Report of the 2024 ICCAT Mediterranean Albacore Data Preparatory and Stock Assessment Meeting

(hybrid, Madrid Spain, 13-18 May 2024)

The results, conclusions and recommendations contained in this report only reflect the view of the Albacore Species Group (ALB SG). Therefore, these should be considered preliminary until the SCRS adopts them at its annual Plenary meeting and the Commission revises them at its annual meeting. Accordingly, ICCAT reserves the right to comment, object and endorse this report, until it is finally adopted by the Commission.

1. Opening, adoption of agenda and meeting arrangements

The hybrid meeting was held in person at the ICCAT Secretariat in Madrid, Spain, and online, from 13 to 18 May 2024. Dr Jose Maria Ortiz de Urbina (EU-Spain) the Rapporteur of the Mediterranean Albacore stock and Dr Haritz Arrizabalaga (EU-Spain) the Albacore Species Group ("the Group") coordinator, and meeting co-Chairs, opened the meeting and welcomed participants. Mr. Camille Manel, ICCAT Executive Secretary, welcomed the participants and wished them success in their meeting. Dr Miguel Neves dos Santos, ICCAT Assistant Executive Secretary, provided information regarding the meeting logistics.

The Chairs proceeded to review the Agenda which was adopted with some changes (**Appendix 1**). The List of Participants is included in **Appendix 2**. The List of papers and presentations presented at the meeting is attached as **Appendix 3**. The abstracts of all SCRS documents and presentations presented at the meeting are included in **Appendix 4**. The following participants served as rapporteurs:

Sections	*Rapporteur*
Items 1 and 9	M. Ortiz and A. Kimoto
Item 2	C. Mayor, F. Fiorellato, J. Garcia, C. Palma
Item 3	J. Urbina, P. Quelle, D. Alvarez, A. Kimoto, C. Pinto, H. Arrizabalaga, C. Brown
Item 4	A. Di Natale, S. Samer, H. Arrizabalaga
Item 5	H. Arrizabalaga, J. Urbina
Item 6	G. Merino, A. Urtizberea
Item 7	H. Arrizabalaga, J. Urbina, M. Ortiz
Item 8	M. Santos

2. Review of fisheries statistics (Task 1 and Task 2)

The Group reviewed the most up-to-date albacore (ALB, *Thunnus alalunga*) fishery statistics (T1NC - Task 1 nominal catches, T2CE - Task 2 catch & effort, T2SZ - Task 2 size frequencies, T2CS - Task 2 catch-at-size reported) and tagging data (both conventional and electronic), currently available in the ICCAT database system (ICCAT-DB) for the period 1950-2022. The information on the three albacore stocks (ALB-N: North Atlantic; ALB-S: South Atlantic; ALB-M: Mediterranean) was presented, with a major focus on the ALB-M stock. The latest CATDIS estimations (catch distribution by trimester and 5x5 degrees squares) of albacore for the three stocks were also made available to the Group.

The Secretariat summarised all the above albacore information in a document (SCRS/P/2024/040) and made available to the Group all the associated datasets (available to meeting participants, on the statistics NEXTCLOUD folder of this meeting). The Group thanked the Secretariat for presenting this new format, agreed on its relevance for the purpose of the meeting, and provided further suggestions on how to improve future revisions of the product, including limiting the global information to comparisons between the order of magnitude of annual catches for each stock.

Two additional presentations related to albacore fisheries statistics (SCRS/P/2024/035 and SCRS/P/2024/039) were also delivered to the Group in this section.

2.1 Task 1 nominal catches data

The available T1NC statistics (SCRS/P/2024/040) were summarised in various forms to identify potential inconsistencies and incompleteness issues in the existing catch series over time. For the three albacore stocks (ALB-N, ALB-S and ALB-M) only minor revisions were made to the most recent years when compared to the corresponding albacore statistics adopted at the 2023 SCRS annual meeting. No updates were adopted by the Group during the meeting.

The updated albacore yearly T1NC statistics on overall catches (landings plus dead discards) by stock and major gear, are presented in **Table 1** (ALB-M in **Figure 1**)**.** The Secretariat presented the Group with the updated SCRS catalogues of albacore (ALB-M in **Table 2**), showing paired series for the last 30 years (1993-2022) of both Task 1 (T1NC) and Task 2 (existence or absence of datasets: T2CE, T2SZ, and T2CS) ranked by order of importance of the fishery (i.e., % contributions by each CPC / gear to the total T1NC catches in the considered timeframe). This information was presented separately by stock, and the general differences in terms of data availability across stocks were also discussed by the Group to identify the level of the combined completeness of all available Task 1 and Task 2 information. The Secretariat reminded that T1NC information is complemented by a web based interactive dashboard which allows interactively querying the data, and that a similar work is in progress to interact with the SCRS catalogues online. The CATDIS estimations for ALB-M made available to the Group, reflect T1NC information as available as of 31 January 2024 and the corresponding maps were also published on the ICCAT website (Statistical Bulletin Vol. 49).

In line with the work done with other ICCAT species, the Secretariat continues its progressive work with the ICCAT CPCs aiming to redistribute albacore catches currently associated to unclassified gears (gear codes: UNCL, SURF). The two albacore Atlantic stocks have today only residual catches not allocated to a specific gear (<1% across all decades). The ALB-M stock is still the most problematic one, especially in the early decades (until the 1980s), with unclassified gear catches reaching more than 75% of the total catches (**Table 3** and **Figure 2**). For the 1950-1999 period, a total of 60,426 t (105 records) with unclassified gears still exists (mostly associated to EU-Italy, Türkiye, and EU-Greece) and require properly allocated gears. The significant presence of historical catches for *unclassified* gears is prevalent in the Mediterranean until 2002. The Group agreed to create a small working group to solve this problem in the future, to which the involved CPCs are invited to participate. The Secretariat will also be engaged in the tasks of this small group.

For the entire period analysed (1950-2022), the ALB-M catches recorded in T1NC represent about 4% of the entire albacore catches of the three stocks (ALB-N with 62%, ALB-S with 34%), but increased to 9% and 6% in the last two complete natural decades (2000s and 2010s, respectively), which could indicate that decades prior to the 1990s may have incomplete (underreported or underestimated catches) catches by year. In the last three decades (2000s, 2010s and 2020s) the total ALB-M catches (landings and dead discards) greatly increased in the longlines (respectively 57%, 86%, and 95%), and consistently decreased in the purse seines (26%, 7%, and 3%) and in the gillnets (5%, 6%, and 1%) due to the ICCAT prohibition of gillnet activities in the Mediterranean Sea (*Recommendation by ICCAT relating to Mediterranean swordfish* (Rec. 03-04)) from 2004 onwards. The remaining gears (including UNCL) decreased from 11% in the 2000s to less than 1% in the 2020s. It was agreed that the small group will also be tasked to complete the historical official T1NC statistics, whenever possible, by contacting the statistical correspondents of the CPCs fishing for albacore in the Mediterranean Sea.

In relation to the reported discards, the Secretariat informed the Group that while T1NC data include a relatively high abundance (~1,800 t in total) of reported dead discards (DD) the same cannot be said regarding reported live discards (DL) which amount to less than 1 t overall. Both types of discards are summarized in **Table 4**. The Group noted how few CPCs provide estimates of live discards together with the methodology used for their estimation, which are indeed mandatory reporting requirements of significant importance to improve estimations of ALB-M stock indicators such as productivity, fishing mortality, and exploitation status.

Further improvements are required for the ALB-M stock in the future. To support that work, the Secretariat has presented preliminary results of an exercise that tries to classify/categorize each cell of a T1NC catch matrix (year and flag) within a stock (ALB-M), highlighting catch discontinuities and fluctuations (compared with the recent past trends) using a colour scheme for various oscillation levels. The classification matrix used ("catch magnitude (t)" vs "delta with previous catches (%)") is presented in **Table 5**. The outcome is presented in **Table 6**. The same exercise was made for each flag using the gear and year dimensions. This work has the potential to systematize the process of finding data gaps and inconsistencies in the catch series of T1NC. The Group acknowledged the importance of this work and suggested its continuity, exploring other scenarios (e.g., other catch matrix dimensions (fleet x year), alternative classification matrices, others) to mature this method to be finally adopted by the Working Group on Stock Assessment Methods (WGSAM). The Secretariat committed to continue this activity for a final WGSAM adoption.

The Group noted that, with the new approach to highlight discontinuities in historical catches by fleet, and for each fleet (respectively), several discontinuities of relevance were observed, affecting specific time periods, fleets, and gears, namely:

- Sudden appearance of a purse seine fishery for EU-Greece in the 2003-2007 timeframe, with reported annual catches in the range of 100-400 t.
- A spike in catches for the longline fishery of EU-Greece in 2016 (~1,300 t).
- Sudden appearance of a purse seine fishery for EU-Italy in 2003, with catches in excess of 1,000 t until 2007, followed by high fluctuations in annual totals until 2022.
- Possible incomplete catch series for Egypt from various gears (2015 onwards only).
- Türkiye recorded over 800 t of catches from its purse seine fishery in 2008, followed by years of extremely limited presence of albacore.
- Türkiye and EU-Italy reporting catches from driftnet fisheries in years following the entry into force of the ICCAT ban on said gears (2004).

The Group queried participants from concerned CPCs regarding possible explanations for the issues identified earlier. The feedback received helped to better understand the situation:

- Catches from the purse seine fishery of EU-Greece (2003-2007) are thought to potentially refer to "mixed tunas" rather than albacore alone.
- It was confirmed that Greek fisheries have been well monitored since 2012 and that therefore the 2016 spike in longline catches is correct and probably caused by exceptional environmental circumstances that increased the presence of the species in fishing grounds traditionally exploited by their longline fleet.
- Egyptian scientists informed that Egypt introduced a specific licensing scheme for the species in 2015 and that longlines are the main gear targeting albacore fisheries, which might explain the detected temporal patterns. It was therefore agreed that Egyptian scientists would review albacore reported catches associated with other gears.
- Catches from EU-Italy purse seines showing the sudden appearance of the fishery in 2003 together with the fluctuating trends detected in the years that follow are official, and therefore to be taken as such until further evidence of the contrary is provided.

The Group noted with concern the potential issues regarding species composition for relevant catches reported as albacore from purse seiners operating in the Mediterranean (2003-2011) and discussed how to best proceed to include these uncertainties in the next assessment model. The Group agreed on the importance of follow-up actions on this matter in light of the fact that apparently, purse seines would be the second largest contributors to the total mortality of the species in the Mediterranean in recent years if the catches are confirmed to be albacore (this assessment considered the catches to be albacore, as reported).

The Group is not aware of important albacore catches made by purse seines in the Mediterranean.

Regarding the presence of reported gillnet catches from EU-Italy and Türkiye (**Tables 1, 2**) in years following the entrance into force of the ICCAT driftnet ban, the Group encouraged concerned CPCs to further clarify this situation.

2.2 Task 2 catch-effort and size samples data

The ALB-M standard SCRS catalogue (**Table 2**) has a score of 2.54 (a slight increase from 2.52 during the 2023 Plenary of the SCRS) for the last 30 years (1992-2022), indicating a poor availability of Task 2 datasets. i.e., important gaps in both T2CE and T2SZ datasets. As for other ICCAT species, the Secretariat has ongoing a long-term project in place since 2014, aiming to (a) recover missing Task 2 datasets and (b) improve the level of Task 2 resolution and harmonization (replacing year/trimester by month, replacing

20x20/10x20/10x10 grids by 1x1 and 5x5, harmonise efforts by gear, harmonise/improve size/weight classes, etc.). This work supported by the SCRS (committed to a long-term continuous improvement of ICCAT statistics) requires the participation and full commitment of the ICCAT CPC scientists. The Secretariat is using the SCRS catalogues as one of the important instruments to request revisions from ICCAT CPCs.

Task 2 catch and effort (T2CE)

The T2CE detailed catalogue, with essential information (metadata and quantities) on albacore by stock, was also prepared for the meeting. Its purpose is to serve as a tool for the ICCAT CPC scientists to revise their T2CE series in search of possible issues (missing datasets, errors, poor time-area resolution, inconsistencies, etc.) and to provide missing datasets or improved updates for the existing datasets.

The T2CE detailed catalogue can also be used to identify existing datasets not shown in the standard SCRS catalogues (DSet = "t2" and character "a" in **Table 2**) due to poor temporal and spatial resolution (not by month, and not by 5x5 latitude-longitude squares or better for longline gears, or 1x1 latitude-longitude squares – or better – for surface gears).

The Secretariat reminded the Group that the CATDIS estimates rely completely on the availability and quality of T2CE information. The Group encouraged ICCAT CPC scientists to revise their T2CE statistics using the SCRS catalogues, as recommended by the SCRS.

Task 2 size frequency samples (T2SZ) and catch-at-size

The T2SZ and T2CS detailed catalogue was also prepared for the meeting, with metadata and quantitative information on all albacore stocks. In the case of the ALB-M stock the T2CS information was never used in the past (stored but never properly analysed/explored). This is intended as a tool for the ICCAT CPC scientists to revise their series in the search for possible incompleteness (gaps) or poor resolution of existing series that require a revision following improved data collection and reviews. By default, this poor time-area resolution is not shown in the standard SCRS catalogues (T2SZ and T2CS data for the fleets using the characters 'b' and 'c', respectively, **Table 2**).

The Secretariat presented Task 2 catch-at-size datasets (T2CS) as estimated/reported by CPCs to ICCAT in the past and reminded the Group that SCRS catalogues do not include T2SZ datasets estimated as being of "inferior quality" due to poor time-area resolution or size (weight) bins larger than 5 cm (kg).

SCRS/P/2024/035 provided information on fisheries statistics (catches, catch and effort) and biological size sampling of the Spanish pelagic longline fishery targeting albacore (LLALB) in the western Mediterranean, for the period 2009 to 2022. It also covered analyses of biological indicator trends (mean size, size at first maturity, L_{50}, etc.), with some important results. For the analysed period (2009-2023) the mean size observed on the catches was 77.66 cm straight fork length (SFL). For the analysed period, on average, the percentage of sizes exceeding the size at first maturity (optimum length) was 85.62% (Arena *et al.*, 1980), 92.19% (Ortiz de Urbina *et al.*, 2011), and 95.14% (Froese and Binohlan, 2000).

SCRS/2024/P/039 provided a summary and preliminary analysis of the ICCAT Task 2 size data (T2SZ) available in the ICCAT database. A total of about 130 thousand size samples have been available since 1974, with most samples from the longline fleets followed by samples from gillnets, baitboat, troll, and other gears. The overall size distribution indicated catches from 58 to 98 cm SFL (97.5% percentile) with a mean of 74 cm SFL close to a normal distribution. A preliminary analysis indicated some seasonality of size catches, with smaller fish caught in the 1st and 4th quarter of the year. However, this was found not to be statistically significant. On the existing T2SZ data, about 20% of the fish caught and sampled is immature (assuming 66.6 cm SFL as L_{50} - size at first maturity). However, it is important to consider that the total weight reported on T2CE and T2SZ represents only about 21% of the total weight of T1NC.

2.3 Tagging data

The Secretariat presented a summary of albacore's conventional and electronic tagging update. It was noted the cases of conventional tags transitions between the Mediterranean Sea and the Atlantic Ocean and vice versa, which need to be further checked.

Table 7 shows releases and recoveries per year and **Table 8** shows the number of recoveries grouped by number of years at liberty. Three additional figures summarise geographically the albacore tuna conventional tagging available in ICCAT. The density of releases in 5x5 squares (**Figure 3**), the density of recoveries in 5x5 squares (**Figure 4**), and the albacore apparent movement (arrows from release to recovery locations) are shown in **Figure 5**.

Additionally, two albacore dashboards were prepared to examine dynamically and interactively the tagging data. The first one (snapshot in **Figure 6**) with conventional tags, showing a summary of released and recovered tags. The second one (**Figure 7**) with electronic tags, showing a summary with data extracted from the meta-database held in ICCAT. The creation of dashboards for the conventional tagging and electronics tags metadata are published on the ICCAT website.

The Secretariat presented a preliminary table with the electronic tags available and reported on the issues with pop-up satellite archival transmitting (PSAT) tag failures. It was noted that since the last SCRS workshop, purchases of PSATs from Wildlife Computers are kept on hold until these issues can be solved. It was also agreed that all available PSATs should be deployed and monitored as regards their performance. Finally, during the 2024 SCRS Workshop (18-20 March 2024), it was agreed to re-activate the Ad Hoc Working Group on Coordination of Tagging Information, with the major objective of developing an integrated tagging workplan across all Working Groups and Species Groups.

The improvements of all the conventional tagging information will continue and will run in parallel with the maintenance and improvement of the conventional tagging database (CTAG), and the development of the new database on electronic tagging (ETAG). The ETAG project's main goal is to integrate into a centralized relational database system (PostgreSQL) all the information obtained from electronic tags and the associated metadata.

3. Mediterranean albacore stock assessment

To meet the ICCAT Commission's request (*Recommendation by ICCAT amending the Recommendation 21-06 to establish a Rebuilding Plan for Mediterranean Albacore* (Rec. 22-05)), an update of the Mediterranean albacore stock status is being conducted using the latest available information.

3.1 Review of available and new information on biology and life-history

No documents or presentations were provided for this agenda item during the meeting. In **Table 9**, the life cycle parameters of the species currently accepted in ICCAT are shown.

During the meeting discussions, it was noted that several research activities on biology and biological parameters are ongoing, the results of which should be considered as inputs for the estimation of priors in future assessment models (see section 4 for further details).

3.2 Examination of relative indices of abundance for incorporation into the stock assessment process

The Group had a general discussion on available abundance indices. It was clarified that all indices except EU-Cyprus were available in the last assessment.

Authors of SCRS/2024/031 presented the abundance index of the Spanish longline targeting albacore in the western Mediterranean.

The Group noted the low number of samples in three years and the low CVs. The authors agreed that this is an issue to be addressed. It was recommended to include a comment noting the years with excessively low data in the Spanish index in the Summary table of abundance indices.

The Group agreed that if there is no time to rerun the standardization of this longline index, those years should potentially be excluded from the assessment analyses. It was decided to drop the years 2014, 2018, and 2020.

SCRS/2024/080 provided albacore abundance indices estimated from Greek longline fisheries targeting albacore in the eastern Mediterranean from 2012-2022. Standardized indices were estimated using Generalized Additive Modeling (GAM) techniques with Year and the interaction of Semester by Area as predictors. Recent Catch Per Unit Effort (CPUE) estimates, particularly for 2022, are lower than in earlier years.

The Group discussed that the observations and the model are nearly identical. The Group raised a question about a discrepancy between the years of the index in the different datasets sent to ICCAT. It was explained that the data were cut off because of the fishery, which was previously opportunistic. It was proposed not to use data from before 2012 and to remove the points of the index previous to that year, a proposal that was agreed by the Group. The Group suggested that standardization could be explored with generalized linear models (GLM) due to the potential effects of the GAM applied. It was also recommended to apply compensation for factor analyses (Estimated Marginal Means (EMMEANS) kind), which can be applied to the GAM and GLM, as it is a standard procedure of the ICCAT WGSAM.

Authors of SCRS/2024/078 presented analyses comparing data used in the estimation of catch rates of albacore (*Thunnus alalunga*) for the Italian drifting longline in 2021 to the time series available within the ICCAT dataset. Based on the results, the authors decided not to present an abundance index and proposed discussing the validity of the index derived from the Italian longline data at the meeting.

The Group asked if, aside from the years with a low number of samples, there are other reasons for not updating the index, and the authors highlighted the discrepancy between the data available for generating the indices and the data that have been reported to ICCAT. The discrepancies between the two databases prevent making a decision on which source is correct for generating an abundance index. The Group asked if the authors proposed withdrawing the entire index series, and the authors confirmed this aspect. Furthermore, the authors commented that there are additional sources of error associated with the landing of Italian catches in other countries that should be clarified.

Document SCRS/2024/068 summarized some of the challenges affecting the understanding of the albacore fishery(ies) in the Mediterranean, considering various influencing factors and irregular catch reporting by CPCs.

SCRS/2024/069 and SCRS/2024/070 correspond to two documents about the larval index that were presented. SCRS/2024/070 was motivated by some doubts showed by the Group in past meetings about the adequacy of the sampling strategies to inform about the larval abundances of albacore tuna. Document SCRS/2024/069 presented the actualization of the index.

The Group requested information on the standardization process and the specific techniques regarding sample size, inclusion of volumes, and the retro-calculation of the larval lengths. The Group asked the reasons for using 2 mm as reference length. The authors explained that this is to respond to the objective of the retro-calculation to get as close as to the egg developmental stage as possible. The Group suggested changing the reference lengths of the retro-calculation model to the mean length of the larval (3-4 mm) as this could reduce the error associated with the retro-calculation approach. It was agreed to do so for future versions of the index.

The Group also requested more details on the calibration process for standardizing old fishing tows (from 2001 to 2005, made with B60 300 micrometer nets, down to 70 m depth) to the new fishing tows (from 2011 to 2022 made with B90, 500 micrometer nets, down to 30 meters). The authors explained the methods in more detail, which are based on experimental fishing for bluefin tuna (BFT), assuming the catchability among bluefin tuna and albacore in larval stages (<8 mm approx.) is the same (due to similar morphologies in those stages). The Group asked why the table values and the figure did not show similar CVs and it was clarified that the figure does not present CVs but lower confidence interval (LCI) and upper confidence interval (UCI) calculated based on non-normal distributions (specified in the document).

