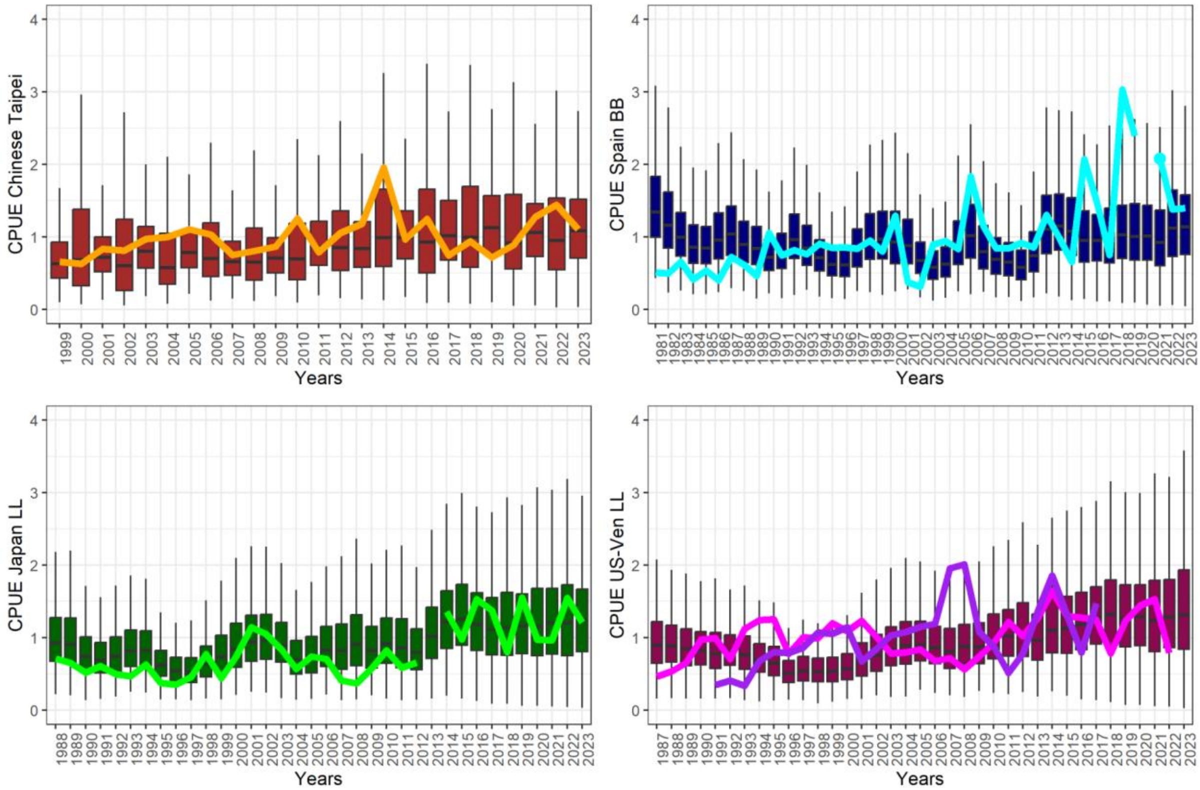


Figure 19.7.2. CPUE trajectories simulated in the MSE (boxplots) and updated standardized CPUEs (lines). Chinese Taipei-LL (orange), Spain-BB (blue), and Japan-LL (green) were all updated to 2023, the USA-LL (pink) was updated to 2022 and Venezuela-LL (purple) has not been updated since 2017.

19.8 Mediterranean albacore stock assessment, state of stock, effectiveness of the rebuilding plan, and minimum size for 2024, Rec. 22-05, para 10

Background: *In 2024, the SCRS shall provide an updated assessment of the state of the stock on the basis of the most recent data available. It shall assess the effectiveness of this rebuilding plan and provide advice on possible amendments to the various measures within this plan. The SCRS shall advise the Commission on the appropriate characteristics of the fishing gear, the closure period in paragraph 8, as well as the minimum size to be implemented for Mediterranean albacore.*

Two presentations were provided to the Albacore Species Group (Saber *et al*., 2024 and Ortiz *et al*., 2024). These provided information and analysis of available information on the size composition of albacore catches in the Mediterranean and its relationship with the currently accepted parameters of the species' life cycle mainly related to its reproductive biology.

The Committee considers that a minimum size (or other measures like fishery closures or gear characteristics) aiming to protect juveniles, would be of limited or no benefit to the stock. This conclusion was based on the following auxiliary information:

- a high percentage (above 80% in numbers of fish caught) of current catches are well above the size at first maturity (L_{50} 66.3 cm straight fork length (SFL), Arena *et al*., 1980).
- the young of the year are not observed in the catches of the main fleets exploiting this resource in the Mediterranean.
- if a minimum size was imposed any fish released, due to being below the minimum size, would still have at-haul-back and post-release mortalities.

It was noted that given the recent implementation of the recovery plan in 2022, it was not possible to assess the effectiveness of the rebuilding plan, as the 2024 Mediterranean albacore stock assessment used data up until 2022.

It is possible that the fishing closures adopted in the fall-winter for the Mediterranean albacore (including the previous closures for other species) had a positive impact in reducing the total fishing effort and therefore the fishing mortality. The Group noted that catches decreased by 21% in 2022 with respect to 2021, but this might be due to factors other than the rebuilding plan as well.

19.9 SCRS should evaluate procedures and results related to the stereoscopic camera programme (or alternative methods) provided by CPCs and report to the Commission at the next Annual meeting, Rec. 22-08, para 25 and 173

Background: *(25) Based on new available scientific information, including where relevant the result of the trials on Artificial Intelligence referred to in paragraph 166, the SCRS should consider reviewing and updating the growth table published in 2022, as soon as possible and present those results at the latest to the 2024 Annual Meeting of the Commission.*

(173) Each farm CPC competent authority shall submit the procedures and results related to the stereoscopic camera programme (or alternative methods) to the SCRS by 31 October annually. The SCRS should evaluate such procedures and results and report to the Commission at the next Annual Meeting.

The Committee reviewed reports of research being conducted into the use of various software and artificial intelligence (AI) systems with the objectives of:

- Testing whether stereoscopic cameras, in combination with conventional cameras, could allow successful recording of first transfers from purse seine to towing cage.

- Test the accuracy of software and AI in determining the number of individuals and their average size during transfers (from stereoscopic camera and conventional camera footage) and compare it with that obtained by current manual means of analysis.

The results of these studies carried out in the Mediterranean (EU-Croatia, EU-Malta, EU-Spain) and the Atlantic (Morocco, still in progress) have shown that it is feasible to estimate fork length at first transfer, which allow the calculation of the biomass based on the established length-weight relationship. In the case of Morocco, the results will be presented in 2025. Whilst the automatic determination of fish length was shown to give results close to the manual determination, counting of fish was less accurate and requires further development. At the same time, the research has shown that using software and AI tremendously reduces the time required for the determination of fish lengths and numbers for a given transfer.

The Committee addressed the discrepancy noted between the lengths of fish determined by stereoscopic camera footage and subsequently by actual manual measurements at harvest. From an initial investigation, it appears that this length difference could be explained by a combination of changes in fish morphometry after harvest and a correction factor associated with the stereoscopic camera measurement itself.

The Committee also reviewed the documents submitted to the Intersessional Meeting of Panel 2 in 2023 and the Intersessional Meeting of Panel 2 in 2024, where it was reported that there were differences between harvest weights reported on the Bluefin Tuna Catch Documents (BCDs) and harvest weights expected after calculation from the 2022 SCRS growth in farms table in 2019 to 2022 while the difference curiously disappeared in 2023. Although the investigation in the documents has limitations, such as the lack of individual fish data, the Committee recognized that reported harvest weights were different from expected calculated weights, making it difficult to evaluate, as required by para 26 of Recommendation by ICCAT amending the *Recommendation 21-08 establishing a multi-annual management plan for bluefin tuna in the eastern Atlantic and the Mediterranean* (Rec. 22-08), the validity of reported harvest weights based on the growth in farms table. The Committee, whilst recognizing this discrepancy, cannot at this time update the growth rate table due to the lack of new available scientific information, but will examine this issue further.

The Committee has two substantive recommendations to the Commission regarding the stereoscopic camera program:

1. Priority be given to continue developing and validating a system for use of software and AI in conjunction with stereoscopic cameras and conventional cameras for estimating biomass at the first transfer from the purse seine and traps to the towing cage and other subsequent transfers.

2. The Committee reiterates that with the application of the technology, it requires that 100% of footage should be provided to the SCRS rather than a 20% sample as so far required. The recent advances of AI allow for rapid and objective reading of the video footages and so would facilitate an objective review of the video footages and determination of minimum sample size.

As a major objective for all of this work is to determine the biomass of fish removed from the water at the time of removal, estimating this biomass at the time of first transfer has many benefits of eliminating all of the confounding factors of fish weight gain or loss, mortality. Furthermore, the purse seiners and traps have a strong interest in accurate knowledge of what has been removed as this is where and how the quota would be most effectively monitored. If they are under the quota then they could make additional sets and if over, release remaining fish. Given that the technology is advancing to the point that stereo videos can be used in that first transfer this should be the top priority.

19.10 The SCRS should develop an algorithm to convert length into weight for fattened and/or farmed fish, Rec. 22-08, para 204/218

Background (para 204): *Until the SCRS develops an algorithm to convert length into weight for fattened and/or farmed fish, the determination of the weight of the carried-over fish shall be estimated using the most updated growth rates tables produced by the SCRS.*

Background (para 218): *The caging of the bluefin tuna at the farm of destination shall be subject to the requirements for caging operations laid down in paragraphs 156 to 171, including a video record to confirm the number and weight of the bluefin tuna caged and the verification of the operation by an ICCAT Regional Observer. The determination of the weight for caged fish from another farm, shall not apply until the SCRS has developed an algorithm to convert length into weight for fattened and/or farmed fish.*

This request was addressed in 2022 with the updated growth table for BFT-E as a function of the initial size of the fish at caging and the time spent on the farm (section 17.16 of the *Report for Biennial Period 2022-2023, Part II (2023), Vol. 2*).

This 2022 table uses modeling based on tagging data and modal progression analyses to estimate on-farm growth and using the very extensive regional observer programme (ROP) harvest database (Ortiz *et al*., 2022). This table has not been updated as no new scientific information is available.

19.11 The SCRS shall review the stereoscopic cameras systems specifications, and if necessary provide recommendations to modify them, Rec. 22-08, Ann. 9, item vii

Background: *The report on the results of the stereoscopic program should include details on all the technical specifications above, including the sampling intensity, the way of sampling methodology, the distance from the camera, the dimensions of the transfer gate, and the algorithms (length-weight relationship). The SCRS shall review these specifications, and if necessary, provide recommendations to modify them.*

The Committee has not reviewed the technical specifications of the stereoscopic cameras, although the projects and documents presented to the Committee and the recommendations regarding the stereoscopic camera programme are detailed in answer 19.9.

19.12 The SCRS shall assess the occurrence of exceptional circumstances annually, Rec. 22-09, para 9

Background: *The SCRS shall assess the occurrence of exceptional circumstances annually and the Commission shall act in accordance with the exceptional circumstances protocol, developed based on scientific advice provided by the SCRS and adopted by the Commission.*

In accordance with the Exceptional Circumstances (EC) Protocol outlined in Rec. 23-07, the Committee has determined that no exceptional circumstances exist which impact the continued use of the Total Allowable Catches (TACs) calculated by the Management Procedure (MP) for 2025. This determination is based upon an evaluation of the criteria outlined in Rec. 23-07, as elaborated below.

a. Stock dynamics

i. *Indices.* The primary quantitative indicator for EC relates to whether the combined indices fall outside of 95% prediction intervals. For 2023, neither of the combined indices falls outside of the 95% prediction intervals (**Figure 19.12.1**), resulting in no triggering of EC. However, it should be noted that some recently updated index values were excluded (see below) from this analysis.

ii. *Abundance and life history or fishery dynamics*. Preliminary BFT-W CKMR estimates of spawner abundance and stock mixing were presented that warrant further consideration in 2025 once finalized. The Committee has developed a plan (see Workplan) for review of the results, consideration of whether such data meet EC thresholds, and whether they are consequential for TAC advice. Beyond this, there is no other evidence that life history or fishery dynamics are substantively different than those tested in the operating models.

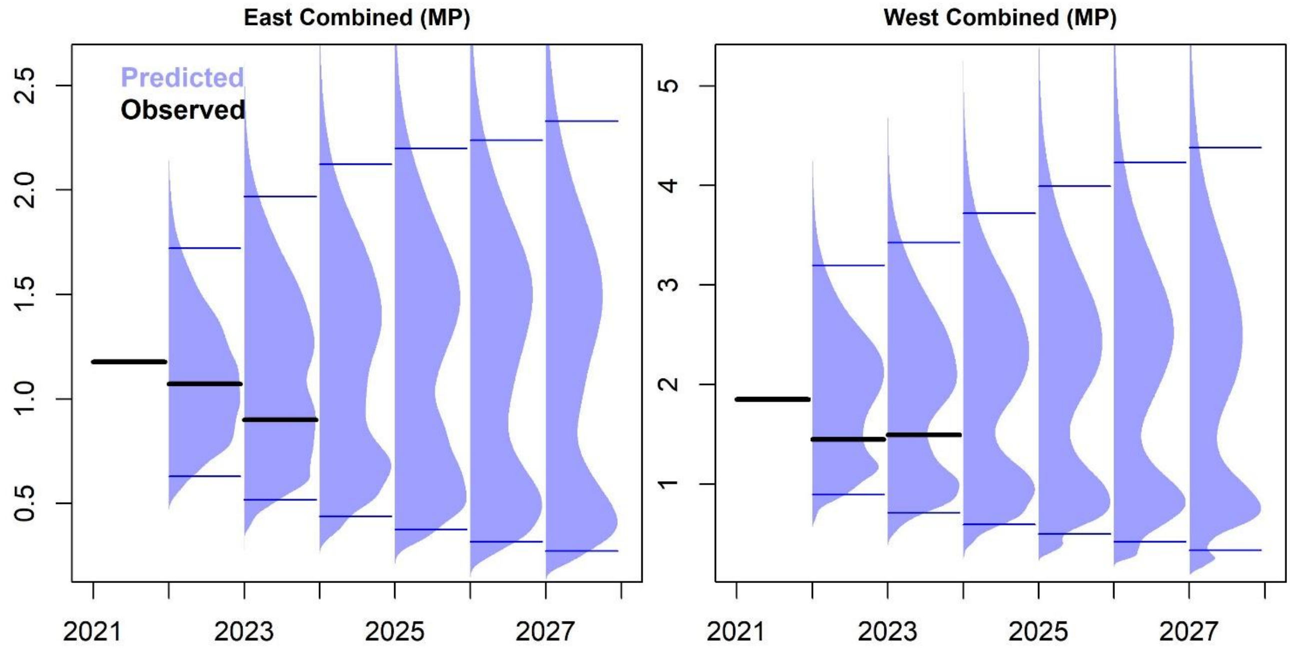


Figure 19.12.1. Standard marginal plots of observed composite indices (black bars) and distribution of posterior predicted data (blue density distribution) for the reference grid of operating models (n =2304, 48 operating models, 48 simulations each). Blue bars represent the 95% intervals. The West Mediterranean Larval survey was not available and the Moroccan-Portugal trap data point for 2023 could not be effectively estimated.

b. Data availability for the MP

For 2023, 8 out of 10 indices are updated, available and deemed acceptable for consideration by the SCRS (**Figure 19.12.2**); furthermore, to date there is no triggering of EC for "data availability for the MP" within the ECP. The West Mediterranean Larval index was not updated with 2023 data as it was not possible to complete the update in time for the meeting; these data are available and the 2023 index will be finalised in 2025. The Portugal trap fishery captured its whole quota in May 2023, catching only fish entering the Mediterranean, in contrast to their normal operations which only manage to achieve the full quota by capturing fish mostly as they leave the Mediterranean in June and July. Given this, the Committee determined that the Moroccan-Portugal trap index could not be effectively estimated for 2023 using the existing standardisation model. No indices have been missing for two or more consecutive years.

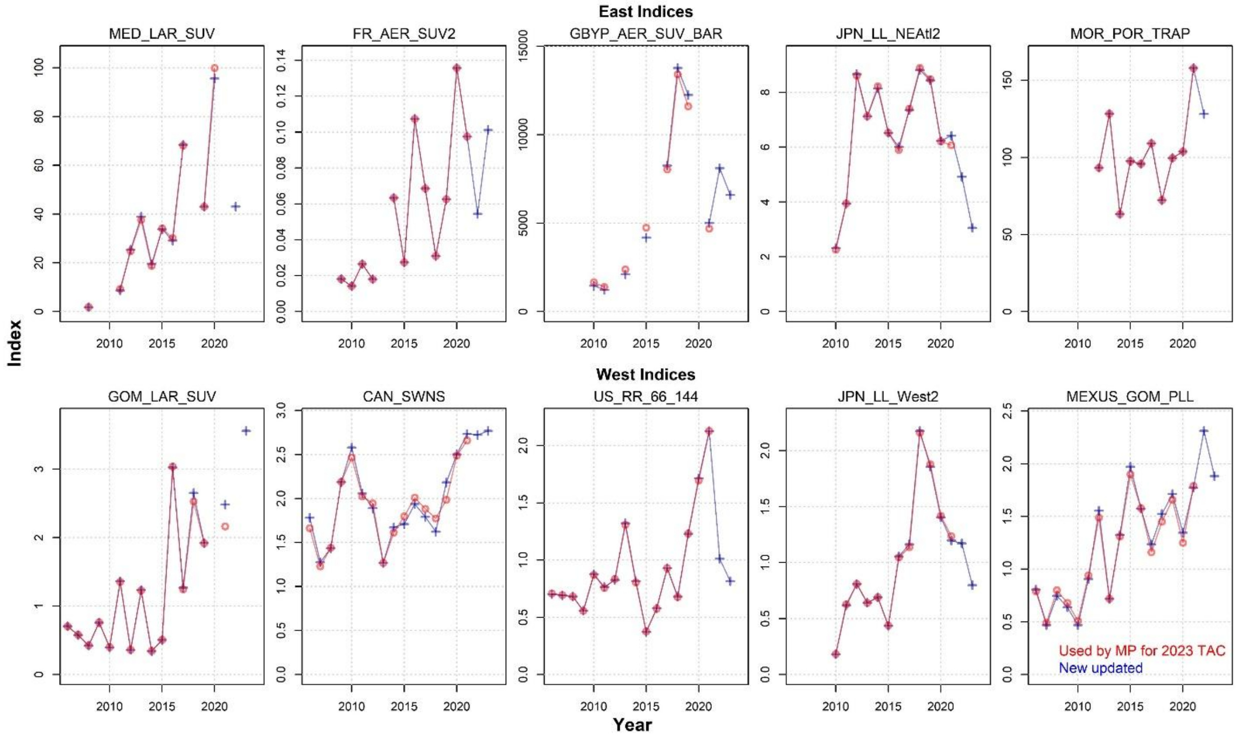


Figure 19.12.2. Plot of indices used in MP calculations (red) and the new updated indices (blue) that were rescaled by the factor *k*. Red values are original indices used to determine the 2023 TAC and in MSE conditioning; the blue values are strict updates of the indices through 2023. The West Mediterranean Larval survey was not available and the Moroccan-Portugal trap index data point for 2023 could not be effectively estimated.

19.13 Review on the performance of the MP by the SCRS, Rec. 22-09, para 11

Background: *A review of the performance of the MP by the Commission and the SCRS shall be completed by 2028 and every 6 years thereafter. The aim of the review is to ensure the MP is performing as expected and to determine whether there are conditions that justify its continuation, or that warrant: reconditioning the MSE operating models; retuning the existing MP; including new indices into a new MP; and/or considering alternate candidate management procedures or development of a new MSE framework. Based on that review and subsequent SCRS advice, the Commission shall decide on future management measures, approaches, and strategies, including, inter alia, regarding TAC levels, for bluefin tuna stocks in both management areas.*

The detailed BFT MSE roadmap is provided as **Appendix 7**, which outlines the path for achieving the tasks outlined above.

19.14 The SCRS shall advise the Commission by 2024 whether size restrictions are effective tools, Rec. 21-09, para 21 b)

Background: *b) Taking into account the information on the technical and other management measures submitted by CPCs in subparagraph a) above, the SCRS shall assess the potential benefits of both minimum and maximum size limits for live retention (applied separately or in combination), in particular sex specific sizes at maturity based on the best available science, particularly when considered in combination with other management measures, to meet required mortality reductions. The SCRS shall advise the Commission by 2024 whether size restrictions are effective tools, especially when used in combination with other measures, to meet required mortality reductions.*

In 2023 the Committee noted that few CPCs submitted documents giving compliance to the Commission request in Rec. 21-09 para 21b. Most of those documents referred to the implementation of the non-retention allowance for the species, and how their fleets are requested to report the information, the implementation of observer programs, safe handling procedures, and the needs of more scientific research. No new documents were presented in 2024.

Based on the information available, the SCRS has been unable to assess whether size restrictions are effective tools to meet the required mortality reductions.

19.15 The SCRS shall provide to the Commission by 2024 updated advice on mitigation measures aimed at further reducing shortfin mako mortality, Rec. 22-11, para 21 a)

Background*: a) The SCRS shall provide to the Commission by 2024, and whenever new information becomes available, updated advice on mitigation measures aimed at further reducing shortfin mako mortality. For that purpose, by 30 April 2024, CPCs shall submit to the SCRS information by fishery on the technical and other management measures they have implemented for reducing total fishing mortality of South Atlantic shortfin mako sharks, except the CPCs that have already provided this information to the ICCAT Secretariat. The SCRS shall review this information and advise the Commission on which tools and approaches have been most effective at reducing fishing mortality with a view to recommending specific measures that should be considered for adoption by the Commission.*

The CPCs that submitted documents in 2024 to address this request were: Angola, Belize, Costa Rica, the European Union, Panama, and Chinese Taipei. In addition, Brazil submitted a document in 2023 containing the current regulations related to this species, that applied to both northern and southern stocks. Most of these documents refer to the implementation of the non-retention allowance for the species, and how their fleets are requested to report the information, the implementation of observer programs, and safe handling procedures.

Documents presenting information on the use and effectiveness of different mitigation measures have been presented to the SCRS in the last few years. This information on mitigation measures has been discussed in various opportunities by the Sharks Species Group, as well as in the Subcommittee on Ecosystems and Bycatch. However, there is still no consensus or recommendation on the most effective measures to reduce fishing mortality. The Committee encourages CPCs to report any new or existing technical management measures aimed at reducing shortfin mako interactions that have not been reported thus far.

19.16 The SCRS shall review the reported landings and discards of longfin mako, for the purpose of formulating management advice, Rec. 21-09 and Rec. 22-11, para 22

Background: *The SCRS shall review the reported landings and discards of longfin mako shark to identify any unexpected inconsistencies that could be the result of misidentification between the two mako species, for the purpose of formulating management advice.*

The Committee reviewed the reported nominal catches of longfin mako shark in the last years. Insofar as the possible reporting of shortfin mako as longfin mako, no unexpected inconsistencies related to possible misidentification of the species were found.

19.17 Exemption of presentation of Shark Check Sheet, Rec. 18-06, para 3

Background: *3. CPCs may be exempt from the submission of the Check Sheet when vessels flying their flag are not likely to catch any sharks species covered by the abovementioned Recommendations in paragraph 1, on the condition that the concerned CPCs obtained a confirmation by the Shark Species Group through necessary data submitted by CPCs for this purpose.*

In 2024 only one CPC, Uruguay, made a statement requesting confirmation that the Sharks Species Group approves the waiver of submitting the Shark Check Sheet. The reason presented for this request is that Uruguay has no pelagic ICCAT fisheries operating since 2014, and it catches these species in other commercial fisheries operating in Uruguay very occasionally. Uruguay has no recreational fisheries targeting these species, nor local artisanal fisheries targeting this species for consumption.

Uruguay has a strong commitment with sharks' management and conservation, implementing in 2008 its first Sharks National Plan of Action (NPOA), then updated in 2015. In 2018 adopted a Regional Plan of Action together with Argentina. All ICCAT Recommendations related to sharks have been internalized in Uruguay, and included in the NPOA, which also includes a Mitigation section, with best practice for the handling of sharks.

The Sharks Species Group agreed that there was no need for Uruguay to submit a Shark Check Sheet.

19.18 Starting in 2023 and annually thereafter, the SCRS will calculate possible level of retention, including eligible CPCs' individual retention allowances, allowed in the subsequent year, and provide the results to the Commission, *Rec. 21-09* ***para 5c***

Background*: Starting in 2023 and annually thereafter, the SCRS will use Annex 1, unless an alternative approach to calculating future permissible retention is agreed (as per paragraph 5(a)), to calculate a possible level of retention, including eligible CPCs' individual retention allowances, allowed in the subsequent year, and provide the results to the Commission.*

The Committee reviewed all data submissions for northern shortfin mako for 2023. For those CPCs that had not submitted information on landings for 2023 nor dead discards, the Committee estimated the captures as dead discards for these nations based on the average of the preceding two years' data. During the meeting, estimations on dead discards and live discards for EU-Spain and Morocco were updated based on the statistical methodology presented.