Based on the different gears applied in different periods of the sampling the Group discussed the possibility of splitting the index or removing the first part of the time series (2001-2005), as this comes from a calibration model designed for bluefin tuna. In addition, even if the bluefin tuna calibration was perfectly valid for albacore (which the Group suggested to test as soon as possible), the calibration-transformed values in the early time series should be more uncertain than recent values, but the uncertainty in the calibration function was basically ignored. For these reasons, the Group decided that splitting the larval series into early and late periods (2001-2005/2012-2022) was a better option than getting rid of the early part of the series. In addition, the Group recommended to study the calibration function for albacore.

Document SCRS/2024/082 presented an attempt to standardize catch rates of the EU-Cyprus fleet, which for the first time addressed a significant gap in information regarding a summer fishery in the Levantine Sea. CPUE data were analysed using Generalized Linear Modeling (GLM) techniques with a lognormal error structure with an identity link function. The authors also highlighted the phenomenon of depredation by common dolphins and bait foraging interactions which may introduce potential sources of bias in the CPUE estimations. Some quantitative data from literature and observers were provided.

The topic sparked discussions within the Group with contributions suggesting the involvement of other species too and a similar phenomenon was reported occurring in the Libyan and Egyptian albacore longline fishery. The Group inquired about strategies employed by the Cypriot fleet to mitigate these interactions. The lead author responded that the use of pinger funded by the European Maritime and Fisheries Fund (EMFF), along with alterations in fishing tactics has shown improvements. The Group also requested information on the size ranges of fish. The Secretariat shared an analysis from another section of the meeting agenda, indicating that the mean size of fish in this fishery aligns with other Mediterranean areas.

Several questions were raised to better understand the extent of the dataset coverage. The authors explained that a combination of sources, including the Electronic Reporting System (ERS), Vessel Monitoring System (VMS) mandated by the EU Control Regulation, and the principles of the Cyprus Data Collection Observer Program operating under the EU-Data Collection Framework (DCF), were utilized to analyze gear set-level data, covering almost the entire fleet effort exerted during these years, amounting to more than 90% coverage. Further clarification was sought regarding the initial increase in CPUE value in 2014. It was clarified that special care was taken during the initial analysis iteration to individually verify all records in 2014 and crosscheck with scientific and control observers' data to validate the results. It was also noted that the Greek longline index, presented during the meeting and geographically proximate, exhibited a similar pattern for the years 2014 and 2015.

The Group raised concerns about the lack of area inclusion in the model. The authors explained that due to warfare in the corresponding dataset years in the surrounding area and occasional jamming of satellite geo-positioning receivers, efforts are underway to crosscheck among various systems to verify the data and incorporate them into a future iteration of the index.

Regarding the analysis statistics, the Group noted some room for improvement, particularly around the Least Squares Means (LSMEANS) approach recommended by the WGSAM. Authors, together with the Secretariat, were offered to continue this work and enrich the analysis by including vessel effects. A revised analysis was presented later, including a masked Vessel ID to protect the identity of vessels. The Group agreed to utilize the index in subsequent model run attempts.

Evaluation and final decision on indices to use for assessment

The available indices are in **Table 10** and **Figure 8**. **Table 11** includes the CPUE evaluation table suggested by the WGSAM to aid in selecting indices. In summary, the Group decided:

- to use all historical indices.
- not to use the Italian LL index.
- drop 3 years (2015, 2016, 2019) from the Spanish longline index.
- to consider the updated index by EU-Greece.
- consider the new EU-Cyprus longline index.

With respect to the larval index, the Group agreed on two alternative options, to split it into early and late periods, as well as to use it as one continuous index.

3.3 Mediterranean albacore stock assessment update

3.3.1 Bayesian State-Space Surplus Production Model (JABBA)

SCRS/2024/076 presented the preliminary assessment results for the Mediterranean albacore stock applying the Bayesian state-space production model JABBA (Winker *et al*., 2018) with similar model settings as the 2017 and 2021 assessments. Three JABBA candidate scenarios were presented by fitting the catch time series (1980-2022) and adding the available updated indices: the Spanish longline CPUE, the western Mediterranean larval index, and the Greek longline index. These models were evaluated for model plausibility using four objective model diagnostics: (1) model convergence, (2) fits to the data, (3) consistency (e.g. retrospective patterns), and (4) prediction skill as described in Carvalho *et al*. (2021).

Following the 2021 final JABBA settings (Anon., 2021), a Fox production function ($B_{MSY}/K = 0.37$), a lognormal prior distribution for r with a mean of log (0.153), and a standard deviation for log(r) of 0.457, and a beta prior for the initial relative biomass ($\varphi = B_{1980}/K$) with a mean = 0.85 and a CV of 10% were assumed for all models. All catchability parameters were formulated as uninformative uniform priors, while the process error of $\log(B_y)$ in year y was estimated "freely" by the model using an uninformative inverse-gamma distribution with both scaling parameters set at 0.001. A fixed observation error approach was considered by assuming a standard error for log(CPUE) of 0.25 for four recent indices (SPN LLALB, ITA LL, Med-W Larval Index, and GRC LL), and down-weighting the historical indices by setting the standard error to 0.35. Each model was run with three Monte-Carlo Markov Chains (MCMCs), each comprising 30,000 iterations sampled with a burn-in period of 5,000 for each chain and a thinning rate of five iterations. Accordingly, the marginal posteriors were represented by a total of 15,000 iterations for each model.

The Group reviewed three initial JABBA model scenarios with different sets of abundance indices:

S0: Update the catch time series to 2022 keeping the CPUE indices used in the 2021 assessment.
S1: Based on S0, add the updated SPNLL CPUE and updated West Med larval index (simple update).
S3: Based on S1, add the updated Greek LL CPUE (not used in 2021).

Scenario S1 is a simple update from the 2021 Mediterranean albacore stock assessment. In scenario S1, adding the updated SPNLL and Med-W larval indices improved the model fitting and the Posterior to Prior Ratio of Variances (PPRV) value, while further adding the Greek LL index in scenario S3 did not improve the model fit. Although attempts were made to perform the hindcasting cross-validation analysis, mean absolute scaled error (MASE) scores were not estimable because most indices were not continuous. Some concerns were raised about the input data used in the 2021 Mediterranean albacore stock assessment, therefore the Group attempted to address some of these issues in the current assessment.

Based on the meeting discussions (see sections 3.1 and 3.2 of this report) on available catch and indices, the Group proposed a work plan to examine further model developments.

1. The Group agreed to use Task 1 catch time series as presented by the Secretariat on 13 May 2024 (SCRS/P/2024/040).

2. The Group agreed to use the same biological assumptions as the 2021 Mediterranean albacore stock assessment (Anon., 2021a), i.e. same set of priors for JABBA as used in the 2021 final model.

3. Indices of abundance: The Group reviewed all available indices (section 3.2) including the Greek longline and the EU-Cyprus longline indices that were not used or available in the 2021 Mediterranean albacore stock assessment. The Group proposed two sets of abundance indices for the evaluations:

    a. Continuity model: Apply only indices used in the 2021 Mediterranean albacore stock assessment (Anon., 2021a) (e.g. simple update, scenario **S1** in SCRS/2024/076), following the initial 2024 work plan of the Albacore Species Group approved in September 2023 by the SCRS.

    b. Alternative case: Modifications on the indices (section 3.2) from the Continuity model (a):

- Drop 3 years (2015, 2016, 2019) from the Spanish longline index
- Drop the initial 3 years (2001, 2004, 2005) from the Med-W Larval Index, or split the index (2001-2005/2012-2022) into two-time series (i.e. different catchability assumptions for each period)
- Exclude entirely the Italian longline index (2011-2019)
- Include the Greek longline index
- Including the EU-Cyprus longline index

4. The Group checked the results of the two scenarios based on their diagnostics and model fit performance.

The Group focused on scenario S3 (including the Greek longline index, during the meeting the EU-Cyprus longline index was provided) and reviewed additional scenarios as follows:

S12: Based on S3, drop 3 years from the Spanish longline index and remove the Italian longline index.
S15: Based on S12, remove the initial 3 years from the Med-W Larval Index.
S16: Based on S12, split the Med-W Larval Index into two time series.
S17: Based on S16, add the EU-Cyprus longline index.

The revised SPNLL index and the removal of the ITALL index (scenario S12) improved the model fit (RMSE=47.5%, **Figure 9**) and improved the residuals' distribution for the Greek LL index (**Figure 10**) from S3 (RMSE=48.7%).

From the Jackknife analysis, it was evident that the assessment results are mainly driven by the Med-W Larval Index trend as observed in the 2021 Mediterranean albacore stock assessment (Anon., 2021a). The Group discussed the following items regarding the Med-W larval index that shows an overall decreasing trend of the index (60% drop) between the first three years of the time series (2001-2005) and the rest of the time series (2012-2022), with a data gap between 2006 and 2011:

- The reliability of the first three data points of the time series associated with the changes in the larval sampling protocols and gear.
- The type/shape of the assumed relationship between the larval index and the stock biomass. Using a larval index in a surplus production model implies a direct linear relationship between the index and the stock biomass, as it is not possible to assign it to a specific age group for example young-of the year age(s).

Finally, the Group agreed to test two alternative scenarios:

- Removing the first three data points of the Med-W larval index (**S15**) and
- Splitting the index into two series with an initial series that included the first three data points (2001, 2004/2005) and a second series (2012-2022) assuming two different catchabilities (**S16**). Splitting the Med-W Larval Index was intended to reflect that there was a change in catchability, between periods where the sampling gear was modified, that has not been addressed with a conversion model known to be appropriate for albacore (a conversion specific for bluefin had been used for the Larval Index).

The Group expressed their concern for the fixed observation error approach that assumed a constant standard error for log(CPUE) of 0.25 or 0.35 within an index. It was suggested to take a similar approach to the other species assessments, e.g. set a minimum value and add extra values if the original index has a higher CV (Anon., 2021b). It was noted that the current available index data required that each index provider check the reported standard error or CV before directly inputting them into the assessment model(s). Due to the time constraints, this approach was not further evaluated during the meeting, but it was recommended to be considered for future evaluations.

The Group continued the discussions on the Med-W Larval Index and expressed strong concerns about the initial 3 points of the index. The new scenario (**S14**) was proposed based on S12 with a higher SE=0.35 on those 3 points. However, there was little effect on this change (**Figure 11**).

Both scenarios (S15 and S16) improved the model fitting (**Figure 12**) compared to S12, although the PPRV (**Figure 13**) was not improved. The Mohn's rho values (**Table 12**) fell outside the acceptable thresholds of -0.15 and 0.2 for longer-lived species (Huerto-Ferro *et al*., 2015) for two indicators (B/B_{MSY} and F/F_{MSY}) in S15 and for one indicator in S16 (F/F_{MSY}). The Group concluded that S16 showed slightly better diagnostics than S15 and that the retrospective analysis did not show a systematic pattern (**Figure 14**). Although the Group tried incorporating the EU-Cyprus longline index in S17 based on S16, there was no major improvement, the EU-Cyprus index did not pass the runs test (**Figure 15**) but time restrictions did not allow for further exploration with this index, and the posterior distributions (**Figure 16**) were not properly estimated.

The Group discussed the influence of the changes applied to the Med-W Larval index. The estimates of the parameters K and r (medians about 36 thousand t and 0.32, respectively) in S16, "Alternative case" became smaller and larger compared to S1, "Continuity case" (medians about 52 thousand t and 0.20). The Group expressed some concerns that such a change influenced the earlier population's assumptions but recognized that both parameters are typically correlated, and multiple pairs of parameter values can explain the observations. In addition, the estimates are within reasonable ranges for low-medium resilience stocks (Table 2 in Froese *et al*., 2017, Froese *et al*., 2023).

The Group further investigated the posterior distributions in S16. It was highlighted that the posterior distribution of the K parameter shifted towards the left side (towards 0) of the prior distribution after the split of the Med-W Larval index (compared to S12). This effect was also observed in S15 and S17. When the posterior of the K parameter lies on the left side of the prior distribution, it can create issues in the model estimation as laying on the steeper part of the probability density function (pdf) impairs the model from updating effectively from the data. Additionally, it brings the distribution away from meaningful values compared to the relation imposed between the virgin population and the catch time series. In general, it is not a good practice to accept a posterior distribution for the K parameter laying on the left side of the prior distribution and it should be avoided. When posterior distributions lay on the left side of the prior the model becomes more unstable. Such instability can cause unexpected behaviours during future updates, lowering the robustness of the model.

Two options were considered to improve this issue, i) modifying the lower bound of the K parameter prior distribution, and ii) reconsidering the K and r prior distributions. The Group tested the first option by changing the lower bound of the K parameter prior from 0.01 to higher values (10,000; 20,000; 25,000; and 30,000 t) to evaluate the effect on the posterior distribution. It was observed that only when the lower bound of the prior was set to values higher than 20,000 the posterior of the K parameter would lay on the right side of the prior distribution (**Figure 17**). However, it should be highlighted that values higher than 20,000 t are closer to the median of the K parameter prior distribution and there were concerns expressed regarding modifying the prior distribution to that extent without additional supporting scientific information. Given the time constraints, the second option was not attempted during this meeting, and the Group recommended that in future analysis this option should be evaluated.

The Group discussed the results of S16 that changed the perception of the stock to a more optimistic status; according to this result the Mediterranean albacore stock has never been below B_{MSY}, and only in a few years did fishing mortality exceed F_{MSY} (**Figure 14**). These results are completely different from the last 2 stock assessments of 2017 and 2021 when the stock has been overexploited and had experienced high fishing mortality rates, well above F_{MSY} (**Table 13**).

Despite the concerns, the Group decided to make further attempts to improve the posterior distributions and diagnostics of S16. The modelers first attempted to reduce the K prior by half and/or increase its CV, but no improvements were achieved. Although the posterior of the K parameter was improved, the posterior of the r parameter had a longer (r=2.0) and thicker tail (**Figure 18**), indicating lower precision in the estimation of this parameter. Therefore, the Group decided to investigate in more detail the diagnostics of the scenarios increasing the lower bound of the K prior, specifically the following 2 additional scenarios:

S18: Based on S16, changing the lower bound of the K prior parameter to 25,000 t.
S19: Based on S16, changing the lower bound of the K prior parameter to 30,000 t.

Both scenarios (S18 and S19) showed retrospective patterns in B/B_{MSY} and F/F_{MSY} (**Figure 19**) compared to S16 (**Figure 14**). The Mohn's rho values (**Table 14**) fell outside the acceptable thresholds for F/F_{MSY} in S18 while the values in S19 were improved. The modelers expressed their doubts about whether increasing the lower bound close to the median of the K parameter is the best approach. Although the median of the resulting trends was very similar between the three scenarios the lower bound of the credibility intervals of S18 and S19 was substantially reduced in the biomass and F estimates (although not seen for B/B_{MSY} and F/F_{MSY} indicators) (**Figure 20**), suggesting that a tighter prior was constraining the uncertainty ranges. It should also be noted that the value of 30 thousand t for the lower bound was arbitrarily chosen through a simplified sensitivity analysis rather than a thorough investigation for alternative K and r priors that would consider the species life history parameters, e.g. to use a more comprehensive tool like the Fish Life package suggested by the WGSAM. Finally, the Group concluded that S19 showed better diagnostics than S16 and S18 and decided to upgrade S19 as an "Alternative case".

The Group reiterated that the models were strongly sensitive to the treatment of the Med-W Larval Index. Many concerns on this index were repeatedly raised at this meeting. The Group suggested updating the Continuity model by reflecting all changes in the list for the indices except for the Med-W Larval Index and considered S12 as alternative case 2.

During the meeting, some national scientists commented that some of their catch in Task 1 was not correct, in particular that associated with catches reported by purse seine fishing gear, indicating possible misidentification with Atlantic bluefin tuna or a mix of tuna catch, as there are/were not purse seine target fisheries for Mediterranean albacore. The catch input is one of the major inputs in production models, however, the Group was reluctant to alter official catch data reports during the meeting without supporting information.

The Group felt that more discussions and investigations should be done with more scenarios for the abundance indices, the uncertainty in the reported catch, and the effects of the management regulations over the recent decades (e.g. driftnet bans by the European Union (1998), and closed seasons under *Recommendation by ICCAT replacing the Recommendation 13-04 and establishing a Multi-Annual Recovery Plan for Mediterranean Swordfish* (Rec. 16-05); *Recommendation by ICCAT establishing management measures for the stock of Mediterranean albacore* (Rec. 17-05)). However, given the time constraint during the meeting and the lack of a data preparatory meeting, the Group agreed to move forward with scenarios S12 and S19 for further consideration of the 2024 Mediterranean albacore stock assessment and conduct projections. The diagnostics for both scenarios are shown in **Figures 21 - 26** for S12 and **Figures 27-32** for S19, with the comparisons between the two models in **Figure 33.**

The Group considered how to convey the two highly contrasting results and decided to project them separately. It was also agreed to prepare separate Kobe plots and Kobe 2 Matrices and overlaid the plots.

3.3.2 Final stock status and projections

Stock status

The selected alternative JABBA models (S12 and S19) were fitted to the total catch from 1980 to 2022 (**Figure 8**) and 8 indices: Spanish, Greek, Ionian, Ligurian, Med-South, and historical Italian longline indices, western Mediterranean larval index, and the Spanish Tournament index (**Figure 8**). The main difference between the 2 scenarios was on how to apply the Mediterranean Larval index, as a single time series (S12) or as the split index assuming two different catchabilities (S19).

The Group agreed not to combine the 2 scenarios nor average the results. The Group preferred to explain the results for each model separately because the models are highly sensitive to the treatment of Med-W Larval Index and provide very different stock perceptions. The comparisons of estimated parameters, B/B_{MSY} and F/F_{MSY} are shown in **Tables 15 - 17** and **Figure 34** and Kobe plots in **Figures 35** and **36.**

The median of B/B_{MSY} was around 2.0 in the 1980s and 1990s and showed a continuous decreasing trend between 1990 and the mid-2000s for both scenarios. The trends diverged since then, depending on the treatment of the larval index. Model S12 showed a large decrease from the early 2000s to the mid-2010s, reaching values around 0.4-0.5 of B/B_{MSY}, while model S19 remained above B_{MSY}. The relatively high values in the larval index (2004, 2005) coincide with the highest catches in the time series (7,898 t in 2003), of which a high percentage were reported from purse seine fleets (40-50%) (see **Figures 1** and **8**), noting again the concerns expressed during the meeting regarding the validity of those relatively higher values of the larval index and the PS catches as albacore catches.

The Group considered S12 as a closer model to a continuity case of the 2021 Mediterranean albacore stock assessment. The main concern with this S12 model is the treatment of the larval index and the high sensitivity of the model to its inclusion. On the other hand, S19 incorporates an alternative treatment of the larval index, but the Group was unable to resolve some concerning diagnostics about the model (see section 3.3.1 above) and indicated a substantially larger uncertainty around B/B_{MSY} in 2022 (95% confidence bounds between 0.59 and 2.64) and F/F_{MSY} in 2022 (95% confidence bounds between 0.42 and 1.17) (**Table 17**, **Figure 36**). S12 model indicates that the stock is in the red quadrant with a 74.2% probability, while S19 indicates that it is in the green quadrant with a 79.1% probability.

The Group emphasized that the data input information to the models remains highly uncertain, including possible under-reporting and/or misreporting of the catch, limitations both in space and time coverage of available indices of abundance, the fact that these indices are limited to the most recent years of the fisheries, and conflicting trends among these indices. As a result, the quantitative characterization of the status of the stock remains uncertain for the Mediterranean albacore stock. As previously discussed, the uncertainty in total catch is of paramount importance in production models and was not addressed in any of the models presented here. To the extent that the reported catches are inaccurate or incomplete, the ability of these two alternative models to reflect the stock dynamics accurately is undermined. The Group also concluded that the previous assessments of 2021 and 2017 were likely affected by the same issues indicated before.

Therefore, the Group stressed that the current assessment has substantial limitations and large uncertainty that precludes them from providing accurate management advice in terms of a catch recommendation. The Group suggests re-evaluating the stock status only after addressing the main concerns expressed above, e.g. as part of the proposed research program.

Projections

Despite the concerns with the models expressed above, the Group agreed to carry out projections for each model scenario.

The Group used the following setting for the projections:

- Stock projections based on scenarios S12 and S19.
- Use 3 recent years (2020-2022) average as estimated catches for 2023 and 2024 (2600 t).
- Projection years: 2025-2037.
- Catch scenarios: between 0 and 4000 t by 500 t intervals.

Uncertainty is characterized in the form of Monte-Carlo Markov Chain (MCMC) posteriors of B/B_{MSY} and F/F_{MSY} (15,000 iterations using three MCMC chains of 5,000 each) which are stochastically forward projected over the range of alternative fixed catch scenarios within the JABBA model using Just Another Gibbs Sampler (JAGS).

The Group reviewed projections from the alternative models. For the S12 model projections indicated that the current TAC values of 2500 t would recover the stock with a probability of being in the green quadrant of the Kobe Plot of 62% by the end of the projection period, and a probability of 14% of $B < 20\%B_{MSY}$ (**Tables 18** and **19**, and **Figures 37** and **38**). By contrast, under the alternative model S19, a projection scenario with a constant catch of 4000 t will reach similar probabilities (62% green and 13% probabilities of $B < 20\%B_{MSY}$ (**Tables 20** and **21**, and **Figures 37** and **39**).

3.4 Management recommendations for Mediterranean albacore

As indicated previously under the Stock status section, the limitation and uncertainty in data inputs contribute to uncertainties in the characterization of stock status, only partially illustrated here with the two alternative models. The Group agreed that no management advice in terms of a specific TAC recommendation can be provided from the current assessment.

4. Advances in the Mediterranean albacore research and new research proposals

4.1 Mediterranean stock

The Group discussed the research needs for the Mediterranean stock, taking into account all discussions in the meeting and the main suggestion obtained during the discussion of the several documents. Some participants recommended adopting a common approach for all the high migratory species. Priorities were *set al*ong with the time schedule for each research item. The need to have standard research, methodologies, and approaches in all areas of the Mediterranean was agreed to.

The Mediterranean albacore stock was first assessed in 2011 and it was classified as data-poor. Taking into account the incomplete and somewhere uncertain fishing statistics (Task 1 and 2), and the need to update the knowledge on the life cycle and biological population parameters (length/age at maturity), the Group proposed the following list of research items. For each item, it identified one or more leads who will work on drafting Terms of Reference (ToRs) and preliminary budgets together with Species Group by September 2024.

Research items	Priority	Feasibility	Lead	When
Task1/2 data recovery	1	Low/Medium	Secretariat –Di Natale	2025
Alternative catch scenarios	1	High	A dedicated Subgroup	2026
Larval survey calibration	1-2	High	Alvarez-Berastegui	2025
Integrated Growth	2	Medium	Ortiz de Urbina - Garibaldi	2025-2026
Improve *r, K* priors	2	Medium	Secretariat (Ortiz, Kimoto) - Pinto	2026-2027
Joint longline CPUE	2	Low-Medium	Secretariat	By Next assessment
Environmental issues	2-3	High	Di Natale - Alvarez-Berastegui	2025-2027

4.2 Atlantic stocks

Albacore Tuna Year Programme (ALBYP) research and new research proposals

The document entitled "Albacore (*Thunnus alalunga*) reproductive biology study for the North Atlantic stock: years 2023 and 2024" (SCRS/2024/033) presented the work carried out by a Consortium including research Institutions from Canada, Chinese Taipei, EU-Spain and Venezuela. The results showed that larger and older albacore individuals are males. The final results of this part of the ALBYP, including the maturity and fecundity estimates, will be reported to ICCAT SCRS at the next meeting in September.

During the discussion, it was noted that samples were collected in several North Atlantic areas (both in the West and in the East). There was a considerable delay in receiving the important samples from Venezuela and therefore it was impossible to fully complete the analyses.

Regarding the reproductive study in the South Atlantic, it was noted that there is a selectivity issue because all albacore individuals are bigger than 100 cm SFL, therefore biasing the analyses on maturity at age and the determination of L_{50}. The analyses from South Atlantic samples were also delayed and will be presented at the September 2024 Species Group meeting.

A short update was provided on electronic tagging activities since the situation is similar to that presented in September, except that some recent tagging activities took place in the Canaries in late April to early May 2024, where four large albacore tunas were tagged with PSATs. Additional efforts to implant archival tags are planned in the Bay of Biscay during the 2024 summer, and a more comprehensive update will be provided later in September.

The Secretariat presented the current situation of the ALBYP from a financial point of view (Anon., 2024, updated). It pointed out that the use of available funds has been decreasing since 2010 and that funds already available for 2024 were only partly used. There are many possible reasons, but the Secretariat underlined the fact that funds are made available by the Commission for a yearly budget. Therefore, all activities, including call for tenders, contracts, field activities, laboratory analyses and reporting shall be completed within the same year. This firm requirement was made clear to the Group, beside the fact that sometimes there can be time and operational constraints. The Secretariat also discussed the issues concerning the functionality of electronic tags, a problem faced by all ICCAT research activities using these tags, which should be resolved with a common approach managed by the Secretariat.

The participants had a long and detailed discussion about how to face the challenges of a multiyear program running on annual budget. Furthermore, some bureaucratic difficulties seriously increased after the COVID pandemic (i.e. shipping problems for biological samples or custom problems for delivering the electronic tags) and it was suggested that, in some areas, it might be better to carry personally the samples or the tags for avoiding these problems. A more practical and improved strategy for facing the time constraints of the annual research budget should be necessary for the Group.

5. Request from the Commission regarding the Mediterranean albacore stock, pending response from the Scientific Committee

The Group developed a draft response to the Commission's request included in Rec. 22-05, paragraph 10, which will be reviewed and potentially revised for adoption by the Albacore Species Group and SCRS Plenary in September.

The Commission at the 2022 annual meeting has requested the SCRS the following:

- ***Rec. 22-05****: 10. 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 Group, SCRS/P/2024/035 and SCRS/P/2024/039. 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 Group concluded that 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 SFL) (Arena *et al*., 1980). In addition, the young of the year are not observed in the catches of the main fleets exploiting this resource in the Mediterranean. Based on the results of the size composition of the catches, and considering also that any potential benefits would be mitigated by mortality at haul back and post-release mortality, the Group considers that a minimum size (or other measures like fishery closures or gear characteristics) aiming to protect juveniles, would be of little or no benefit to the stock.

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.

The Group remarked that if a more detailed response is needed, it would require further clarification from the Commission regarding the objectives (if other than protecting juveniles) of the management measures (i.e. fishing gear characteristics, closure period, and minimum size) for which SCRS advice is requested in paragraph 10 of Rec. 22-05.

6. North Atlantic albacore

6.1 Exceptional Circumstances based on catch and CPUE updates

The Group reviewed the principles that should be considered as a signal indicating the possibility that exceptional circumstances (ECs) exist according to the *Recommendation by ICCAT on conservation and management measures, including a Management Procedure and Exceptional Circumstances Protocol, for North Atlantic albacore* (Rec. 21-04). For the "stock dynamics" principle the Group discussed if the updated CPUE series falls 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 Management Procedure (MP) was tested.

For this exercise, four CPUE indices were updated (the Japanese longline, Chinese Taipei Longline, Spanish baitboat until 2023, and the U.S. Longline until 2022). Documents were available for the updates of the Spanish baitboat (see SCRS/2024/066) and the Chinese Taipei longline indices (SCRS/2024/083).

SCRS/P/2023/027 showed the updated abundance indices overlaid on top of the CPUE values estimated from the OMs used in the MSE. Overall, all the CPUE series presented fall within the 2.5% and 97.5% percentiles of the simulated values except for the Spanish baitboat where the CPUE exceeds the range marginally in 2018 (**Figure 40**). As the updated CPUE data indicate a larger than the estimated relative abundance (i.e. above the 97.5% percentile of the simulated OM in the MSE) the Group agreed that this is not a source of concern.

6.2 Updates on the new MSE

SCRS/2024/P/028 presented an update of the Operating Models. The presentation covered the progress made by the Albacore Technical Sub-group on MSE that held informal online meetings in December 2023 and February 2024, with the aim to review, report, and receive feedback from the Albacore Species Group. The presentation covered the inclusion of additional age-length data and a proposal on criteria (based on likelihood, B_{RATIO}, and convergence thresholds) to exclude and discard unrealistic simulation runs.

The Group noted the expected differences between OMs due to different data sources having different weights. It also inquired about the new length at age data and confirmed that, although a limited sampling of the oldest ages, it was not affecting the growth curve estimation.

The Group agreed that it was best not to consider unrealistic runs (filtered using the suggested criteria), and that the uncertainty covered by the OMs was still wide enough and spread around the last stock assessment results. Overall, the Group agreed to go ahead with these OMs for the next MSE steps.

SCRS/2024/P/029 presented a new observation error model for the albacore MSE, that considered both historical and future uncertainty in CPUEs, as well as autocorrelation. Most longline indices (all except JPLLN and TAILLN) showed significant autocorrelation, but the baitboat index did not. The Group agreed that it would be simpler to consider autocorrelation to all longline indices. Autocorrelation parameters were very similar between OMs, thus, the Group agreed to use the same (average) autocorrelation parameters for all four OMs.

The Group noted that the new Observation Error Model (OEM) represents an improvement with respect to the previous OEM, as it considers autocorrelation in CPUE residuals. In addition, it noted the preference to keep considering uncertainty in historical CPUEs, as it better represents the process of updating standardized CPUEs every 3 years for new assessments, where historical values might slightly change from those used in the past. The uncertainty in the historical values was represented by assuming errors with normal distribution, but the Group noted that autocorrelation in the errors following the same method as in the projection could also be another way to simulate uncertainty in the historical values.

The Group noted that the errors were applied to the spawning stock biomass (SSB) or total number of matured fish however, another option could be to apply those errors to the vulnerable biomass to show more contrast between the indices.

The Group suggested making additional projections at higher catch levels (around 50000 t, closer to the historical peak catches), and to continue investigating the effects/merits of considering autocorrelation in historical CPUE observations. It was also agreed to present the model to the WGSAM given the different approaches to project indices of abundance under MSEs of different species groups.

SCRS/P/2024/030 presented the performance of the current management procedure with a new set of OMs that include 10 more years of data. Fisheries Library in R (FLR) objects (OMs conditioned with SS3 results) were built and projected under F_{MSY} as well as the current MP, showing expected behaviour with oscillations and future stabilization of catch values. The authors are working on the implementation of the MSE in FLBEIA.

The Group noted the effects of the recent high recruitment (which varies across OMs) in the projections and considered that alternative hypotheses could explain it (an environmental anomaly, or an artifact derived from the interpretation of fishery data used in the assessment). The Group agreed that future CPUE, size data, and other stock indicators might shed light on some of the alternative hypotheses. Meanwhile, alternative robustness tests could be entertained to test robustness, including alternative recruitment scenarios (beyond those already planned) or catchability assumptions.

The analysis suggests that the current MP would meet management objectives under the new set of OMs, and the Group agreed to test alternative MPs once the OEM is developed.

SCRS/2024/077 presented a review of climate change effects on albacore tuna (all 6 stocks worldwide). The work aimed to synthesize the available literature into simple figure/table formats that could be useful for the Group, classifying the studies into different effects (e.g. on recruitment, distribution, growth, etc.).

The Co-Chair reminded the Group that this review was one of the tasks in the albacore workplan, derived from the need to consolidate knowledge (e.g. from scientific literature out of the SCRS).

The Group thanked the authors for the initiative and agreed that the approach could be useful to consolidate knowledge at the SCRS level if other Species Groups could follow similar literature reviews and perhaps improved approaches to synthesize the results, focusing on the most important categories (e.g. effects on productivity/recruitment). The Group concluded that the format for integrating the information on climate change at the level of multi-stocks or worldwide is appropriate for other ICCAT species. It was also indicated that research should focus on key stages of life cycles to climate change and its impact.

The Group noted that while it was interesting to summarize results, it was also important to consider the methods followed by the original studies. In general, the Group agreed that most studies had addressed climate impacts on albacore distribution and habitat quality (interpreted as potentially affecting abundance). However, it is unclear what climate change effects will be on albacore recruitment, so there is little information to consider refining the robustness tests agreed in 2023. The Group agreed that for robustness tests, it would be more interesting to consider negative deviations in recruitment, not because we know that this will be the case, but to test different MPs under such scenarios. The Group noted that this would be a precautionary approach, but not necessarily a “climate safe” approach (as the effects of climate change are not known).

7. Recommendations on research and statistics

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 programs 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 Atlantic Albacore Tuna Year Programme (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 CPUE, and environmental effects.

8. Other matters

8.1 Research funding

The Secretariat provided a brief overview of the ICCAT Science funding assigned to the Albacore Species Group between 2018 and 2022, which was previously presented during the 2024 SCRS Workshop (Anon., 2024). The overview focused on the comparison of the available funds and their effective use by the Albacore Species Group.

The Secretariat also listed possible ways to ensure full use of the available science funds, as follows:

- Better assessment of funding needs.
- Enhance ability to make full use of funding, through:
  - Improve planning/coordination within Consortium/between teams.
  - Enhance the number of teams involved.
  - Enhance management skills related to project coordination.
  - Enhance Secretariat engagement in project administration and management.
  - Fully comply with the budget(s).

Based on the above, the Secretariat informed the Group that the Science budget for 2024 must be used strictly in line with the approved budget by the Commission, which is detailed in Table 1 of "SCRS Research Activities Requiring Funding for 2024 and 2025" contained in Appendix 2 to ANNEX 7 of the *Report for Biennial Period, 2022-23 Part II (2023), Vol. 1.* Accordingly, no extensions will be granted, nor changes between budget line items will be allowed. Moreover, the importance that the Secretariat receives soon after the SCRS Plenary all the ToRs related to the science activities that would require funding for the following year was emphasized. As such, the Secretariat would be able to conduct and conclude the administrative processes very early in the year, allowing more time for the development of the activities that are dependent on issuing contracts.

The SCRS Chair pointed out that these guidelines, and particularly the deadline for developing ToRs, was consistent with and supported by the development of longer-term research plans (approximately six years) and detailed budget requests covering the next two years. Considering these research plans, the objective would be to prepare the draft ToRs for the Species Group meeting in September for review and approval by the Group. This will also facilitate the discussion of the proposed science budget requests for submission to the SCRS Plenary meeting.

The SCRS Chair recognized the possibility that the identification of new science activity needs might be developed at the Species Group meeting. In such cases, the ToRs should be developed in advance of the annual Commission meeting. Having all the ToRs prepared before the annual Commission meeting should aid the Commission in considering the science funding requests as well as facilitating a more rapid initiation of projects funded by the Commission – which is critical given the new guidelines on the use of funds.

The Group acknowledged the new guidelines and recognized that in 2024 it will be challenging to make full use of the available funds, but hopefully, the situation will improve in 2025. Suggestions were made for more coordination between the different Species Groups as a way of overcoming issues related to the collection of biological samples within ICCAT Research Programmes. Finally, the Group highlighted the importance of funding to be allocated to research activities on the Mediterranean stock (see item 4.1 of this report).

9. Adoption of the report and closure

The report was adopted during the meeting. The Chairs of the Group thanked all the participants for their efforts. The meeting was adjourned.

References

Anonymous. 2021a. Report of the Intersessional Meeting of the Albacores Species Groups including the Mediterranean Albacore Stock Assessment. Collect. Vol. Sci. Pap. ICCAT, 78(8): 1-101.

Anonymous. 2021b. Report of the First 2021 Intersessional Meeting of the Bluefin Tuna Species Group (including BFT-W Data Preparatory) (5-13 April 2021). ICCAT Collect. Vol. Sci. Pap. 78(3): 1-145.

Anonymous. 2024. Overview of ICCAT Science funding between 2018 and 2024. SCRS/P/2024/009.

Arena, P., Potoschi, A., Cefali, A. 1980. Risultati preliminari di studi sull'etá, l'accrescimento a la prima maturitá sessuale dell'alalunga *Thunnus alalunga* (Bonn., 1788) del Tirreno. Mem. Biol. Mar. Ocean., 10.

Carvalho, F., Winker, H., Courtney, D., Kapur, M., Kell, L., Cardinale, M., Schirripa, M., Kitakado, T., Yemane, D., Piner, K.R., Maunder, M.N., Taylor, I. Wetzel, C.R., Doering, K., Johnson, K.F., Methot, R.D. 2021. A cookbook for using model diagnostics in integrated stock assessments. Fisheries Research Volume 204. https://doi.org/10.1016/j.fishres.2021.105959.

Froese, R., Demirel, N., Coro, G., Kleisner, K. M., Winker, H. 2017. Estimating fisheries reference points from catch and resilience. Fish and Fisheries, 18(3), 506-526. https://doi.org/10.1111/faf.12190.

Froese, R., Binohlan, C. 2000. Empirical relationships to estimate asymptotic length, length at first maturity and length at maximum yield per recruit in fishes, with a simple method to evaluate length frequency data. Journal of Fish Biology 56, 758–773.

Froese, R., Winker, H., Coro, G., Palomares, M.L., Tsikliras, A.C., Dimarchopoulou, D., Touloumis, K., Demirez, N., Vianna, G.M.S., Scarcella, G., Schijns, R., Liang, C., Pauly, D. 2023. New developments in the analysis of catch time series as the basis for fish stock assessment: The CMSY++ methods. Acta Icthy et Piscat 53, 173 – 189. https://doi.org/10.3897/aiep.53.105910.

Hurtado-Ferro, F., Szuwalski, C.S., Valero, J.L., Anderson, S.C., Cunningham, C.J., Johnson, K.F., Licandeo, R., McGilliard, C.R., Monnahan, C.C., Muradian, M.L., Ono, K., Vert-Pre, K.A., Whitten, A.R., Punt, A.E., 2015. Looking in the rear-view mirror: Bias and retrospective patterns in integrated, age-structured stock assessment models, in: ICES Journal of Marine Science. pp. 99–110. https://doi.org/10.1093/icesjms/fsu198.

Ortiz de Urbina, J.M., Macías, D., Kell, L., Arrizabalaga, H. Saber, S. 2011. An approximation to albacore (*Thunnus alalunga*, Bonnaterre, 1788) maturity ogive in the Mediterranean Sea by means of length-converted catch curve analysis. SCRS/2011/117.

Winker, H., Carvalho, F., Kapur, M. 2018. JABBA: Just Another Bayesian Biomass Assessment. Fish. Res. 204, 275–288. https://doi.org/10.1016/j.fishres.2018.03.010

Table 1. Albacore Task 1 nominal catch (T1NC) in tons (landings plus dead discards) by stock, major gear, and year. Unclassified gear group (UN) series are shown in red for each stock.