The reported data and estimated missing landings and dead discards are presented in the table below:

FlagName	Landings					Dead Discards					Live Discards				
	2019	2020	2021	2022	2023	2019	2020	2021	2022	2023	2019	2020	2021	2022	2023
Belize	2		3		2										
Brazil					16										
Canada	63	1	0		0	1	20	22	26	12	12	81	63	83	23
China PR						20	2	1	5	4	7	3	2	9	7
Chinese Taipei	0	0	0	0	0	5	12	1	2	7	2	6	1	1	6
Costa Rica	0	0													
EU-España	866	870	0	0	0			585	588	935			329	331	705
EU-France	1	0	1	1	0	0		0	0	1	1		0	0	0
EU-Netherlands															0
EU-Portugal	289	342	202	1	0		11	14	141	87		20	26	256	158
Great Britain	0	0	0		0		0								
Japan	4	0	0	0	0	30	28	15	10	14		17	11	7	10
Korea Rep	4			0	0	0			0	0				0	0
Liberia		10			10										
Maroc	501	382	299		0		0	0		125			0		216
Mexico	2	2	2	3	2	0	0	0	0	0	1	1	1	1	1
Russian Federation	0		0	0		0		0	0				0	0	0
Senegal	26				26										
St Vincent and Grenadines	3				3										
Sta Lucia		0	1		1										
Trinidad and Tobago	1	1	1	1	0	0	0		0	0				0	0
UK-Bermuda	0	0	0			0	0	0		0	0	0	0	0	0
UK-British Virgin Islands		0					0								
UK-Turks and Caicos		0													
USA	57	48	39	40	0	1	3	4	10	29	24	31	68	47	43
Venezuela	8	8	3	1	0										
Total	1829	1664	552	46	63	57	76	642	782	1213	47	160	500	733	1170

Considering all CPCs, the preliminary Committee estimates were as follows:

- Retained catch (landings): 63 t
- Dead discards: 1,213 t
- Live discards: 1,170 t

Using a post-release mortality rate of 23% (Miller *et al.*, 2020) the "total fishing mortality from all sources" (the value needed for Rec. 21-09, Annex 1, paragraph 1a) for 2022 was estimated as 1,545 t. Applying a 34% longline post-release mortality rate (Bowlby *et al.,* 2022), the total fishing mortality from all sources was estimated as 1,673 t.

According to Annex 1 of Rec. 21-09, these values are then subtracted from the amount established in Rec. 21-09, paragraph 4a, 250 t, to estimate the "dead bycatch retention allowance" in 2024 (see equation 1 below).

"limit from Rec. 21-09" – "fishing mortality 2023" = "dead bycatch retention allowance in 2025" (1)

If the "dead bycatch retention allowance" amount is negative, no retention is to be allowed in 2025.

The dead bycatch retention allowance was calculated to be -1,295 t or -1,423 t (depending on the post-release mortality rate used, see above). Therefore, the possible retention allowance for 2025 (calculated with Annex 1) is 0 t. In accordance with paragraph 1c of Annex 1, CPCs shall prohibit retaining onboard, transhipping, and landing, whole or in part, North Atlantic shortfin mako caught in association with ICCAT fisheries in year Y+1 (in this case 2025).

19.19 Derogation to retention prohibition for certain shark species, Rec. 21-09 and Rec. 22-11, para 18

Background: *18. Notwithstanding paragraph 7, in the context of this Recommendation and only for vessels less than 15 meters, where an extraordinary safety concern exists that precludes deployment of an onboard observer, a CPC may exceptionally apply an alternative approach as set out in Recommendation 16-14. This derogation from paragraph 7, shall be without prejudice to the overall commitment of all CPCs as outlined in this measure to immediately end overfishing and to reduce mortality levels. Any CPC wishing to avail itself of this alternative approach must: 1) present the details of the approach to the SCRS based on the advice of the SCRS for evaluation and 2) obtain approval from the Commission (as stipulated in Recommendation 16-14).*

No documents nor requests were received by the SCRS for its evaluation.

19.20 SCRS shall provide to the Commission by 2023 updated advice on mitigation measures aimed at further reducing shortfin mako mortality, Rec. 21-09 para 21a

Background: *The SCRS shall provide to the Commission by 2023, and whenever new information becomes available, updated advice on mitigation measures aimed at further reducing shortfin mako mortality. For that purpose, by 30 April 2023, CPCs shall submit to the SCRS information by fishery on the technical and other management measures they have implemented for reducing total fishing mortality of North Atlantic shortfin mako sharks, except the CPCs that have already provided this information to the Secretariat. The SCRS shall review this information and advise the Commission on which tools and approaches have been most effective at reducing fishing mortality with a view to recommending specific measures that should be considered for adoption by the Commission.*

The Committee noted that no new documents were submitted in 2024 in response to this Commission request.

Documents presenting information on the use and effectiveness of different mitigation measures have been presented to the SCRS in the last few years by EU-Portugal, United States and Canada. This information on mitigation measures has been discussed on various occasions by the Sharks Species Group, and in the Subcommittee on Ecosystems and Bycatch. However, at this time the Committee is not in a position to recommend the most effective measures to reduce shortfin mako fishing mortality. The Committee encourages CPCs to report any new or existing technical management measures aimed at reducing shortfin mako interactions that have not been reported thus far.

19.21 SCRS review and approve the methods and, if it determines that the methods are not scientifically sound, the SCRS shall provide relevant feedback to the CPCs in question to improve them: Rec. 22-11 para 13

Background: *No later than 31 July 2023, CPCs that reported annual average catches (landings and dead discards) of South Atlantic shortfin mako over 1 t between 2018-2020 shall present to the SCRS the statistical methodology used to estimate dead discards and live releases. CPCs with artisanal and small-scale fisheries shall also provide information about their data collection programs. The SCRS shall review and approve the methods and, if it determines that the methods are not scientifically sound, the SCRS shall provide relevant feedback to the CPCs in question to improve them.*

No new documents were presented in 2024. EU-Spain submitted a document in 2024 updating the results obtained by applying the same methodology presented in 2023 to estimate discards. In 2023, Chinese Taipei presented a document complying with this request.

19.22 Evaluation of data completeness on sharks: Rec. 22-11, para 15

Background: *The SCRS shall evaluate the completeness of Task 1 and 2 data submissions, including estimates of total dead discards and live releases. If, after conducting this evaluation, the SCRS determines that significant gaps in data reporting exist, or, following the review in paragraph 13, that the methodology used by one or more CPCs to estimate dead discards and live releases is not scientifically sound, the SCRS shall inform the Commission that the data for those CPCs are inappropriate for inclusion in the calculation of the retention allowance. In this case, the SCRS shall estimate dead discards and live releases for those CPCs for use in the retention allowance calculation.*

Taking into consideration that the retention allowance for southern shortfin mako should be calculated in 2025 for 2026 (see response to Rec. 22-11, paragraph 6b), the Committee intends to conduct such an evaluation of completeness of Task 1 and 2 data submissions in 2025.

19.23 The SCRS shall review existing data and information relating to the life history and conservation status of whale sharks, Rec. 23-12, para 8

Background: *The SCRS shall, in 2024, review existing data and information relating to the life history and conservation status of whale sharks, and confirm whether they meet the definition of being a taxon of the greatest biological vulnerability and conservation concern for which there are very few data. Should this be the case, the SCRS shall advise on the appropriateness of applying precautionary management measures in ICCAT fisheries, such as a retention ban. The SCRS may also identify options for future research and data collection, as well as advise on other mitigation measures for relevant ICCAT fisheries.*

During the September 2024 meeting of the Sharks Species Group, Cuevas *et al*., 2024 was presented to the SCRS related to this Commission request. The Committee reviewed information available and remarked on some of the most important points.

The whale shark (*Rhincodon typus*) is characterized by its large size, slow growth, late reproductive maturation, and extended longevity, which leads to an increased likelihood of population decline. Genetic studies suggest at least the existence of two populations that rarely mix between the Atlantic Ocean and Indo-Pacific Ocean. Based on count data, modelled population estimates, and habitat availability, 75% of the global whale shark population is inferred to occur in the Indo-Pacific, and 25% in the Atlantic.

Key current threats to whale sharks include ship strikes, marine pollution, and incidental catches in tuna fisheries. While the available evidence is limited, it indicated that if best-practices to release whale sharks from purse seines are followed, then post-release mortality is negligible. Due to lack of data, it is difficult to determine in which fisheries (besides purse seine) bycatch is occurring. Targeted fishing for this species is now uncommon. According to the International Union for Conservation of Nature (IUCN) Red List assessment in the Atlantic Ocean, the overall population decline is estimated at ≥30%, resulting in a subpopulation assessment of Vulnerable.

Detailed data on its biology and global distribution remains limited, most likely due to its sporadic and unpredictable encounters. The available information on whale shark life-history characteristics, conservation status, and paucity of scientific data on whale sharks indicate that whale sharks in the Atlantic Ocean can be considered "a taxon of the greatest biological vulnerability and conservation concern for which there are very few data".

For the above reasons, the Committee recommends that the Commission give full effect to Rec. 23-12. Given the dearth of data on whale shark interactions in ICCAT fisheries, the Committee considers that it is particularly important to comply with the reporting provisions in paragraph 5 of Rec. 23-12.

19.24 The SCRS shall review existing data and information relating to the life history and conservation status of mobulid rays, Rec. 23-14, para. 8

Background: *The SCRS shall, in 2024, review existing data and information relating to the life history and conservation status of mobulid rays, and confirm whether they meet the definition of being a taxon of the greatest biological vulnerability and conservation concern for which there are very few data. Should this be the case, the SCRS shall advise on the appropriateness of applying precautionary management measures such as a prohibition on retention. The SCRS may also identify options for future research and data collection, as well as advise on other mitigation measures.*

During 2024, two documents were presented to the SCRS related to this Commission request. The first one (Cronin *et al*., 2024) was presented during the Subcommittee on Ecosystems and Bycatch (SC-ECO) meeting. In that opportunity, it was agreed to wait until the Sharks Species Group meeting in order to have a common response between both Groups. The second document (Ellis *et al*., 2024) was presented during the September 2024 meeting of the Sharks Species Group. The Committee reviewed information available from these two documents and remarked on some of the most important points.

Mobulids life history traits include low productivity and slow growth. Also, the tendency to aggregate makes these species susceptible to fisheries. Though they are impacted by multiple anthropogenic activities, target fisheries and bycatch pose the greatest threat to mobulid populations. In the ICCAT Convention area, there are known interactions between mobulids and fisheries, including purse seine fisheries and, to a lesser extent, longline fisheries. Whilst often discarded, ICCAT data indicate that there are reported landings, and mobulid products are known in international trade. In addition to the limited availability of life-history information, robust data on population size are lacking for mobulids in the ICCAT Convention area, and fisheries data (landings and discards) are incomplete.

Also, the taxonomy of mobulids is still somewhat uncertain, with recent changes in the number of recognised species and genera, and lack of consensus on the overall number of valid species. All species may be taken in pelagic fisheries and species identification is generally poor, including those fisheries under the management of ICCAT. Consequently, any management measures for mobulid rays would be better applied at the family-level (i.e. Mobulidae).

For the above reasons, the Committee recommends that the Commission give full effect to Rec. 23-14. Given the dearth of data on mobulids interactions in ICCAT fisheries, the Committee considers that it is particularly important to comply with the reporting provisions in paragraph 3 of Rec. 23-14, paying particular attention to reporting information at a species level, if possible.

19.25 SCRS shall continue to refine the MSE and test candidate management procedures, Rec. 22-03 para 5

Background: *The SCRS shall continue to refine the MSE and test candidate management procedures in 2023. In support of this effort, the SCRS and Panel 4 shall hold two MSE dialogue meetings in 2023. At the 2023 ICCAT Annual Meeting, the Commission shall review the final candidate management procedures and select one for adoption and application to establish the TAC for 2024 and future years, including pre-agreed management actions to be taken under various stock conditions*

The response to this request is provided in sections 19.28, 19.29, and 19.30.

19.26 SCRS shall monitor swordfish Southern Atlantic catch levels and report to the Commission annually, Rec. 22-04 para 2

Background: *The SCRS will monitor the catch levels in 2023, 2024, 2025 and 2026 and report to the Commission annually.*

Reported catch for South Atlantic swordfish in 2023 was 8,212 t. This was below the 10,000 t Total Allowable Catch (TAC) set for 2023 in Rec. 22-04. This information is annually provided to the Commission as part of the SCRS Report. The latter will serve as the response to this request in the future.

19.27 During 2024, the SCRS shall, taking into account the progress made to date, to identify final operational management objectives: Rec. 23-04, para 7a y b

Background: *a. Review and approve the North Atlantic swordfish combined index to be used for testing the CMPs in the management strategy evaluation (MSE), and pursuant to 7f below, recalculate the performance metrics for the current suite of CMPs;*

The combined index was updated and improved by a technical team. This model was reviewed and approved by the Committee and then used in Candidate Management Procedure (CMP) testing which included recalculation of the performance metrics.

Background: *b. Review the MCC CMP variants in light of the changes to the combined index and increase the number of TAC steps, if appropriate;*

The steps in the Mostly Constant Catch (MCC) CMP variants were modified and tailored to the behaviour of the updated combined index of abundance.

19.28 During 2024, the SCRS shall, taking into account the progress made to date, to identify final operational management objectives: Rec. 23-04, para 7c

Background: *c. Update the combined index with 2023 catch data, if possible;*

The combined index of abundance contains data to 2022-a two-year data-lag. The index was not updated with data from 2023 as these data are sometimes received late in the year, leaving little time for update and review.

19.29 During 2024, the SCRS shall, taking into account the progress made to date, to identify final operational management objectives: Rec. 23-04, para 7d

Background: *d. Develop the scientific components of the Exceptional Circumstances Protocol (ECP) for North Atlantic swordfish and review Panel 4's draft ECP*

An ECP for North Atlantic swordfish was not completed in 2024 because The Committee recommends that the scientific elements of this protocol be developed after the Commission has selected a management procedure (MP). The 2025 swordfish workplan includes ECP development.

19.30 During 2024, the SCRS shall, taking into account the progress made to date, to identify final operational management objectives: Rec. 23-04, para 7e/f

Background: *e. Conduct robustness testing envisioned in the 2024 SCRS swordfish workplan, including related to Climate Change and the effectiveness of minimum size limits, and add robustness tests of the impact on CMP performance of various data gaps within the combined index.*

Work on these robustness tests was conducted in 2024.

Some initial work was done on Climate Change. This work is included in Robustness testing and has been included in the Management Strategy Evaluation (MSE) results. Additional development on that and the minimum size limit should be done in 2025.

Background: *f. Assess the effect of and develop results for a two-year data lag in advance of the 2024 SCRS plenary meeting. If the combined index and updated evaluations of the CMPs are not finalized by the conclusion of the 2024 SCRS plenary meeting, the SCRS should provide final results using fishing year 2022 as the terminal year for the combined index, thereby incorporating a 2-year data lag.*

Testing completed in 2023 of a 1-year versus 2-year data lag showed no discernable difference in Candidate Management Procedures (CMPs) performance. Recognizing that data submission and data processing often occur late in the year, leaving little time for thorough review of new data and updating of the index, the Committee recommends that a 2-year data lag be used for the combined index, and has implemented a 2-year data lag in all the North Atlantic swordfish CMP results presented in 2024.

19.31 The SCRS to inform on CPCs that have provided by 31 July 2022 the required historical FAD set data, Rec. 22-01, para 31

Background: *With a view to establishing FAD set limits to keep the catches of juvenile tropical tunas at sustainable levels, in 2023 the SCRS should inform the Commission about the maximum number of FAD sets which should be established per vessel or per CPC. To support this analysis, CPCs with purse seine vessels shall urgently undertake to report to the SCRS by 31 July 2023 the required historical FAD set data in the format required by SCRS (Task 2 catch and effort through Form ST03-T2CE) for a minimum of the last five years. CPCs that do not report these data in accordance with this paragraph shall be prohibited from setting on FADs until such data have been received by the SCRS.*

In addition, each CPC with purse seine fishing vessels is encouraged not to increase its total fishing effort on FADs from its 2018 level. CPCs shall report the difference between the 2018 level and the 2020 level to the 2023 Commission meeting.

In 2023 the Committee summarized the information provided by CPCs in response to the request for historical data on Floating object (FOB)/ Fish Aggregating Devices (FADs) deployments (Ortiz et *al*., 2023).

In 2024 one CPC provided new information on historical FADs deployments for the years 2018 and 2019 (Table 17 of **Appendix 5**), which has been incorporated into the ICCAT database.

The Committee reiterates that current ICCAT data for tropical tunas does not have catches for a single vessel unit or by FAD. Catch Task 2 CE is reported at a resolution of 1 month and 1x1 degree, but not disaggregated by vessel or FAD-associated vessel fishing activity, therefore it is not possible to associate catches and number of sets by vessel. This detailed information and resolution is only available at the national level likely from the vessel logbook forms.

While CPCs had provided to the Secretariat the historical FAD set data requested by the Commission, the level of resolution of the data does not allow to carry out the specific analysis by vessel requested by the Commission. This is in part because currently there is no established mechanism that allows CPCs to submit vessel-specific information.

Therefore, the Committee recommends that national scientists perform for vessels fishing on FADs an analysis of the per vessel catch rates of tropical tunas on FADs and present it to the SCRS for their evaluation

19.32 The SCRS shall refine the MSE process in line with the SCRS Roadmap and continue testing the candidate management procedures (CMPs), Rec. 22-01, para 62

Background: *The SCRS shall refine the MSE process in line with the SCRS Roadmap and continue testing the candidate management procedures. On this basis, the Commission shall review the candidate management procedures, including pre-agreed management actions to be taken under various stock conditions. These shall take into account the differential impacts of fishing operations (e.g., purse seine, longline and baitboat) on juvenile mortality and the yield at MSY*

The response to this request is addressed under agenda item 14.6 and **Appendix 7** of this report.

The Committee draws the attention of the Commission that the development on multi-stock management strategy evaluation (MSE) for tropical tuna is progressing and multi-stock Management Procedure (MP) could be ready for adoption by the Commission in several years if resources are sufficiently allocated. The Committee suggests the Commission that the adoption of management objectives and performance metrics in consultation with the SCRS would be helpful to advance the process for the development of multi-stock tropical tuna MSE, which would be more complicated than single-stock MSE (SKJ-W). The Committee requests the Commission provide priority, clear direction and commitment for the development and implementation of the multi-stock tropical tuna MSE.

19.33 SCRS input on the development of Management Objectives for SKJ-W MP tested through MSE, Rec. 22-02 para 4

Background: *Panel 1 will provide its recommendations for final management objectives for western Atlantic skipjack tuna, considering the SCRS input, to the Commission for consideration as part of the selection of a management procedure at its 2023 Annual Meeting or as soon as possible thereafter.*

The SCRS Tropical Tunas Species Group has been developing a management strategy evaluation (MSE) framework for West Atlantic skipjack (SKJ-W) since 2020. The MSE was reconditioned in 2022 based on outputs of the 2022 Skipjack Stock Assessment Meeting (ICCAT, 2022b). The full suite of uncertainties evaluated in the stock assessment was included in the MSE's uncertainty grid of nine reference operating models. In 2023, initial testing of candidate management procedures was conducted to evaluate performance against a set of indicators related to Panel 1's preliminary management objectives for safety, stock status, yield, and stability (**Table 19.33.1**). During 2024, a series of meetings conducted within both the SCRS and Panel 1 culminated in an update to the workplan and further development of the SKJ-W MSE. Under this new workplan, catch data and abundance indices were updated and Candidate Management Procedures (CMPs) were further developed.

Table 19.33.1. Current management objectives (conceptual from Res. 22-02 and probabilities from the Second Intersessional Meeting of Panel 1 and corresponding performance metrics.

Management Objectives	*Corresponding Performance metrics*
Status The stock should have a 70% or greater probability of occurring in the green quadrant of the Kobe matrix using a 30-year projection period as determined by the SCRS.	**PGK_{short}**: Probability of being in the Kobe green quadrant (i.e. $SSB \geq SSB_{MSY}$ and $F<F_{MSY}$) in years 1-3 **PGK_{medium}**: Probability of being in the Kobe green quadrant (i.e. $SSB \geq SSB_{MSY}$ and $F<F_{MSY}$) in years 4-10 **PGK_{long}**: Probability of being in the Kobe green quadrant (i.e. $SSB \geq SSB_{MSY}$ and $F<F_{MSY}$) over years 11-30 **PGK_{all}:** Probability of being in the Kobe green quadrant (i.e. $SSB \geq SSB_{MSY}$ and $F<F_{MSY}$) over years 1-30 **POF:** Probability of $F>F_{MSY}$ over years 1-30 **PNOF:** Probability of $F<F_{MSY}$ over years 1-30
Safety There should be no greater than [10%][1] probability of the stock falling below B_{LIM} ($0.4*SSB_{MSY}$) at any point during the 30-year projection period.	**LRP_{short}**: Probability of breaching the limit reference point (i.e. $SSB<0.4*SSB_{MSY}$) over years 1-3 **LRP_{medium}**: Probability of breaching the limit reference point (i.e. $SSB<0.4*SSB_{MSY}$) over years 4-10 **LRP_{long}**: Probability of breaching the limit reference point (i.e. $SSB<0.4*SSB_{MSY}$) over years 11-30 **LRP_{all}**: Probability of breaching the limit reference point (i.e. $SSB<0.4*SSB_{MSY}$) over years 1-30 **$nLRP_{short}$**: Probability of not breaching the limit reference point (i.e. $SSB<0.4*SSB_{MSY}$) over years 1-3 **$nLRP_{medium}$**: Probability of not breaching the limit reference point (i.e. $SSB<0.4*SSB_{MSY}$) over years 4-10 **$nLRP_{long}$**: Probability of not breaching the limit reference point (i.e. $SSB<0.4*SSB_{MSY}$) over years 11-30 **$nLRP_{all}$**: Probability of not breaching the limit reference point (i.e. $SSB<0.4*SSB_{MSY}$) over years 1-30
Yield Maximize overall catch levels in the short (1-3 years), medium (4-10 years) and long (11-30 years) terms.	**AvC_{short}** – Median catches (t) over years 1-3 **AvC_{medium}** – Median catches (t) over years 4-10 **AvC_{long}** – Median catches (t) over years 11-30
Stability Any changes in TAC between management periods should be 20% or less[2].	**$VarC_{medium}$** – Variation in TAC (%) between management cycles over years 4-10 **$VarC_{long}$** – Variation in TAC (%) between management cycles over years 11-30 **Var_{all}** – Variation in TAC (%) between management cycles over years 1-30

[1] At the May 2023 intersessional, Panel 1 indicated that the probability of breaching B_{LIM} could be reduced to 5% at a later date.
[2] At the May 2023 intersessional, Panel 1 asked that CMPs also be tested with no restriction on Total Allowable Catch (TAC) changes from one management cycle to the next. They also expressed openness to asymmetric TAC change restrictions where there would be no limit on TAC decreases if $B_{CURRENt}<B_{MSY}$.

The objectives contained in **Table 19.33.1** are informed by the conceptual management objectives adopted for SKJ-W by the Commission in 2022 (Res. 22-02). Panel 1 started to operationalize those objectives by setting interim probability levels at the Second Intersessional Meeting of Panel 1 based on preliminary results of constant catch and empirical management procedures. Panel 1 provided feedback on the initial MSE results in May 2023 and at an intersessional meeting in February 2024, which the SCRS took into consideration when continuing its CMP development work. These new final results are summarized below (**Table 19.33.2**, **Figures 19.33.1 to 19.33.3**) and described fully in Sant'Ana and Mourato (2024).

There are currently 10 CMPs, six empirical and four model-based. Full descriptions are available in Sant'Ana and Mourato (2024), but briefly, these include:

- IR: Three index ratio CMPs with different limits on TAC change. TACs are set based on the combined index but when the change of index is within the specified envelope, TAC is not changed;
- CE: Three constant exploitation rate CMPs with three different limits on TAC change;
- SP: Four model-based CMPs that use either a surplus production model or state-space surplus production model with a 100-40 hockey stick harvest control rule and an F_{TARGET} of either 100%F_{MSY} or 80%F_{MSY}.

Table 19.33.2 and **Figures 19.33.1 to 19.33.3** present the final MSE results. The results have changed considerably since May 2023 when Panel 1 advised on operational management objectives. This is because the CMPs now use the combined index and incorporate the actual fishery data rather than simulations only. Those prior results had very low observation error and were overly optimistic, whereas the new results are based on the final operating models and a more thorough accounting of uncertainty. It is therefore more difficult to achieve a probability of green Kobe (PGK) of 70% for the 30-year projection period, which results in lower average yields. All CMPs achieve a 90% or higher chance of not breaching the limit reference point over the entire projection period, although some CMPs are down to 88% for years 21-30. The current MSE results can be now considered final as a basis for Commission adoption of final management objectives and a Management Procedure (MP) to set the TAC for 2025 and beyond.

Table 19.33.2. Quilt table showing results for the 10 CMPs against key performance indicators for the reference set of operating models. See **Table 19.33.1** for performance indicator descriptions. The nLRP performance metric is the probability of not breaching the limit reference point; this modification of the LRP performance metric means that higher values are better for all metrics except VarC. Darker shading indicates better performance, but some of the values are very similar, despite different shading.