	Stock/Gear group																																						
	ALB-N															ALB-S									ALB-M														TOTAL
Year	BB	GN	HL	HP	HS	LL	PS	RR	TL	TN	TP	TR	TW	UN	Sub-total	BB	GN	HL	LL	PS	RR	TW	UN	Sub-total	BB	GN	HL	HS	LL	PS	RR	SP	TN	TP	TR	TW	UN	Sub-total	
1950												39623			39623								0	0													0	0	39623
1951												34149			34149								0	0													0	0	34149
1952												32397			32397								0	0													0	0	32397
1953	3875											26242			30117								0	0													0	0	30117
1954	7250											32729			39979								0	0													0	0	39979
1955	3125											28299			31424								0	0													0	0	31424
1956	5500					2						35398			40900				21				0	21													0	0	40921
1957	11959					135						30028			42122				725				0	725													1700	1700	44547
1958	17558					945						33945			52448				1047				0	1047													2900	2900	56395
1959	18517					599						30796			49912				4715				0	4715													2900	2900	57527
1960	18139					1658						33072			52869				10475				0	10475													1300	1300	64644
1961	21120					703						20907			42730				10365				400	10765													1400	1400	54895
1962	21469					6375						30943			58787				17171				1800	18971													1200	1200	78958
1963	20739					14976						24625			60340				17385					17385													1600	1600	79325
1964	20428					16148						28058			64634	22			25977					25999													1600	1600	92233
1965	20112					15002	0					25544			60658				29845					29845													2200	2200	92703
1966	16757					7815	0					22791			47363				27296					27296													3000	3000	77659
1967	18349					10124	0					30669			59142				15883				0	15883													2300	2300	77325
1968	13936					7291	0					23993			45220	38			25650				0	25688													2600	2600	73508
1969	14569					14238	0					17923			46730				28493				0	28493						200							3200	3400	78623
1970	14388		0			15801	0					15706			45895				23653				0	23653													500	500	70048
1971	15677		0			17115	0					24029			56821				24885				0	24885													500	500	82206
1972	8196		0			14068	0					26517			48781				33079	10	100			33189					1								700	701	82671
1973	8833		0			18155	0					18712			45700	1			28134	3	96			28234													500	500	74434
1974	13986		0			14662	0					20958			49606	97			19553	13	53			19716													500	500	69822
1975	19687		0			12710						9491			41888	46			17456	1	104			17607													500	500	59995
1976	20227		0			23090						13918			57235				19178	47	150			19375					41								520	561	77171
1977	15559		0			21081						17391			54031	66			20982	114	150		143	21455					130								483	613	76099
1978	11958		0			14163	68					23931		1	50121	43			22800	51	162		39	23095					150								440	590	73806
1979	15764		3			12214	59					23332			51372	53			21855	188	410		134	22640													833	833	74845
1980	16177	1	0			9453					0	13059	0	0	38691	1346			20671	579	264		86	22946													500	500	62137
1981	13412	2	7			9819	51	398			63	10778	1		34531	1721			20426	1804	69		20	24040	900												600	1500	60071
1982	15857	4	7			13206	84	667			0	12831	0	16	42673	2575			25255	1349	467		26	29672	539										33		700	1272	73617
1983	21108	0	5	1		16896	364	322			3	12788	0	3	51490	1794			11941	699	429		55	14918	535												700	1235	67643
1984	8313	1	4			19709	555	2176			0	11029	0	13	41800	4166			9834	365	20		214	14599	1331	191	37		226	141							1525	3451	59850
1985	12589	3	2			17413	59	75			3	10654	2	25	40826	7909	0		22672	182	181		153	31097	243	385			375	274					264		2588	4129	76052
1986	15202	3	10			21232	60	190			0	10847		10	47554	6829			29815	244	38		362	37288		100			324	10	10				310		2958	3712	88554
1987	18756	90	21			7296	1	230			0	11457	262	2	38115	8181			30964	948	60		477	40630		107			164	50	10						3665	3996	82741
1988	15933	758	9			3013	97	214			0	11329	1693	13	33059	7696			21894	185	45		353	30173		110			168	16	15						3754	4063	67295
1989	15374	1481	12	0	0	2239	12	133	22		0	10554	2240	3	32071	7393			19407		57		354	27212		110			165	16	15						3754	4060	63342
1990	18624	3682	5	0		2683	1	175			0	10675	1033	3	36881	5981	927		21590	4	61		151	28714	83	565			624	91	30			3			500	1896	67491
1991	8968	3732	6		2	5315	222	251			2	8959	469	6	27931	3454			22025	417	60		60	26016	499	668	0		524	110	30				48		500	2379	56327
1992	12436	4984	4		54	3152	139	103			8	7348	2603	20	30851	6490			27167	2518	82		306	36564	171	1025			442	6	5			3	50		500	2202	69616
1993	15646	7034	2			7093	229	224			0	6109	1779	19	38135	7341			23950	1450	74		0	32814	231	873			410	559	5				59		1	2138	73087
1994	11967	7122	8			7309	292	324			1	5959	2131	50	35163	9334			24806	1065	94		2	35301	81	759			350	23	5				129		2	1349	71813
1995	16411	3518	1			4859	278	23	1			10226	3049	12	38377	7009			20040	413	92			27554	163	1027			87	0	3				306		1	1587	67518
1996	11338	3002	2			4641	263	309	10		3	6652	2571	11	28803	6913			21000	258	256	0		28426	205	1383	80		391			20			119		952	3150	60379
1997	9821	3706	5			4051	26	337	3		1	7870	2877	325	29023	8092			19547	118	145	120		28022		1222	2		348		5	20			202		742	2541	59586
1998	7562	6108	0			4035	91	601	3		1	5894	1318	133	25746	10352			19799	434	1	9		30595	33	1222	24		194		5	20		2	45		1153	2698	59039
1999	8780	6315	18			6710	55	94	10		0	6845	5343	379	34549	6708			20640	183	74	52		27656	96	2254	61		416					0	73		1956	4856	67062
2000	11072	5254	77			7320	191	258	12		0	5023	3547	370	33123	6815			24399	58	116	0		31388	88	916	23		2796		6	2		8			1739	5577	70088
2001	6123	2585	86	0		7372	263	126	5		0	4312	5374	5	26252	10343			28039	25	389			38795	77	379	26		2597	0		2					1790	4870	69918
2002	6638	17	9			6235	93	335	2		1	4009	5376	1	22716	9710			21671	39	325	0		31746	29	397	38		3704	1	12	4			117		1306	5608	60070
2003	7840	1	55			7826	211	352	6		1	5373	3846	55	25567	6973		0	20626	308	85	12		28005		0	27		4248	3557	13	1				48	5	7898	61470
2004	8128	5	46	0		7037	344	501	3		6	7501	2369	16	25957	7475		96	14735	16	202	18	2	22545			49		2335	2452	6	1	7				25	4874	53375
2005	10458	12	225	0		6911	99	367	1		2	10224	7001	17	35318	5084			12977	499	322	0	0	18882	0		53		1997	1362	30	2	58				26	3529	57728
2006	14273	6	309	0		5223	162	297	2		1	10296	6385	10	36963	5876			17740	442	386		9	24453		0	78		3026	2803					1		56	5965	67381
2007	8496	6	114	0		3237	198	399	0		0	6105	3429	6	21991	3375			15087	58	1741		21	20283	0		163		4101	2237	2			0	0		17	6520	48794
2008	7931	10	123	3		2647	70	130	1		0	5239	4321	6	20483	4350			13218	81	1121		98	18867	0	208	31		2694	24			1	0	1	5	5	2970	42320
2009	4994	30	30	1		2619	101	24	0		0	4440	2811	342	15391	7926		96	12113	144	1936		34	22248	0	631	0		2160	1230				0	0	0	3	4024	41663
2010	6026	27	133	0		3913	70	57	0	0	0	7146	2026	14	19411	3748		89	13471	355	1531		30	19225	0	402	2		1719				0	0	1			2124	40759
2011	5530	1	48	1		3666	3	123	0	26	0	3578	6852	160	19989	5938	41	104	16445	205	1389		5	24126	0	1396	10		2352	869				0	0	0	2	4628	48743
2012	8816	6	17	1		3510	176	143	0		0	5909	6678	177	25432	6931		64	17847	428	2		0	25272	0	0	5		1965	68				0	6		3	2047	52751
2013	4975	21	5	1		6391	40	563	0	0	0	5891	6558	226	24671	5211		264	13888	58	2			19424	0	0	11		1399	86				0	0	0	6	1503	45598
2014	7341	4	6	1		3255	35	142	2		0	6660	9184	8	26638	4765		7	8907	44				13723	0	0	15		2350	15				5	3	5	8	2400	42761
2015	9265	8	4	0		4751	116	122	0			5597	5771	1	25635	4965		0	10104	131				15201	0	0	4	0	3245	543			0	0	0	7	0	3800	44635
2016	14455	19	26	1		5748	50	44	0	2		3753	6299	3	30400	2949			11243	83			108	14383		0	3		4349	34			0		0	9	1	4396	49179
2017	12196	90	18	0		5326	38	29	0	1		4165	6611	0	28475	1846			11674	191			114	13825		0	2		3087	82			0		2	3		3176	45476
2018	11330	4	47	0		4728	39	10		0		4807	8820	1	29786	3228		84	13715	19				17045		0	2		2378	481			0		1	2		2863	49694
2019	12662	1	146			4909	65	30	0	0		6292	10816	2	34922	2852		113	12510	3				15478			5		2656	30	3		0		67	2	0	2762	53163
2020	11855	2	55	0		5767	21	45		0	0	5938	7577	13	31274	4297		17	13759	11				18084		27	2		2513	66			0		62	5		2675	52033
2021	11696	0	58	0		4955	30	55	0			6250	8309	1	31355	4434		0	20513	21				24968		0	1		2803	72			0		5	13	0	2895	59218
2022	11069	1	134			4415	1	153				6134	9738	0	31645	7014		196	16270	36				23517		22	10		2150	110			0	0	0	1	1	2295	57457

Table 2. Standard SCRS catalogues on statistics (Task 1 and Task 2) for the Mediterranean albacore stock, for the major fisheries (flag/gear combinations ranked by order of importance), between 1994 and 2023. The last year is incomplete and preliminary. For each data series, Task 1 (DSet="t1", in t) is visualised against its equivalent Task 2 availability (DSet= "t2") scheme. The Task 2 colour scheme, has a concatenation of characters ("a"= T2CE exists; "b"= T2SZ exists; "c"= T2CS exists) that represents Task 2 data availability in the ICCAT-DB system.

				T1 Total		1349	1587	3150	2541	2698	4856	5577	4870	5608	7898	4874	3529	5965	6520	2970	4024	2124	4628	2047	1503	2400	3800	4396	3176	2863	2762	2675	2895	2295	10			
Score:	2.546																																					
Species	**Stock**	**Status**	**FlagName**	**GearGrp**	**DSet**	**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**	Rank	%	%cum
ALB	MED	CP	EU-Italy	LL	t1	347	81	366	172	172	307	2712	2445	3631	3786	1555	1189	1995	2721	2083	1497	1109	1634	1117	605	1342	1356	1480	1322	1029	1268	1365	1180	1134		1	38.8%	39%
ALB	MED	CP	EU-Italy	LL	t2	a	a	a	a	a	a	ab	ab	a	ab	b	b	ab	b	bc	abc	abc	abc	abc	abc	abc	abc	abc	abc	bc	abc	abc	abc	abc		1		
ALB	MED	CP	EU-Italy	PS	t1										3079	2100	1046	2589	1249	15	1230		866		10	9	244	4	26	13	17	29		19		2	11.9%	51%
ALB	MED	CP	EU-Italy	PS	t2										-1	-1	-1	b	-1	-1	-1		-1		-1	-1	-1	-1	abc	-1	-1	-1		-1		2		
ALB	MED	CP	EU-Greece	UN	t1	1		952	741	1152	1950	1735	1786	1304																						3	9.1%	60%
ALB	MED	CP	EU-Greece	UN	t2	-1		-1	-1	-1	-1	-1	-1	-1																						3		
ALB	MED	CP	EU-Italy	GN	t1	759	1027	1383	1222	1222	2254	916	379	397																		26				4	9.1%	69%
ALB	MED	CP	EU-Italy	GN	t2	a	-1	-1	-1	-1	-1	ab	b	-1	b		b															-1				4		
ALB	MED	CP	EU-Cyprus	LL	t1										17	243	337	451	695	204	220	206	247	321	357	385	505	558	568	624	652	586	518	484		5	7.7%	77%
ALB	MED	CP	EU-Cyprus	LL	t2										a	a	a	ab	abc	abc	abc	abc	abc	ab	a	abc	abc	abc	abc	abc	abc	abc	abc	abc		5		
ALB	MED	CP	EU-Greece	LL	t1						35	33	40	36	445	427	323	242	257	191	116	125	126	126	165	287	541	1332	608	522	297	158	182	145		6	6.4%	83%
ALB	MED	CP	EU-Greece	LL	t2						-1	-1	-1	-1	a	a	ab	ab	-1	a	a	-1	-1	-1	b	b	a	-1	a	ab	ab	ab	ab	ab		6		
ALB	MED	CP	EU-España	LL	t1	3	6	25	176	22	74	51	112	37	1	109	148	322	421	208	204	277	338	385	238	270	52	48	206	70	60	63	127	98		7	3.9%	87%
ALB	MED	CP	EU-España	LL	t2	ab	ab	ab	ab	ac	ac	ab	ac	ac	-1	-1	a	a	a	abc	abc	abc	a	abc	ab	abc	abc	ab	abc	abc	abc	ac	abc	abc		7		
ALB	MED	CP	Türkiye	GN	t1															208	631	402	1396											21		8	2.5%	89%
ALB	MED	CP	Türkiye	GN	t2															a	a	ab	ab											a		8		
ALB	MED	CP	Egypt	LL	t1																							75	381		270	295	616	177		9	1.7%	91%
ALB	MED	CP	Egypt	LL	t2																							-1	-1		-1	-1	-1	-1		9		
ALB	MED	CP	Libya	LL	t1																						750	800		30	21	19	17	20		10	1.6%	93%
ALB	MED	CP	Libya	LL	t2																						-1	-1		-1	-1	-1	-1	-1		10		
ALB	MED	CP	Türkiye	PS	t1											27	30	73	852					62	71	0	53	25	44	38	4	16	58	90		11	1.4%	94%
ALB	MED	CP	Türkiye	PS	t2											-1	-1	-1	-1					-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	a		11		
ALB	MED	CP	EU-Greece	PS	t1										478	326	287	141	123																	12	1.3%	95%
ALB	MED	CP	EU-Greece	PS	t2										-1	-1	-1	-1	-1																	12		
ALB	MED	CP	EU-España	TR	t1	129	306	119	202	45	73			117										2							6		5			13	1.0%	96%
ALB	MED	CP	EU-España	TR	t2	abc	abc	abc	abc	abc	abc			abc							b			a							ab		abc	c		13		
ALB	MED	CP	EU-España	BB	t1	81	163	205		33	96	88	77	29			0		0																	14	0.7%	97%
ALB	MED	CP	EU-España	BB	t2	ac	ac	ac		ac	ac	a	-1	ac			-1		a															c		14		
ALB	MED	CP	Egypt	PS	t1																						243	2	12	429	7	18	6			15	0.7%	98%
ALB	MED	CP	Egypt	PS	t2																						-1	-1	-1	-1	-1	-1	-1			15		

Table 3. Albacore Mediterranean stock (ALB-M) catch series in tons with unclassified gears (UNCL) by flag and year, in Task 1 nominal catches (T1NC). From 2002 onwards, the UNCL catches are residual (< 50 t /year).

	ALB-M (UNCL gear)									
Year	Algerie	EU-Croatia	EU-Cyprus	EU-España	EU-France	EU-Greece	EU-Italy	EU-Malta	Türkiye	TOTAL
1950								0		0
1951								0		0
1952								0		0
1953								0		0
1954								0		0
1955								0		0
1956								0		0
1957								0	1700	1700
1958								0	2900	2900
1959								0	2900	2900
1960								0	1300	1300
1961								0	1400	1400
1962								0	1200	1200
1963								0	1600	1600
1964								0	1600	1600
1965							500	0	1700	2200
1966							500	0	2500	3000
1967							500	0	1800	2300
1968							500	0	2100	2600
1969							500	0	2700	3200
1970							500	0		500
1971							500	0		500
1972				200			500	0		700
1973							500	0		500
1974							500	0		500
1975							500	0		500
1976							520	0		520
1977							483	0		483
1978							440	0		440
1979							833	0		833
1980							500	0		500
1981							600	0		600
1982							700	0		700
1983							700	0		700
1984							1525	0		1525
1985							2588	0		2588
1986							2958	0		2958
1987						500	3165	0		3665
1988						500	3254	0		3754
1989						500	3254	0		3754
1990						500		0		500
1991						500		0		500
1992						500		0		500
1993						1	0	0		1
1994						1	1	0		2
1995							1	0		1
1996						952		0		952
1997				0		741		1		742
1998						1152		1		1153
1999						1950		6		1956
2000						1735		4		1739
2001						1786		4		1790
2002						1304		2		1306

Table 4. Current albacore dead (DD) and live discards (DL) in tons, reported under T1NC for the three stocks (data for 2023 is preliminary).

	ALB-N			ALB-S			ALB-M		
Year	DD	DL	Total	DD	DL	Total	DD	DL	Total
2010	0		0	0		0			
2011	0	0	0	0		0	25	0	25
2012	0	0	0	1		1	6		6
2013	93	0	93	0		0	7	0	7
2014	179	0	179	0		0	8		8
2015	209	0	209	0		0	10		10
2016	300	0	300	0	0	0	16	0	16
2017	302	0	302	0	0	0			
2018	160	0	160	0		0	0		0
2019	151	0	151	37		37	0		0
2020	53	0	53	11		11	16		16
2021	121	0	121	4	0	4	5	0	5
2022	26	0	26	16	0	16	39	0	39
2023	0	0	0	0		0	0	0	0

Table 5. The classification matrix used ("catch magnitude (t)" vs "delta with previous catches (%)") highlighting catch discontinuities and fluctuations (compared with the recent past trends). It uses a colour scheme for various oscillation levels. It serves as the legend for **Table 6.**

Catch magnitude (t)	Delta with other catches (%)						
	0	[0, 5)	[5, 10)	[10, 50)	[50, 90)	[90, 100]	NA
[0, 10)	-	-	-	-	-	-	-
[10, 100)	0	-	-	-	-	+	+
[100, 1,000)	0	-	-	-	+	++	++
[1,000, 10,000)	0	-	-	+	++	+++	+++
[10,000, ...)	0	-	+	++	+++	++++	++++

Table 6. T1NC trends of Mediterranean albacore major fishing flags (EU-Greece: top; EU-Italy: center; Türkiye: bottom) between 1993 and 2022. Colour scheme is presented in **Table 5.**

EU-Greece

Flag name	Gear group	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
EU-Greece	HL	-	-	-	-	-	-	20	18	14	12	27	20	13	18	68
	LL	-	-	-	-	-	-	35	33	40	36	445	427	323	242	257
	PS	-	-	-	-	-	-	-	-	-	-	478	326	286	141	123
	TR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	UN	1	1	-	952	741	1,152	1,950	1,735	1,786	1,304	-	-	-	-	-

Flag name	Gear group	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
EU-Greece	HL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	LL	191	116	125	126	126	165	287	541	1,332	608	522	297	158	182	145
	PS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	UN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

EU-Italy

Flag name	Gear group	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
EU-Italy	GN	873	759	1,027	1,383	1,222	1,222	2,254	916	379	397	-	-	-	-	-
	HL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	LL	402	347	81	366	172	172	307	2,712	2,445	3,631	3,786	1,555	1,189	1,995	2,721
	PS	-	-	-	-	-	-	-	-	-	-	3,079	2,100	1,046	2,589	1,249
	SP	-	-	-	20	20	20	-	2	2	4	1	1	2	-	-
	TP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TW	-	-	-	-	-	-	-	-	-	-	48	-	-	-	-
	UN	-	1	1	-	-	-	-	-	-	-	-	15	11	-	-

Flag name	Gear group	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
EU-Italy	GN	-	-	-	-	-	-	-	-	-	-	-	-	26	-	-
	HL	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-
	LL	2,083	1,497	1,109	1,634	1,117	605	1,342	1,356	1,480	1,322	1,029	1,268	1,365	1,180	1,134
	PS	15	1,230	-	866	-	10	9	244	4	26	13	17	29	-	19
	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TW	5	-	-	0	-	-	2	2	7	0	2	1	2	13	1
	UN	0	-	-	-	-	0	-	-	-	-	-	-	-	-	0

Türkiye

Flag name	Gear group	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Türkiye	GN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	LL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PS	-	-	-	-	-	-	-	-	-	-	-	27	30	73	852
	UN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Flag name	Gear group	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Türkiye	GN	208	631	402	1,396	-	-	-	-	-	-	-	-	-	-	21
	LL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7
	PS	-	-	-	-	62	71	0	53	25	44	38	4	16	58	90
	UN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 7. Summary of albacore conventional tagging data available in ICCAT. Number of albacore releases by year and associated recoveries by year.

			Recoveries (year)																																														
Year	Releases	Recoveries	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1986	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2012	2011	2013	2016	2018	2019	2023	Unk
1960	15	0																																																
1961	3	0																																																
1962	2	0																																																
1963	12	0																																																
1964	21	0																																																
1965	1	0																																																
1966	11	0																																																
1968	18	16	8	4	3	1																																												
1969	11	11		5	1	3	1	1																																										
1970	15	15			6	5	2	1																																										1
1971	37	37				14	12	8	3																																									
1972	24	22					4	6	6	3			2	1																																				
1973	17	12						3	4	2	1																																							2
1974	3	0																																																
1975	10	10								4	1		5																																					
1976	241	9									1	3	3	1		1																																		
1977	48	2										1		1																																				
1978	10	4											1		2				1																															
1979	35	0																																																
1980	227	5													2	2			1																															
1981	20	3															2																																	1
1982	56	1																			1																													
1983	290	25																23																																2
1984	226	0																																																
1985	147	0																																																
1986	214	4																		2	2																													
1987	39	0																																																
1988	541	42																			23	7	8	1	1																									2
1989	3106	115																				20	67	20	6	1	1																							
1990	4650	104																					32	25	37	2	1	2	2	1				1																1
1991	4745	174																						54	91	17	6	3			1	2																		
1992	68	0																																																
1993	221	7																								4		3																						
1994	341	10																									5	3		1			1																	
1995	19	1																										1																						
1996	20	0																																																
1997	6	0																																																
1998	75	0																																																
1999	3	0																																																
2000	19	1																																1																
2001	51	1																																		1														
2002	122	2																																	1		1													
2003	546	15																																		1	6	7												1
2004	134	1																																				1												
2005	547	19																																				11	6	2										
2006	2770	18																																					3	5	6	3			1					
2007	140	3																																							1	2								
2008	27	1																																							1									
2009	168	0																																																
2010	65	0																																																
2011	170	3																																									1	2						
2012	45	2																																										2						
2013	65	0																																																
2015	7	0																																																
2016	31	1																																												1				
2017	36	0																																																
2018	124	3																																													1	2		
2019	56	0																																																
2020	24	0																																																
2021	2	0																																																
2022	168	7																																															6	1
Unk	9	9									1											1	1							1			1					1		1	2								
Year	20874	715	8	9	10	23	19	19	13	9	3	5	11	3	4	3	2	23	2	2	26	27	108	101	135	24	13	12	2	2	2	2	1	3	1	2	7	19	10	7	9	7	1	4	1	1	1	2	6	11

Table 8. Summary of albacore conventional tagging data: number of recoveries grouped by number of years at liberty in each release year. The last column shows the recovery rate (%) in each release year.

Number of tag Albacore (*Thunnus alalunga*)			Years at liberty								
Year	Releases	Recaptures	< 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 10	10+	Unk	% recapt*
1960	15	0									
1961	3	0									
1962	2	0									
1963	12	0									
1964	21	0									
1965	1	0									
1966	11	0									
1968	18	16	10	3	2	1					88.9%
1969	11	11	6	2	2		1				100.0%
1970	15	15	7	4	2	1				1	100.0%
1971	37	37	20	11	4	2					100.0%
1972	24	22	4	6	6	3		3			91.7%
1973	17	12	5	3	2					2	70.6%
1974	3	0									
1975	10	10	4	1	3	2					100.0%
1976	241	9	1	6		1		1			3.7%
1977	48	2	1		1						4.2%
1978	10	4	1		2			1			40.0%
1979	35	0									
1980	227	5	4				1				2.2%
1981	20	3	2							1	15.0%
1982	56	1						1			1.8%
1983	290	25	23							2	8.6%
1984	226	0									
1985	147	0									
1986	214	4	2	1	1						1.9%
1987	39	0									
1988	541	42	30	7	2	1				2	7.8%
1989	3106	115	58	40	11	5	1				3.7%
1990	4650	104	42	41	12	2		5	1	1	2.2%
1991	4745	174	108	46	9	6	2	3			3.7%
1992	68	0									
1993	221	7	4		3						3.2%
1994	341	10	8			1		1			2.9%
1995	19	1	1								5.3%
1996	20	0									
1997	6	0									
1998	75	0									
1999	3	0									
2000	19	1		1							5.3%
2001	51	1			1						2.0%
2002	122	2	1	1							1.6%
2003	546	15	6	6	2					1	2.7%
2004	134	1		1							0.7%
2005	547	19	13	4	2						3.5%
2006	2770	18	7	5	4	1		1			0.6%
2007	140	3	1	1	1						2.1%
2008	27	1	1								3.7%
2009	168	0									
2010	65	0									
2011	170	3	2	1							1.8%
2012	45	2	2								4.4%
2013	65	0									
2015	7	0									
2016	31	1	1								3.2%
2017	36	0									
2018	124	3	3								2.4%
2019	56	0									
2020	24	0									
2021	2	0									
2022	168	7		7							4.2%
Unk	9	9								9	100.0%
	20874	715	378	198	72	26	5	16	1	19	3.4%

Table 9. Mediterranean albacore biological parameters.

	Parameters	***Source***
VBG	L = 94.7 cm k = 0.258 y-1 t0 = -1.354	Megalofonou, 2000
LW	a = 3.119 10-5 b = 2.88	Megalofonou, 1990
Maturity	66.3 cm (50% mature fish)	Arena et al., 1980
M	0.3	Anon., 2011, 2012

Table 10. Available Mediterranean albacore abundance indices available for the 2024 stock assessment.

Name	SPN LLALB(n)		Larval W-Med		ITA LL(w)		SPN Tournament(n)		ITA-Ionian LL(w)		ITA-Ligurian LL bycatch(w)		Med South ITALL(w)		South Adriatic ITALL(w)	GRC LLALB(w)		CYP LLALB (w)	
Fleet	EU-Spain		EU-Spain		EU-Italy		EU-Spain		EU-Italy		EU-Italy		EU-Italy		EU-Italy	EU-Greece		EU-Cyprus	
Gear	LL		Larval Survey		LL		Recreational		LL		LL		LL		LL	LL		LL	
Docs	SCRS/2024/031		SCRS/2024/069		SCRS/2024/078		SCRS/2021/103		SCRS/2021/115		SCRS/2021/115		SCRS/2021/115		Marano et al., 2005	SCRS/2024/080		SCRS/2024/082	
Use in 2024 assessment	YES, remove 2015, 2016, 2019		YES, single series or split (2001-2005/2012-2022)		NO		Yes		Yes		Yes		Yes		Yes	Yes		NO	
Units	Num.	SE	Num.	CV	Wt.	SE	Num.	SE	Wt.	SE	Wt.	SE	Wt.	SE	Num. Nominal (Wt.)	Wt.	SD	Wt.	SD
1984															85.020				
1985															105.590				
1986															112.810				
1987															248.770				
1988																			
1989																			
1990															220.610				
1991															181.670				
1992															188.890				
1993															124.440				
1994											19.910	0.190			169.300				
1995									45.300	0.050	25.780	0.170			136.440				
1996											25.420	0.110							
1997									56.010	0.060	17.110	0.150							
1998									141.770	0.050					98.560				
1999									43.680	0.040					105.780				
2000									78.550	0.090					133.640				
2001			7.907	0.282					99.610	0.080									
2002									55.080	0.170									
2003									53.630	0.120									
2004			10.965	0.214									164.750	0.170					
2005			8.387	0.190			0.700	0.180					130.980	0.240					
2006							0.940	0.240					273.550	0.230					
2007							0.620	0.150											
2008							1.170	0.210					62.160	0.320					
2009	15.092	2.223					1.090	0.270					257.370	0.350					
2010	23.487	2.388					0.520	0.140											
2011	28.912	2.827			0.129		1.220	0.310											
2012	13.367	1.157	5.380	0.220	1.488	0.003	0.490	0.130								136.170	29.360		
2013	8.533	1.128	3.361	0.344	0.343	0.002	2.280	0.560								243.830	33.980		
2014			2.010	0.365	0.231	0.002	1.710	0.420								399.580	50.650	1.350	0.062
2015	12.275	1.135	0.651	0.342	0.443	0.003	0.650	0.120								152.000	40.470	1.003	0.030
2016	5.115	1.117	2.060	0.377	0.166	0.001	0.940	0.160								302.110	44.800	1.075	0.034
2017	12.046	2.336	2.606	0.259	0.148	0.001	1.090	0.190								132.670	16.850	1.186	0.038
2018							0.890	0.160								139.470	28.650	1.120	0.035
2019	8.454	1.405	1.954	0.346	0.169	0.002	0.720	0.130								109.990	22.330	1.009	0.029
2020			2.360	0.228	0.325	0.003										121.180	31.160	0.978	0.028
2021	17.231	2.507			0.433	0.004										177.050	49.350	0.819	0.023
2022	18.167	2.077	4.113	0.356												91.250	13.850	0.676	0.018
2023																		0.784	0.024

Table 11. Criteria table for available abundance indices for the Mediterranean albacore stock assessment.

Application to the 2024 assessment	YES, remove 2015, 2016, 2019	YES, single series or split (2001-2005/2012-2022)	NO	Yes	Yes	Yes	Yes	Yes	Yes	NO
SCRS Doc No.	SCRS/2024/031	SCRS/2024/069	SCRS/2021/115	SCRS/2021/103	SCRS/2021/115	SCRS/2021/115	SCRS/2021/115	Marano et al., 2005	SCRS/2024/080	SCRS/2024/082
Index Name:	Spanish LLALB	Larval W-Med	Italian LL	Spanish Tournament	Ionian LL	Ligurian LL bycatch	Med South LL	Italy LL South Adriatic bycatch	Greek LLALB	Cyprus LLALB
Data Source (state if based on logbooks, observer data etc)	scientific observer	survey	logbooks	scientific observer	logbooks	logbooks	logbooks	logbooks	scientific observer & port sampling	logbooks and scientific observer
Do the authors indicate the percentage of total effort of the fleet the CPUE data represents?	NA	NA	NA	NA	NA	NA	NA		NA	Yes
If the answer to 1 is yes, what is the percentage?										91-100%
Are sufficient diagnostics provided to assess model performance??	Sufficient	Sufficient	Incomplete	None	Incomplete	Incomplete	Incomplete		Sufficient	Sufficient
How does the model perform relative to the diagnostics ?	Well									Well
Documented data exclusions and classifications?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA	NA	Yes
Data exclusions appropriate?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA	NA	Yes
Data classifications appropriate?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA	NA	Yes
Geographical Area	Localised (< 10 x 10 degrees)	Localised (< 10 x 10 degrees)	Localised (< 10 x 10 degrees)	Localised (< 10 x 10 degrees)	Localised (< 10 x 10 degrees)	Localised (< 10 x 10 degrees)	Localised (< 10 x 10 degrees)	Localised (< 10 x 10 degrees)	Localised (< 10 x 10 degrees)	Localised (< 10 x 10 degrees)
Data resolution level	Set	Set	trip	trip	trip	trip	trip		trip	Set
Ranking of Catch of fleet in TINC database (use data catalogue)	6-10		1-5	11 or more	1-5	1-5	1-5	1-5	6-10	1-5
Length of Time Series	11-20 years	11-20 years	11-20 years	11-20 years	6-10 years	0-5 years	0-5 years	11-20 years	11-20 years	6-10 years
Are other indices available for the same time period?	Many	Many	Many	Many	Few	Few	Few	Few	Many	Many
Are other indices available for the same geographic range?	Few	Few	Few	Few	Few	Few	Few	Few	Few	Few
Does the index standardization account for Known factors that influence catchability/selectivity? (eg. Type of hook, bait type, depth etc.)	No	Yes	No	No	No	No	No		No	
Estimated annual CV of the CPUE series	Variable	High	Variable	Variable	Low	Medium	High		Low	
Annual variation in the estimated CPUE exceeds biological plausibility	Possible	Possible	Possible	Possible	Possible	Unlikely	Possible	Unlikely	Possible	
Is data adequate for standardization purposes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Is this standardised CPUE time series continuous?	No	No	Yes	Yes	No	Yes	No	No	Yes	
For fisheries independent surveys: what is the survey type?		Larval								
For 19: Is the survey design clearly described?		Yes								
Other Comments	Gaps in 2014, 2018 and 2020. Low number of sample size	Gaps in 2002, 2003, 2006-2011, 2018		Spatial and temporal limited, same area as SPNLL	Gap in 1996	index for 4 years	Gap in 2007	Nominal CPUE, Gaps in 1996, and 1997		

Table 12. Mohn's rho for Mediterranean Albacore scenarios S1, S3, S12, S15, S16 and S17 (see text for details).

	Stock Quantity					
Scenario	*B*	*F*	*B/B*$_{MSY}$	*F/F*$_{MSY}$	*B/K*	MSY
S1	-0.037	0.045	-0.015	0.083	-0.015	-0.038
S3	-0.039	0.042	-0.076	0.100	-0.007	-0.014
S12	-0.079	0.097	-0.107	0.154	0.007	-0.017
S15	-0.104	0.111	-0.211	0.397	0.005	-0.065
S16	-0.095	0.103	0.138	-0.175	-0.006	0.104
S17	-0.097	0.103	-0.136	0.298	0.003	0.009

Table 13. Summary of the estimated K, r, and MSY values from the 2011, 2017, 2021, and 2024 (S1 and S16) Mediterranean albacore stock assessments.

Models	BSP	JABBA	JABBA	JABBA S1	JABBA S16
Estimates	2011	2017	2021	2024	2024
K	NA	43940	53241	51254	35722
r	NA	0.314	0.186	0.204	0.318
MSY	NA	3460	3654	3841	4216

Table 14. Mohn's rho Mediterranean albacore S16, S18, and S19.

	Stock Quantity					
Scenario	*B*	*F*	*B/B*$_{MSY}$	*F/F*$_{MSY}$	*B/K*	MSY
S16	-0.095	0.103	0.138	-0.175	-0.006	0.104
S18	-0.096	0.101	-0.134	0.214	0.005	-0.050
S19	-0.098	0.108	-0.087	0.130	0.006	-0.021

Table 15. Summary of posterior quantiles presented in the form of marginal posterior medians and the associated 95% credibility intervals of parameters for the JABBA scenarios S12 and S19 for Mediterranean albacore.

	S12			S19		
Estimates	Median	95%LCI	95%UCI	Median	95%LCI	95%UCI
K	47621	29246	80303	38498	29177	71571
r	0.205	0.109	0.359	0.296	0.134	0.641
B_{MSY}/K	0.370	0.370	0.370	0.370	0.370	0.370
F_{MSY}	0.202	0.107	0.355	0.292	0.132	0.634
B_{MSY}	17623	10823	29718	14247	10798	26487
MSY	3564	2584	4663	4174	2831	7936
B_{2022}/B_{MSY}	0.583	0.305	1.096	1.444	0.592	2.644
F_{2022}/F_{MSY}	1.216	0.663	2.096	0.424	0.126	1.174

Table 16. Estimates of biomass, fishing mortality, and biomass relative to B_{MSY}, and fishing mortality relative to F_{MSY} between 1980 and 2019 of the JABBA S12 for Mediterranean albacore, with 95% credibility intervals.

S12	B/Bmsy			F/Fmsy		
Year	Median	95%LCI	95%UCI	Median	95%LCI	95%UCI
1980	2.168	1.366	3.153	0.065	0.040	0.108
1981	2.078	1.258	3.087	0.197	0.118	0.341
1982	1.997	1.193	2.983	0.174	0.104	0.313
1983	1.916	1.164	2.795	0.176	0.104	0.318
1984	1.894	1.150	2.776	0.511	0.319	0.900
1985	1.938	1.195	2.866	0.615	0.381	1.075
1986	2.131	1.321	3.175	0.540	0.329	0.940
1987	2.113	1.286	3.229	0.531	0.316	0.923
1988	2.109	1.279	3.226	0.543	0.317	0.956
1989	2.131	1.318	3.238	0.541	0.316	0.962
1990	2.146	1.342	3.242	0.252	0.147	0.443
1991	2.084	1.308	3.149	0.314	0.184	0.545
1992	1.940	1.209	2.936	0.299	0.176	0.520
1993	1.871	1.178	2.837	0.312	0.185	0.539
1994	1.826	1.137	2.723	0.204	0.121	0.350
1995	1.850	1.129	2.867	0.247	0.151	0.422
1996	1.742	1.055	2.624	0.485	0.287	0.836
1997	1.828	1.144	2.745	0.412	0.252	0.711
1998	1.746	1.103	2.587	0.419	0.256	0.712
1999	1.769	1.134	2.635	0.782	0.489	1.293
2000	1.691	1.096	2.596	0.889	0.550	1.448
2001	1.583	1.010	2.466	0.816	0.494	1.320
2002	1.479	0.940	2.316	1.000	0.595	1.632
2003	1.255	0.784	2.012	1.501	0.902	2.415
2004	1.050	0.649	1.669	1.119	0.643	1.797
2005	0.985	0.613	1.556	0.967	0.566	1.546
2006	0.784	0.475	1.260	1.743	1.033	2.750
2007	0.623	0.360	1.053	2.340	1.423	3.626
2008	0.695	0.419	1.144	1.350	0.766	2.156
2009	0.658	0.387	1.118	1.649	0.939	2.628
2010	0.739	0.456	1.244	0.924	0.512	1.512
2011	0.586	0.353	0.963	1.820	1.001	2.903
2012	0.611	0.375	0.993	1.008	0.568	1.631
2013	0.637	0.392	1.027	0.708	0.395	1.145
2014	0.502	0.303	0.774	1.107	0.625	1.786
2015	0.549	0.344	0.856	2.078	1.304	3.254
2016	0.483	0.298	0.773	2.272	1.369	3.473
2017	0.462	0.281	0.752	1.881	1.096	2.925
2018	0.440	0.267	0.707	1.783	1.031	2.803
2019	0.465	0.282	0.754	1.781	1.051	2.810
2020	0.528	0.316	0.875	1.619	0.940	2.580
2021	0.537	0.316	0.902	1.561	0.867	2.551
2022	0.583	0.305	1.096	1.216	0.663	2.096

Table 17. Estimates of biomass, fishing mortality, and biomass relative to B_{MSY}, and fishing mortality relative to F_{MSY} between 1980 and 2019 of the JABBA S19 for Mediterranean albacore, with 95% credibility intervals.

S19	B/Bmsy			F/Fmsy		
Year	Median	95%LCI	95%UCI	Median	95%LCI	95%UCI
1980	2.229	1.417	3.215	0.053	0.025	0.100
1981	2.146	1.310	3.141	0.161	0.071	0.309
1982	2.056	1.231	3.025	0.143	0.062	0.281
1983	1.944	1.197	2.816	0.145	0.061	0.292
1984	1.904	1.164	2.764	0.426	0.182	0.841
1985	1.950	1.203	2.816	0.517	0.225	1.029
1986	2.156	1.340	3.165	0.451	0.195	0.889
1987	2.123	1.299	3.167	0.440	0.192	0.864
1988	2.115	1.282	3.156	0.452	0.204	0.907
1989	2.153	1.317	3.179	0.454	0.200	0.911
1990	2.199	1.337	3.213	0.209	0.091	0.419
1991	2.145	1.303	3.149	0.259	0.110	0.521
1992	1.990	1.199	2.904	0.247	0.104	0.502
1993	1.920	1.171	2.791	0.260	0.108	0.523
1994	1.859	1.124	2.688	0.170	0.068	0.340
1995	1.900	1.117	2.839	0.207	0.082	0.422
1996	1.763	1.037	2.602	0.402	0.159	0.821
1997	1.854	1.119	2.727	0.350	0.138	0.710
1998	1.757	1.072	2.525	0.353	0.142	0.708
1999	1.759	1.085	2.563	0.667	0.271	1.306
2000	1.640	0.997	2.464	0.765	0.308	1.493
2001	1.571	0.952	2.381	0.719	0.283	1.391
2002	1.484	0.907	2.271	0.860	0.331	1.662
2003	1.263	0.715	2.096	1.284	0.479	2.442
2004	1.208	0.647	2.006	0.942	0.321	1.907
2005	1.352	0.730	2.316	0.716	0.233	1.510
2006	1.196	0.627	2.072	1.087	0.339	2.294
2007	1.082	0.516	1.926	1.322	0.423	2.838
2008	1.335	0.631	2.401	0.671	0.204	1.610
2009	1.406	0.630	2.546	0.739	0.220	1.810
2010	1.630	0.744	2.953	0.371	0.109	0.970
2011	1.392	0.619	2.460	0.703	0.208	1.852
2012	1.461	0.651	2.650	0.364	0.109	0.968
2013	1.493	0.675	2.777	0.256	0.074	0.675
2014	1.084	0.514	1.988	0.401	0.115	1.066
2015	1.257	0.574	2.354	0.854	0.253	2.086
2016	1.145	0.511	2.144	0.872	0.246	2.223
2017	1.096	0.478	2.120	0.688	0.193	1.827
2018	1.044	0.466	1.999	0.650	0.181	1.726
2019	1.131	0.499	2.153	0.654	0.181	1.712
2020	1.288	0.563	2.410	0.583	0.161	1.548
2021	1.333	0.579	2.406	0.558	0.159	1.502
2022	1.444	0.592	2.644	0.424	0.126	1.174

Table 18. Preliminary results. Mediterranean albacore estimated probabilities (in %) based on Bayesian surplus production model S12 that the stock biomass is below 20% B_{MSY}. Projections for constant catch levels (0 t to 4,000 t with 500 t intervals) are shown. Assumed catches for 2023 and 2024 were 2,600 t (average of the 2020-2022 period).

Probability of B < 20% of B_{MSY}

Catch (t)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
0	1%	2%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
500	1%	2%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1000	1%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	0%	0%
1500	1%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
2000	1%	2%	3%	3%	3%	4%	4%	4%	4%	5%	5%	5%	5%	5%
2500	1%	2%	3%	5%	6%	7%	8%	10%	11%	11%	12%	13%	14%	14%
3000	1%	2%	4%	7%	9%	12%	15%	17%	20%	21%	23%	25%	26%	27%
3500	1%	2%	5%	9%	14%	19%	24%	28%	31%	35%	38%	41%	43%	45%
4000	1%	2%	6%	13%	20%	28%	35%	41%	46%	51%	55%	58%	61%	63%

Table 19. Preliminary results. Mediterranean albacore estimated probabilities (in %) based on Bayesian surplus production model S12 that the stock fishing mortality is below F_{MSY} (a), biomass is above B_{MSY} (b) and both (c). Projections for constant catch levels (0 t to 4,000 t with 500 t intervals) are shown. Assumed catches for 2023 and 2024 were 2,600 t (average of the 2020-2022 period).

(a) Probaility F<=F_{MSY}

Catch (t)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
0	32%	39%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
500	32%	39%	99%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
1000	32%	39%	93%	95%	97%	98%	98%	98%	99%	99%	99%	99%	99%	99%
1500	32%	39%	80%	85%	88%	90%	92%	93%	94%	95%	95%	96%	96%	96%
2000	32%	39%	64%	69%	73%	77%	80%	82%	83%	85%	86%	87%	88%	88%
2500	32%	39%	47%	52%	56%	59%	62%	64%	66%	68%	70%	71%	72%	72%
3000	32%	39%	34%	37%	39%	42%	44%	45%	47%	48%	49%	49%	50%	51%
3500	32%	39%	24%	25%	26%	27%	28%	29%	29%	29%	30%	30%	30%	30%
4000	32%	39%	16%	17%	16%	17%	17%	16%	16%	16%	16%	16%	16%	15%

(b) Probability B>=B_{MSY}

Catch (t)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
0	15%	20%	38%	56%	71%	81%	88%	92%	95%	97%	98%	98%	99%	99%
500	15%	20%	36%	51%	64%	75%	82%	87%	91%	94%	95%	96%	97%	98%
1000	15%	20%	33%	46%	57%	67%	75%	80%	84%	88%	90%	92%	94%	95%
1500	15%	20%	31%	40%	50%	59%	65%	71%	76%	80%	83%	85%	87%	89%
2000	15%	20%	28%	36%	43%	50%	55%	61%	65%	68%	71%	74%	76%	78%
2500	15%	20%	26%	31%	36%	41%	45%	48%	52%	55%	57%	59%	61%	62%
3000	15%	20%	24%	27%	30%	33%	35%	37%	38%	40%	41%	43%	44%	45%
3500	15%	20%	22%	23%	24%	25%	26%	27%	27%	28%	28%	28%	28%	28%
4000	15%	20%	20%	20%	19%	19%	19%	18%	18%	17%	17%	16%	16%	16%

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

Catch (t)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
0	14%	20%	38%	56%	71%	81%	88%	92%	95%	97%	98%	98%	99%	99%
500	14%	20%	36%	51%	64%	75%	82%	87%	91%	94%	95%	96%	97%	98%
1000	14%	20%	33%	46%	57%	67%	75%	80%	84%	88%	90%	92%	94%	95%
1500	14%	20%	31%	40%	50%	59%	65%	71%	76%	80%	83%	85%	87%	89%
2000	14%	20%	28%	36%	43%	50%	55%	60%	65%	68%	71%	74%	76%	78%
2500	14%	20%	26%	31%	36%	41%	45%	48%	51%	55%	57%	59%	61%	62%
3000	14%	20%	22%	25%	28%	31%	34%	36%	37%	39%	40%	42%	43%	44%
3500	14%	20%	18%	20%	21%	22%	23%	24%	25%	25%	26%	26%	26%	27%
4000	14%	20%	14%	14%	14%	14%	15%	15%	15%	14%	14%	14%	14%	14%

Table 20. Preliminary results. Mediterranean albacore estimated probabilities (in %) based on Bayesian surplus production model S19 that the stock biomass is below 20% B_{MSY}. Projections for constant catch levels (0 t to 4,000 t with 500 t intervals) are shown. Assumed catches for 2023 and 2024 were 2,600 t (average of the 2020-2022 period).