MP	AvC_short	AvC_med	AvC_long	PGK_short	PGK_med	PGK_long	PGK	PNOF	nLRP_short	nLRP_med	nLRP_long	nLRP	VarCmedium	VarClong	VarC
IR_01	20581	21096	20065	0.71	0.72	0.69	0.70	0.77	1.00	0.96	0.88	0.91	0.01	0.00	0.00
IR_02	20581	21096	20065	0.71	0.72	0.69	0.70	0.77	1.00	0.96	0.88	0.91	0.01	0.00	0.00
IR_03	20581	21106	20061	0.71	0.72	0.69	0.70	0.77	1.00	0.96	0.88	0.91	0.01	0.00	0.00
CE_01	20677	20609	20324	0.71	0.72	0.69	0.70	0.80	1.00	0.96	0.92	0.94	0.22	0.31	0.25
CE_02	20677	20712	20641	0.71	0.72	0.67	0.69	0.79	1.00	0.96	0.91	0.93	0.21	0.29	0.23
CE_03	20677	21571	20189	0.71	0.68	0.64	0.66	0.77	1.00	0.95	0.90	0.92	0.34	0.53	0.37
SP_01	21616	22142	19716	0.70	0.68	0.71	0.70	0.78	1.00	0.94	0.89	0.92	0.04	0.02	0.02
SP_02	21395	17649	15658	0.68	0.75	0.87	0.82	0.90	1.00	0.96	0.96	0.97	0.31	0.26	0.28
SP_03	21616	22142	19716	0.70	0.68	0.71	0.70	0.78	1.00	0.94	0.89	0.92	0.04	0.02	0.02
SP_04	21395	17695	15771	0.68	0.75	0.86	0.82	0.89	1.00	0.96	0.96	0.97	0.31	0.26	0.28

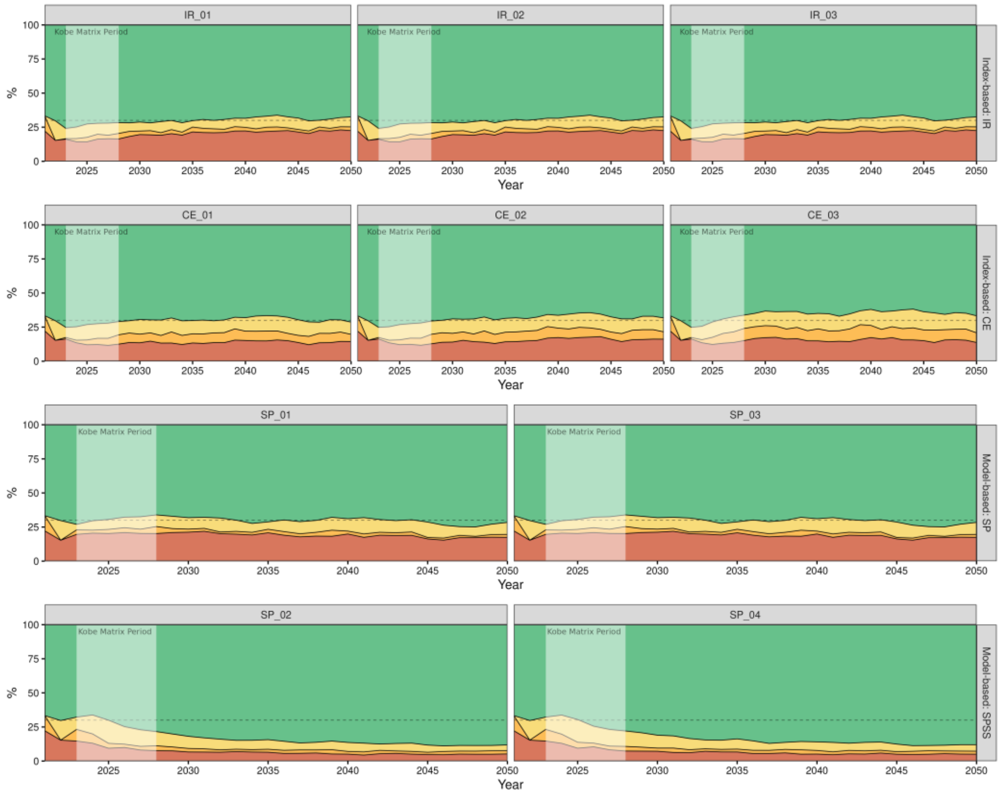


Figure 19.33.1. Kobe time plot showing the percentage (vertical axis) of simulations across all reference operating models that fall in each of the Kobe quadrants in each projection year (horizontal axis). Green indicates that the stock is neither overfished nor subject to overfishing. Orange means that the stock is subject to overfishing but not overfished. Yellow indicates that the stock is overfished but not subject to overfishing. Red means that the stock is both overfished and subject to continued overfishing.

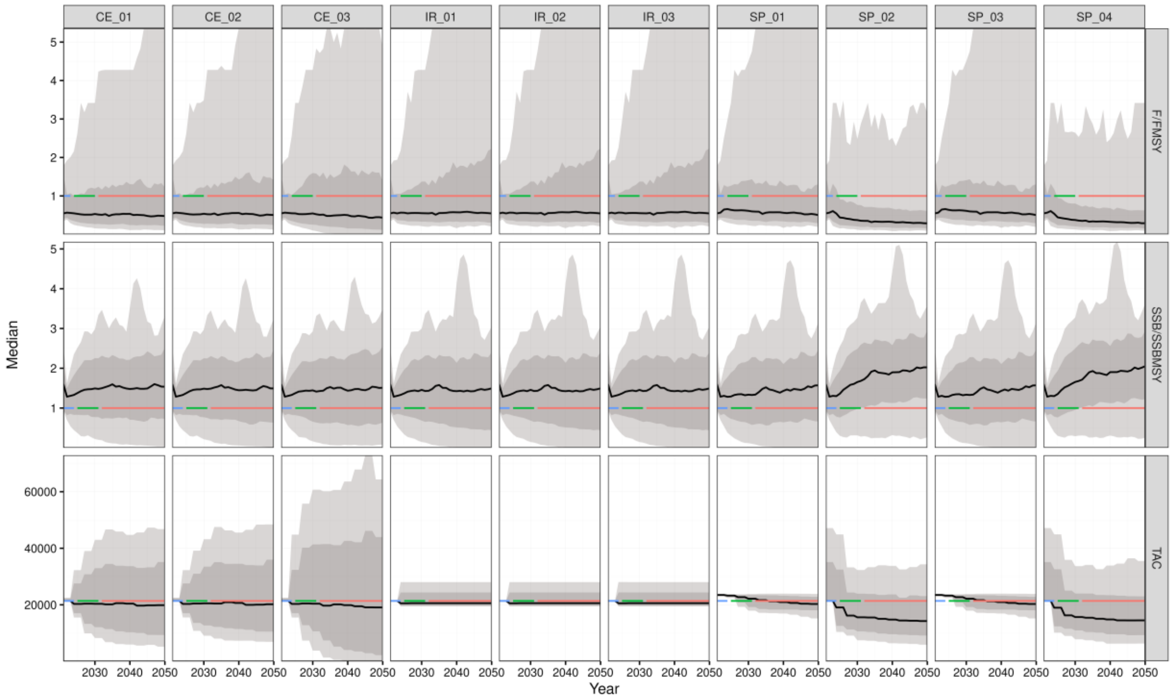


Figure 19.33.2. Trajectory of a) fishing mortality (F) relative to F_{MSY} (top row), b) spawning stock biomass (SSB) relative to SSB_{MSY} (middle row), and c) TAC (in tons, bottom row) for the 'b' tunings of the 10 final CMPs. Results are summarized across all reference operating models. Blue bars show the short time period, while green depicts medium and red long.

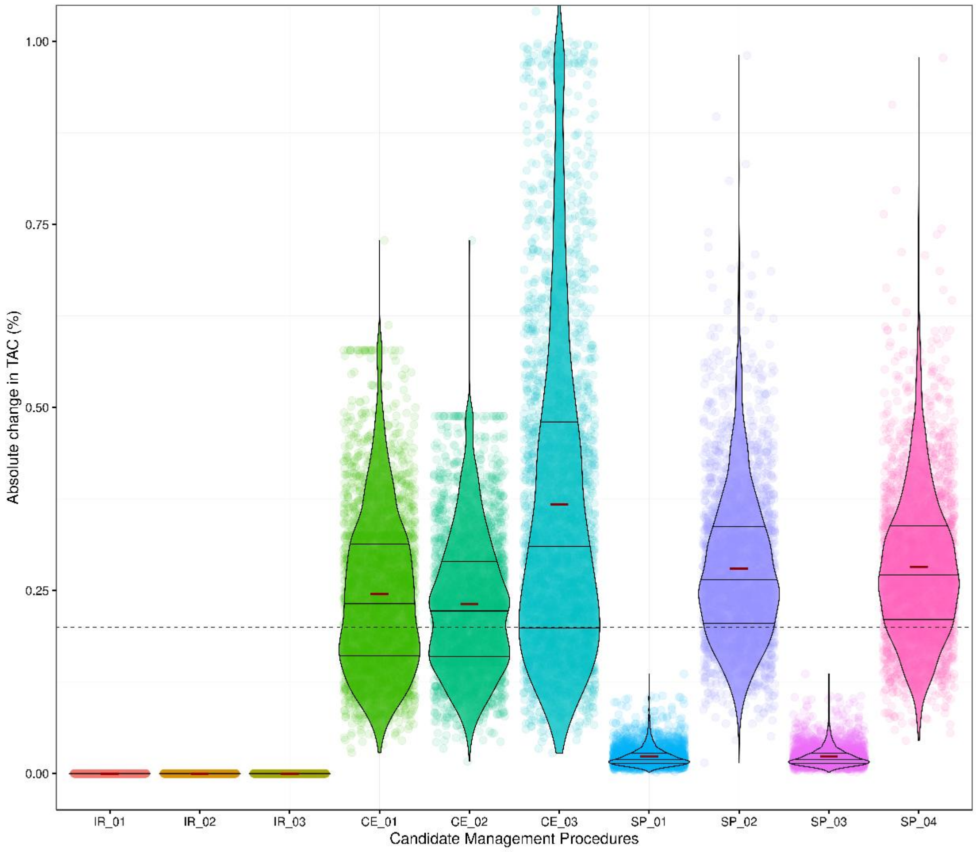


Figure 19.33.3. Violin plot for the change in TAC between management cycles. The width of the violin plot indicates the proportion of data points that are in each region of the plot (i.e. wide areas of the plot indicate a relatively large number of data points in that region, while narrow areas of the plot indicate few data points). The lines inside the violin plots indicate the 25, 50 and 75 percentiles, and the red line the mean of the distributions.

19.34 The SCRS shall review these data and determine the feasibility of estimating fishing mortality by commercial fisheries, Rec. 16-11, para 2

Background*: CPCs shall enhance their efforts to collect data on catches of sailfish, including live and dead discards, and report these data annually as part of their Task 1 and 2 data submission to support the stock assessment process. The SCRS shall review these data and determine the feasibility of estimating fishing mortality by commercial fisheries (including longline, gillnets and purse seine), recreational fisheries and artisanal fisheries.*

The Committee conducted a stock assessment of sailfish stocks in 2023 (ICCAT, 2023b) and blue marlin in 2024 (ICCAT, 2024i). As part of the assessments, the Committee estimated fishing mortality by commercial fisheries (including longline, gillnets and purse seine), recreational fisheries and artisanal fisheries for the West sailfish stock and Atlantic blue marlin using the integrated stock assessment model (SS3).

Ortiz *et al*., 2024 provided an evaluation of the relative fishing mortality impact by main fleet/gear on blue marlin and west sailfish stocks. Both blue marlin and sailfish stocks are mainly caught as bycatch by the ICCAT commercial longline gears, and they account for the major source of mortality for these stocks. Based on the exploitation rate (i.e. biomass portion removed by fishing from the overall population biomass) it was estimated a standard fishing mortality unit (*F'*)[1] that is comparable among the different gears selectivities. **Figure 19.34.1** shows the estimated annual standard *F'* by year and main fleet/gear groups for blue marlin and west sailfish stock respectively. In **19.34.2** the same information is provided as the relative percent of mortality for each year and main fleet/gear.

[1] Definition of *F'* standard is provided in Ortiz *et al*., 2024.

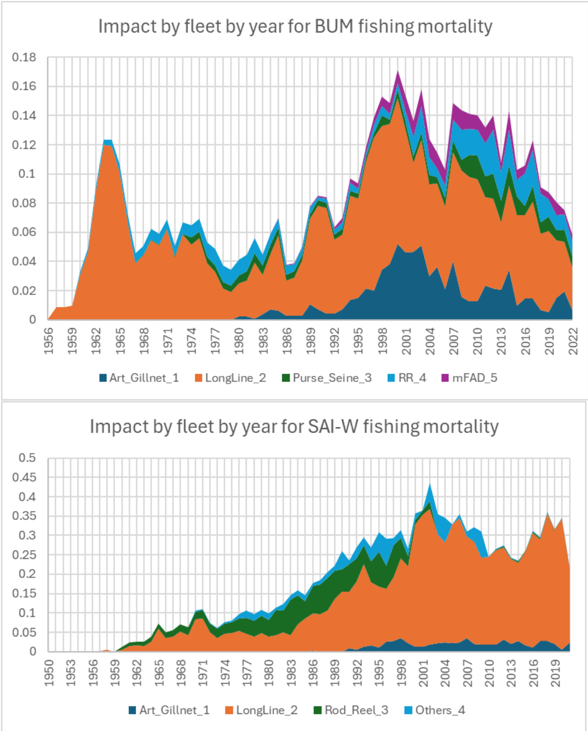


Figure 19.34.1. Estimated annual overall standard fishing mortality by fleet/gear selectivity at size for the blue marlin (top) and western sailfish (bottom).

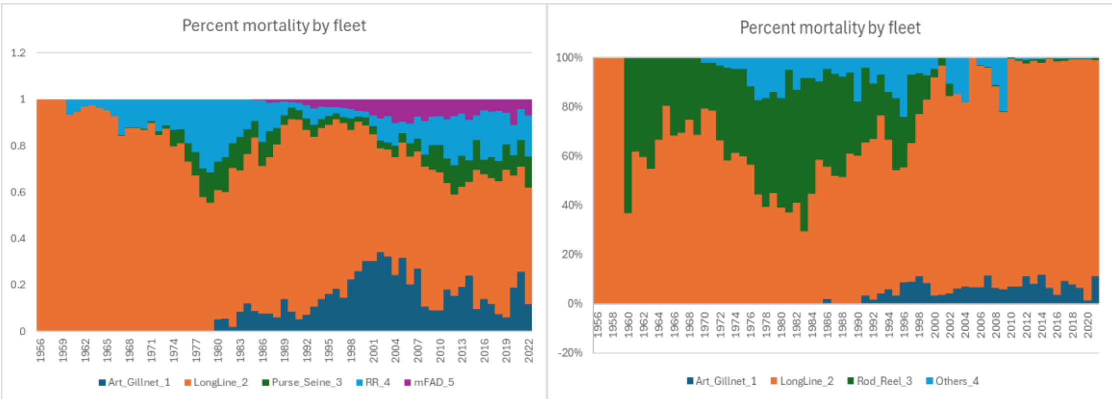


Figure 19.34.2. Relative annual standard fishing mortality by main fleet/gear for blue marlin and West sailfish stocks. The left plot corresponds to the blue marlin and the right plot corresponds to the West sailfish.

The results indicated that the bycatch from the longline fleets is the main source of fishing mortality on average 53% for blue marlin and 92% for sailfish for both stocks in the last 5 years of the assessment. In the case of blue marlin, the sport recreational fisheries account for 16% of mortality, followed by the small-scale fleets associated with artisanal gillnets with 14% and 11% from the purse seine bycatch. For West sailfish small scales fisheries account for 7% mortality with minor impact from other fleets.

In summary, the estimates of fishing mortality impact by the main fleet/gear are directly related to the proportion of the catches reported, thus in the case of the eastern sailfish stock the Committee expects that the relative fishing mortality is mainly from the artisanal gillnets fleets, followed by the surface gears, and the bycatch from longline fleets (**Figure 19.34.3**). The results should be interpreted with caution given the uncertainties in the completeness of the reported landings and dead discards for most of the billfish species.

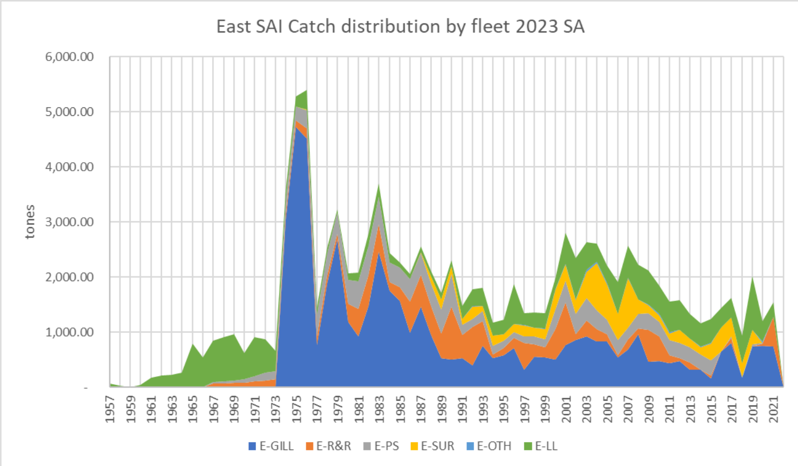


Figure 19.34.3. East sailfish catch series by main fleet/gear.

19.35 Revise the statistical methodology used to estimate dead and live discards and provide feedback to CPCs, Rec. 19-05 para 16

Background*: No later than 2020, CPCs shall present to the SCRS the statistical methodology used to estimate dead and live discards. CPCs with artisanal and small-scale fisheries shall also provide information about their data collection programmes.*

The SCRS shall review these methodologies and if it determines that a methodology is not scientifically sound, the SCRS shall provide relevant feedback to the CPCs in question to improve the methodologies.

The SCRS shall also determine if one or more capacity building workshops are warranted to help CPCs to comply with the requirement to report total live and dead discards. If so, the Secretariat in coordination with the SCRS should begin organizing the SCRS-recommended workshop(s) in 2021 with a view to convening them as soon as practicable.

The Committee noted that, since the response to this request provided in the *Report for Biennial Period, 2022-23 Part I (2022), Vol. 2*, several CPCs (Brazil, Canada, Morocco and the United States) have provided information on their statistical methodology to estimate dead and live discards of billfish species. The Committee did not receive additional methodologies from other CPCs in 2024.

There is limited information provided by CPCs on the methods they employ for estimating discards. The Committee reiterates that it is important for the Committee to understand the methodology used by CPCs to estimate live and dead discards of billfish. The Committee reminds CPCs that have not yet presented documentation on the bycatch estimation methodologies used of the obligation to do so. Until the Committee can review the methods currently used by these other CPCs, the Committee cannot provide suggestions and recommendations for any necessary improvements on such methods.

The SCRS has recently conducted regional workshops on statistics of small-scale fisheries in West Africa and the Caribbean and has implemented a pilot project to improve data on blue marlin and yellowfin tuna caught by Caribbean fisheries. Artisanal and small-scale fleets do not often discard billfish as these species are retained and landed for local consumption. In most cases, landings represent the total catch. Unfortunately, landing reports of billfish from small-scale fisheries are often unreliable, as for many fleets they are a bycatch.

In recent decades many sport vessels released most billfish caught, however, most of these fishing fleets do not report releases or landings consistently. The ratio of release vs landing from these fleets varies with time, between regions, and depending on whether fishing is done as part of a tournament.

To improve the quality of landing and discards of billfish it is recommended to support a collaborative project between national statistical correspondents, national scientists, and ICCAT data monitoring experts.

The project should aim to improve small-scale and sport fishery data on Caribbean billfish and have the following elements:

- Thorough review of historical documents on small-scale and sport fisheries catching ICCAT species, particularly billfish;
- Review of national governance systems related to ICCAT fisheries;
- Interview key informants involved in fishery governance, operations, and monitoring;
- Technical support to improve the design, monitoring, and statistical estimation of catch, discards, and fishing effort;
- Improve biological sample collections.

To increase capacity building to estimate dead and live discards, the Committee developed and made available the Bycatch Estimation Tool (BYET). This tool is intended to provide a standardized method that CPCs can use to estimate such quantities as bycatch, dead and live discards, and other aspects of their fishery catch. The Committee conducted a workshop on the use of the BYET in the summer of 2024. The Committee will offer a workshop in 2025 and recommends more workshops to be done in the future. The Committee recommends that CPCs make every effort to take advantage of this tool and these workshops to address the issues indicated in this request.

19.36 Estimate of capacity in the Convention area, to include at least all the fishing units that are large-scale or operate outside the EEZ of the CPC they are registered in, Rec. 22-01 para 66b

Background: *Actions required from the SCRS and the Secretariat:*

b) *The ICCAT Secretariat shall work with the SCRS in preparing an estimate of capacity in the Convention area, to include at least all the fishing units that are large-scale or operate outside the EEZ of the CPC they are registered in. All CPCs shall cooperate with this work, providing estimates of the number of fishing units fishing for tuna and tuna-like species under their flag, and the species or species groups each fishing unit targets (e.g., tropical tunas, temperate tunas, swordfish, other billfish, small tunas, sharks, etc.); this work shall be presented to the next meeting of the SCRS in 2020 and forwarded to the Commission for consideration.*

The Committee is unable to estimate capacity for fishing vessel types other than purse seiners (see below). However, effective this year, CPCs must report vessels that were active during the previous year and the number of active days for each vessel (FORM ST01-T1FC). It will therefore be possible for the Secretariat to make the necessary calculations in the future. The Committee recommends that the Secretariat provide those estimates beginning in 2025 and urges all CPCs to comply with this reporting requirement.

For large scale purse seine vessels, one estimate of capacity was made using a methodology similar to previous years (Restrepo *et al*., 2024), but also including data reported in ST01. It is estimated that 62 such vessels were active in the Atlantic in 2023. The Committee notes that the estimate is lower than for the period 2020-2022 (**Table 19.36.1**). There could be several reasons for that, including that vessels move between oceans, but it could also be partly due to changes in methodology.

The Committee also notes that there are different ways to measure fishing capacity (e.g. number of vessels, carrying capacity, fish hold volume). For future analyses, the Committee recommends that capacity estimates be weighted by the number of days of activity per vessel per year in order to account for vessels with partial activity in the ICCAT Convention area. As carrying capacity can strongly vary among fishing vessels, the Committee recommends estimating carrying capacity weighted by active fishing days to complement the capacity estimates in number of vessels. Indeed, weighted carrying capacity has been identified as a key fishing indicator for purse seine fleets by the Committee (Restrepo *et al*., 2024).

Table 19.36.1. Comparison of the SCRS estimation of large-scale purse seiners operating in the Atlantic Ocean in 2018 and 2020-2023. When a number is uncertain, a range (min.-max.) is given. The table reflects updates made during the SCRS Plenary.

FLAG/Year	*2018*	*2020*	*2021*	*2022*	*2023*
BLZ	2	8	8	8	10
CPV	1	1	1	0	0
CUW	5	4	4	2	0
EU.ESP	10	10	11	10	8
EU.FRA	10	9	10	10	9
GHA	15	16	16-17	16-17	16
GIN	0	0	1	1	1
GTM	2	2	2	2	2
LBR	0	2	2	0	0
MAR	0	1	3-4	3-4	1
PAN	2	4	4	4	4
SEN	7	7	7	7	6
SLV	4	4	3	3	3
VEN	0	1	2-4	2-3	2
Total	**58**	**69**	**74-78**	**68-71**	**62**

19.37 Further analysis shall be conducted by the SCRS on the impact of support vessels on the catches of juvenile yellowfin and bigeye tuna to be considered in 2023, Rec. 22-01, para 33

Background: *Further analysis shall be conducted by the SCRS on the impact of support vessels on the catches of juvenile yellowfin and bigeye tuna to be considered in 2023.*

The Committee provided a partial response to this request in 2021 and 2023. The Committee provided some additional information on support vessels in Restrepo *et al*. (2022) by comparing the list of support vessels in the International Seafood Sustainability Foundation (ISSF) ProActive Vessel Register and the ICCAT record but was unable to determine which support vessels were active on those years.

The Secretariat provided a summary of the reported list of support vessels provided by CPCs in ST-07 SP form between 2010 and 2023 (2024 Secretariat Report on Research and Statistics, **Appendix 5**). However, the Committee was informed that the activities of support vessels may support purse seine operations of more than one CPC and that by adding the individual CPC reports would likely double count the number of support vessels. It was noted that the contribution of support vessels to fishing efficiency has changed as FADs provided with echo-sounder buoys have been introduced to the fishery. Support vessels are no longer involved in the identification of tuna schools, being fully involved in tasks related to the seeding, maintenance, and recovery of FADs.

19.38 Fishing prohibited with FADs, Rec. 22-01 para 28

Background: *1 January to 13 March 2023, throughout the Convention area. This should be reviewed and, if necessary, revised based on advice by the SCRS taking into account monthly trends in free school and FAD-associated catches and the monthly variability in the proportion of juvenile tuna in catches. SCRS should provide this advice to the Commission in 2023.*

The catches (t) by PS-FOB fisheries on the three tropical species show different trends over time, but there are clear indications that since 2019, catches in quarter 1 are lower than in other quarters (**Figure 19.38.1**), which corresponds to the closure period. Using catch alone, it is not possible to fully evaluate the impact of the full closure on the fishing mortality of juvenile yellowfin and bigeye, or the longer-term impacts to the spawning biomass of these stocks. Therefore, the Group conducted a suite of analyses to further evaluate these objectives. In some cases, these analyses were possible only for yellowfin tuna which was assessed in 2024. The Committee intends to conduct similar analyses for bigeye tuna in 2025.

To evaluate the effect of various moratoria, the Committee undertook an 'impact' analysis for the three tropical tuna species using the outputs of the Stock Synthesis (SS) base models for the three species. The relative impacts of the major gear types differ by species (**Figure 19.38.2**), but for all three species the aggregate impact of fisheries that largely target skipjack and also catch juvenile yellowfin and bigeye tunas have increased significantly since the 1990s. It is currently difficult to discern any reduction in the aggregate impact of these fisheries on yellowfin or bigeye tuna spawning biomass as a result of the full closure. This is not unexpected because it takes time for reductions in juvenile mortality to have positive effects on spawning biomass. There appears to be a significant reduction in the impact of both of those fisheries on skipjack (2021) but that year was also impacted by COVID.

To further explore potential impacts of recent closures on juvenile mortality of yellowfin tunas, the Committee plotted the recent (2010-2021) fishing mortality rates on juveniles (ages 0 and 1) and overlaid the two most recent closures (**Figure 19.38.3**). Perhaps due to redistribution of effort to other quarters, there was no clear evidence that juvenile mortality (ages 0 and 1) of yellowfin tuna has been reduced by the FOB closures. Currently, the effect of the full closure is hard to estimate as there are only two years of data on fishing mortality and 2021 was a year affected by COVID. A similar analysis will be conducted next year for bigeye tuna.

The Commission also requested scientific advice on the most suitable period and duration of the full closure. The Committee evaluated the effectiveness of alternative temporal closures (season and duration) and the correct implementation of current catch limits using outputs of the most recent stock assessments of bigeye (ICCAT, 2021b) and yellowfin (ICCAT, 2024k). The results of this analyses are shown in **Figure 19.38.4** (yellowfin) and **Figure 19.38.5** (bigeye), which show the estimated relative biomass (B/B_{MSY}) after 10 years of projection of the stock assessment model under the different closure assumptions.

For yellowfin tuna, the recent catches exceed both total allowable catch (TAC) and the most recent estimation of maximum sustainable yield. Therefore, lacking mechanisms to ensure that the catches of yellowfin do not exceed any adopted TAC, closures of one to three months could help reduce catch and avoid overfishing. The level of reduction on catch will depend on alternative assumptions of catch redistribution to other quarters when FOB fishing is allowed, which season the closure occurs and the length of the closure. The analysis identifies season 2 (April-June) as the period that would produce the highest benefit to yellowfin tuna as would closures that are applied to all fishing gears. Levels of fishing capacity are also relevant to be considered.