Probability of B < 20% of B_{MSY}

Catch (t)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
500	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1000	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1500	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2000	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2500	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%	1%	1%
3000	0%	0%	0%	0%	0%	1%	1%	1%	1%	2%	2%	2%	2%	3%
3500	0%	0%	0%	0%	1%	1%	2%	2%	3%	4%	4%	5%	6%	7%
4000	0%	0%	0%	1%	1%	2%	3%	4%	6%	7%	9%	11%	12%	13%

Table 21. Preliminary results. Mediterranean albacore estimated probabilities (in %) based on Bayesian surplus production model S19 that the stock fishing mortality is below F_{MSY} (a), biomass is above B_{MSY} (b) and both (c). Projections for constant catch levels (0 t to 4,000 t with 500 t intervals) are shown. Assumed catches for 2023 and 2024 were 2,600 t (average of the 2020-2022 period).

(a) Probaility F<=F_{MSY}

Catch (t)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
0	93%	93%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
500	93%	93%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
1000	93%	93%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
1500	93%	93%	99%	99%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%
2000	93%	93%	97%	98%	98%	98%	98%	98%	99%	99%	99%	99%	99%	99%
2500	93%	93%	94%	95%	95%	95%	96%	96%	96%	96%	96%	96%	96%	96%
3000	93%	93%	91%	91%	91%	90%	90%	90%	90%	90%	90%	90%	90%	90%
3500	93%	93%	86%	85%	84%	84%	83%	82%	82%	81%	81%	80%	80%	80%
4000	93%	93%	81%	79%	77%	75%	74%	72%	71%	69%	68%	67%	67%	66%

(b) Probability B>=B_{MSY}

Catch (t)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
0	84%	86%	92%	95%	97%	98%	99%	99%	100%	100%	100%	100%	100%	100%
500	84%	86%	91%	94%	96%	98%	98%	99%	99%	99%	100%	100%	100%	100%
1000	84%	86%	90%	93%	95%	96%	97%	98%	98%	99%	99%	99%	99%	99%
1500	84%	86%	89%	92%	94%	95%	96%	97%	97%	98%	98%	98%	99%	99%
2000	84%	86%	88%	90%	91%	93%	94%	94%	95%	96%	96%	96%	96%	97%
2500	84%	86%	87%	88%	89%	90%	91%	91%	91%	92%	93%	93%	93%	93%
3000	84%	86%	86%	86%	86%	86%	86%	87%	87%	87%	87%	87%	87%	87%
3500	84%	86%	85%	84%	83%	82%	81%	80%	80%	80%	79%	78%	78%	78%
4000	84%	86%	83%	81%	79%	77%	75%	73%	71%	70%	69%	68%	67%	65%

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

Catch (t)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
0	84%	85%	92%	95%	97%	98%	99%	99%	100%	100%	100%	100%	100%	100%
500	84%	85%	91%	94%	96%	98%	98%	99%	99%	99%	100%	100%	100%	100%
1000	84%	85%	90%	93%	95%	96%	97%	98%	98%	99%	99%	99%	99%	99%
1500	84%	85%	89%	92%	94%	95%	96%	97%	97%	98%	98%	98%	99%	99%
2000	84%	85%	88%	90%	91%	93%	94%	94%	95%	96%	96%	96%	96%	97%
2500	84%	85%	87%	88%	89%	90%	90%	91%	91%	92%	92%	93%	93%	93%
3000	84%	85%	85%	85%	85%	85%	86%	86%	86%	86%	86%	86%	86%	86%
3500	84%	85%	82%	81%	81%	80%	79%	78%	78%	78%	77%	77%	76%	76%
4000	84%	85%	78%	76%	74%	72%	71%	69%	68%	66%	65%	64%	64%	62%

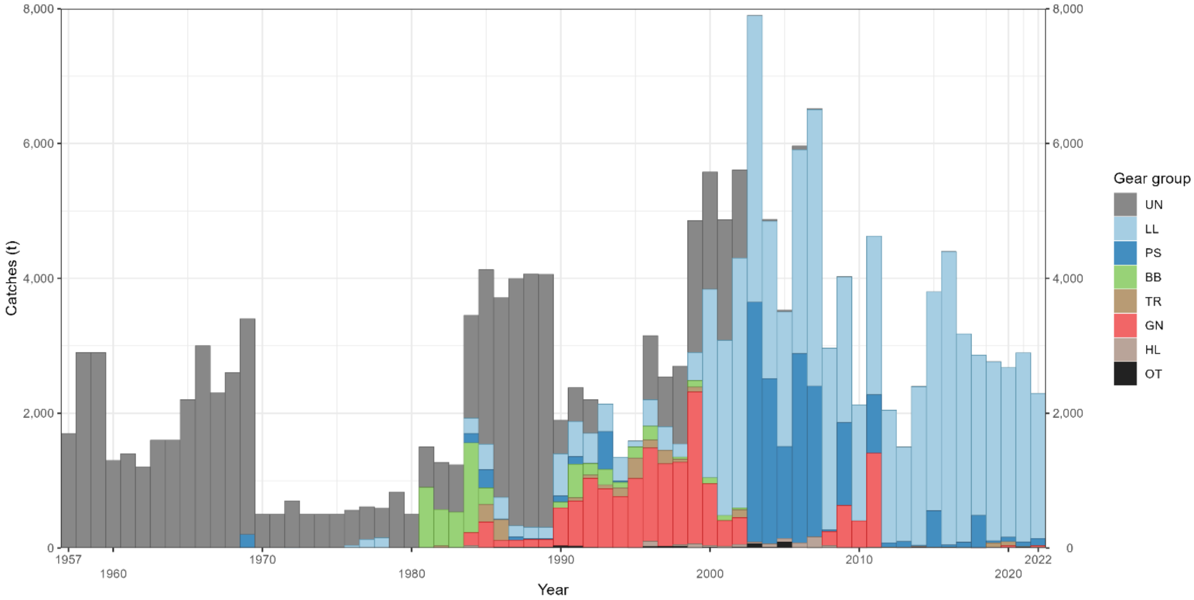


Figure 1. ALB-M cumulative catches (t) by gear and year.

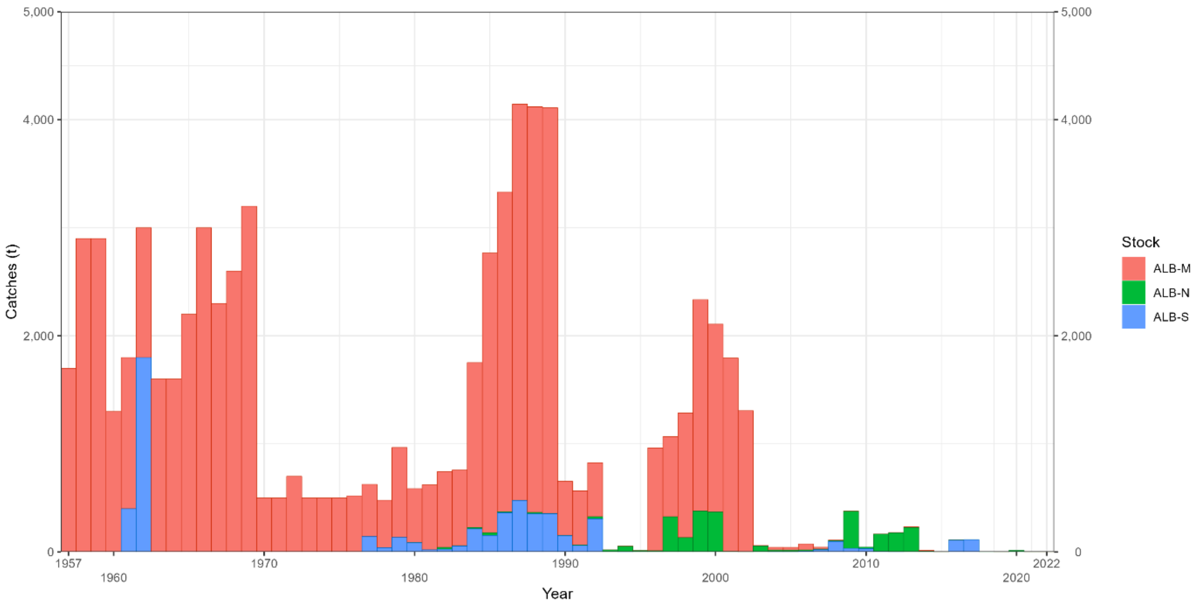


Figure 2. ALB-M cumulative catches (t) of unclassified gears (UNCL) by stock.

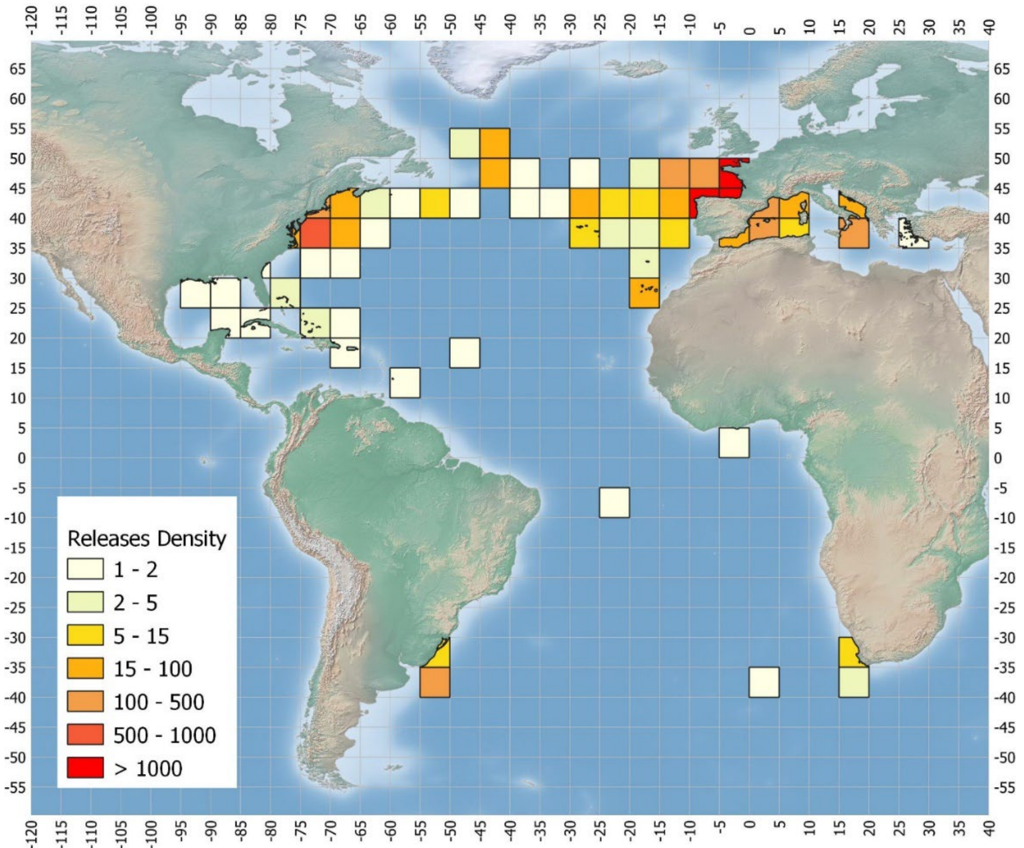


Figure 3. Density of the release positions at 5x5 latitude-longitude grids in ICCAT conventional tagging on albacore.

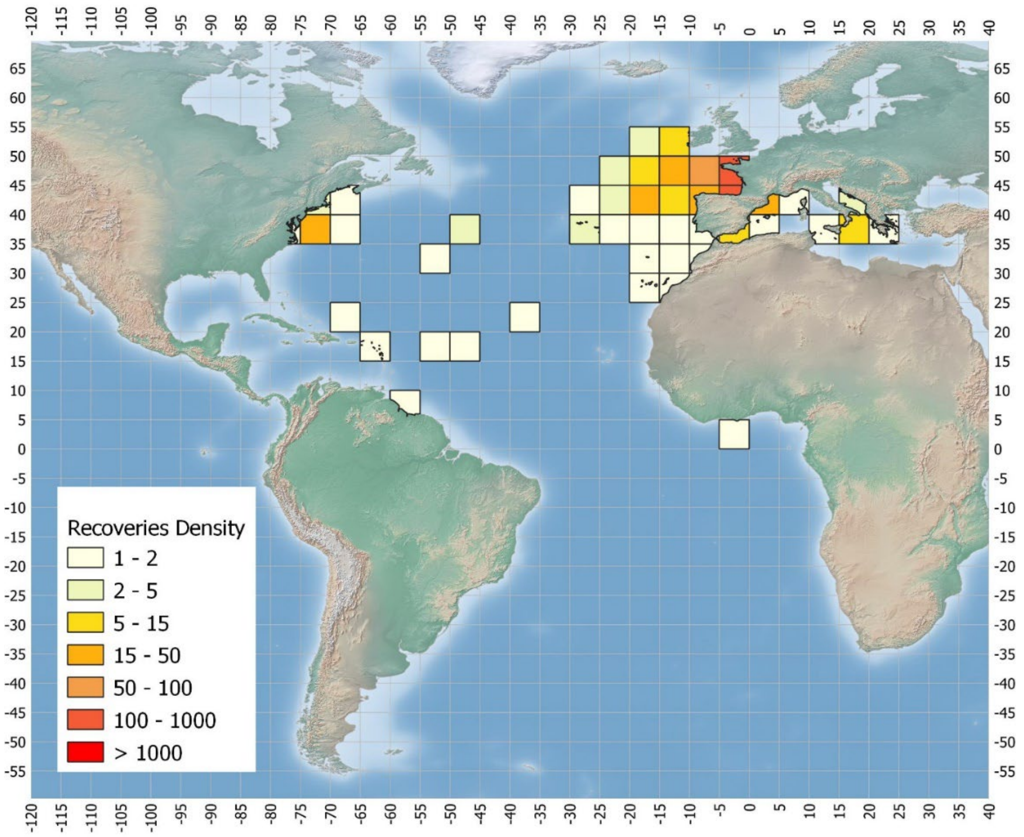


Figure 4. Density of the recovery positions at 5x5 latitude-longitude grids in ICCAT conventional tagging on albacore.

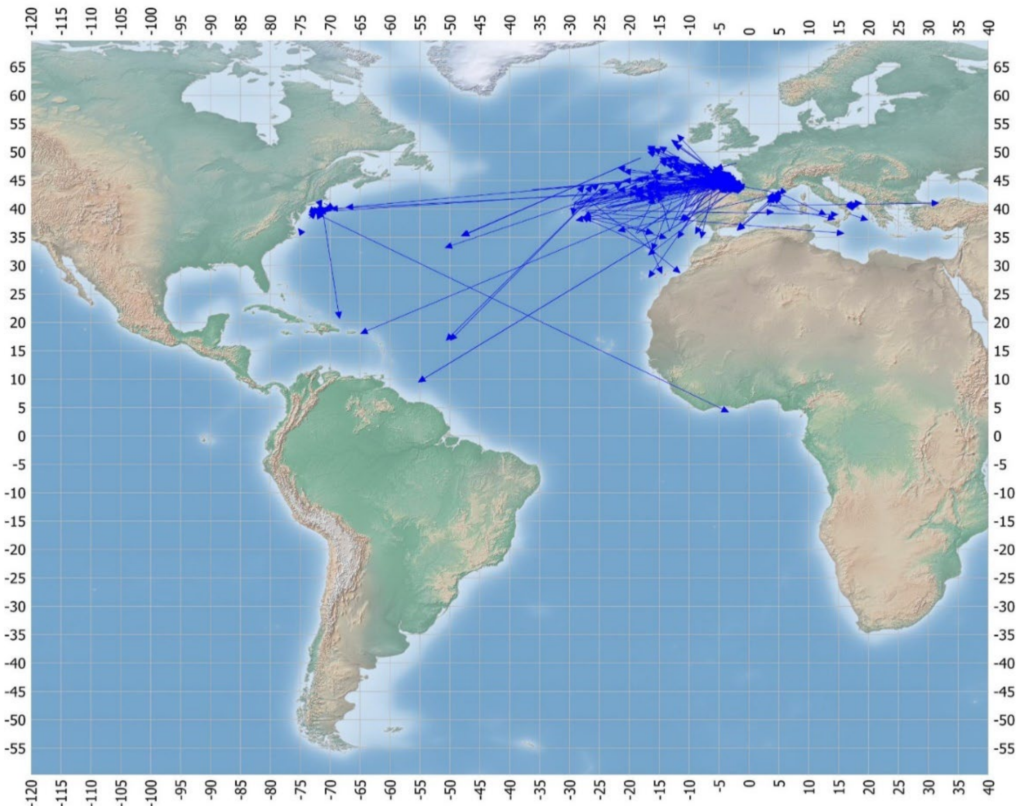


Figure 5. Straight displacement from the release to the recovery position of the recaptured specimens in ICCAT conventional tagging on albacore.

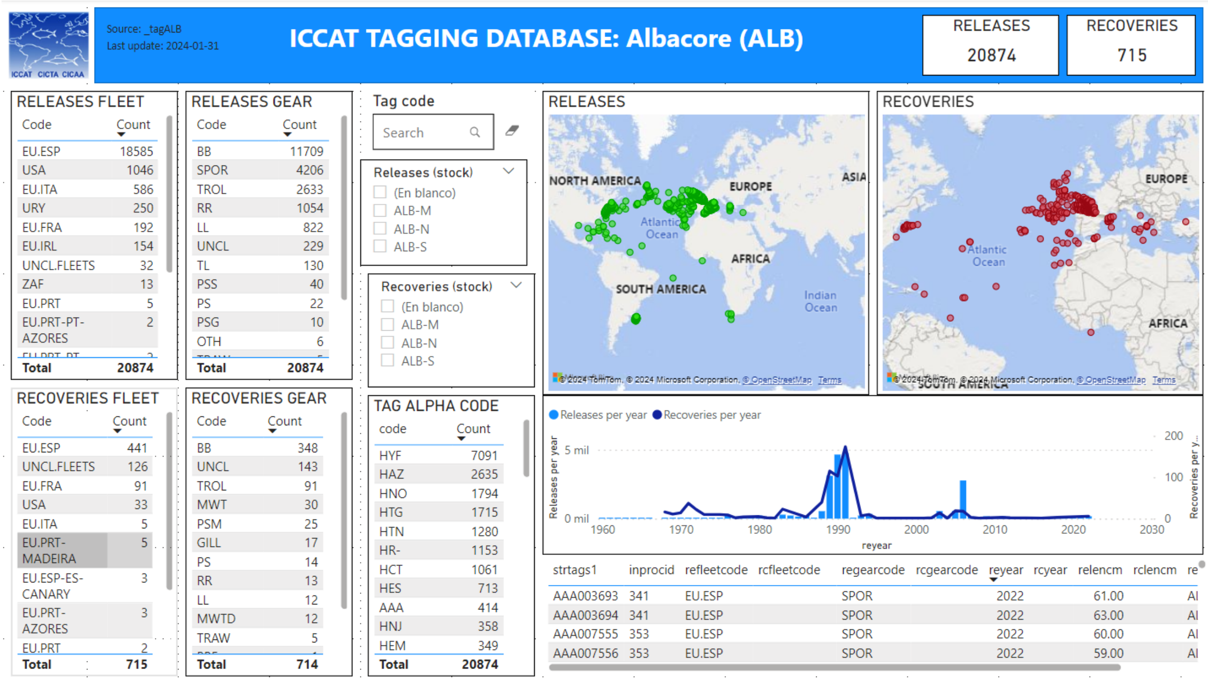


Figure 6. Screenshot of the conventional albacore tagging dashboard.

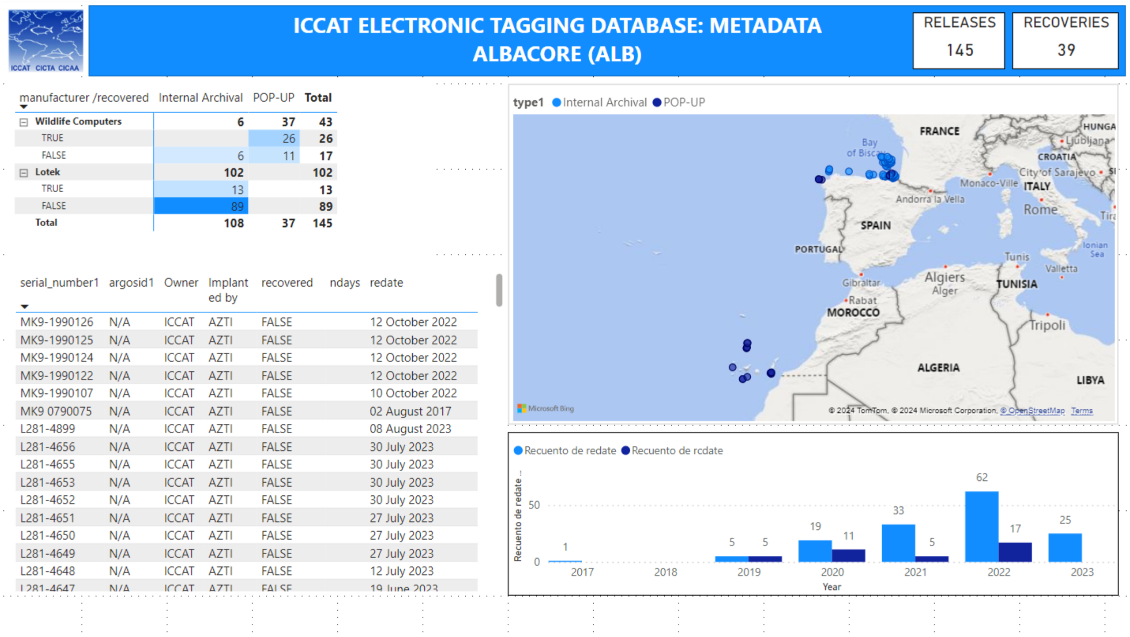


Figure 7. Screenshot of the albacore electronic tagging dashboard.