The effect of the closure for bigeye tuna is less evident as the catch used for the analyses (2017-2019, 75,708 t) and TAC (62,000 t) are below the catch levels associated with the stock being “not overfished and not subject to overfishing” based on the 2021 stock assessment.

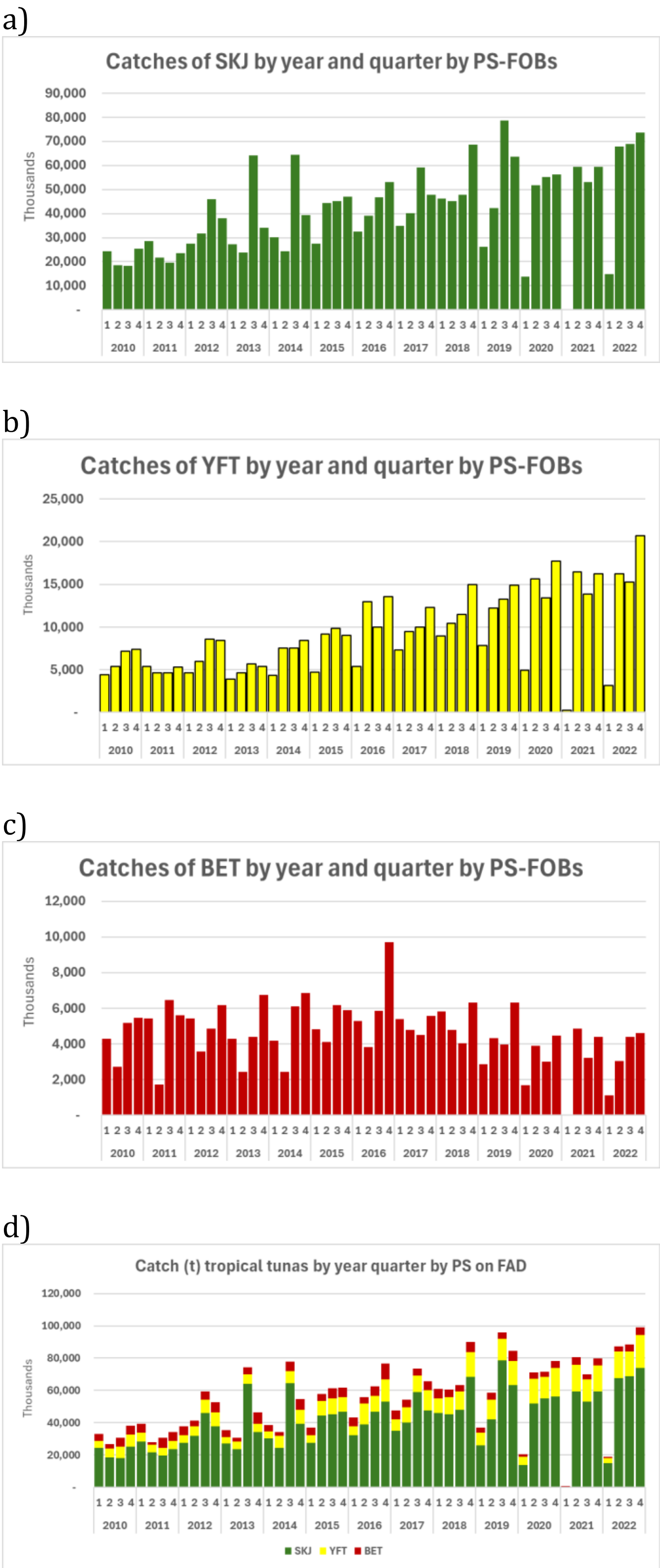


Figure 19.38.1. Catches (t) of the three tropical tuna species by year and quarter for the PS-FOB fisheries (panel a = SKJ; b=YFT; c=BET). The bottom panel (d) shows the combined PS-FOB catches (t) of all three species.

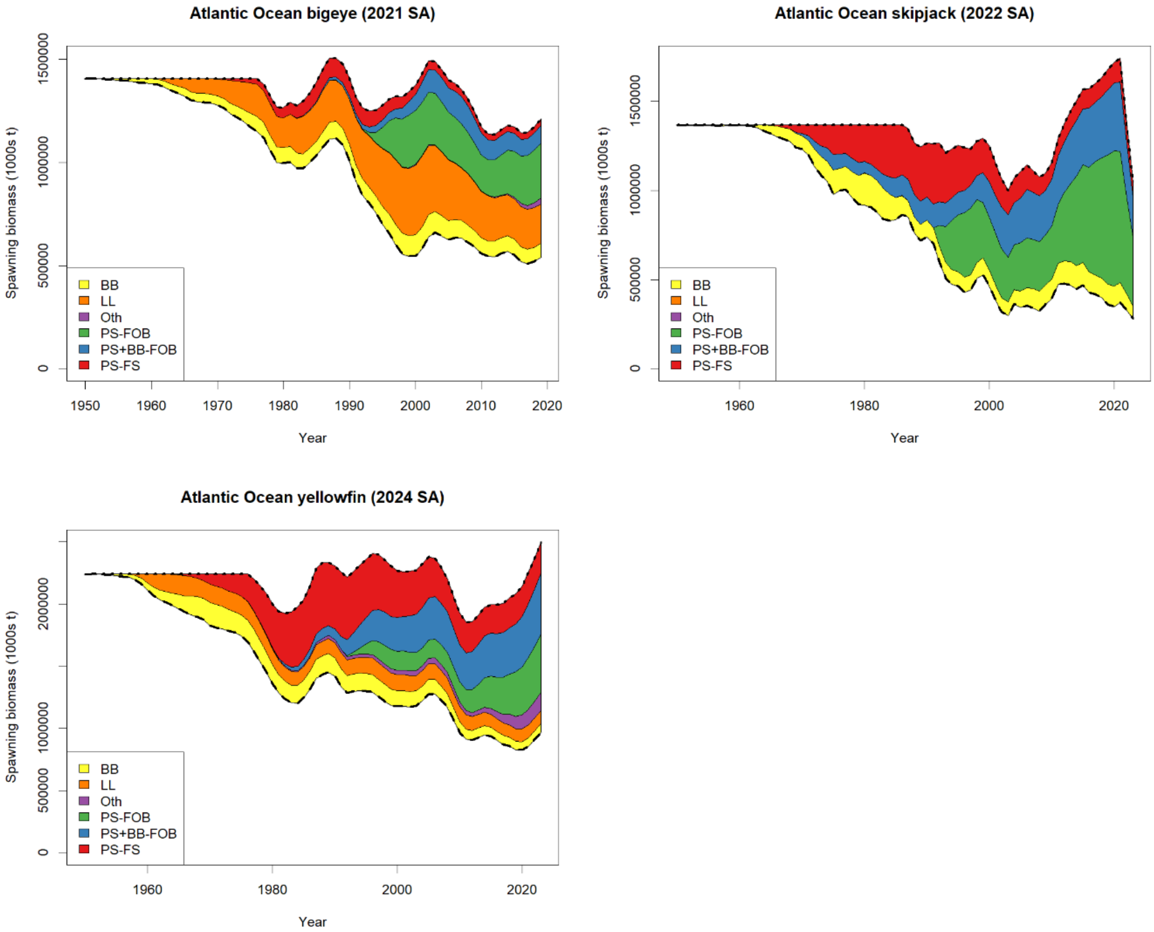


Figure 19.38.2. Impact plots represent the relative impact of each gear on the spawning biomass of the stock. Coloured areas represent model predicted increases in spawning biomass when catches of each gear are eliminated from the historical catches. The estimated unfished spawning biomass (upper dotted line) varies with recruitment deviations. The historical SSB trajectory, estimated by the stock assessment model, is indicated with a bottom dashed line. The codes PS FOB and PS+BB-FOB represent the purse seine fisheries operating on FOB/FADs. The code PS+BB-FOB reflects that these purse seine fleets have operated in association with baitboats (BB) in the past. The free school refers to the purse seine operations on free school banks.

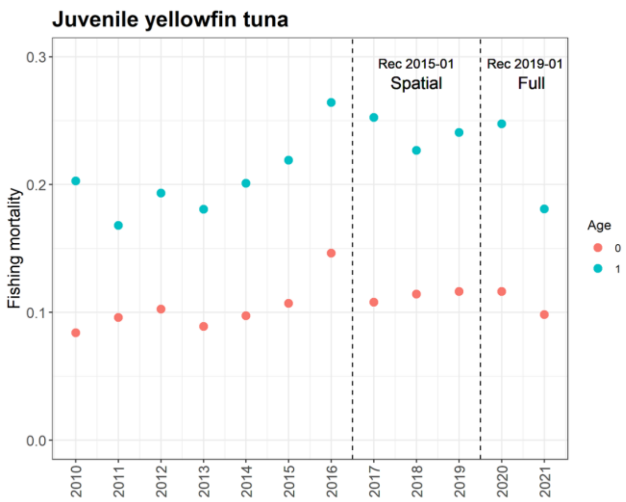


Figure 19.38.3. F at age 0 and 1 YFT for 2010-2021 from the SS base case, which used data from 1950-2022. The most recent spatial closures indicated with vertical dashed lines. The F at age in 2022 was not appropriate for this comparison because recruitment (Age 0) was not estimated in 2022.

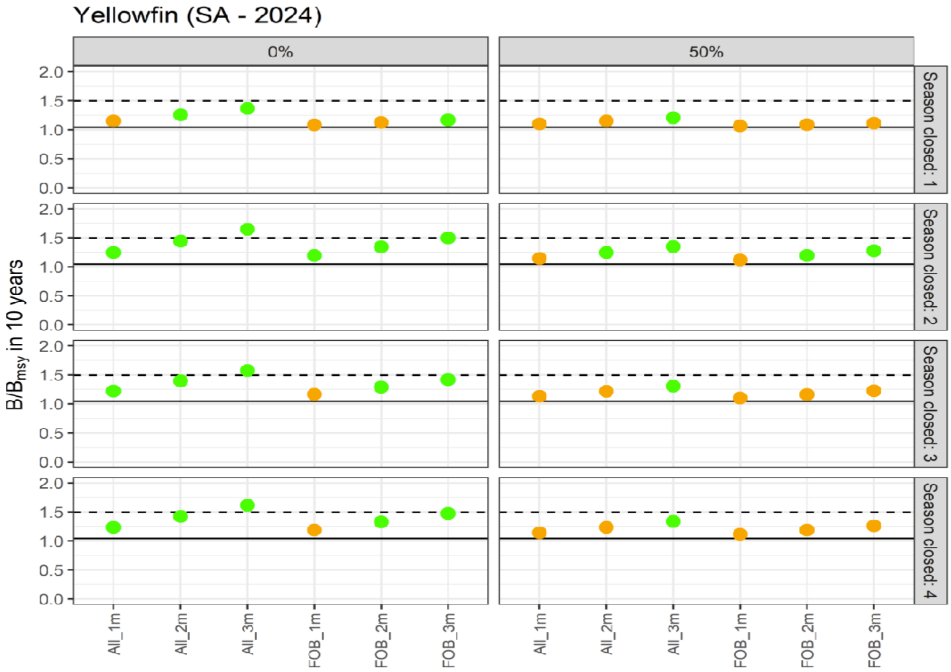


Figure 19.38.4. The expected effects on the status of yellowfin (i.e. B/B_{MSY} in 10 years) due to various closures. The x-axes show the modality of the closure: "All" assumes that the catch of all gears is reduced to zero for 1, 2 or 3 months, while the "FOB" scenarios assume the same catch reduction for purse seine fisheries on FADs. The rows represent the closure of year quarters 1 (January-March) to 4 (October-December), and the two columns represent scenarios where the catch not taken in the closed season is not taken in any other season (0%) versus scenarios where 50% of that catch is redistributed across the other three seasons. The colour of the dots represents the stock status category, the dashed black horizontal line represents the estimated relative biomass if the current catch limits were fulfilled, and the solid black line represents the relative biomass under the catch levels prior to the assessment.

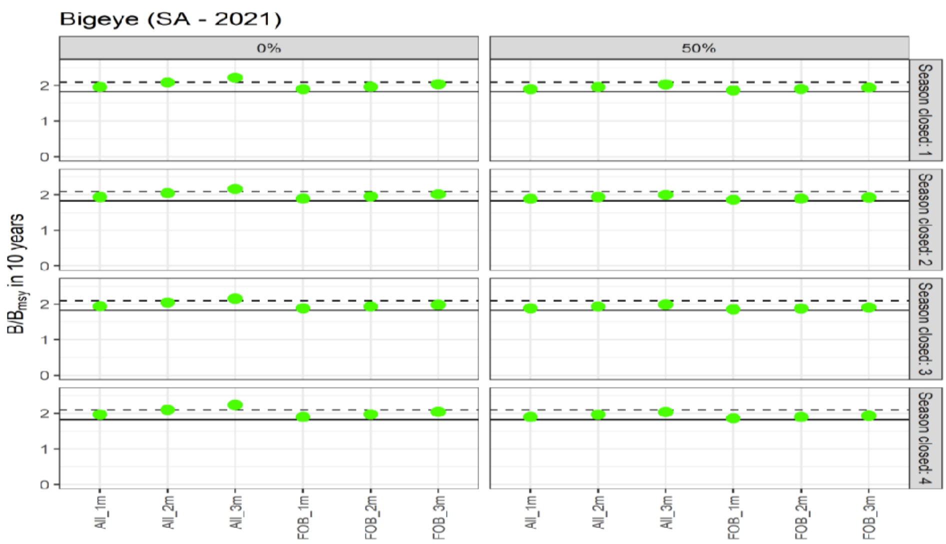


Figure 19.38.5. The expected effects on the status of bigeye (i.e. B/B_{MSY} in 10 years) due to various closures. The x-axes show the modality of the closure: "All" assumes that the catch of all gears is reduced to zero for 1, 2 or 3 months, while the "FOB" scenarios assume the same catch reduction for purse seine fisheries on FADs. The rows represent the closure of year quarters 1 (January-March) to 4 (October-December), and the two columns represent scenarios where the catch not taken in the closed season is not taken in any other season (0%) versus scenarios where 50% of that catch is redistributed across the other three seasons. The color of the dots represents the stock status category, the dashed black horizontal line represents the estimated relative biomass if the current catch limits were fulfilled. and the solid black line represents the relative biomass under the catch levels prior to the assessment.

19.39 SCRS will calculate annually possible level of retention and provide the results to the Commission, Rec. 22-11 para 6b

Background: *Starting in 2024 and annually thereafter, the SCRS will use Annex 1 to calculate possible level of retention, including eligible CPCs' individual retention allowances, allowed in the subsequent year, and provide the results to the Commission.*

Given that the stock assessment for shortfin mako planned for 2024 was postponed by Commission decision, the Committee was unable to calculate the level of retention for 2025, as the methodology detailed in Annex 1 of Rec. 22-11 is based on the results of the Kobe II strategy matrix.

In 2025, if the stock assessment is conducted, the Committee will calculate the level of retention for 2026.

20. New templates for Executive Summaries

The Chair presented the new draft proposal for the Revised Publication Guidelines for Executive Summaries and the new draft template for the Executive Summaries.

The Committee was supportive of changes to the Executive Summary and that there was a need to reduce the volume of text in the current Executive Summaries. The Committee noted the need to balance making the Executive Summary brief against the risk of oversimplification. To address the risk of oversimplification, the Committee added that any relevant information for the provision of advice should be included in the Additional Information section. The Committee also noted that removing the biological information would require that the ICCAT Manual kept updated, a process which is now underway, and requested the Secretariat to keep updating Chapter 2 of the ICCAT Manual.

The Committee agreed that the proposed new Executive Summary template could be presented, along with the provided examples, for the Commission to provide feedback to the SCRS and/or potentially adopt. If the Commission adopts the new format, the Committee noted that, given the variety across Executive Summaries in how stocks are assessed and managed (e.g. small tunas *versus* single stocks), among other things, may require additional adjustments to the format being proposed (**Appendix 8**).

21. Other matters

21.1 Memorandum of Understanding between ICCAT and ICES

The Committee was informed that the Secretariats of ICCAT and ICES have been working on a draft Memorandum of Understanding (MOU) between the two Organizations. The Secretariat invited the representative of ICES to present the draft MoU.

The Committee welcomed the formal proposal of collaboration between ICES and ICCAT, highlighting past scientific collaborations, particularly with elasmobranchs spp. The Committee recommended that the Memorandum of Understanding (MoU) between ICCAT and ICES should include additional clauses for any pertinent data confidentiality policies. It was also highlighted that future collaboration on ecosystems and bycatch issues common to both organizations will be of great benefit for both Organizations. A revised version of the MoU was prepared by the Secretariat, which was endorsed by the Committee for consideration at the upcoming Commission annual meeting.

22. Election of SCRS Chair

The Executive Secretariat call for nominations for the position of SCRS Chair. Sierra Leone nominated Dr Craig Brown for a second mandate as SCRS Chair. Several Contracting Parties also showed their support to this nomination, and thanked Dr Brown for his hard work during his first mandate. Finally, several Contracting parties suggested Dr Brown to consider having a Vice Chair to assist him in the course of his second mandate as SCRS Chair.

The SCRS Chair thanked the Committee for their support of his continued tenure as Chair of the Committee. He expressed his continued commitment to support the SCRS in the development of its scientific advice and the clear communication of that advice to the Commission. The Chair also noted the ongoing importance of working with the Commission to help ensure that their requests of the SCRS take into account data availability and timing, capacity limitations, and the science, so that the SCRS responses can better support the work of the Commission.

The Chair notified the Committee of his intention to appoint a Vice Chair, as this would be very helpful in addressing the many demands on the SCRS Chair. Such an appointment will be announced at a later date, as there is still a need to identify a candidate willing and able to take on the role of Vice Chair.

The SCRS Chair noted the increasing demands on other SCRS Officers, such as the preparation of draft documents, terms of reference, intersessional meetings etc. and recognized their success despite these increasing responsibilities. But he highlighted the need for these Officers to also have support in carrying out these tasks, as well, and strongly encouraged SCRS scientists to participate in sub-groups and other processes intended to support the SCRS Officers in their work.

23. Adoption of the Report

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

Dr Brown thanked the SCRS Officers and the Secretariat staff for their excellent work, as well as appreciating their professional attitude. Dr Brown then expressed his appreciation towards the interpreters and to all participants. The Report of the 2024 SCRS meeting was adopted and the 2024 Meeting of the SCRS was adjourned.

Appendix 1

Opening address of Mr Camille Jean Pierre Manel, ICCAT Executive Secretary

SCRS Chair,
Species Group Coordinators and Rapporteurs,
Scientific Delegates,
Dear partners,
Dear interpreters,
Dear colleagues,
Dear in-person and online participants,

Good morning / good evening,

As usual, and after a busy intersessional period, I am delighted to see you again at this Plenary Session of the Standing Committee on Research and Statistics, and I wish you a warm welcome.

On behalf of the Secretariat, I would like to pay a heartfelt tribute to all those who devoted part of their lives and their expertise to contributing to the work of this Committee, and who are no longer with us; in particular, I am thinking of Professor Pasquale Arena, a Sicilian marine scientist who was an EU-Italy delegate for several years, and who dedicated his entire career to the study of bluefin tuna, with a legacy that is still relevant today.

Chairman, dear scientific delegates, dear partners, I would like to extend my warm thanks to you for your invaluable efforts and for the results that you will be reviewing at this meeting. We all know how demanding your commitments are, especially if your other activities in your respective institutions at national level are taken into account, which is sufficient proof, if any were needed, of the current work overload within the SCRS. This situation of overload has not undermined the Secretariat. This is an opportunity for me to praise, once again, the remarkable work of the staff, their tirelessly committed at your side, in providing unlimited support for your work. Dear colleagues, I also thank you and congratulate you warmly on your continuous efforts!

Chairman, dear scientific delegates, dear partners, the subjects are increasingly numerous and complex, but I remain convinced that the mobilisation of all synergies will enable the Commission to continue to have the best scientific advice for the conservation of tunas and tuna-like species in the Atlantic Ocean and its adjacent seas.

Before concluding my remarks, I would like to reiterate an appeal that has been made over the past few years to find a solution to the equation of appropriately limiting the number of meetings so that the quality of our contribution continues to improve, while preserving our self-fulfilment. In this respect, the current proposal on the number of meetings is a concern given the Secretariat's current resources, and bearing in mind that the number of meetings during the year always increases in practice.

I would like to reiterate the Secretariat's full commitment and availability, and wish you a fruitful meeting.

Thank you for your kind attention!

Appendix 2

SCRS Plenary Agenda

1. General remarks by the SCRS Chair and the Executive Secretary

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 and presentations

6. Report of ICCAT Secretariat activities on statistics and science

7. Review of national fisheries and research programmes

8. Reports of intersessional SCRS meetings

   8.1 Blue Marlin Data Preparatory Meeting

   8.2 SCRS Workshop

   8.3 Yellowfin Data Preparatory Meeting

   8.4 Intersessional Meeting of Bluefin Tuna Species Group

   8.5 Intersessional Meeting of Swordfish Species Group (including MSE)

   8.6 Mediterranean Albacore Data Preparatory and Assessment Meeting

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

   8.8 Blue Marlin Stock Assessment Meeting

   8.9 Meeting of the Joint Experts Group on Climate Change

   8.10 Meeting of the Ad Hoc Working Group on Coordination of Tagging Information

   8.11 Yellowfin Tuna Stock Assessment Meeting

9. Executive Summaries on species:

   9.1 YFT – Yellowfin

   9.2 BET - Bigeye

   9.3 SKJ – Skipjack

   9.4 ALB-AT - Atlantic albacore

   9.5 ALB-MD - Mediterranean albacore

   9.6 BFT-E - Eastern bluefin

   9.7 BFT-W - Western bluefin

9.8 SBF - Southern bluefin

9.9 BUM - Blue marlin

9.10 WHM - White marlin

9.11 SAI – Sailfish

9.12 SWO-AT - Atlantic swordfish

9.13 SWO-MD - Mediterranean swordfish

9.14 SMT - Small tunas

9.15 BSH - Blue shark

9.16 SMA - Shortfin mako

9.17 POR - Porbeagle

9.18 Ecosystem and Climate Change considerations

10. ICCAT Research Programmes

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

10.2 Small Tunas Year Programme (SMTYP)

10.3 Shark Research and Data Collection Programme (SRDCP)

10.4 Enhanced Programme for Billfish Research (EPBR)

10.5 Albacore Year Programme (ALBYP)

10.6 Swordfish Year Programme (SWOYP)

10.7 Tropical Tuna Research and Data Collection Program (TTRaD)

11. Report of the Meeting of the Subcommittee on Statistics

12. Report of the Intersessional Meeting of the Subcommittee on Ecosystems and Bycatch

13. Discussions at the Intersessional Meetings of the Commission relevant to the SCRS

13.1 Intersessional Meetings of Panel 1

13.2 Intersessional Meeting of Panel 2

13.3 Intersessional Meeting of Panel 4 on North Atlantic Swordfish MSE

13.4 Intersessional Meetings of the Working Group on Electronic Monitoring Systems (EMS WG)

13.5 17th Meeting of the Working Group on Integrated Monitoring Measures (IMM)

14. Progress related to work developed on MSE

14.1 Work conducted for northern albacore

14.2 Work conducted for bluefin tuna

14.3 Work conducted for northern swordfish

14.4 Work conducted for western skipjack

14.5 Work conducted for tropical tunas multi-stock MSE

14.6 Review of the Roadmap for the ICCAT MSE processes adopted by the Commission in 2023

15. SCRS Science Strategic Plan

16. Update of the stock assessment software catalogue

17. Consideration of plans for future activities

17.1 Annual workplans and research programmes

17.1.1 Subcommittee on Ecosystems and Bycatch Workplan

17.1.2 Subcommittee on Statistics Workplan

17.1.3 Working Group on Stock Assessment Methods (WGSAM) Workplan

17.1.4 Albacore Workplan

17.1.5 Billfishes Workplan

17.1.6 Bluefin Tuna Workplan

17.1.7 Sharks Workplan

17.1.8 Small Tunas Workplan

17.1.9 Swordfish Workplan

17.1.10 Tropical Tunas Workplan

17.2 Intersessional meetings proposed for 2025

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

18.1.1 Subcommittee on Ecosystems and Bycatch

18.1.2 Subcommittee on Statistics

18.1.3 Albacore

18.1.4 Billfishes

18.1.5 Bluefin tuna

18.1.6 Sharks

18.1.7 Small tunas

18.1.8 Swordfish

18.1.9 Tropical tunas

18.1.10 Working Group on Stock Assessment Methods (WGSAM)

18.2 Other general recommendations

18.2.1 Subcommittee on Ecosystems and Bycatch

18.2.2 Subcommittee on Statistics

18.2.3 Albacore

18.2.4 Billfishes

18.2.5 Bluefin tuna

18.2.6 Sharks

18.2.7 Small tunas

18.2.8 Swordfish

18.2.9 Tropical tunas

18.2.10 Working Group on Stock Assessment Methods (WGSAM)

19. Responses to the Commission's requests

20. New templates for Executive Summaries

21. Other matters

21.1 Memorandum of Understanding between ICCAT and ICES

22. Election of SCRS Chair

23. Adoption of the report

Appendix 3

List of participants*[1]

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Appendix 4

List of SCRS documents and presentations

List of documents

Doc. Ref	Title	Authors
SCRS/2024/001	Blue Marlin Data Preparatory Meeting	ICCAT
SCRS/2024/002	Yellowfin Data Preparatory Meeting	ICCAT
SCRS/2024/003	Intersessional Meeting of Bluefin tuna Species Group	ICCAT
SCRS/2024/004	Intersessional Meeting of Swordfish Species Group (including MSE)	ICCAT
SCRS/2024/005	Mediterranean Albacore Data Preparatory and Assessment Meeting	ICCAT
SCRS/2024/006	Intersessional Meeting of the Subcommittee on Ecosystems and Bycatch	ICCAT
SCRS/2024/007	Meeting of the Working Group on Stock Assessment Methods (WGSAM)	ICCAT
SCRS/2024/008	Blue Marlin Stock Assessment Meeting	ICCAT
SCRS/2024/009	Yellowfin Tuna Stock Assessment Meeting	ICCAT
SCRS/2024/010	Report of the Second ICCAT Workshop on the identification of regions in the ICCAT Convention area for supporting the implementation of the ecosystem approach to fisheries management	ICCAT
SCRS/2024/011	SCRS Workshop	ICCAT
SCRS/2024/012	Ad Hoc Working Group on coordination of tagging information	ICCAT
SCRS/2024/016	An overview of the southern swordfish closed-loop simulation approach	Taylor N.G.
SCRS/2024/017	Report of ICCAT capacity building workshops for management strategy evaluation in tropical tuna fisheries	Die D., Sant'Ana R., Mourato B.
SCRS/2024/018	Expert-driven testing and proposed improvements to a bycatch estimator toolkit	Babcock E.A., Harford W.J., Adao A., Gedamke T.
SCRS/2024/019	Estimation of undersized swordfish, *Xiphias gladius* (Linnaeus, 1758) catches in the Spanish Mediterranean longline fleet	Rueda L., García-Barcelona J., Moreno J., Ortiz de Urbina J., Puerto M.A., Macías D.
SCRS/2024/020	Revision of historical landings statistics of blue marlin (*Makaira nigricans*) caught by the French fishing fleets in the North Atlantic	Vigneau J., Baudrier J., Demanèche S., Guyader O., Rault J.
SCRS/2024/021	Standardized catch rates for blue marlin (*Makaira nigricans*) from the Venezuelan pelagic longline fishery off the Caribbean Sea and adjacent areas of the western Central Atlantic 1991 - 2018	Arocha F., Ortiz M.
SCRS/2024/023	Atlantic blue marlin standardized CPUE index from the artisanal drift-gillnet fishery operating at the billfish hotspot, off La Guaira, Venezuela (1991-2022)	Narvaez M., Evaristo E., Marcano L.A., Arocha F.
SCRS/2024/025	Update of input data (catch and size) for the Atlantic blue marlin (*Makaira nigricans*) stock assessment models 2024	Ortiz M., Kimoto A., Mayor C.
SCRS/2024/026	Spatio-temporal model for CPUE standardization: application to Atlantic blue marlin caught by Japanese tuna longline fishery from 1994 to 2022	Kai M.
SCRS/2024/027	Análisis de la información del marlín aguja azul (*Makaira nigricans*) obtenida por Uruguay en el Atlántico sur en el período 1998-2019	Domingo A., Forselledo R., Jiménez S., Mas F.
SCRS/2024/028	A Review of Objectives, Performance Metrics, for Management Strategy evaluation at tRMFOs	Taylor N.G., Miller S., Dupre N.

SCRS/2024/029	Blue marlin (*Makaira nigricans*) standardized indices of abundance from the U.S. pelagic longline and recreational tournament fisheries	Lauretta M., Carlson J., Goodyear P., Schirripa M., Diaz G.A.
SCRS/2024/030	CPUE standardization of blue marlin (*Makaira nigricans*) for the Chinese Taipei tuna longline fishery in the Atlantic Ocean using delta approach	Su N-J., Chang C.X.
SCRS/2024/031	Standardized albacore-targeted catch rates in the Spanish surface longline fishery in the western Mediterranean for the period 2009-2022	Garcia–Barcelona, S., Macias D., Rioja P., Rueda L., Saber S.
SCRS/2024/032	Some features of the Spanish surface albacore (*Thunnus alalunga*) fishery in 2023	Ortiz de Zarate V., Jaranay M., Quelle P.
SCRS/2024/033	Results of the albacore (*Thunnus alalunga*) reproductive biology study for the North Atlantic stock in 2023	Ortiz de Zarate V., Macias D., Su N.J., Dheeraj B., Puerto M.J., Gomez M.J., Rodriguez E., Quelle P., Jaranay M.
SCRS/2024/034	Standardized yellowfin tuna CPUE of the multiple longline fleets by vector autoregressive spatiotemporal GLMM in the Atlantic Ocean	Satoh K., Sant'Ana R., Wang S.P., Tsai W.P., Su N.J., Chang S.T., Chang F.C., Matsumoto T., Park H., Lim J.H., Kwon Y., Lee S.I., Lauretta M., Kitakado T.
SCRS/2024/035	Standardization of yellowfin tuna CPUE in the Atlantic Ocean by the Japanese longline fishery	Matsumoto T., Satoh K.
SCRS/2024/036	Collaborative study of yellowfin tuna CPUE from multiple Atlantic Ocean Longline Fleets in 2024	Matsumoto T.
SCRS/2024/037	Natural mortality estimates of yellowfin tuna (*Thunnus albacares*) in the Atlantic and Indian Oceans	Artetxe-Arrate I., Lastra-Luque P., Fraile I., Zudaire I., Morón Correa G., Merino G., Urtizberea A.
SCRS/2024/038	Estimation of Ghana Tasks 1 and 2 purse seine and baitboat catch 2019 – 2022: data input 2024 yellowfin stock assessment	Ortiz M., Ayivi S., Kwame Dovlo E., Mayor C.
SCRS/2024/039	Review and preliminary analyses of size samples of Atlantic yellowfin tuna stock (*Thunnus albacares*)	Ortiz M., Kimoto A.
SCRS/2024/040	Information available on Mobulid rays in the Atlantic Ocean and the need for conservation	Cronin M., Moreno G., Restrepo V.
SCRS/2024/041	Standardized CPUE abundance indices for adult yellowfin tuna caught in free-swimming school sets by the European purse-seine fleet in the Atlantic Ocean, 1993-2022	Kaplan D., Moron Correa G., Ramos Alonso M.L., Duparc A., Uranga J., Floch L., Rojo Méndez V., Pascual Alayón P., Merino G.
SCRS/2024/042	Standardized catch rates for yellowfin tuna (*Thunnus albacares*) from the Venezuelan purse seine fishery in the Caribbean Sea and adjacent waters of the western central Atlantic for the period of 1987-2022	Narvaez M., Evaristo E., Marcano J.H., Gutiérrez X., Arocha F.
SCRS/2024/043	Standardized catch rates for yellowfin tuna (*Thunnus albacares*) from the Venezuelan bait boat fishery in the Caribbean Sea and adjacent waters of the western central Atlantic for the period of 1987-2022	Narvaez M., Evaristo E., Marcano J.H., Gutiérrez X., Arocha F.
SCRS/2024/044	Index of abundance of yellowfin tuna in the Atlantic Ocean derived from echosounder buoys (2010-2023)	Uranga J., Goienetxea I., Grande M., Quincoces I., Merino G., Boyra G., Urtizberea A., Santiago J.
SCRS/2024/045	Statistics of the French purse seine fishing fleet targeting tropical tunas in the Atlantic Ocean (1991-2022)	Floch L., Cauquil P., Depetris M., Duparc A., Imzilen T., Lerebourg C., Sabarros P.S., Lebranchu J.
SCRS/2024/046	Conversion factors for tropical tunas caught with purse seine in the Atlantic Ocean. Update of the article SCRS/2023/148	Fily T., Duparc A.
SCRS/2024/047	Revision of historical catch statistics of yellowfin tuna (*Thunnus albacares*) caught by the Mexican fishing fleet in the Gulf of Mexico	Ramirez-Lopez K., Rojas González R.I., Mayor C.

SCRS/2024/048	Ongoing projects to understand and mitigate bycatch from the longline bluefin tuna fishery in the French Mediterranean	Landreau A., Nieblas A., Bonhommeau S., Boyer A., Chanut J., Derridj O., Brisset B., Evano H., Wendling B., Cosnard N., Boguais A., Bernard S., Kerzerho V., Rouyer T.
SCRS/2024/049	CPUE standardization of yellowfin tuna (*Thunnus albacares*) caught by Brazilian and Uruguayan longline fleets in South West Atlantic Ocean using integrated nested laplace approximation	Sant'Ana R., Mourato B., Forselledo R., Domingo A.
SCRS/2024/050	2024 Workplan for the development of the Western Atlantic Skipjack Tuna MSE	Sant'Ana R., Mourato B.L.
SCRS/2024/051	Estadísticas de las pesquerías atuneras españolas en el océano atlántico tropical (1990-2022)	Rojo V., Déniz S., Abascal F.J., N'Gom F., Yala D., Casañas I., Ramos M.L., Báez J.C., Pascual Alayón P.J.
SCRS/2024/052	Standardized catch per unit effort of yellowfin tuna in the Atlantic Ocean for the European purse seine fleet operating on floating objects.	Moron Correa G., Kaplan D.M., Grande M., Uranga J., Ramos Alonso M.L., Pascual Alayón P., Rojo V., Merino G., Santiago J.
SCRS/2024/053	Model-based sampling design for eastern bluefin tuna close-kin mark recapture	Bravington M., Fernández C.
SCRS/2024/056	Standardized CPUE of yellowfin tuna (*Thunnus albacares*) by region for the Chinese Taipei tuna longline fleet in the Atlantic Ocean using delta approach	Nan-Jay S., Chi-Xuan C.
SCRS/2024/057	ABFT SNP array: a new genomic resource for Atlantic bluefin tuna connectivity and CKMR studies	Diaz-Arce N., Rodriguez-Ezpeleta N.
SCRS/2024/058	Planning necessary revisions for updating some of the current CPUE data set aggregations and areas for the bluefin tuna (*Thunnus thynnus*)	Di Natale A., Garibaldi F.
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SCRS/2024/060	Standardization of the fishery dependent index of abundance for Atlantic bluefin tuna in the southwestern Nova Scotia using spatio-temporal modelling based on VAST: 1996 TO 2022	Akia S., Hanke A.
SCRS/2024/061	Standardization of the fishery dependent index of abundance for Atlantic bluefin tuna in the Gulf of St. Lawrence using spatio-temporal modelling based on VAST: 1988 to 2022	Akia S., Hanke A.
SCRS/2024/062	Pre-Workshop analysis in preparation for the Second ICCAT Ecoregion Workshop. Identification of regions in the ICCAT convention area to inform the implementation of the ecosystem approach to fisheries management	Nieblas A.E., Murua H., Andonegi E., Juan Jordá M.J.
SCRS/2024/063	An index of atlantic swordfish relative abundance developed from multilateral fisheries data	Sosthene A., Hanke A., Gillespie K.
SCRS/2024/064	A new challenge for assessing the swordfish fishery: the use of an innovative fishing gear	Garibaldi F., Di Natale A., Zava B.
SCRS/2024/065	Swordfish (*Xiphias gladius* L.) catches in the Palestinian Area (southeastern Mediterranean Sea)	Salah J., Aboutair M., Zava B., Di Natale A.
SCRS/2024/066	Standardized catch per unit of effort of albacore (*Thunnus alalunga*) from the Spanish bait boat fleet for period: 1981-2023 in the North East Atlantic	Ortiz de Zarate V., Ortiz M.
SCRS/2024/067	Review of code and simulation framework for southern swordfish closed loop simulations	Hordyk A.
SCRS/2024/068	Factors to be taken into account for the albacore fishery in the Mediterranean Sea	Di Natale A.

SCRS/2024/069	Actualization of albacore (*Thunnus alalunga*) retro-calculated larval abundances in the western Mediterranean Sea (2001-2022)	Tugores M.P., Torres A.P., Martín M., Balbín R., Alvarez I., Santandreu M., Reglero P., Alvarez-Berastegui D.
SCRS/2024/070	Assessing the adequacy of survey strategies in the Balearic Sea (western Mediterranean) for monitoring abundances of the albacore tuna (*Thunnus alalunga*) during early life stages	Alvarez-Berastegui D., Tugores M.P., Torres A.P., Alvarez I., Casaucao A., Reglero P., Saber S.
SCRS/2024/072	Bluefin tuna (*Thunnus thynnus* L.) catches in the Palestinian area (southeastern Mediterranean Sea)	Salah J., Aboutair M., Zava B., Di Natale A.
SCRS/2024/073	Final report for phase five of the ICCAT short-term contract for continuation of the swordfish growth, reproduction, and genetics studies: biological samples collection and analysis	Gillespie K., Hanke A., Coelho R., Rosa D., Carnevali O., Gioacchini G., Macias D.
SCRS/2024/075	Updated combined biomass index of abundance for the North Atlantic swordfish stock 1963-2022	Gilespie K., Akia S., Hanke A., Coelho R., Su N., Ikkiss A.
SCRS/2024/076	Preliminary 2024 stock assessment of Mediterranean albacore (*Thunnus alalunga*) using the Bayesian state-space surplus production model JABBA	Pinto C., Kimoto A., Winker H.
SCRS/2024/077	Climate change effects on albacore tuna, a review	Goikoetxea N., Arrizabalaga H., Erauzkin M., Merino G., Andonegi E.
SCRS/2024/078	Revision of the standardized albacore catch rates from Italian drifting longline fisheries	Pinto C., Di Natale A., Gentiloni P., Mariani A., Garibaldi F.
SCRS/2024/079	Effectiveness of Conservation and Management Measures for reducing seabird bycatch on pelagic longlines in the South Atlantic	Bell J., Bertoldi Carneiro A., Bielli A., Jiménez S., Oppel S., Phillips R., Wade H., Yates O., Griffiths S., Reeves S.
SCRS/2024/080	Standardized CPUE rates from the Greek albacore fishery in the eastern Mediterranean	Tserpes G., Peristeraki P.
SCRS/2024/081	Incorporating climate considerations into fisheries assessments and management advice at ICCAT	Taylor N.G., Walter J.
SCRS/2024/082	Standardization of albacore (*Thunnus alalunga*) CPUE rates in the Mediterranean Cypriot fisheries for the period 2014 - 2023	Thasitis I., Theocharus A.
SCRS/2024/083	Standardized CPUE of albacore tuna in the North Atlantic Ocean for the Chinese Taipei Longline fishery: updated to 2023	Su N-J., Chang C.X
SCRS/2024/084	Example Application of MCMC with ADnuts for A North Atlantic blue shark stock synthesis model	Courtney D.
SCRS/2024/085	Pilot product to test the utility of iccat ecoregions for supporting the development of ecosystem-based advice product	Ortuño-Crespo G, Andonegi E., Murua H., Juan-Jordá M.
SCRS/2024/087	EcoTest Phase III: Identifying Indicators	Carruthers T., Huynh Q., Taylor N.G.
SCRS/2024/088	Incorporating bycatch release devices in guidelines for best bycatch handling and release practices in tropical tuna purse seiners	Murua J., Ferarios J.M., Grande M., Ruiz J., Cuevas N., Krug I., Onandia I., Zudaire I., Salgado A., Erauskin-Extramiana M., Lopetegui-Eguren L., Santiago J.
SCRS/2024/089	Review of the ICCAT Rec. 07-07 and Rec. 11-09 against ACAP best practice advice for reducing the impact of pelagic longline fisheries on seabirds	Agreement on the Conservation of Albatrosses, Birdlife International
SCRS/2024/090	ACAP best practice advice for reducing the impact of pelagic longline fisheries on seabirds	The Agreement on the Conservation of Albatrosses and Petrels
SCRS/2024/091	Extending the Ecosystem Report Card: an example of including demographic indicators	Kell L., Cardinale M., Griffiths C., Mosqueira I., Wright S.
SCRS/2024/092	Offshore wind energy development and highly migratory species: ecological, fishery and management implications	Hendon R., Serafy J., Walter J., Lipsky A., Curtis T., Di Natale A., Rouyer T., Hanke A., Alvarez-Berastegui D., Orbesen E., Lauretta M., Stelzenmüller V.

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SCRS/2024/097	Listing criteria and non-detriment findings for CITES-listed shark species	Taylor N.G.
SCRS/2024/098	Mobulid Rays in the ICCAT Convention area: a review of current knowledge	Ellis J., Carlson J., Coelho R., Reeves S., Cronin M., Domingo A., Forselledo R., Mas F., Moreno G., Reeves S., Restrepo V., Taylor N.G.
SCRS/2024/099	Development of risk screening tool to support ICCAT EAFM based on machine learning	Tsuji S., Tanaka T., Hasegawa T., Nishimoto M., Ochi D.
SCRS/2024/100	Report of the 2024 Meeting of the Ecosystem Sub-group	ICCAT
SCRS/2024/101	Interacción de tortugas marinas en la pesca del atún con palangre en el golfo de México y mar Caribe	Ramírez-López K., Rojas-González R.I., Wakida-Kusunoki A.T., Vallarta-Zárate J.F.
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SCRS/P/2024/097	The ABFT array: a key tool for stock assignment, population mixing monitoring and CKMR	Diaz-Arce N., Artetxe-Arrate I., Zudaire I., Arrizabalaga H., Fraile I., Rodriguez-Ezpeleta N.

SCRS/P/2024/098	Migration to the new MSE framework for North Atlantic albacore	Urtizberea A.
SCRS/P/2024/099	Development of an observation error model for North Atlantic albacore	Urtizberea A.
SCRS/P/2024/100	Automation of video footage analysis of bluefin tuna transfers	Dell M.
SCRS/P/2024/101	Understanding the blue sharks in the Bay of Biscay	Erauskin-Extramiana M., Lopetegui-Eguren L., Salgado A., Cabello de los Cobos M., Vossgaetter L.
SCRS/P/2024/102	Trends in bluefin tuna mixing	Hanke A.
SCRS/P/2024/103	Workplan for tropical tunas MSE in 2024	Merino G., Urtizberea A., Correa G.M., Laborda A., Santiago J.
SCRS/P/2024/104	Direct ageing of South Atlantic Swordfish (*Xiphias Gladius*). Preliminary results	Quelle P., Chapela I., Pérez P., Carroceda A. Jaranay M., Castiñeiras B., Gutiérrez O., Ramos-Cartelle A., Rodríguez-Marín E., Mejuto J.
SCRS/P/2024/105	Short-Term contract for filling knowledge gaps on age and growth studies on priority shark species within the Shark Research and Data Collection Program (SRDCP)	Santos C.C., Domingo A., Junge C., Mas F., Bowlby H., Carlson J., Gustavo Cardoso L., Passerotti M., Forselledo R., Joyce W., Coelho R.
SCRS/P/2024/106	Pilot project to test the use of stereoscopic cameras during the first transfer and the automation of video footage analysis	Muñoz-Benavent P., Martínez-Peiró J., Blom-Dahl Á., Andreu-García G., Morell-Monzó S., Puig-Pons V., Espinosa V.
SCRS/P/2024/107	First update of BFT potential habitats using recent data as a basis for standardizing the abundance indices	Druon J-N.
SCRS/P/2024/108	Development of operational management objectives for tropical tunas	Merino G., Urtizberea A., Correa G.M., Laborda A., Santiago J.
SCRS/P/2024/109	Investigating potential North Atlantic swordfish climate-conditioned management approaches - proposed process	Mormede S.
SCRS/P/2024/110	Close Kin Mark Recapture estimates of abundance of western Atlantic bluefin tuna	Lauretta M., Walter J.
SCRS/P/2024/111	Updated West Atlantic bluefin indices, US rod and reel 66-144cm and MEXUS longline	Lauretta M., Ramirez-Lopez K.
SCRS/P/2024/112	Comparison between the CAS estimated externally, and the CAS estimated by the Stock Synthesis model	Ortiz M., Palma C., Mayor C., Fiorellato F.
SCRS/P/2024/113	Introduction of Panel 2 documents submitted by Japan regarding the growth rate in farm	Tsukahara Y.
SCRS/P/2024/114	BFT MSE MP re-running and next steps	Walter J., Rodriguez-Marin E., Duprey N.
SCRS/P/2024/116	An update on the North Atlantic swordfish MSE process and next steps	Gillespie K., Hordyk A., Brown C., Coelho R., Duprey N., Hanke A., Miller S., Rueda L., Rosa D., Schirripa M.
SCRS/P/2024/117	Refinement and validation of age estimates for swordfish from thin sectioned otoliths	Andrews A.H.
SCRS/P/2024/119	Updated North Atlantic albacore e-tagging research 2019-2024	Cabello de los Cobos M., Arregui I., Onandia I., Markalain G., Uranga J., Lezama-Ochoa N., Ortiz de Zarate V., Delgado de Molina R., Santiago J., Abascal F., and Arrizabalaga H.
SCRS/P/2024/121	Acoustic tagging of adult bluefin tunas in a tuna trap off the South coast of Portugal	Lino P.G., Mansilla O., Vilas Fernandez C., Alemany F., Poço A., Nunes M., Morikawa H., Santos M.

SCRS/P/2024/122	Evaluation of BFT EC 2024	Walter J., Kimoto A., Rodriguez-Marin E.
SCRS/P/2024/124	Correction for the MSE Wmed Larval index 2022 and preliminary results on 2023 TUNIBAL campaign	Alvarez-Berastegui D., Tugores P., Perez A., Martín M., Reglero P.
SCRS/P/2024/126	Brief overview of the 2024 update of the MOR-POR joint Tuna Trap CPUE Index	Lino P.G., Noureddine A., Malouli M.I., Bensbai J., Coelho R.
SCRS/P/2024/128	Electronic tags preliminary summary in performance analysis	Secretariat
SCRS/P/2024/129	Assessment of the stock status of blackfin tuna *Thunnus atlanticus* in the Southwest Atlantic Ocean	Santos L, Kikuchi E., Lucena-Frédou F., Bezerra N., Travassos P., Hazin F., Leite-Júnior N., Cardoso L.
SCRS/P/2024/130	Investigating the reproduction of blackfin tuna on its climate-related southward expansion	Santos L, Rêgo M., Lucena-Frédou F., Andrade H., Rodrigues L., Cardoso L.
SCRS/P/2024/131	Preliminary results on age and growth of little thunny (*Euthynnus alletteratus*) in the southwestern Atlantic Ocean based on dorsal fin spines	Silva G., Muñoz-Lechuga R., Pinheiro J., Cardoso H., Sant'ana R.
SCRS/P/2024/132	Sampling effort in the Small Tunas Year Program (SMTYP)	Fredou F., Silva G.
SCRS/P/2024/134	ICCAT data improvement and capacity building - Caribbean	Die D.
SCRS/P/2024/136	Short-term contract for ICCAT SMTYP for the biological samples collection for growth, maturity and genetics studies	Viñas J.
SCRS/P/2024/137	Update on small tuna references and life history parameters in relation to the Data Limited Methods Workshop	Lino P.

Appendix 5

2024 Secretariat Report on Statistics and Coordination of Research

The final 2024 Secretariat Report on Statistics and Coordination of Research will be published in the *Report for Biennial Period 2024-2025, Part I (2024), Vol. 4.*

Appendix 6

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Appendix 7

Revised roadmap for the ICCAT MSE processes adopted by the Commission in 2023 and revised by the SCRS in 2024

This schedule is intended to guide the development of harvest strategies for priority stocks identified in *Recommendation by ICCAT on the development of Harvest Control Rules and of Management Strategy Evaluation* (Rec. 15-07) (North Atlantic albacore, North Atlantic swordfish, eastern and western Atlantic bluefin tuna, and tropical tunas). It builds on the initial roadmap that was appended to the 2016 Annual Meeting report, which has been revised regularly based on the SCRS advice and Commission decisions. It provides an aspirational timeline that is subject to revision and should be considered in conjunction with the stock assessment schedule that is revised annually by the SCRS. Due to the amount of cross-disciplinary dialogue that may be needed, intersessional Panel meetings and/or meetings of the Standing Working Group to Enhance Dialogue between Fisheries Scientists and Managers (SWGSM) will be necessary. However, the exact timeline for delivery is contingent on funding, prioritization, and other work of the Commission and SCRS. Tasks are divided into four categories: Commission intersessionally, SCRS development, SCRS implementation, and Commission at Annual Meeting. The table below contains the revisions suggested by the SCRS during its 2024 plenary meeting for Commission consideration.

		Northern Albacore	*Bluefin Tuna*	*Northern Swordfish*	*Tropical Tunas (BET, YFT, Eastern SKJ)*	*Western Skipjack*
2023*	Commission intersessionally		COMM (PA2) developed an exceptional circumstances protocol through an iterative consultation process with the SCRS that provides, inter alia, guidance on range of appropriate management responses should exceptional circumstances be found to occur.	COMM (PA4) met intersessionally (March, June, October), with SCRS participation, to: - discuss CMPs, operational management objectives, and performance indicators - refine CMP(s) - recommend operational management objectives and identify performance indicators Ambassadors' meetings were held in June and October.	COMM (PA1) dialogue with SCRS on management objectives and performance indicators to be used for tropical tunas MSE.	COMM (PA1) met intersessionally (May and October, with SCRS participation, to: - recommend final operational management objectives and identify performance indicators - consider final CMPs.

		Northern Albacore	*Bluefin Tuna*	*Northern Swordfish*	*Tropical Tunas (BET, YFT, Eastern SKJ)*	*Western Skipjack*
2023*		SCRS to initiate independent peer review of MSE process				
	SCRS development	New SS3 reference case developed for future conditioning of OMs. Reference and Robustness grid of OMs reconsidered.	SCRS provided final advice to COMM (PA2) on criteria for determining exceptional circumstances and inclusion in the exceptional circumstances protocol to be developed by Panel 2 in consultation with the SCRS.	SCRS incorporated feedback from COMM through PA4.	SCRS to list major sources of uncertainty to be considered in the MSE for multi-stock tropical tuna MSEs. Developing operating and observational error models. Capacity building workshops held.	SCRS advanced work on the SKJ-W MSE, incorporating feedback from COMM through PA1.
	SCRS implementation	SCRS conducted assessment to ensure that the conditions considered in MP testing are still applicable to the stock. SCRS evaluated existence of exceptional circumstances.	SCRS evaluated existence of exceptional circumstances taking into account, to the extent possible, the latest draft of the exceptional circumstances protocol provided to the SCRS by 1 September 2023.			

		Northern Albacore	*Bluefin Tuna*	*Northern Swordfish*	*Tropical Tunas (BET, YFT, Eastern SKJ)*	*Western Skipjack*
2023*	Commission at Annual Meeting	COMM continued to use of the MP to set 2024-2026 TAC at the Annual Meeting, on the predetermined timescale for MP setting. [...]	COMM to adopt exceptional circumstances protocol as a new Annex in MP (Rec. 22-09).	COMM reviewed updated results.		COMM reviewed updated results on performance of CMPs.
2024*	Commission intersessionally			[...]	[...]	SCRS will present recommendation on CMPs to the COMM (PA1), to: - consider final CMPs [...]