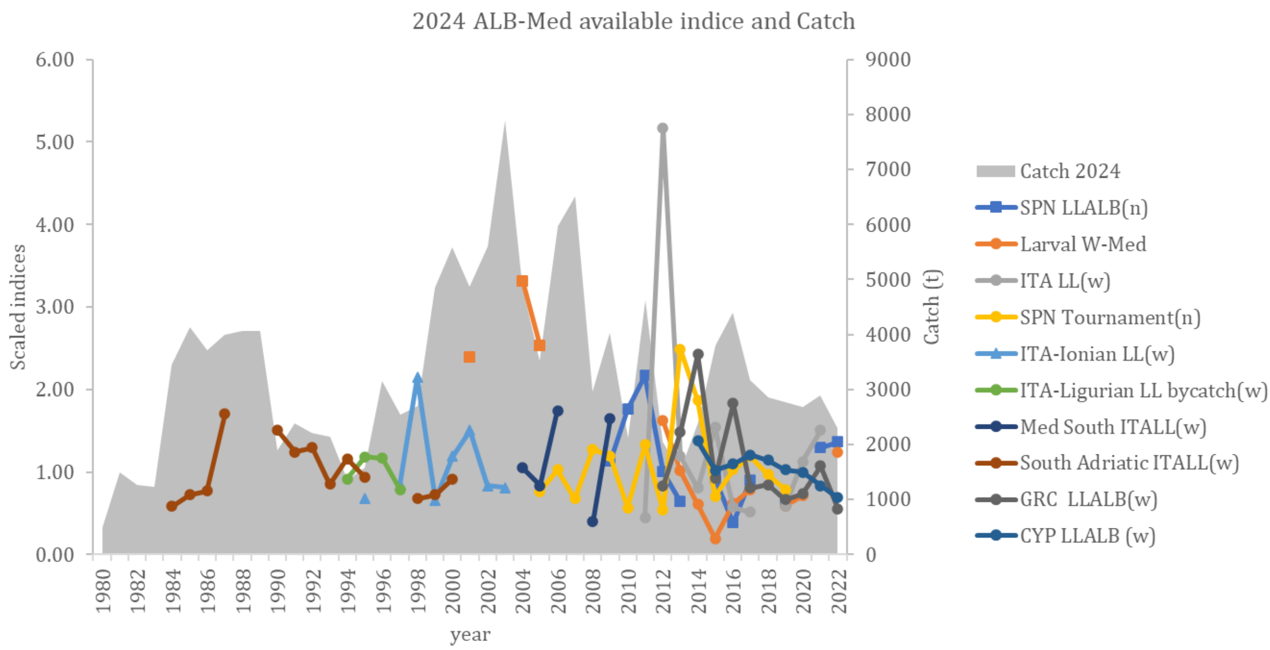


Figure 8. Available Mediterranean albacore abundance indices and catch for the 2024 stock assessment.

S3 **S12**

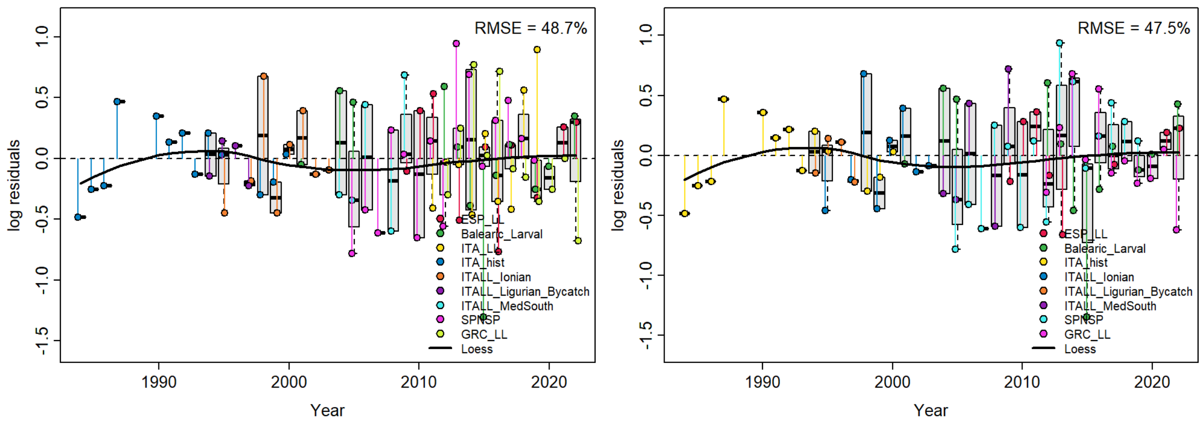


Figure 9. JABBA residual diagnostic plots for Mediterranean albacore scenarios S3 (left) and S12 (right).

S3 **S12**

Figure 10. Runs tests to quantitatively evaluate the randomness of the time series of CPUE residuals for the Mediterranean albacore models (left: S3 and right: S12). Green areas indicate no evidence of lack of randomness of time-series residuals (*p*>0.05) while red panels (not shown here) indicate the opposite. The inner shaded area shows three standard errors from the overall mean and red circles identify a specific year with residuals greater than this threshold value (3- sigma rule).

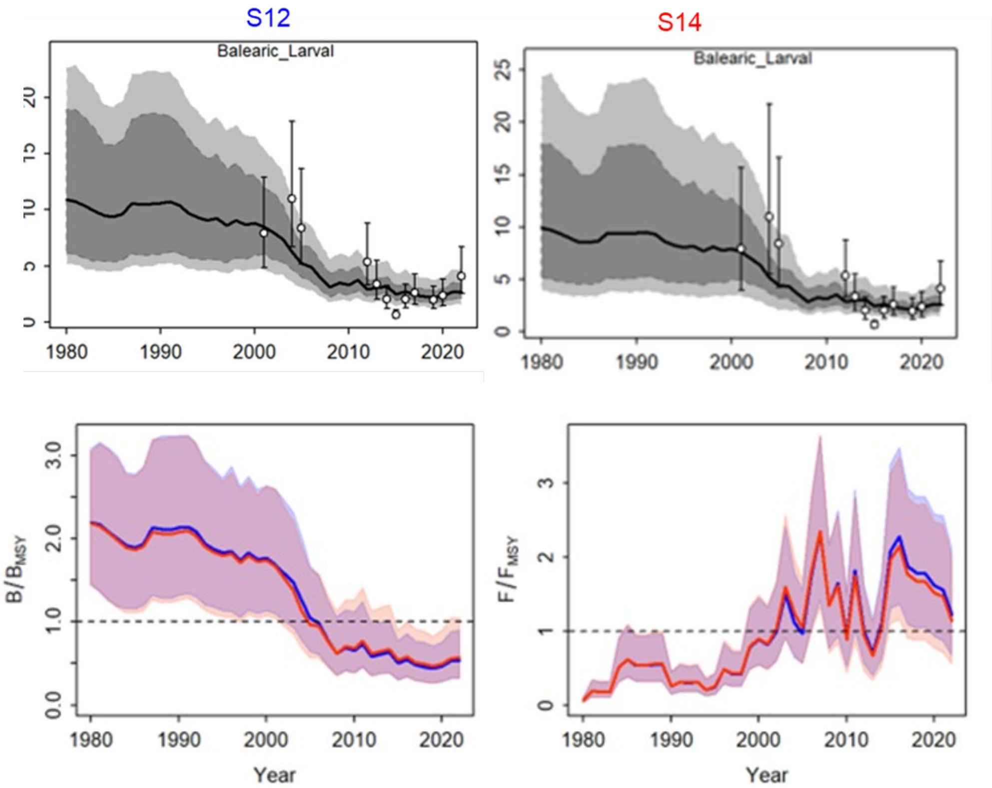
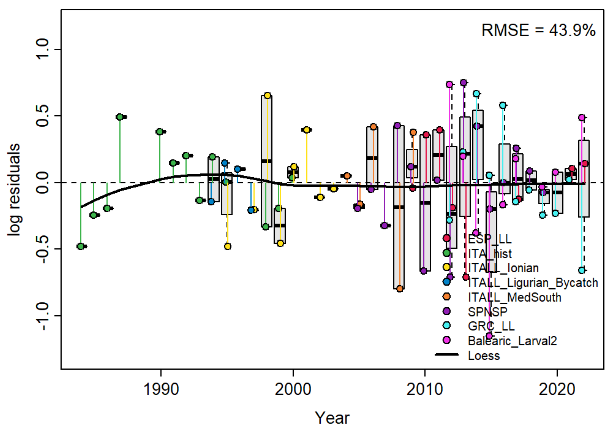


Figure 11. The fitting of Med-W Larval Index in S12 and S14 (upper panels) and the comparisons of B/B_{MSY} and F/F_{MSY} in Mediterranean albacore S12 (blue) and S14 (red) (lower panels).

S15



S16

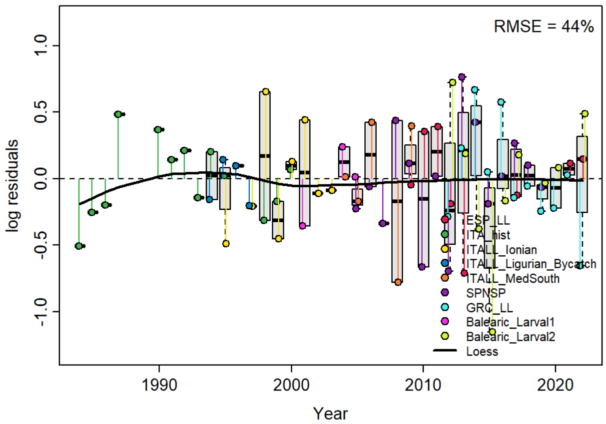


Figure 12. JABBA residual diagnostic plots for Mediterranean albacore scenarios S15 (left) and S16 (right).

S15 **S16**

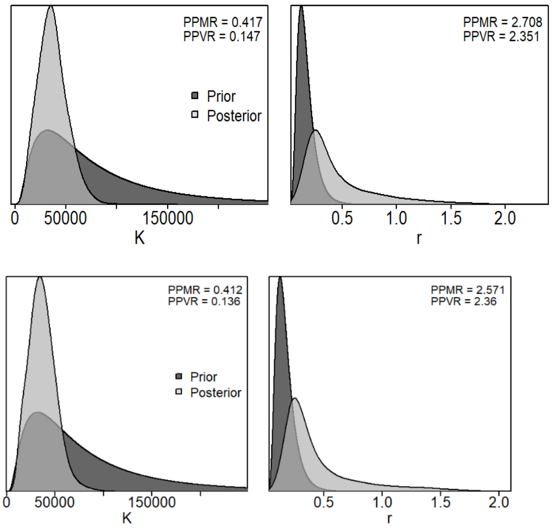
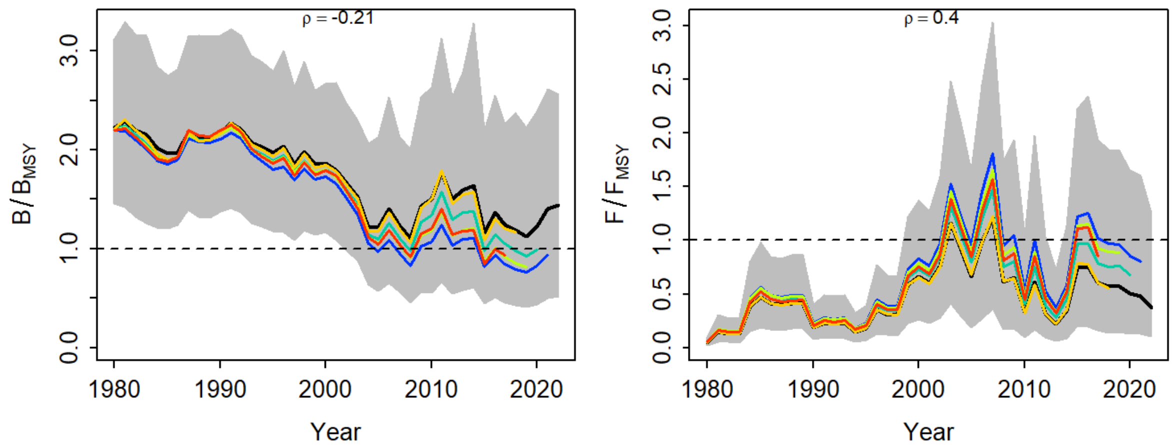


Figure 13. Prior and posterior distributions of K and r in scenarios S15 (left) and S16 (right) for the Bayesian state space surplus production fitted for the Mediterranean albacore stock. PPRM: Posterior to Prior Ratio of Medians; PPRV: Posterior to Prior Ratio of Variances.

S15



S16

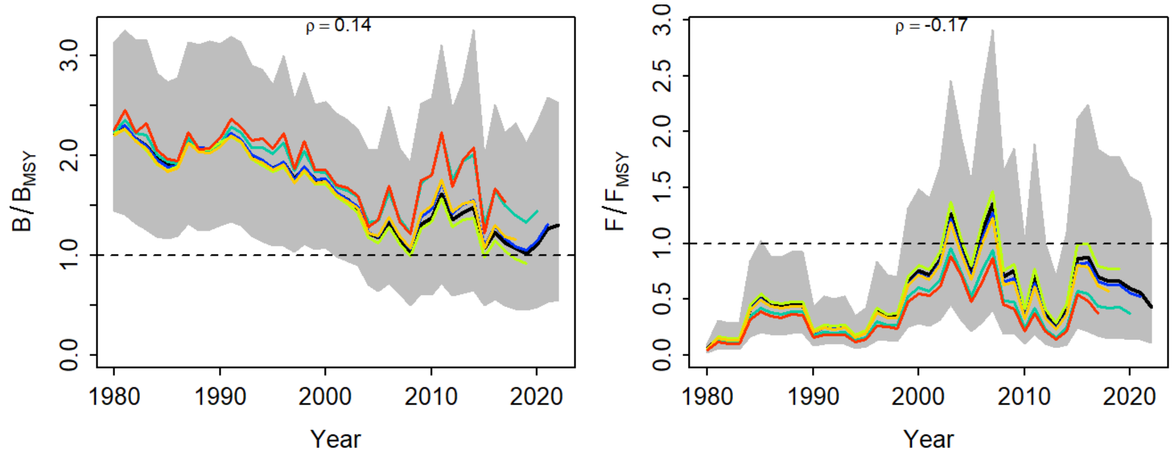


Figure 14. Retrospective analysis by removing one year at a time sequentially (n=5) and predicting the trends in biomass relative to B_{MSY} (B/B_{MSY}) and fishing mortality relative to F_{MSY} (F/F_{MSY}) for scenarios S15 (upper panels) and S16 (lower panels) from the Bayesian state space surplus production model fits to Mediterranean albacore.

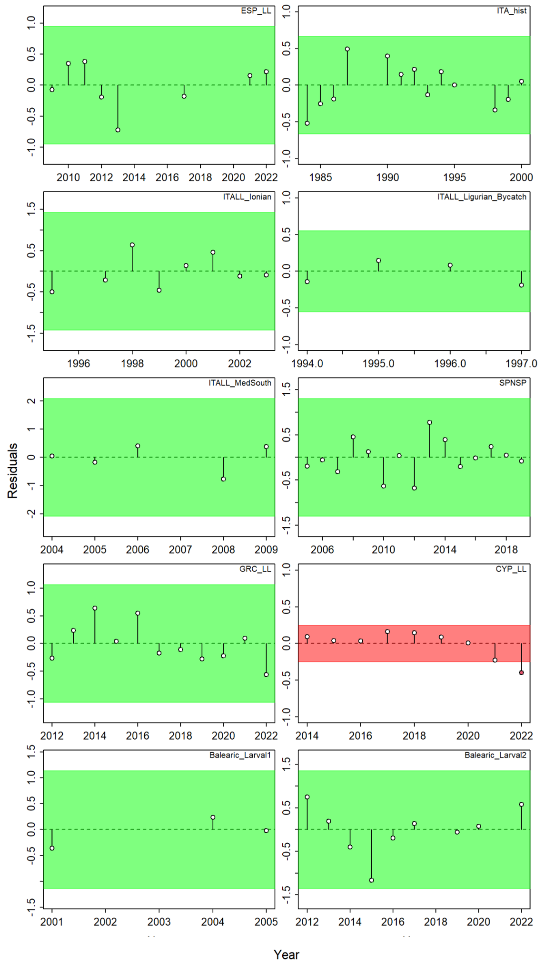


Figure 15. Runs tests to quantitatively evaluate the randomness of the time series of CPUE residuals for the Mediterranean albacore model S17. Green areas indicate no evidence of lack of randomness of time-series residuals (p>0.05) while red panels (not shown here) indicate the opposite. The inner shaded area shows three standard errors from the overall mean and red circles identify a specific year with residuals greater than this threshold value (3- sigma rule).

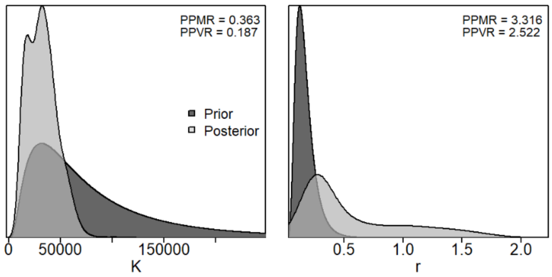
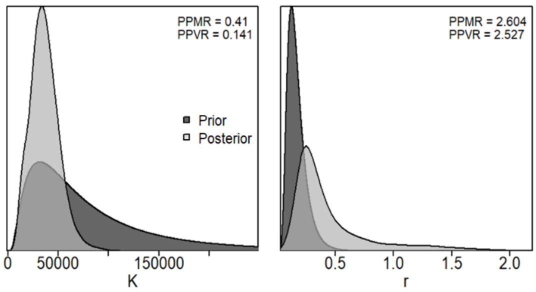
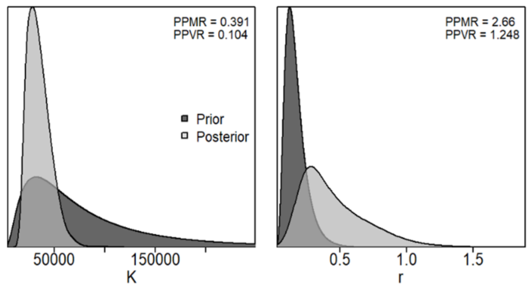


Figure 16. Prior and posterior distributions of K and r in scenario S17 for the Bayesian state space surplus production fitted for the Mediterranean albacore stock. PPRM: Posterior to Prior Ratio of Medians; PPRV: Posterior to Prior Ratio of Variances.

(a) K_bounds = c(1*10000, 10E10)

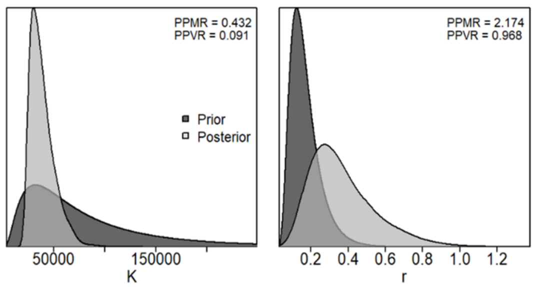
(b) K_bounds = c(2*10000, 10E10)





(c) K_bounds = c(2.5*10000, 10E10)

(d) K_bounds = c(3*10000, 10E10)



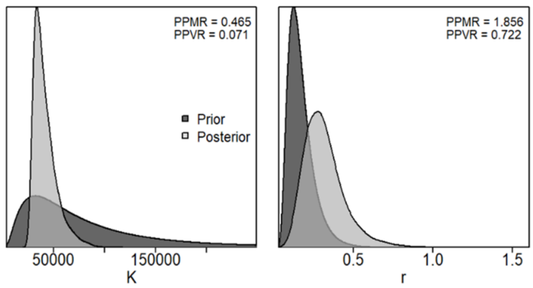


Figure 17. Prior and posterior distributions of K and r in scenario S16 with 4 different options on lower bound of the K bounds (a: 10,000, b: 20,000, c: 25,000, d: 30,000) for the Bayesian state space surplus production fitted for the Mediterranean albacore stock. PPRM: Posterior to Prior Ratio of Medians; PPRV: Posterior to Prior Ratio of Variances.