		Northern Albacore	*Bluefin Tuna*	*Northern Swordfish*	*Tropical Tunas (BET, YFT, Eastern SKJ)*	*Western Skipjack*
2024*	SCRS development	SCRS started elaboration of a grid of reference and robustness OMs based on Stock Synthesis as part of a new MSE. SCRS started improvements of the Observation Error Model by incorporating statistical properties of CPUE residuals. SCRS preliminarily tested the adopted MP on the new reference uncertainty grid. SCRS reviewed climate change impacts on albacore, to consider them in robustness tests.		SCRS updated, reviewed, and approved the combined index. SCRS reviewed and approved projections and CMP performance in light of the updated combined index. SCRS tested two-year data lags on CMP performance. […] The SCRS continued to develop robustness scenarios.	SCRS to conduct yellowfin assessment. […] Meetings of Technical MSE Group. […] SCRS to start the development of educational material to explain how the 3 species interact in the proposed MSE, and What information the SCRS needs from PA1 in order to begin constructing and testing the operating models, including capacity building workshops.	[…] The following abundance indices should be updated using data through 2023, if possible, maintaining the model structure of these indices as used in the 2022 SKJ-W stock assessment: Baitboat Brazil Present, Handline Brazil, Purse Seine Venezuela, and Longline United States of America. […] SCRS to develop climate change scenarios to test robustness of MPs. SCRS to develop and propose a time schedule for SKJ-W MSE updates and revisions.

		Northern Albacore	*Bluefin Tuna*	*Northern Swordfish*	*Tropical Tunas (BET, YFT, Eastern SKJ)*	*Western Skipjack*
2024*	SCRS implementation	SCRS evaluated existence of exceptional circumstances in accordance with the EC protocol.	SCRS to evaluate existence of exceptional circumstances in accordance with the EC protocol.	[...] [...]	External peer review of Observation and Operating models. Initial development of candidate MPs and testing of MPs. SCRS to develop clear educational material to explain how the 3 species interact in the proposed MSE and what information the SCRS needs from PA1 in order to begin constructing and testing the operating models, including capacity building workshops.	[...]
	Commission at Annual Meeting			COMM to adopt an MP, including the TAC. [...]		COMM to consider final evaluation of CMPs and adopt an MP at the Annual Meeting.

2025	Commission intersessionally			COMM (PA4) to develop an exceptional circumstances protocol through an iterative consultation process with the SCRS that provides, inter alia, guidance on a range of appropriate management responses should exceptional circumstances be found to occur	COMM (PA1) to develop initial operational MOs for the multi-stock TRO MSE. PA1 also to provide guidance to the SCRS on how to handle: trade-offs in species yields; changes in effort over time; changes in gear use over time; changes in closure periods over time; and variable allocations over time (and therefore changes in geospatial effort and gear type over time). COMM (PA1) to meet intersessionally, with SCRS participation, to: - discuss CMPs, operational management objectives, and performance indicators - refine CMP(s) - recommend final operational management objectives and identify performance indicators Ambassadors' meetings to be held.	SCRS to develop an exceptional circumstances protocol through an iterative consultation process that provides, inter alia, guidance on a range of appropriate management responses should exceptional circumstances be found to occur.

		Northern Albacore	*Bluefin Tuna*	*Northern Swordfish*	*Tropical Tunas (BET, YFT, Eastern SKJ)*	*Western Skipjack*
2025	SCRS development	SCRS to finalize the grid of reference and robustness OMs based on Stock Synthesis as part of a new MSE. SCRS to finalize the improvement of the Observation Error Model. SCRS to test the adopted MP on the new reference uncertainty grid. SCRS to test alternative candidate MPs (e.g., based on JABBA, or empirical).		SCRS to provide final advice to COMM (PA4) on criteria for determining exceptional circumstances and inclusion in the exceptional circumstances protocol to be developed by Panel 4 in consultation with the SCRS. The SCRS to continue to develop robustness scenarios, as requested by COMM.	SCRS to finalize MSE results, incorporating feedback from COMM through PA1.	SCRS to develop an exceptional circumstances protocol.
	SCRS implementation	SCRS to evaluate existence of exceptional circumstances in accordance with the EC protocol.	SCRS to evaluate existence of exceptional circumstances in accordance with the EC protocol. SCRS to provide the TAC for 2026-2028 by the MP.	Should a final EC protocol be ready well in advance of the SCRS annual meeting, SCRS to evaluate existence of exceptional circumstances in accordance with that protocol.		SCRS to evaluate existence of exceptional circumstances in accordance with the EC protocol.

		Northern Albacore	*Bluefin Tuna*	*Northern Swordfish*	*Tropical Tunas (BET, YFT, Eastern SKJ)*	*Western Skipjack*
2025	Commission at Annual Meeting		COMM to continue use of the MP to set TAC on the predetermined timescale defined in the MP setting.	COMM to adopt exceptional circumstances protocol.	COMM to adopt an MP, including the TACs.	
2026 and beyond*	Commission intersessionally	PA2 will provide guidance to SCRS on updated management objectives and performance statistics.			[...]	
	SCRS development	SCRS to test alternative candidate MPs (e.g., based on JABBA, or empirical). SCRS to complete new MSE in 2026.	SCRS to review the MP in 2027-2028 as outlined in Rec. 22-09.	The SCRS to review the MP on a pre-determined schedule, as defined by COMM.	SCRS to provide final advice to COMM (PA1) on criteria for determining exceptional circumstances and inclusion in the exceptional circumstances protocol to be developed by Panel 1 in consultation with the SCRS.	

		Northern Albacore	*Bluefin Tuna*	*Northern Swordfish*	*Tropical Tunas (BET, YFT, Eastern SKJ)*	*Western Skipjack*
2026 and beyond*	SCRS implementation	SCRS to evaluate existence of exceptional circumstances in accordance with the EC protocol. SCRS to conduct periodic assessments to ensure that the conditions considered in MP testing are still applicable to the stock.	SCRS to evaluate existence of exceptional circumstances in accordance with the EC protocol. SCRS to conduct periodic assessments to ensure that the conditions considered in MP testing are still applicable to the stock.	SCRS to evaluate existence of exceptional circumstances in accordance with the EC protocol. SCRS to conduct periodic assessments to ensure that the conditions considered in MP testing are still applicable to the stock.	SCRS to develop an exceptional circumstances protocol through an iterative consultation process that provides, inter alia, guidance on range of appropriate management responses should exceptional circumstances be found to occur. SCRS to evaluate existence of exceptional circumstances in accordance with the EC protocol. (2027) SCRS to conduct periodic assessments to ensure that the conditions considered in MP testing are still applicable to the stocks.	SCRS to evaluate the existence of exceptional circumstances in accordance with the EC protocol. SCRS to conduct periodic assessments to ensure that the conditions considered in MP testing are still applicable to the stock.

		Northern Albacore	*Bluefin Tuna*	*Northern Swordfish*	*Tropical Tunas (BET, YFT, Eastern SKJ)*	*Western Skipjack*
2026 and beyond*	Commission at Annual Meeting	COMM to continue use of the MP to set management measures on the predetermined timescale defined in the MP setting. Per Rec. 21-04, COMM to consider adoption of new MP in 2026.	COMM to continue use of the MP to set TAC on the predetermined timescale defined in the MP setting. COMM to review the MP in 2028.	COMM to continue use of the MP to set TAC on the predetermined timescale for MP setting.	COMM to adopt exceptional circumstances protocol in 2027 as a new Annex in MP. COMM to continue use of the MP to set TACs on the predetermined timescale for MP setting.	COMM to continue use of the MP to set TAC on the predetermined timescale for MP setting.

* Assumes that the workplan is accomplished as described.

LIST OF ACRONYMS:

BET = Bigeye tuna
BFT = Bluefin tuna
COMM = Commission
CMP = Candidate Management Procedure
HCR = Harvest Control Rule
MP = Management Procedure
MSE = Management Strategy Evaluation
OM = Operating Model
SCRS = Standing Committee on Research and Statistics
TAC = Total Allowable Catch
TRO = Tropical tunas

Appendix 8

Revised Publication Guidelines: Executive Summaries

Effective communication of the work of the SCRS is of great importance to the Commission. The following guidelines seek to provide guidance to SCRS officers on the reports they prepare for the Commission. These guidelines seek to help in the development of comprehensive and concise Executive Summaries. The guidelines also seek to improve communication with the Commission by preparing Executive Summaries that highlight the most relevant science for the Commission.

1. Deadlines

The Rapporteurs of Species Groups are responsible for the preparation of the draft Executive Summary. Note that final adoption of the Executive Summary takes place at the end of the SCRS plenary session.

Document type	*Submitted to Secretariat by*	*Deadlines*		*Notes*
		Document for distribution	*Final corrections*	
Executive Summary*	Rapporteur	Initial draft provided to the Secretariat at least one week prior to the September Species Group meetings. After adoption by the Species Group, provided to the Secretariat at least 48 h before the SCRS Plenary	On the same day as SCRS review	Draft reviewed and adopted by the SCRS Plenary

* Published in the Biennial Report series and in the ICCAT website (https://www.iccat.int/en/assess.html).

2. Executive Summary of the Species Group (translated for SCRS Plenary and Biennial Report)

The Executive Summary of Species Group is the report for the sections on species stock evaluation in the SCRS Report. It contains the stock status advice for the ICCAT stocks. The Executive Summary for the SCRS Report should be as concise as possible and follow the *Resolution by ICCAT to standardize the presentation of scientific information in the SCRS Annual Report and in Working Group Detailed Reports* (Res. 11-14) and the *Resolution by ICCAT to complete the standardization of the presentation of scientific information in the SCRS Annual Report* (Res. 13-15), namely by:

- Characterizing the robustness of methods applied to assess stock status and to develop the scientific advice;
- Providing a Kobe plot chart showing management reference points expressed as $F_{CURRENT}$ on F_{MSY} (or a proxy) and as $B_{CURRENT}$ on B_{MSY} (or a proxy), the estimated uncertainty around current stock status estimates and the stock status trajectory;
- Providing a Kobe II strategy matrices indicating the probability of $B>B_{MSY}$ and $F<F_{MSY}$ for different levels of catch across multiple years;
- Providing climate conditioned Kobe II results when appropriate;
- Including a scoring table addressing data completeness and quality in an Annex;
- Including information on the bycatches of the different fleet segments and fisheries, as well as other ecosystems considerations;
- Clearly identifying the sources of variability and uncertainty and clearly explain how this variability and uncertainty affect the stock assessment results and the interpretation of the Kobe II Strategy Matrices.

Additionally, the report should summarize important fishery changes and new facts or findings that the Commission should be made aware of. Substantial changes to methodologies used for previous assessments should be noted. The term "the Committee" is used in Executive Summaries to refer to the SCRS Plenary and should be reserved for strong recommendations.

2.1 Format for Executive Summaries

A template/format was established in 1995, which was revised in 2018 by the SCRS, partially at the SCRS Meeting on Process and Protocol in 2020 and, more recently, at the 2024 SCRS Workshop. Rapporteurs are requested to follow the appropriate format and guidelines given below. However, some flexibility may be accepted as regards those species that have more than one stock and species/stocks for which it may not be possible to provide some of the information listed below (e.g., stocks for which data poor models are used for the provision of advice).

Executive Summary Outline	**Maximum # pages*** (2 pages)
Introduction	1/4
Summary table	1/2
Total catch table by gear, for the last 25 years Landings, discards (L, D)	1/4
Stock status	1/4 (Kobe plot including a pie chart representing the probabilities of stock in the different colour quadrants.)
Outlook	1/4
Management recommendations	1/2 including HCR table or Exceptional Circumstances. Include Kobe II tables (climate conditioned when appropriate)
Additional supporting information	**Maximum # pages*** (2 pages)
Summary table on biology aspects	1/2
Summary table on fisheries indicators	1/2 + 3 figures [Geographic distribution cumulative catch (t) by gear and year + Total annual catch by gear and flag + CPUE indices + 1 table (Total annual catch by gear and flag)]
Status of the stock (additional info)	1/2 + 2 figures (Estimates of relative abundance and fishing mortality per year from base case/combines models)
Outlook (additional info)	1/2+ 2 figures (projections of relative abundance and fishing mortality from base case/combined models)
Ecosystem and Climate Change Considerations	1/4 [if available…] suggested Exec. Sum. from ECO/BYC

* Where multiple stocks are presented in one Executive Summary, the length of the report may be expanded proportionally at the discretion of the SCRS Chair.

2.2 *Tables and figures for Executive Summaries*

There will be **three tables** only in the Executive Summary: a Summary table placed at the beginning of the Executive Summary, the reported catches by year and gear and, when applicable, a third (triple) Kobe II strategy matrices table with the estimated probabilities (%) that: a) $F<F_{MSY}$; b) $B>B_{MSY}$; and c) both the fishing mortality is below F_{MSY} and stock biomass is above B_{MSY} ($F<F_{MSY}$ and $B>B_{MSY}$), derived from projections of the base case/combined model(s) and placed at the end of the Executive Summary. The Summary table will summarize the status of the resource and state what the management objective is and where the stock is in relation to that benchmark, including the Kobe plot colouring codes. There should be flexibility in the choice of the benchmark(s) used and this is best determined by the Species Group. Please see below the **headings** for the **Executive Summary SPECIES SUMMARY table**:

SPECIES SUMMARY		
Indicator		***Year (stock status)***
Maximum Sustainable Yield[1]	xxxx t (xxxx-xxxx)[3]	2018 (cell to be filled with the corresponding colour quadrant key; grey if stock not assessed or status uncertain)
Current (year) TAC	xxxx t	
Current (year) Yield[2]	xxxx t	
Relative Biomass (B_{YEAR}/B_{MSY}) (if applicable, from last stock assessment)	x.xx (x.x-x.xx)	
Relative Fishing Mortality (F_{YEAR}/F_{MSY}[1])	x.xx (x.x-x.xx)	
Stock Status	Overfished: YES or NO (xx% probability)[4] Overfishing: YES or NO (xx% probability)[4]	
Management Measures in Effect	(as appropriate)	
Recommended TAC for the period XX-YY as estimated following the adopted MP	xxxx t	

[1] Base case/combined model: model results based on catch data from year-year.
[2] Provisional and subject to revision as of mm-dd-yy.
[3] Point estimate, 80% bias corrected confidence intervals are shown.
[4] As of dd mm yyyy.

Colour key	Stock overfished ($B_{YEAR}/B_{MSY}<1$)	Stock not overfished ($B_{YEAR}/B_{MSY}\geq 1$)
Stock subject to overfishing ($F_{YEAR}/F_{MSY}>1$)		
Stock not subject to overfishing ($F_{YEAR}/F_{MSY}\leq 1$)		
Not assessed/Uncertain		

A single standardized figure will be included, showing the stock status trajectory (Kobe plot) from the base case/combined model(s), including a pie chart representing the probabilities of stock in the different colour quadrants (see example below).

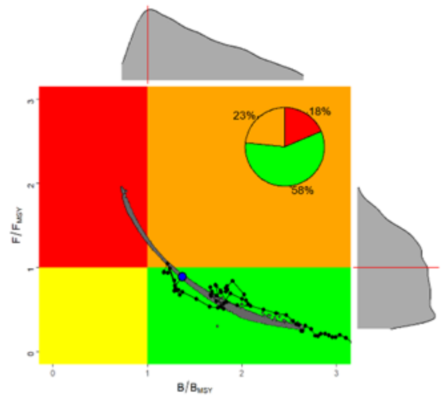

Figure 1. Kobe plot for the xxx stock status in 2022, estimated during the 20xx stock assessment. The line indicates the stock status trajectory starting in 19xx. The inserted pie indicates the probability of the stock being within each Kobe colour quadrant.

2.3 New relevant information

This section would appear when there has been no new stock assessment carried out in the current year, nor other work to provide new management advice, leading to a substantial revision of the Executive Summaries. In such cases, changes to the Executive Summary would be limited. This section would allow the SCRS to alert the Commission to new information which it considers important for Commissioners to be aware of.

2.4 Additional supporting information

Additional supporting information can be added to the Executive Summaries, such as relevant biological parameters and fisheries indicators summarized in tables. Additionally, a brief description of the Stock Status (1/4 of a page), Effects of Current Regulation (1/4 of a page) and Ecosystem and Climate Change Considerations (1/4 of a page), can be added, together with relevant figures and a table. Same of the following figures can also be included: Geographic distribution of species cumulative catch (t) by gear, in the Convention area, shown on a decadal scale; Graph of the reported catches (and TAC when applicable). Additionally the following figures could be included whenever felt necessary: Yearly abundance indices (CPUE indices) used in the assessment; Trends in relative biomass and fishing mortality from the base case/combined model(s); Plots of the ratios of stock biomass to B_{MSY} and fishing mortality rate to F_{MSY} from the base case; Projections of the relative biomass (B/B_{MSY}) and fishing mortality (F/F_{MSY}) for the projected stock based on the base case/combined model(s) under different catch scenarios; as well as any additional information that the SCRS may consider relevant for the provision of advice. A table with the estimated catches by gear and flag can also be included. All figures and the tables must have a clear caption, which shall be standardized to the extent possible.

2.5 Executive summary template

A template has been developed to facilitate drafting the Executive summaries (**Addendum 1 of Appendix 8**).

Addendum 1 to Appendix 8

Executive Summary template

FAO species 3-digit code – Species common name (Species scientific name)

Introduction *(1/4 of a page)*

(*Example of text*) A stock assessment was conducted for yellowfin tuna in 2024, using data through 2022, applying … model. Management advice was developed using a…. A summary of the stock status is provided below (**Table 1**). **Table 2** provides estimated catches and discards by gear, for the period 1999-2023. The Kobe Phase Plot and uncertainty of current status estimates is summarized in **Figure 1**. **Table 3** provides estimated probabilities (%) that both the fishing mortality will below F_{MSY} and spawning stock biomass will be above SSB_{MSY} in future years under different constant catch scenarios.

Table 1. Species summary table. (*1/2 of a page*)

Indicator		***Stock Status in Year (last year of data in the stock assessment)***
Maximum Sustainable Yield[1]	xxxx t (xxxx-xxxx)[3]	2024 *(cell to be filled with the corresponding colour quadrant key; grey if stock not assessed or status uncertain)*
Current (year) TAC	xxxx t	
Current (year) Yield[2]	xxxx t	
Relative Biomass (B_{YEAR}/B_{MSY}) if applicable	x.xx (x.x-x.xx)	
Relative Fishing Mortality (F_{YEAR}/F_{MSY}[1])	x.xx (x.x-x.xx)	
Stock Status	Overfished: YES or NO (xx% probability)[4] Overfishing: YES or NO (xx% probability)[4]	
Management Measures in Effect	(as appropriate)	
If managed according to a Management Procedure: Recommended TAC for the period XX-YY	xxxx t	

[1] Base case/combined model: model results based on catch data from year-year.
[2] Provisional and subject to revision as of mm-dd-yy.
[3] Point estimate, 80% bias corrected confidence intervals are shown.
[4] As estimated from the Kobe plot probability in each quadrant.

Table 2. Estimated catches and discards of Atlantic yellowfin tuna by gear, for the period 1999-2023.

			1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
TOTAL			134817	132453	153101	136461	123192	119573	105075	105892	102843	111874	117915	118280	113918	113686	106333	115024	130699	151385	137519	136530	136866	154592	119499	146256
	ATE		103601	96825	112772	106797	98205	88267	75559	77614	78667	93744	99135	97251	94678	91176	82445	89880	102473	114124	98841	102632	107943	124460	92305	112678
	ATW		31217	35628	40329	29665	24987	31305	29516	28278	24176	18130	18780	21029	19239	22510	23888	25144	28226	37262	38678	33898	28922	30131	27194	33577
Landings	ATE	Bait boat	16444	9830	13950	11398	9956	14511	9540	12492	12795	9457	8750	9305	12219	9029	6748	9352	9173	9862	7785	7274	6814	6354	5435	6499
		Longline	13063	11588	7576	5864	9183	11537	7206	7234	13437	8562	7443	5161	6298	5337	5657	4742	4343	4860	4583	5025	6132	4519	4022	5320
		Other surf.	1581	2437	2021	1714	2467	2886	2350	2988	2129	1595	1844	1752	1264	2040	3032	1702	1774	2651	2550	1803	3469	5886	3491	4530
		Purse seine	70730	70920	88838	87499	75294	57798	55409	54153	49471	73122	79675	79164	71875	72897	65676	72682	85146	94245	82477	86950	89910	105951	78526	96135
	ATW	Bait boat	5364	6753	5572	6009	3764	4868	3867	2695	2304	886	1331	1436	2311	1299	1602	520	810	1238	925	742	862	826	1028	2067
		Longline	14259	16168	15699	11926	10167	18166	18171	15469	16106	13780	14654	14888	11977	13005	10067	9059	10027	13129	11710	11236	11512	11591	9898	10357
		Other surf.	4900	4838	5107	3763	6445	5004	4826	5667	3418	1392	1417	1975	2686	4432	8181	12431	14293	16881	20493	17550	13288	14615	15238	19655
		Purse seine	6527	7870	13951	7966	4611	3266	2652	4442	2341	2067	1370	2722	2256	3768	4035	3131	3037	5948	5499	4331	3224	3053	1011	1479
Landings(FP)	ATE	Purse seine	1781	2051	387	321	1305	1534	1054	747	836	1008	1423	1869	3021	1872	1332	1401	1901	2506	1384	1533	1596	1725	803	163
	ATW	Purse seine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	54	63	49	35	32	28	0	
Discards	ATE	Bait boat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	6	5	7	10	7
		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	
		Purse seine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	137	0	63	40	17	20	19	25
	ATW	Longline	167	0	0	0	0	0	0	5	6	5	9	8	9	7	3	3	3	3	3	5	4	18	18	20
		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	
		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	

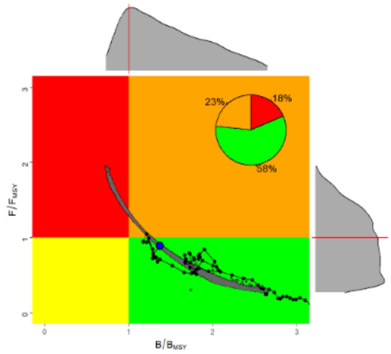

Figure 1. Kobe plot for the Atlantic yellowfin tuna stock status in 2022, estimated during the 2024 stock assessment. The line indicates the stock status trajectory starting in 19xx. The inserted pie indicates the probability of the stock being within each Kobe colour quadrant.

Outlook (*1/4 of a page*)

(Example of text) In summary, 2024 stock biomass was estimated to be about 5% below B_{MSY} (overfished) and fishing mortality rates were about 23% below F_{MSY} (no overfishing). Projections conducted in 2024 considered a number of constant catch scenarios. In most cases, catches less than 120,000 t led to, or maintained, a healthy stock status through 2024.

Management recommendation (*1/4 of a page + 1/2 of a page for Kobe matrices*)

(*Example of text*) The results from xxxx models were summarized to produce estimated probabilities of achieving the Convention objectives ($B>B_{MSY}$, $F<F_{MSY}$) for a given level of constant catch, for each year up to (insert last year of projections) (**Table 3**). Maintaining catch levels at the current total allowable catch (TAC) of 110,000 t is expected to maintain healthy stock status ($B>B_{MSY}$, $F<F_{MSY}$) through 2024 with at least 68% probability, increasing to 97% by 2024. This result is similar to the previous assessment result (2011) which indicated that catch levels of 110,000 t were expected to lead to or maintain healthy stock status through 2017 with a probability of at least 64% probability, and 77% by 2024. The Commission should also be aware that increased harvests on FADs could have negative consequences for yellowfin and bigeye tuna, as well as other bycatch species[1]. Should the Commission wish to increase long-term sustainable yield, the Committee continues to recommend that effective measures be found to reduce fish aggregating device (FAD)related and other fishing mortality of small yellowfin tuna.

[1] Second Meeting of the Ad Hoc Working Group on FADs (*Bilbao, Spain, 14-16 March 2016*).

Table 3. Kobe II matrices giving the joint probability that: a) $F<F_{MSY}$; b) $B>B_{MSY}$; and c) both $F<F_{MSY}$, $B>B_{MSY}$ and the joint probability of $F<F_{MSY}$ and $B>B_{MSY}$, for given years, for various constant catch levels based on model results.

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

TAC	2017	2018	2019	2020	2021	2022	2023	2024
60,000	99%	100%	100%	100%	100%	100%	100%	100%
70,000	99%	99%	100%	100%	100%	100%	100%	100%
80,000	98%	99%	99%	99%	99%	100%	100%	100%
90,000	95%	98%	99%	99%	99%	99%	99%	99%
100,000	91%	96%	98%	98%	99%	99%	99%	99%
110,000	84%	89%	93%	96%	97%	98%	98%	98%
120,000	74%	79%	83%	80%	81%	82%	83%	84%
130,000	60%	61%	62%	62%	58%	54%	51%	48%
140,000	46%	44%	39%	33%	31%	31%	31%	30%
150,000	32%	25%	21%	20%	19%	20%	20%	20%

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

TAC	2017	2018	2019	2020	2021	2022	2023	2024
60,000	75%	91%	99%	99%	99%	99%	100%	100%
70,000	74%	87%	97%	99%	99%	99%	99%	99%
80,000	73%	86%	96%	99%	99%	99%	99%	99%
90,000	71%	82%	91%	97%	99%	99%	99%	99%
100,000	70%	80%	89%	92%	96%	97%	99%	99%
110,000	68%	78%	85%	90%	93%	95%	96%	97%
120,000	67%	75%	80%	80%	81%	82%	84%	84%
130,000	64%	68%	72%	70%	69%	67%	65%	62%
140,000	63%	64%	63%	59%	53%	46%	40%	38%
150,000	61%	59%	55%	47%	34%	30%	28%	27%

c) Probability that $F<F_{MSY}$ and $B>B_{MSY}$

TAC	2017	2018	2019	2020	2021	2022	2023	2024
60,000	75%	91%	99%	99%	99%	99%	100%	100%
70,000	74%	87%	97%	99%	99%	99%	99%	99%
80,000	73%	86%	96%	99%	99%	99%	99%	99%
90,000	71%	82%	91%	97%	99%	99%	99%	99%
100,000	70%	80%	89%	92%	96%	97%	99%	99%
110,000	68%	78%	85%	90%	92%	95%	96%	97%
120,000	65%	73%	79%	78%	79%	80%	82%	82%
130,000	57%	59%	61%	61%	57%	54%	50%	48%
140,000	45%	44%	38%	33%	31%	31%	31%	30%
150,000	31%	24%	21%	20%	19%	20%	20%	20%

Additional supporting information (*Optional, maximum of 2 pages*)

Additional supporting information can be added to the Executive Summaries, such as: relevant biological parameters and fisheries indicators summarized in tables; brief description of the Stock Status (1/4 of a page), Effects of Current Regulation (1/4 of a page) and Ecosystem and Climate Change Considerations (1/4 of a page), can be added, together with relevant figures and a table; Yearly abundance indices (CPUE indices) used in the assessment; Trends in relative biomass and fishing mortality from the base case/combined model(s); Projections of the relative biomass (B/B_{MSY}) and fishing mortality (F/F_{MSY}) for the projected stock based on the base case/combined model(s) under different catch scenarios; as well as any additional information that the SCRS may consider relevant for the provision of advice. All figures and the tables must have a clear caption, which shall be standardized to the extent possible.

Appendix 9

Updated 2024 Candidate Management Procedures (CMPs) results for North Atlantic Swordfish Management Strategy Evaluation (MSE)

Introduction

The Commission was scheduled to adopt a management procedure (MP) for North Atlantic Swordfish in 2023, but delayed one year to allow the SCRS to complete requested work and present updated results at the 2024 Annual Commission meeting in Cyprus (*Recommendation by ICCAT replacing Recommendation 22-03 extending and amending Recommendation 17-02 for the conservation of North Atlantic swordfish* (Rec. 23-04)). Similar to what was presented in 2023, the Committee has prepared several documents to support the Commission in their decision making, including a webpage, and an interactive online platform (SWO-N Shiny App) which present the final performance and trade-offs of the CMPs relative to predetermined performance indicators (PI). A Trial Specifications Document provides a detailed description of technical elements for this MSE. This Appendix provides a brief description of CMP results.

Methods

Operating models (OMs)

Operating models for the SWO-N MSE were based on the 2022 Stock Assessment (ICCAT, 2022), conducted with the Stock Synthesis 3 (SS3) assessment software.

The OMs were classified into two categories:

- the Reference Set, which spanned the key uncertainties in the 2022 Stock Assessment, and
- the Robustness OMs, a group of modified OMs that account for additional potential uncertainties.

The OMs were re-conditioned in July 2024 with the most up-to-date information available to the SCRS, which included catch data and catch per unit effort (CPUE) indices through to 2022. Other changes to the methodology since 2023 include generating a new Combined Index using the updated data and a new methodology. Additional Robustness OMs were also developed.

Reference Set Operating Models (OMs)

Natural mortality rate (M) and the steepness of the Beverton-Holt stock-recruit relationship (h) are the axes of uncertainty included in the reference set of operating models.

Three values were selected for each parameter (M=0.1, 0.2, 0.3 and h=0.69, 0.80, 0.88) and the unique combinations resulted in nine different OMs.

One OM of the Reference Set (Base Case) had the same values for the biological parameters as the 2022 stock assessment (M=0.2 & h=0.88).

Robustness tests

A set of Robustness OMs were developed to evaluate the impact of additional uncertainties that were not considered in the Reference Set. Seven Robustness OMs were developed to consider additional uncertainties for the historical and projection periods. **Table 1** provides a summary of the Robustness OMs.

Management cycle length

All CMPs are designed with a three-year management cycle as decided by Panel 4 in 2023.

Minimum TAC threshold implemented

A minimum Total Allowable Catch (TAC) change threshold requires that no change in TAC advice occur between management cycles if the change being recommended by the MPs is less than 200 t. CMP testing indicated there was no impact on CMP performance should this rule be adopted.

Performance indicators (PI)

Panel 4 identified 10 performance indicators (PI) as primary criteria for comparing performance of CMPs (**Table 2**) that relate to Status, Safety, Stability and Yield.

Candidate Management Procedures (CMPs)

After several meetings of Panel 4 in 2023, three CMP types remained (CE, MCC, and SPSSFox). These were tuned to two different levels, a minimum of 60% and 70% probability of being in the green quadrant of the Kobe plot in the short (years 1–10), medium (years 11–20) and long (years 21–30) time periods.

Each CMP has a "b" script or a "c" script added to the CMP name (e.g. "CE_b"). The "b" script indicates the CMP was tuned to achieve 60% probability of being in the green zone of the Kobe plot, while the "c" scripts indicate the CMP was tuned to 70% probability of being in the green zone of the Kobe plot. A description of each CMP is found in **Table 3.**

Results and Discussion

Table 4 shows the probability of each CMP breaching the Limit Reference Point (LRP; $0.4SB_{MSY}$) in the Reference Set and for each Robustness Test OM. **Table 5** shows the performance of CMPs relative to the 10 performance indicators (PI) identified by Panel 4. For each of the CMPs, a time series for fishing mortality, spawning biomass, and TAC trends in the projections were plotted (example time series plots for MCC11 are shown in **Figure 1**).

Given the structural differences among the CMP types, their performance differs across indicators. Trade-offs between the CMPs, when run through the OM reference set, are shown in **Figure 2**. This figure has four plots which show:

- short-term (years 1-10) average TAC vs short-term (years 1-10) PGK;
- medium-term (years 11-20) average TAC vs medium-term (years 11-20) PGK;
- medium-term (years 11-20) average TAC vs probability of avoiding the LRP;
- medium-term (years 11-20) average TAC vs mean variation in TAC (shown as a negative value so lower values mean more variable).

In all four plots, being higher in the plot (increased yield) and further to the right (higher PGK / better LRP avoidance / lower variability) are viewed as better results.

Robustness tests in the SWO MSE include scenarios that are often more challenging for the CMPs. **Figure 3** shows the same set of trade-offs as described above, but for Robustness scenario R5, which is the most challenging of all the robustness tests developed in this MSE.

Variability in TAC between management periods among the CMPs is shown in a violin plot (**Figure 4**). As per Panel 4's request, the Committee tested CMPs with (CE and SPSSFox) and without (MCC9 and MCC11) limits in maximum change in TAC between management cycles. SPSSFox2 has no constraint on reduction in TAC if estimated $SB/SB_{MSY} < 1$. **Figure 4** shows the distribution of the absolute change in TAC for the CMPs. The width of the violin plot is proportional to the frequency of the absolute change in TAC (i.e., wider areas means that value is more common).

All remaining CMPs have achieved the minimum requirements for performance identified by Panel 4 (**Table 5**).

- Probability of being in the green zone of the Kobe plot for each of the three time periods (short, medium, and long) has been achieved by tuning to 60% and 70%.

- Probability of not breaching the 0.4 SB_{MSY} LRP is >95% in the entire projection period, and for most CMPs the probability is >98%. The minimum acceptable probability for not breaching the LRP adopted by Panel 4 is 85%.

- Variability in TAC has been kept low with some CMPs not allowing greater than 25% changes in TAC while other CMPs having no limit on the change in TAC allowed between management cycles but performance indicates their average variability to be low.

All CMPs have a two-year data lag, meaning that the TAC calculated for the first management cycle (2025-2027) uses data up to and including 2022 to calculate the combined index.

Table 1. Description of the Robustness operating models (OMs) developed for the North Atlantic swordfish MSE.

Robustness OM	***Purpose***
R0	Reference OM for the Robustness tests. This OM has M=0.2 and h=0.80.
R1	Evaluate impact of an assumed 1 percent annual increase catchability, that is not accounted for in the standardization of the indices of abundance (historical & projection).
R2	Same as R1, but bias in the indices of abundance is only for the historical period.
R3	Robustness test to evaluate the ability of the CMPs to recover the stock from a low initial level. The historical indices such that SB/SB_{MSY} = 0.6 in the terminal year (2022) of the OM conditioning.
R4	Evaluate impact of cyclical pattern in recruitment deviations in projection period; a proxy for impact of climate change on stock productivity. Recruitment is lower than expected for the first 15 years of the projection period, and then higher than expected in the following 15 years.
R5	Evaluate impact of lower than expected recruitment deviations for first 15 years of projection period; a proxy for impact of climate change on stock productivity. Similar to R4, but recruitment returns to average after the first 15 years.
R6	Evaluate impact of illegal, unreported, or unregulated catches. The catch is consistently 10% higher than the TAC.
R7	Evaluates impact of additional observation error in the index of abundance. The standard deviation of the log-normal observation error in the projection years was doubled from the base robustness OM (R0).

Table 2. Summary of the Management Objectives and corresponding performance indicators (PI) developed by Panel 4 for the North Atlantic swordfish MSE. The PI descriptions now take into account that the MP's first year is 2025.

Category	***Management Objective***	***PI Name***	***PI Description***
Status	The stock should have a [60 or 70]% or greater probability of occurring in the green quadrant of the Kobe matrix.	PGK_{short}	Probability of being in Green Zone of Kobe Space ($SB>SB_{MSY}$ & $F<F_{MSY}$) in years 1-10 (2025-2034)
		PGK_{med}	Probability of being in Green Zone of Kobe Space ($SB>SB_{MSY}$ & $F<F_{MSY}$) in years 11-20 (2035-2044)
		PGK_{long}	Probability of being in Green Zone of Kobe Space ($SB>SB_{MSY}$ & $F<F_{MSY}$) in years 21-30 (2045-2054)
		PGK	Probability of being in Green Zone of Kobe Space ($SB>SB_{MSY}$ & $F<F_{MSY}$) over all years (2025-2054)
		PNOF	Probability of Not Overfishing ($F<F_{MSY}$) over all years (2025-2054)
Safety	There should be a [5, 10, 15]% or less probability of the stock falling below B_{LIM} ($0.4*SB_{MSY}$) at any point during the 30-year evaluation period.	LRP	Probability of breaching the limit reference point ($SB<0.4SB_{MSY}$) in any year (2024-2053)
Yield	Maximize overall catch levels.	TAC1	TAC (t) in the first implementation cycle (2025-2027)
		$AvTAC_{short}$	Median TAC (t) over years 1-10 (2025-2034)
		$AvTAC_{med}$	Median TAC (t) over years 11-20 (2035-2044)
		$AvTAC_{long}$	Median TAC (t) over years 21-30 (2045-2054)
Stability	Any increase or decrease in TAC between management periods should be less than [25]%. Testing should also include no stability limitation.	VarC	Mean variation in TAC (%) between management cycles over all years and simulations

Table 3. Summary of the shortlisted candidate management procedures that were developed and tested for the North Atlantic swordfish MSE.

Name	***Type***	***Abundance Indicator***	***Description***
CE	Empirical	Combined index	Attempts to maintain a constant exploitation rate in the projection period, based on the mean exploitation rate in the recent historical years (2016 - 2020). TAC is constrained to change no more than 25% between management cycles.
MCC9	Empirical	Combined index	Aims to maintain a mostly constant catch (MCC). The TAC is adjusted between a set of 9 steps based on the ratio of the mean index over the 3 most recent years compared to the mean index from 2017-2019. Five more steps have been added to this CMP since the 2023 annual meeting; the CMP now has 9 steps. MCC9 implements a set minimum TAC of 4kt when the recent 3-yr average Combined Index hits a lower limit. See **Table 6** for the TACs available for each step.
MCC11	Empirical	Combined index	Aims to maintain a mostly constant catch (MCC). The TAC is adjusted between a set of 11 steps based on the ratio of the mean index over the 3 most recent years compared to the mean index from 2017 - 2019. Four more steps have been added to this CMP since the 2023 annual meeting; the CMP now has 11 steps. MCC11 differs from MCC9 by having a different lowest step and having more steps overall. See **Table 6** for the TACs available for each step.
SPSSFox	Model	Combined index	Surplus production assessment model, using a constant F policy and a linear harvest control rule that reduces fishing mortality when the estimated $SB/SB_{MSY} < 1$. TAC is constrained to change no more than 25% between management cycles.
SPSSFox2	Model	Combined index	Same as SPSSFox, except there is no constraint on reduction in TAC if estimated $SB/SB_{MSY} < 1$.

Table 4. The probability of breaching the Limit Reference Point (LRP; $0.4SB_{MSY}$) for the tuned versions of the five CMPs for the Reference Set and the Robustness Test OMs.

CMP	***Probability of Breaching LRP***								
	Reference Set	***R0***	***R1***	***R2***	***R3***	***R4***	***R5***	***R6***	***R7***
CE_b	0	0	0.11	0.03	0.58	0.25	0.70	0.06	0.01
CE_c	0	0	0.10	0.01	0.36	0.17	0.61	0.05	0.01
MCC9_b	0	0	0.12	0.03	0.51	0.14	0.61	0.03	0
MCC9_c	0	0	0.06	0.01	0.32	0.06	0.49	0.03	0
MCC11_b	0	0	0.26	0.03	0.59	0.22	0.66	0.03	0
MCC11_c	0	0	0.14	0.01	0.40	0.09	0.54	0.03	0
SPSSFox_b	0	0	0.17	0.03	0.68	0.09	0.60	0	0.01
SPSSFox_c	0	0	0.07	0.01	0.48	0.03	0.42	0	0
SPSSFox2_b	0	0	0.17	0.03	0.66	0.06	0.36	0	0.01
SPSSFox2_c	0	0	0.07	0.01	0.48	0.03	0.22	0	0

Table 5. Quilt table indicating performance indicators (PI) values for each of the remaining CMPs. An interactive version of this table is available in the NSWO MSE Shiny Application. This table shows 10 CMP configurations (rows) and 10 performance indicators (PI) (columns). The selection of the CMPs and performance indicators (PI) can be customized in the Shiny application. The cells are shaded indicating the range of values, with darker colors indicating more desirable outcomes for the various performance indicators (PI). In this table, TAC1 is the TAC calculated for 2025-2027 (first 3-year cycle).

	MP	AvTAC_long	AvTAC_med	AvTAC_short	nLRP	PGK	PGK_med	PGK_short	PNOF	VarC	TAC1
1	CE_b	11,820	8,266	14,172	1.00	0.79	0.87	0.60	0.83	0.18	14,172
2	CE_c	11,934	8,241	13,846	1.00	0.84	0.91	0.70	0.87	0.18	13,846
3	MCC9_b	12,258	11,315	14,144	1.00	0.73	0.78	0.60	0.80	0.12	15,087
4	MCC9_c	11,794	10,887	13,609	1.00	0.80	0.84	0.70	0.85	0.12	14,516
5	MCC11_b	11,911	10,958	14,769	1.00	0.71	0.74	0.60	0.78	0.12	14,769
6	MCC11_c	11,523	11,523	14,289	1.00	0.77	0.80	0.70	0.83	0.12	14,289
7	SPSSFox_b	11,557	11,397	13,869	1.00	0.73	0.75	0.60	0.79	0.14	15,629
8	SPSSFox_c	11,531	11,336	13,370	1.00	0.81	0.83	0.70	0.85	0.13	14,952
9	SPSSFox2_b	11,556	11,397	13,869	1.00	0.73	0.76	0.60	0.80	0.14	15,629
10	SPSSFox2_c	11,522	11,336	13,370	1.00	0.81	0.83	0.70	0.85	0.13	14,952

Table 6. The TAC steps available for the Mostly Constant Catch (MCC) CMP at both the 60% or greater (PGK60) and 70% or greater (PGK70) probability of occurring in the green quadrant of the Kobe matrix. Icur is the mean of the most recent 3 years of index values divided by the mean of the index values 2017-2019 (historical).

Step number	MCC9			MCC11		
	Icur values	TAC PGK60 (tonnes)	TAC PGK70 (tonnes)	Icur values	TAC PGK60 (tonnes)	TAC PGK70 (tonnes)
11				> 1.85	17,628	17,055
10				1.75 - 1.85	16,675	16,133
9	> 1.7	16,030	15,423	1.65 - 1.75	15,722	15,211
8	1.6 - 1.7	15,087	14,516	1.55 - 1.65	14,769	14,289
7	1.5 - 1.6	14,144	13,609	1.45 - 1.55	13,816	13,367
6	1.4 - 1.5	13,201	12,702	1.35 - 1.45	12,863	12,445
5	1.3 - 1.4	12,258	11,794	1.25 - 1.35	11,911	11,523
4	1.2 - 1.3	11,315	10,887	1.15 - 1.25	10,958	10,602
3	0.75 - 1.2	9,429	9,073	0.75 - 1.15	9,528	9,219
2	0.50 - 0.75	7,072	6,804	0.50 - 0.75	7,146	6,914
1	< 0.50	4,000	4,000	< 0.50	4,764	4,609

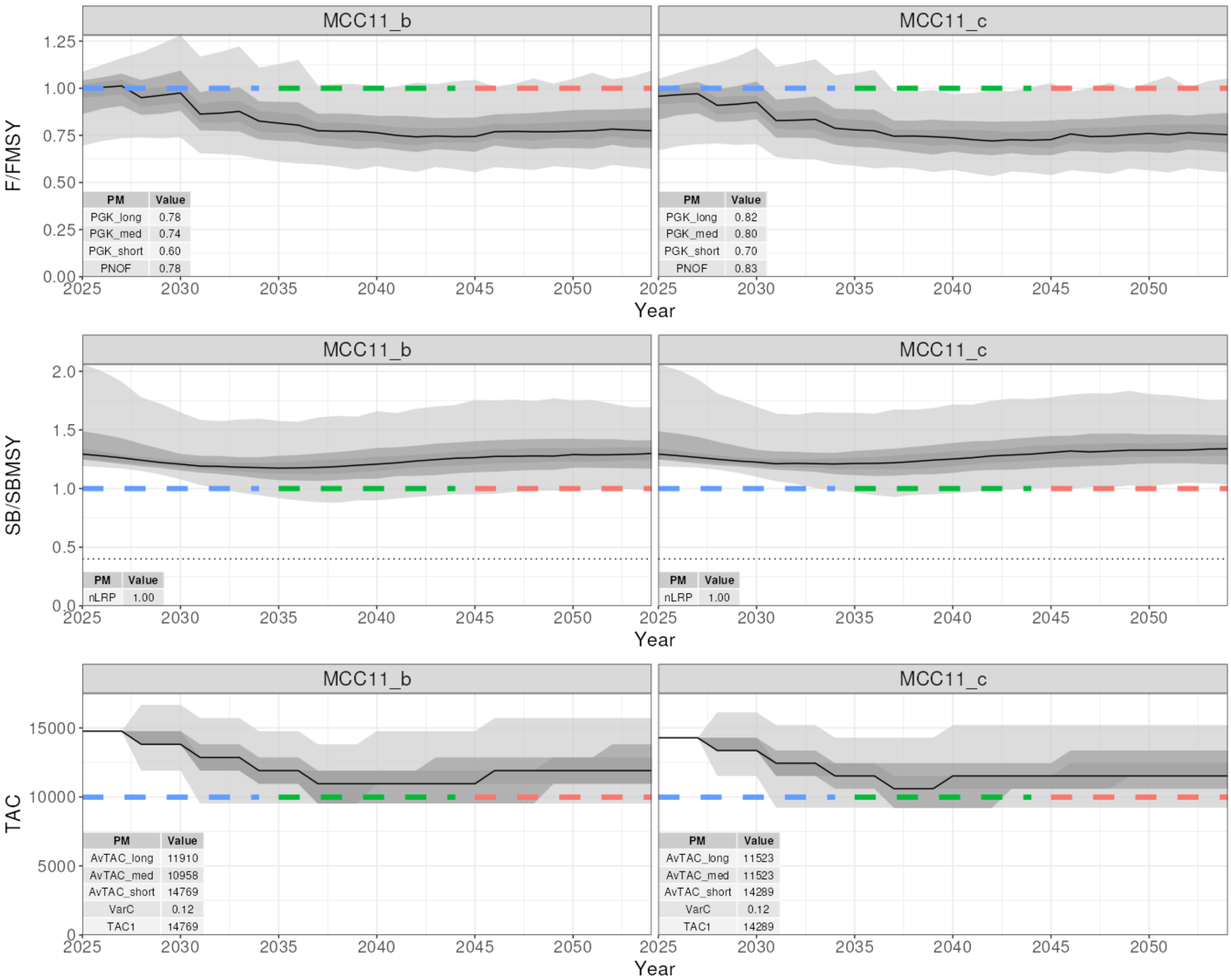

Figure 1. An example of time-series plots for the CMPs-in this case for two configurations of the MCC11 CMP-showing the median (black line), 60th, 70th, and 90th percentiles (increasingly lighter shades of grey respectively) for F/F_{MSY} (top), SB/SB_{MSY} (center), and the TAC (bottom) over the 30-year projection period. This plot shows the combined results for all nine-reference set OMs. Other plots are available for the Robustness operating models in the Shiny application. The performance indicators (PI) associated with this configuration of the MCC11 CMP are shown in tables in the bottom left of each plot.

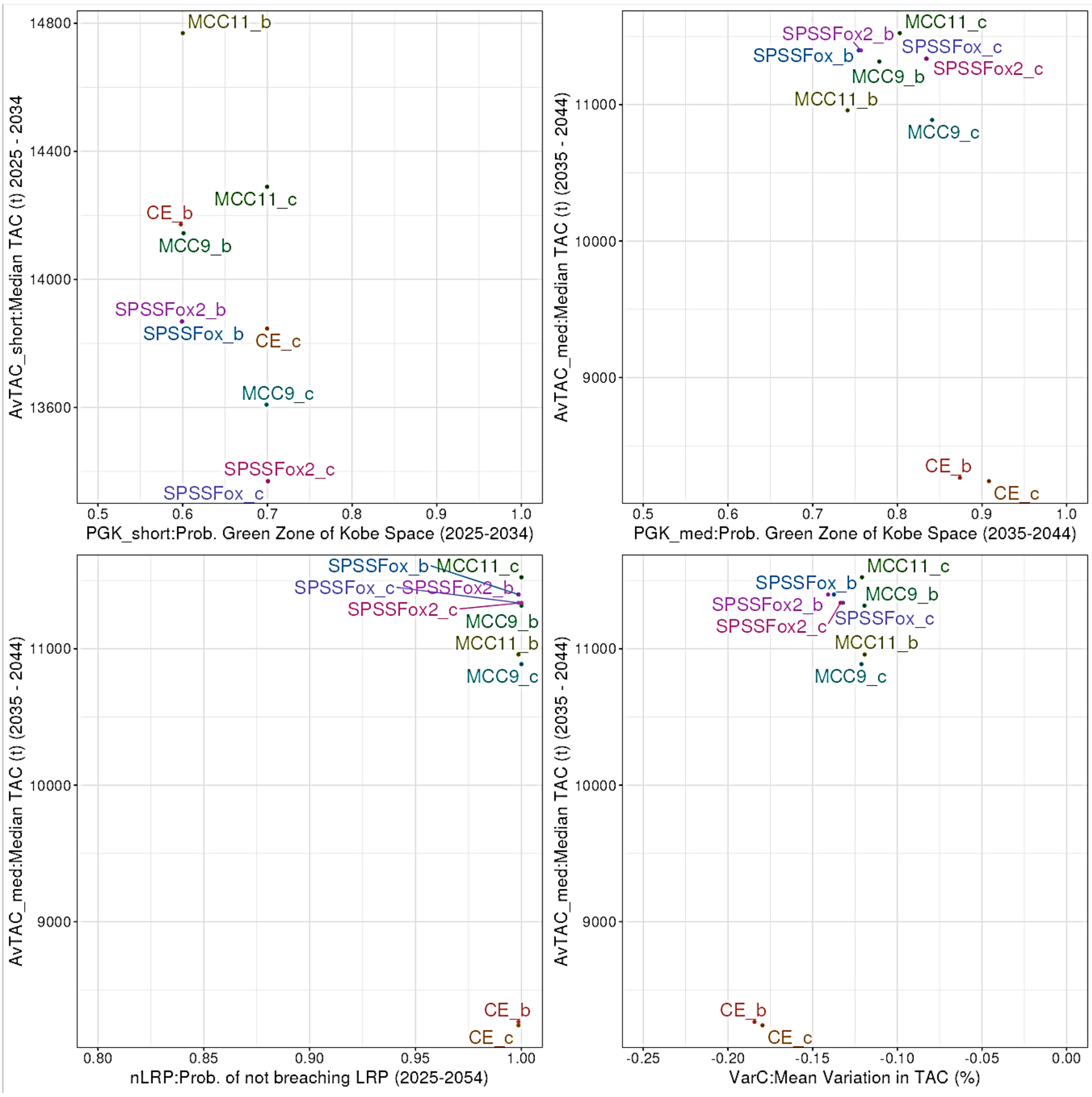

Figure 2. An example of a set of trade-off plots showing the results from 10 configurations of 5 CMPs for the Reference operating models. The plots show the trade-offs between the average TAC in years 11-20 (vertical axis in all plots) and the probability of being in the green space of the Kobe matrix (PGK) in the first 10 years of the projection period against the average TAC over this same period (top left), the PGK in years 11 – 20 against the average TAC over this same period (top right), the probability of not breaching the limit reference point (years 1-30) against the average TAC in years 11 – 20 (bottom left), and the mean variation in TAC (shown as a negative value so lower values mean more variable) against the median TAC in the medium timeframe (bottom right).

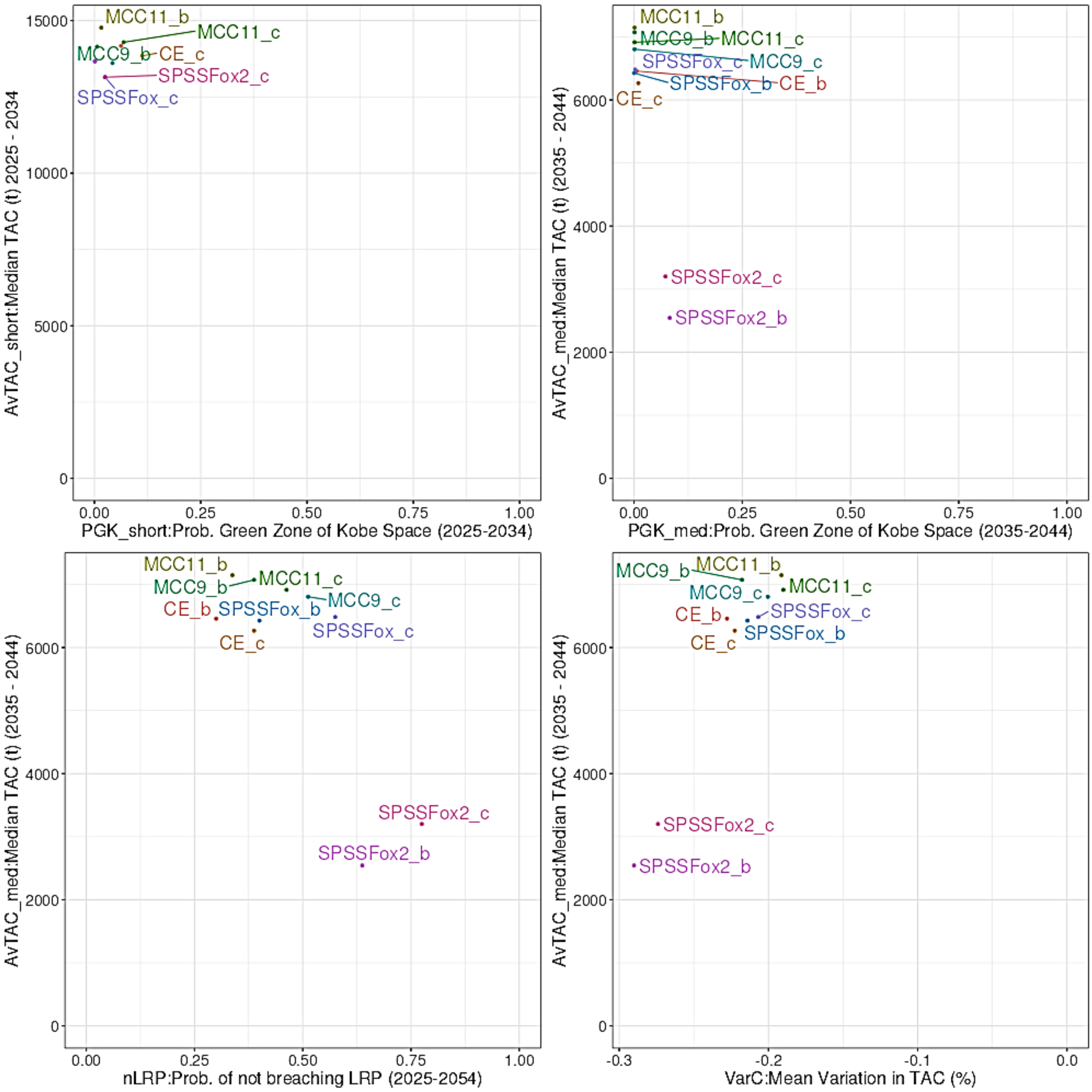

Figure 3. An example of a set of trade-off plots showing the results from 10 configurations of 5 CMPs for the Robustness operating model 5 (climate change). The plots show the trade-offs between the probability of being in the green space of the Kobe matrix (PGK) in the first 10-years of the projection period against the average TAC over this same period (top left), the PGK in years 11 – 20 against the average TAC over this same period (top right), the probability of not breaching the limit reference point against the average TAC in years 11 – 20 (bottom left), and the mean variation in TAC (shown as a negative value so lower values mean more variable) against the median TAC in the medium timeframe (bottom right).

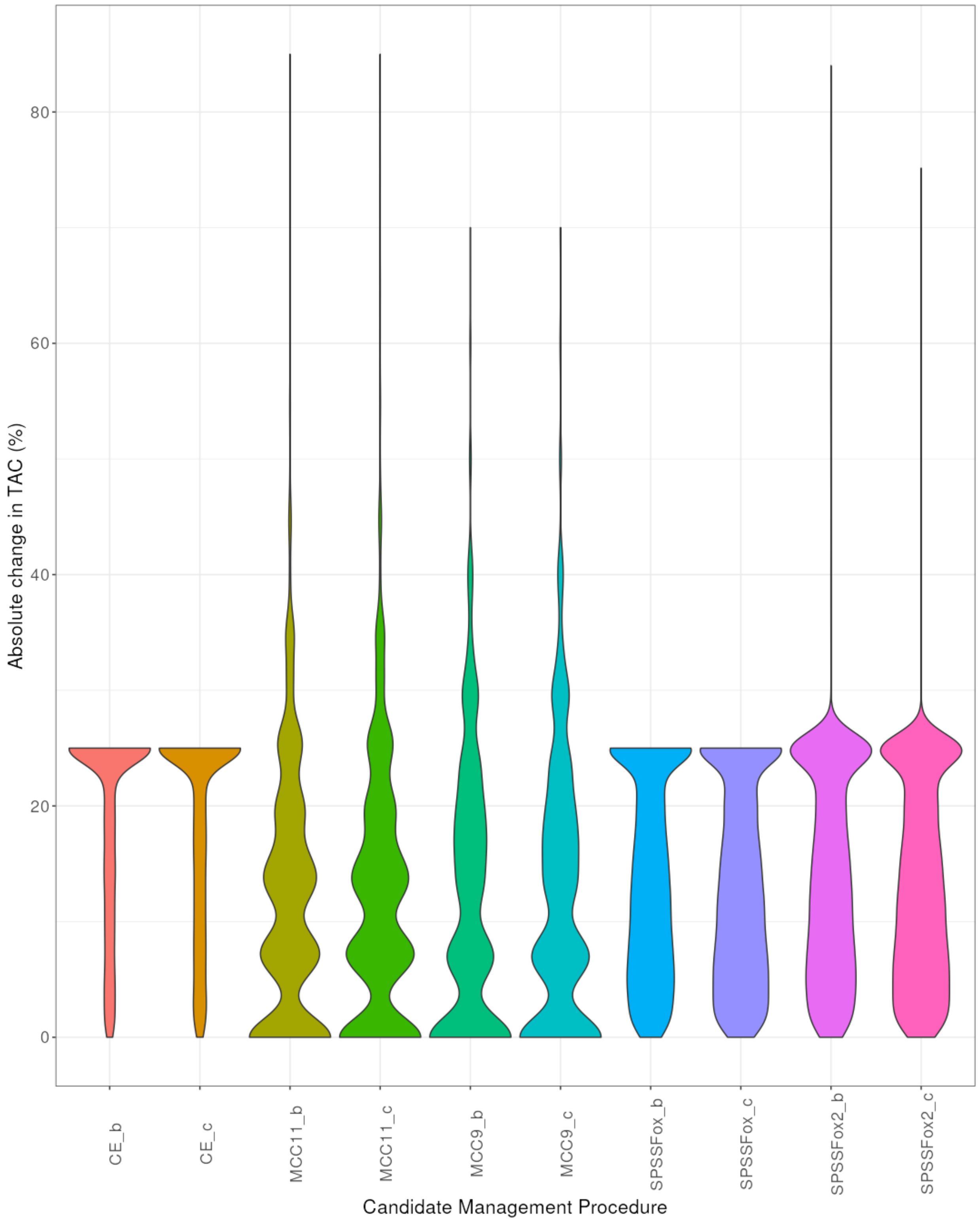

Figure 4. A violin plot showing the distribution of the absolute change in TAC (y-axis) for the 10 configurations of the five CMPs (x-axis). The width of the violin plot is proportional to the frequency of the absolute change in TAC (i.e., wider area means value is more common).

Appendix 10

Eastern Atlantic Bluefin Tuna Close-Kin Mark-Recapture (CKMR) Implementation Plan Proposal

Vision: To reduce the greatest source of uncertainty in the bluefin management strategy evaluation (MSE) through use of Close-Kin Mark-Recapture (CKMR) to inform the absolute scale of the spawning stock biomass, starting with the MSE reconditioning in 2027.

Purpose and need: To address the major uncertainty in the MSE as well as to develop methods for assessing Atlantic bluefin tuna (BFT) that are less susceptible to changes in fish spatial distribution and fleet behavior, the Committee proposes to implement the CKMR Implementation Plan for BFT-E. Now is the time to evaluate the potential of CKMR as an emerging tool to estimate spawning stock biomass to inform the 2027 reconditioning of the MSE and to support long-term management of BFT, regardless of stock of origin.

Objective: The project has two phases: a 3-year pilot project intended to provide an initial estimate of total BFT-E spawner population size to inform the 2027 MSE review and a longer-term operational project intended to provide a more precise estimate with options for development of CKMR-based management procedures (MPs) for both East and West by 2030. This proposal seeks to obtain support for the 3-year pilot project, which will provide a prerequisite foundation for a longer-term plan.

The 3-year pilot project would initiate sampling, tissue archiving and prerequisite projects. Based on the design plan, sampling during the whole pilot project is essential to inform 2027 MSE reconditioning. The project builds on an extensive sample archive (~34,000 fish), genetic analytical capacity, and a comprehensive statistical design (SCRS/2024/165) and feasibility study (SCRS/2024/150).

Why CKMR: Close-Kin Mark-Recapture method will provide dependable data and important insights that enhance management of bluefin tuna. Within the context of Management Strategy Evaluation, information on stock mixing and the absolute biomass of the spawning fraction is crucial to ensure that key parameters are accurately incorporated into the Operating Models (OMs). The OMs consider a wide range of abundance between 200-400 kt, which means that TACs may be precautionary for low-biomass scenarios, possibly missing opportunities for higher catches. Accurate biomass estimations allow a more effective management procedure, ensuring that TACs can be closer to the highest sustainable level while safely avoiding overfishing. Unlike most fisheries data, CKMR is less susceptible to changes in fish spatial distribution and fleet behaviour, making it well suited to coping with impacts of Climate Change. In the long-term, CKMR could form the basis for a climate-resilient MP, robust to environmental factors that could affect indices.

How CKMR works: Similar to the use of genetics to identify human relationships, for example a paternity test, CKMR uses the unique genetic signals that any individual gets from its mother and father as a 'tag' shared amongst 'close-kin'; i.e. parent-offspring pairs and siblings. Intuitively, the more kin-pairs are identified in a fixed number of samples analysed, the smaller the population. Sample sizes needed for CKMR are a function of population size: the bigger the population, the bigger the sample size needed to give precise results. Unlike most other methods in fisheries science, the cost of genetics is decreasing over time.

One of the first applications of CKMR, to southern bluefin tuna (SBT), estimated the population size, resolving the most critical uncertainty for management. Since 2019, CKMR has been an essential input for the SBT MP. CKMR is also being applied to Pacific bluefin tuna and many other species, globally. Recent CKMR results for Western bluefin tuna provide critical proof of concept.

Funding options: Although not ideal, and if additional funding is unavailable, the Committee has proposed to conduct the GBYP aerial survey every two years and only for the Balearic region which will provide sufficient funds for all years of the project with no other changes to the 2025 GBYP budget, except in 2026, where additional funding is required to complete genetic analysis and CKMR calculations (see **Table** below). Provided that the pilot project is a success then the Commission can decide in 2027 whether to embark upon the implementation phase of the project.

Timeline:
2024: Study design, sampling feasibility, rough budget and existing sample inventory- completed;
2025: Initiate BFT-E CKMR pilot. Commission decision for additional funding for 2026;
2026: Second field season for sampling and genetic analyses;
2027: Deliver pilot CKMR estimate to inform the MSE review;
2028-2029: Field seasons for sampling and genetic analyses;
2030: Deliver Operational BFT CKMR estimate and options for development of a CKMR-based MP.

		BFT-E CKMR pilot			Operational CKMR		
Budget	***2025 approved 2023 (GBYP Phase 14)***	***2025 revised (GBYP Phase 14)***	**2026**	**2027**	**2028**	**2029**	**2030**
Tagging	€ 50 000	€ 50 000	€ 50 000	€ 50 000	€ 50 000	€ 50 000	€ 50 000
Biological studies							
CKMR pilot studies (epigenetics & mtDNA)	€ 100 000	€ 140 000					
Genotyping and bioinformatics[1,2]			€1 198 000[1]	€ 191 000	€ 336 000	€ 266 000	€ 406 000
CKMR modeling		€ 50 000	€ 25 000	€ 25 000	€ 50 000		€ 30 000
Sampling collection (Larvae, Traps(Mor, Por,Esp,Cro)), processing and curation and tissue bank	€ 55 000	€ 145 000	€ 218 000	€ 129 000	€ 129 000	€ 129 000	€ 129 000
Other studies							
Fisheries independent index, GBYP aerial survey[3]	€ 365 000	€ 170 000	0	€ 170 000	0	€ 170 000	0
Further development of assessment models & MSE	€ 10 000	€ 25 000	€ 50 000	€ 50 000	€ 50 000		
Workshops/meetings							
Program coordination	€ 235 000	€ 235 000	€ 200 000	€ 200 000	€ 200 000	€ 200 000	€ 200 000
TOTAL[4]	**€ 815 000**	**€ 815 000**	**€ 1 741 000**	**€ 815 000**	**€ 815 000**	**€ 815 000**	**€ 815 000**

Footnotes:
[1] The 2026 genotyping cost includes both historical samples and new samples obtained
[2] Assumes that mtDNA and epigentic aging costs will be reduced in half during operational phase through gains in efficiency or improved modeling, genetic sample size is the same but the genotyping costs are spread over different years.
[3] The GBYP aerial index cost calculations take into account that the campaign will only be carried out in the Balearic Islands Area and every two years, starting in 2025.
[4] Total does not account for inflation and values are rough approximations, should population size prove higher, additional samples will be necessary for the same degree of precision.

Appendix 11

SCRS Science Strategic Plan 2025-2030

Participants at the 2024 SCRS Workshop (Madrid, 18-20 March 2024) discussed the development of a new SCRS Science Strategic Plan. It was agreed that workplan to develop the 2025-2030 SCRS Science Strategic Plan would be similar to the roadmap followed to the elaborate the 2015-2020 Strategic Plan.

With the aim of approving the new Strategic Plan at the 2025 SCRS Plenary meeting and adoption at the 2025 ICCAT Commission Annual Meeting, the workplan would follow seven phases:

Phase:

1. *Assess the situation – gaps and needs, identify goals and strategies*

   a. At the 2024 Workshop, participants reviewed the 2015-2020 Science Strategic Plan and, assessing the current situation, proposed specific changes to gaps, needs, goals, and strategies;

   b. Intersessionally during 2024, SCRS Officers were asked to further revise these items.

2. *Inform on current status, mission, vision and values; validate goals*

3. *Elaborate First Draft, including strategies and measurable targets, tentative schedule of meetings, links to data collection and research program documents*

   a. Online and through correspondence during first part of 2025, in consultation with Phase 1 participants and Heads of CPC SCRS delegations (to be completed prior to Phase 4 meeting).

4. *Completion of the Plan*

   a. By the SCRS at a 2025 ad-Hoc meeting; potentially part of a 2025 SCRS intersessional meeting dedicated for this purpose.

5. *Dialogue with the Commission*

To be determined.

6. *Approval of the Plan*

   a. At the 2025 SCRS Plenary

7. *Adoption of the Plan*

   a. At the 2025 ICCAT Commission Annual Meeting

Appendix 12

List of acronyms

AAVY	Average Annual Variability in Yield
ABNJ	Areas beyond National Jurisdiction (UN)
ACCOBAMS	Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea, and Contiguous Atlantic Area
AI	Artificial intelligence
ALB	Albacore (*Thunnus alalunga*)
ALBSG	Albacore Species Group
ALBYP	Albacore Year Programme
AMO	Atlantic Multidecadal Oscillation
AOTTP	Atlantic Ocean Tropical tuna Tagging Programme (expired)
ASAP	Age-structured Assessment Programme
ASFA	Aquatic Sciences and Fisheries Abstracts
ASFIS	Aquatic Sciences and Fisheries Information System
ASPIC	A Surplus-Production Model Incorporating Covariates
B	Biomass
BAI	Buoy associated index
BB	Baitboat
BBNJ	Biodiversity Beyond National Jurisdiction (UN)
BCD	Bluefin Tuna Catch Document
BE	Bycatch Estimator
BYET	Bycatch Estimation Tool
BET	Bigeye (*Thunnus obesus*)
BFT	Bluefin tuna (*Thunnus thynnus*)
BFT MP	Bluefin Tuna Management Procedure
BFTSG	Bluefin Tuna Species Group
BIOSAMP	Biological sampling database
BLT	Bullet tuna (*Auxis rochei*)
BON	Atlantic bonito (*Sarda sarda*)
BRS	Serra Spanish mackerel (*S. brasiliensis*)
BSH	Blue shark (*Prionace glauca*)
BSP	Bayesian Surplus Production model
BSP2JAGS	Just Another Gibbs Sampler emulating the Bayesian production model
BTH	Bigeye thresher shark
BUM	Blue marlin (*Makaira nigricans*)
BYET	Bycatch estimation tool
CAA	Catch-at-age
CAPAM	Center for the Advancement of Population Assessment Methodology
CAS	Catch-at-size
CATDIS	Catch distribution
CBD	Convention on Biodiversity
CCSBT	Commission for the Conservation of Southern Bluefin Tuna
CDS WG	Catch Document Scheme Working Group
CECAF	Fishery Committee for the Eastern Central Atlantic
CFASPM	Catch-free age-structured production
CFP	Common Fishery Policy
CI	Confidence interval
CITES	Convention on International Trade of Endangered Species of Wild Fauna and Flora
CKMR	Close-Kin Mark-Recapture
CMP	Candidate Management Procedure
CMS	Convention on Migratory Species of Wild Animals
COM	Commission
COPACE	Comité des Pêches pour l'Atlantique Centre-Est
COVID-19	Coronavirus disease
CP	Compliance form

CP	Contracting Party
CPCs	Contracting Parties and Cooperating Contracting Parties, Entities or Fishing Entities
CpG	Cytosine-phospho-guanine
CPUE	Catch per unit effort
CRO	Centre de Recherches Océanologiques (Cote d'Ivoire)
CRODT	Centre de Recherche Océanographique de Dakar/Thiaroye (Senegal)
CWP	FAO Coordinating Working Group on Fishery Statistics
CZMAI	Coastal Zone Management Authority and Institute
DB	Database
DBSRA	Depletion Based Stock Reduction Analysis
DCF	Data Collection Framework (EU)
ddRAD	Double digest restriction-site associated DNA
dFADs	drifting fish aggregating devices
DNA	Deoxyribonucleic acid
DOL	Common dolphinfish (*Coryphaena hippurus*)
DP	Data Preparatory
DST	Decision Support Tool
EAFM	Ecosystem Approach to Fisheries Management
EBSA	Ecologically and Biologically Significant Areas
EC	Exception circumstance
ECP	Exceptional Circumstances Protocol
EEZ	Exclusive Economic Zone
EFFDIS	Fishing effort distribution
EM	Electronic Monitoring
EMS	Electronic Monitoring System
EMS WG	Electronic Monitoring System Working Group
EPBR	Enhanced Programme for Billfish Research
ETAGS	Electronic Tags Management System
eTUFF	Electronic Tag Universal File Format
F	Fishing mortality
FAD	Fish aggregating device
FADURPE	Fundação Apolônio Salles de Desenvolvimento Educacional (Brazil)
FAL	Silky shark (*Carcharhinus falciformis*)
FAO	Food and Agriculture Organization (UN)
FAS	Fish Ageing Services
FC	Fleet Characteristics
FHV	Fish Hold Volume
FIRMS	Fisheries and Resources Monitoring System (FAO)
FIS	Inbreeding coefficient
FL	Fork length
FLUX TL	Fisheries Language for Universal Exchange – Transportation Layer (UN)
FO	Fishing Operation
FOB	Floating object
FPS	Frames per second
FRI	Frigate tuna (*Auxis thazard*)
FS	Fisheries Subject Group
FSC	Free school
GBYP	Atlantic-Wide Bluefin Tuna Research Programme
GEF	Global Environment Facility (UN)
GFCM	General Fisheries Commission for the Mediterranean
GIS	Geographic Information System
GitHub FLBEIA	GitHub Bio-Economic Impact Assessment of Management Strategies using FLR
GOM	Gulf of Mexico
GTA	Global Tuna Atlas
H	Steepness
H	Harvest rate
HCRs	Harvest Control Rules
ICCAT	International Commission for the Conservation of Atlantic Tunas

ICES	International Council for the Exploration of the Sea
ICM	Incidental Catch Model
ICNAF	International Commission for the Northwest Atlantic Fisheries
IMIPAS	Mexican Institute for Research in Sustainable Fisheries and Aquaculture (Mexico)
IMM	Working Group on Integrated Monitoring Measures
IOMS	Integrated Online Management System
IOTC	Indian Ocean Tuna Commission
IPMA	Instituto Português do Mar e da Atmosfera (Portugal)
ISA	International Seabed Authority
ISRA	Institut sénégalais de recherches agricoles (Senegal)
ISSCFG	International Standard Statistical Classification of Fishing Gear
ISSF	International Seafood Sustainability Foundation
IT	Information Technology
IUCN	International Union for Conservation of Nature
IUU	Illegal, Unreported and Unregulated fishing
IWC	International Whaling Commission
JABBA	Just Another Bayesian Biomass Assessment
JAVA	Just Another Virtual Accelerator
JFO	Joint Fishing Operation
KGM	King mackerel (*Scomberomorus cavalla*)
K2SM	Kobe II Strategy Matrix
L	Length
L/W	Length-weight
LIME	Length-based integrated mixed effects
LJFL	Lower Jaw Fork Length
LL	Longline
LMA	Longfin mako shark (*Isurus paucus*)
LOA	Length Overall
LRP	Limit Reference Point
LSPR	Length-based Spawning Potential Ratio
LTA	Little tunny (*Euthynnus alletteratus*)
LTY	Long-term yield
M	Natural mortality
MCC	Mostly Constant Catch
MCMC	Markov chain Monte Carlo
MED	Mediterranean
MEDAC	Mediterranean Advisory Council
MFAD	Moored Fish Aggregating Devices
MiniPAT	Pop-up archival transmitting tag
MoU	Memorandum of Understanding
MP	Management Procedure
MPA	Marine Protected Areas
MSE	Management Strategy Evaluation
MSY	Maximum Sustainable Yield
MVLM	Multivariate lognormal Monte Carlo
MVLN	Multivariate lognormal
NAFO	Northwest Atlantic Fisheries Organisation
NAO	North Atlantic Oscillation
NC	Nominal Catches
NCC	Cooperating Non-Contracting Party, Entity or Fishing Entity
NEAFC	North East Atlantic Fisheries Commission
NEI	Not elsewhere included
NGO	Non-governmental Organization
NGS	Next generation sequencing
NM	Nautical miles
NOAA	National Oceanic and Atmospheric Administration (United States)
OCS	Oceanic whitetip shark (*Carcharhinus longimanus*)
OECM	Other Effective area-based Conservation Measures
OMs	Operating Models

OTC	Oxytetracycline
PGK	Probability of green Kobe
PIs	Performance Indicators
PMs	Performance Metrics
PNOF	Probability of not overfishing
POF	Probability of overfishing
POR	Porbeagle (*Lamna nasus*)
PS	Purse seine
PSA	Productivity and Susceptibility Analysis
PSAT	Pop-up satellite archival tag
PWG	Permanent Working Group for the Improvement of ICCAT Statistics and Conservation Measures
RCG LP	EU Regional Coordination Group Large Pelagics
RFMO	Regional Fisheries Management Organization
RFO	Regional Fisheries Organization
ROP	Regional Observer Programme
RRBS-SEQ	Reduced Representation Bisulfite Sequencing
RSP	Roundscale spearfish (*Tetrapturus georgii*)
SA	Stock assessment
SAFE	Sustainability Assessment for Fishing Effects
SAI	Sailfish (*Istiophorus albicans*)
SC	Steering Committee
SC-ECO	Subcommittee on Ecosystems and Bycatch
SCRS	Standing Committee on Research and Statistics
SC-STAT	Subcommittee on Statistics
SFL	Straight fork length
SH	Southern Hemisphere
SKJ	Skipjack (*Katsuwonus pelamis*)
SMA	Shortfin mako (*Isurus oxyrinchus*)
SMTYP	Small Tunas Year Programme
SNP	Single nucleotide polymorphism
SPF	Spearfish (*Tetrapturus pfluegeri*)
SPiCT	Surplus Production Model in Continuous Time
SPL	Scalloped hammerhead shark (*Sphyrna lewini*)
SPN	Hammerhead sharks nei (Sphyrna spp.)
SPZ	Hammerhead shark (*Sphyrna zygaena)*
SRDCP	Shark Research and Data Collection Programme
SS	Stock Synthesis
SS3	Stock Synthesis 3
SSB	Spawning stock biomass
SSF	Spawning stock fecundity
SSG	Sharks Species Group
SSS	Simple Stock Synthesis
SWGSM	Standing Working Group to Enhance Dialogue between Fisheries Scientists and Managers
SWO	Swordfish (*Xiphias gladius*)
SWOYP	Swordfish Year Programme
T1	Task 1
T1FC	Task 1 fleet characteristics
T1NC	Task 1 nominal catches
T2CE	Task 2 catch and effort data
T2SZ	Task 2 size data
TAC	Total Allowable Catch
TG	Tagging form
ToRs	Terms of Reference
TRO	Tropical tunas
TTRaD	Tropical Tuna Research and Data Collection Programme
UN	United Nations
UNFSA	United Nations Fish Stocks Agreement

UPV	Universitat Politècnica de València
VAST	Vector Autoregressive Spatio-Temporal
VMS	Vessel Monitoring System
VPA	Virtual Population Analysis
W	Weight
WAH	Wahoo (*Acanthocybium solandri*)
WC	Wildlife Computers
WCPFC	Western and Central Pacific Fisheries Commission
WECAFC	Western Central Atlantic Fishery Commission
WGEF	ICES Working Group on Elasmobranch Fishes
WG-ORT	Online Reporting Technology Working Group
WGS	Whole Genome Sequencing
WGSAM	Working Group on Stock Assessment Methods
WHM	White marlin (*Kajikia albida*)
WT	Weight
YFT	Yellowfin (*Thunnus albacares*)

Appendix 13

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