(a) K.prior = lognormal (μ=max(catch)*4, CV=1)   (b) K.prior = lognormal (μ=max(catch)*4, CV=2)

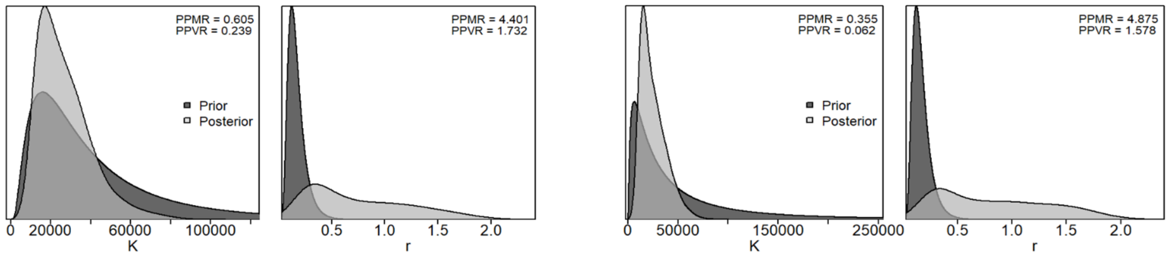
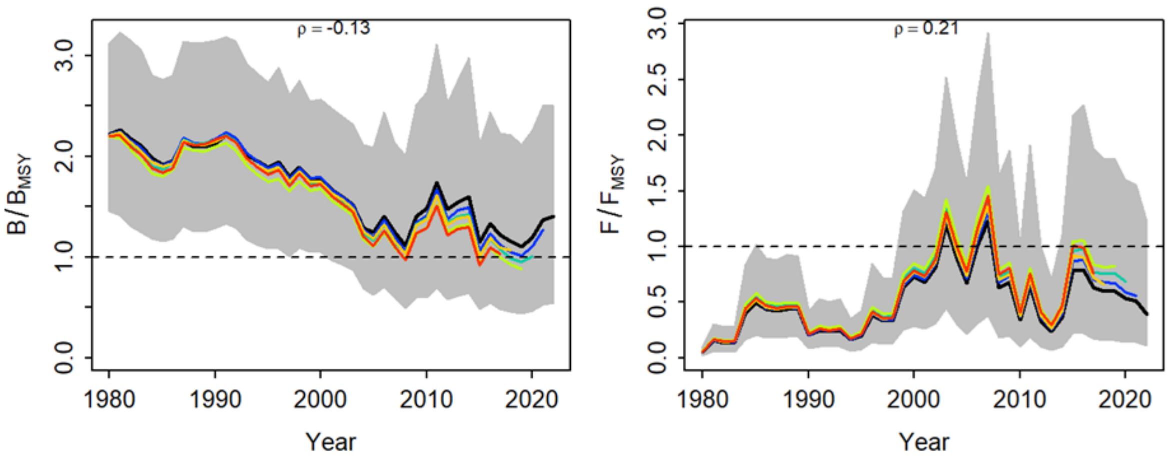


Figure 18. Prior and posterior distributions of K and r in scenario S16 with 2 different options on K prior distribution (a: maximum catch*4 with CV=1, b: maximum catch*4 with CV=2) for the Bayesian state space surplus production fitted for the Mediterranean albacore stock. PPRM: Posterior to Prior Ratio of Medians; PPRV: Posterior to Prior Ratio of Variances.

S18



S19

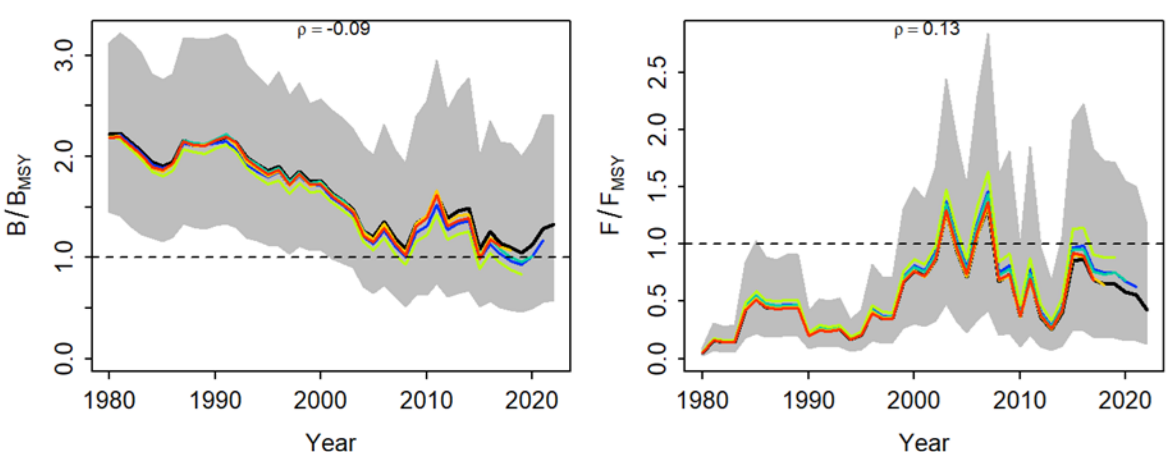


Figure 19. Retrospective analysis by removing one year at a time sequentially (n=5) and predicting the trends in biomass relative to B_{MSY} (B/B_{MSY}) and fishing mortality relative to F_{MSY} (F/F_{MSY}) for scenarios S18 (upper panels) and S19 (lower panels) from the Bayesian state space surplus production model fits to Mediterranean albacore.

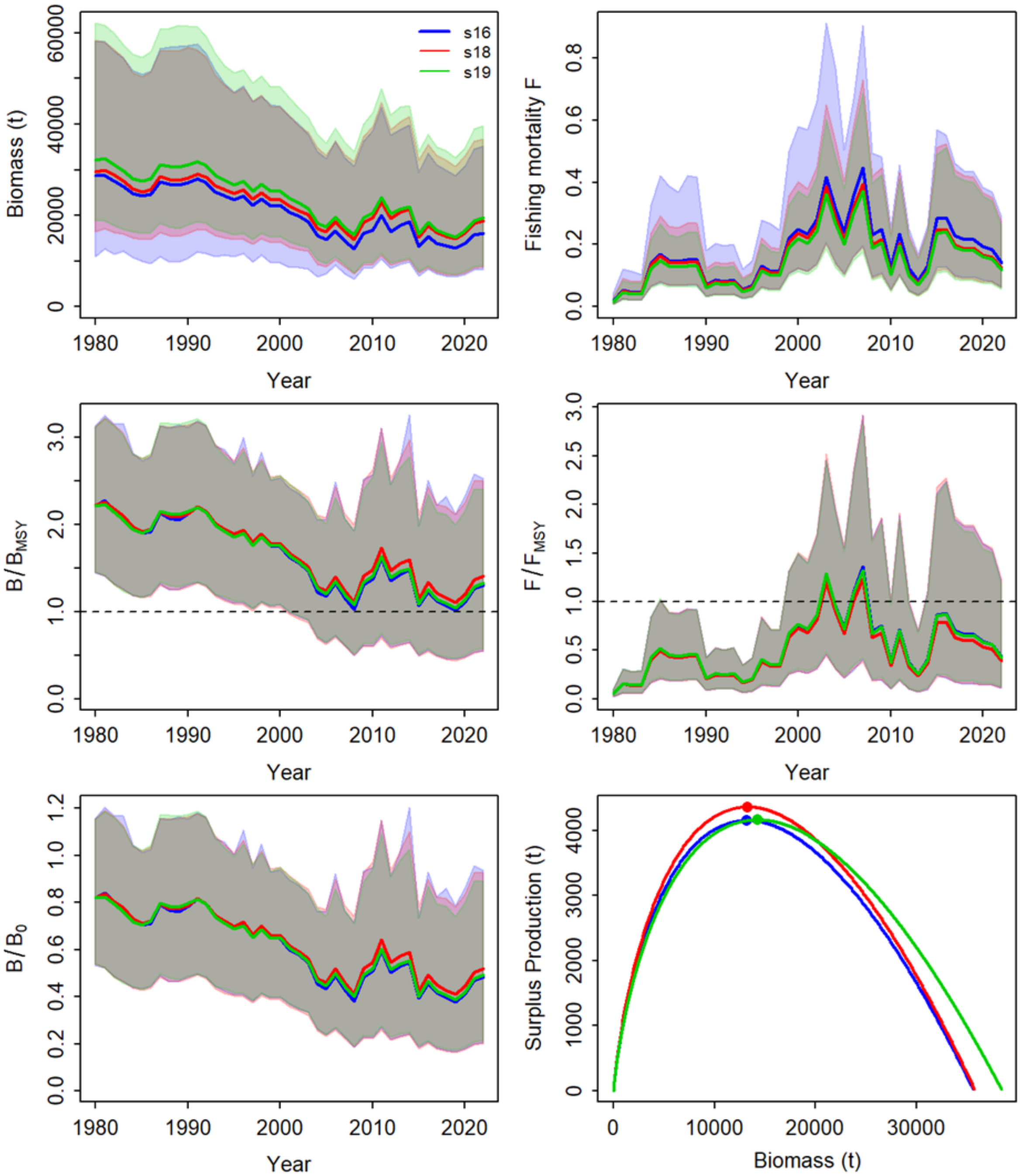


Figure 20. Comparison stock trajectory estimates for the Mediterranean albacore scenarios S16 (blue line), S18 (red line), and S19 (green line), showing trends in biomass and fishing mortality (upper panels), biomass relative to B_{MSY} (B/B_{MSY}) and fishing mortality relative to F_{MSY} (F/F_{MSY}) (middle panels) and biomass relative to K (B/K) and surplus production curve (bottom panels).

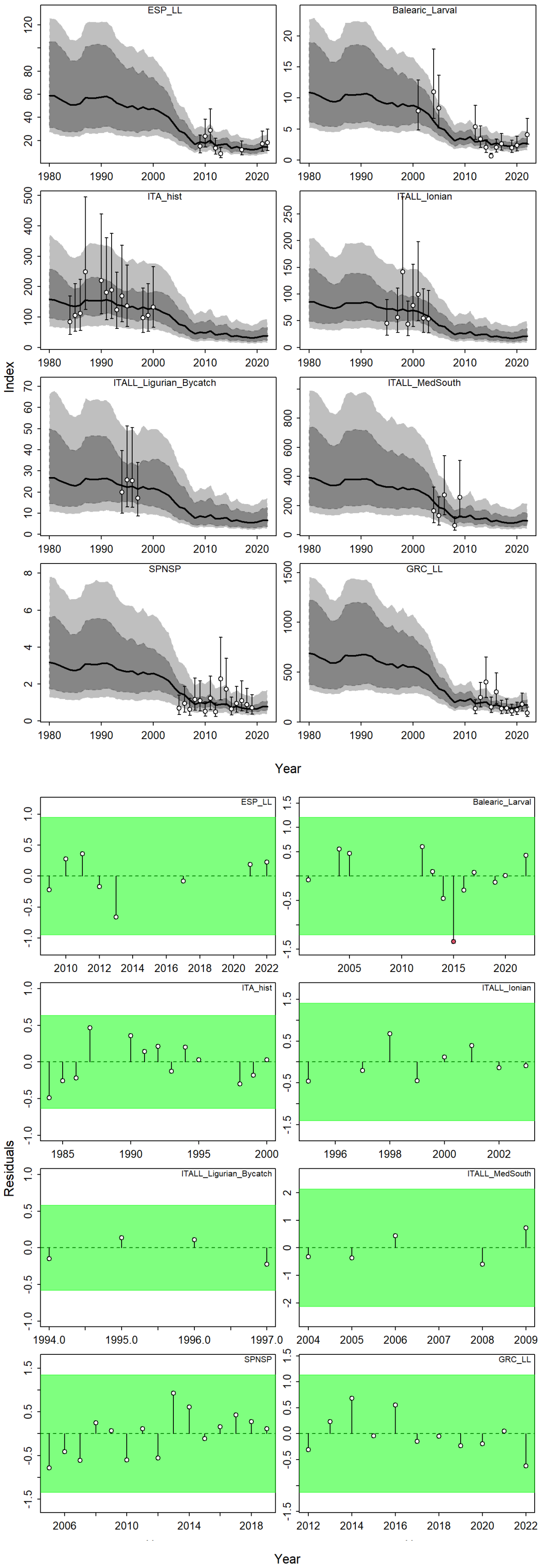


Figure 21. Time-series of observed (circle) with error 95% CIs (error bars) and predicted (solid line) CPUE (left) and Runs tests to quantitatively evaluate the randomness of the time series of index residuals (right) for the Mediterranean albacore scenario S12. On the left panel, the dark-shaded grey areas show 95% credibility intervals of the expected mean CPUE and light-shaded grey areas denote the 95% posterior

predictive distribution intervals. On the right panel, green areas indicate no evidence of lack of randomness of time-series residuals (p>0.05) while red panels (not shown here) indicate the opposite. The inner shaded area shows three standard errors from the overall mean and red circles identify a specific year with residuals greater than this threshold value (3- sigma rule).

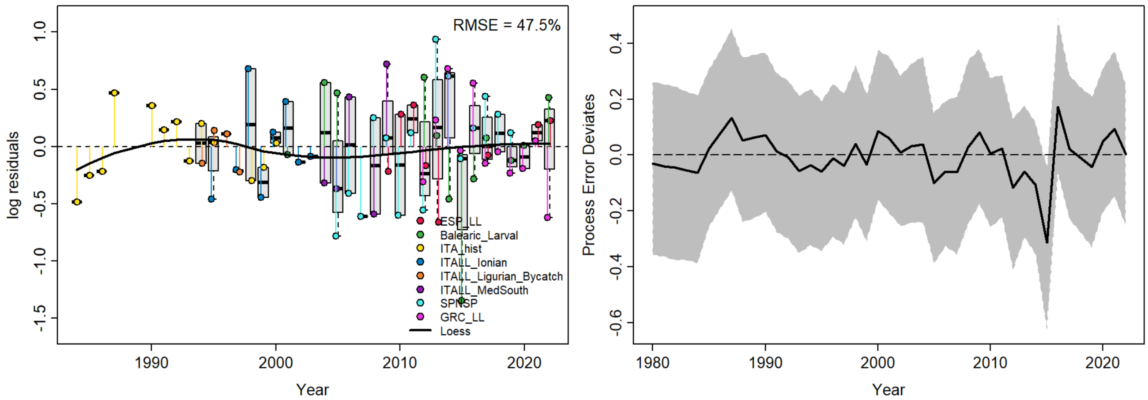


Figure 22. JABBA residual diagnostic plots of relative abundance indices (left panel) and process error deviation (right panel) for the Mediterranean albacore scenario S12. Left panel: Boxplots indicating the median and quantiles of all residuals available for any given year, and solid black lines indicate loess smoother through all residuals. Right panel: Process error deviation (median: solid line) with a shaded grey area indicating 95% credibility intervals.

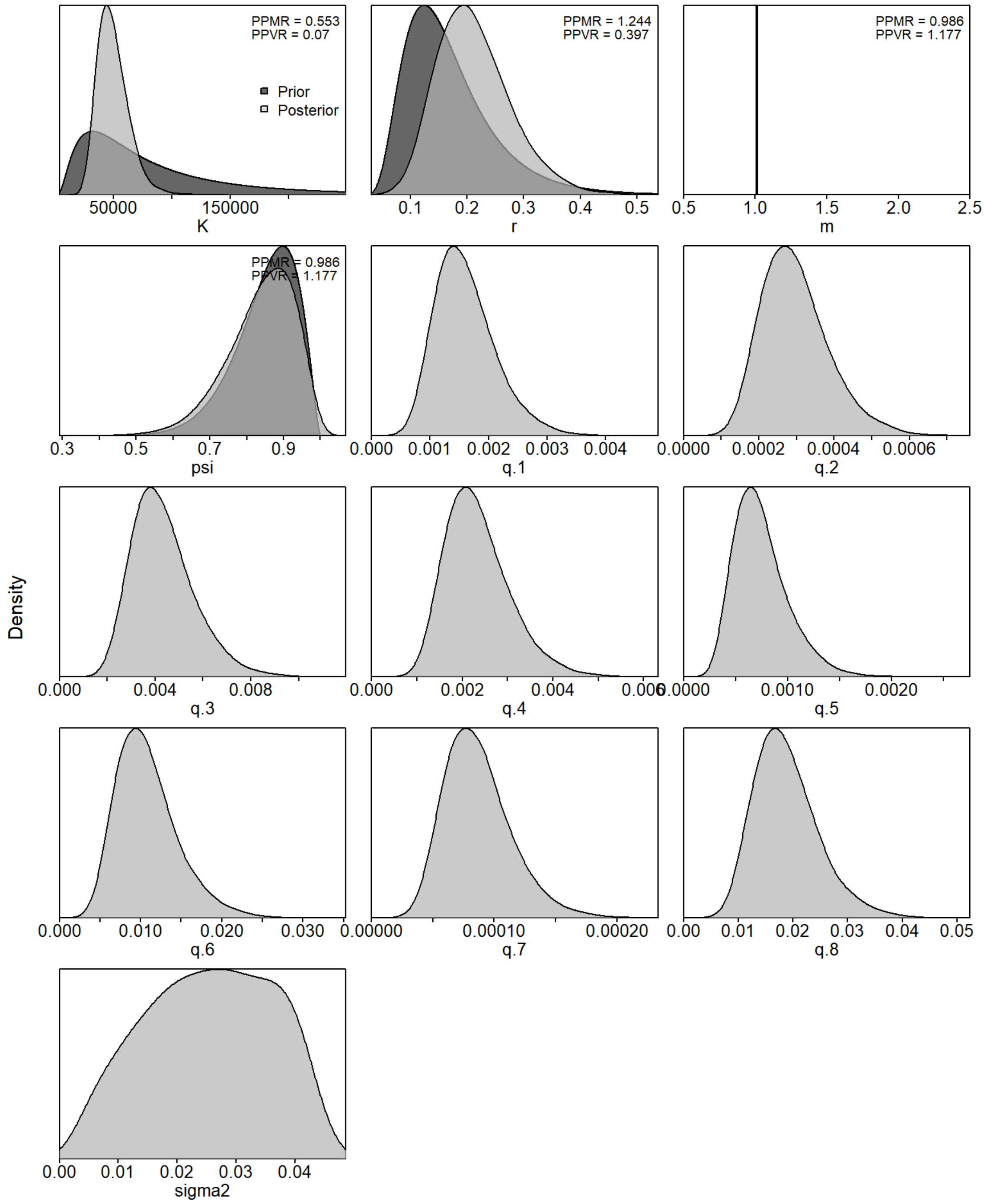


Figure 23. Prior and posterior distributions of various models and management parameters for scenario S12 for Mediterranean albacore. PPRM: Posterior to Prior Ratio of Means; PPRV: Posterior to Prior Ratio of Variances.

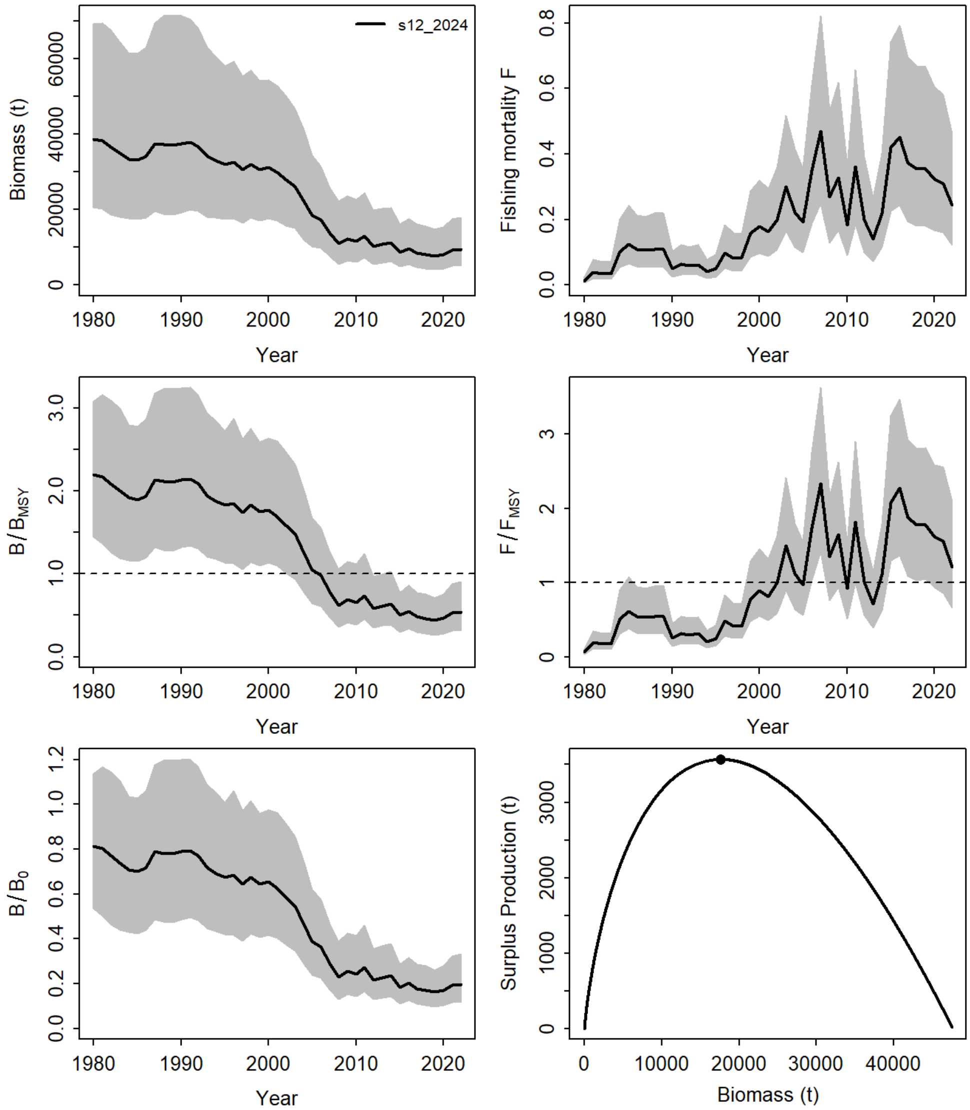


Figure 24. JABBA Mediterranean albacore stock assessment scenario S12 results. Upper panels: estimated biomass and fishing mortality with associated 95% credibility interval; middle panels: biomass relative to B_{MSY} (B/B_{MSY}) and fishing mortality relative to F_{MSY} (F/F_{MSY}); bottom panels: biomass relative to B_0 (B/B_0) and surplus production curve.

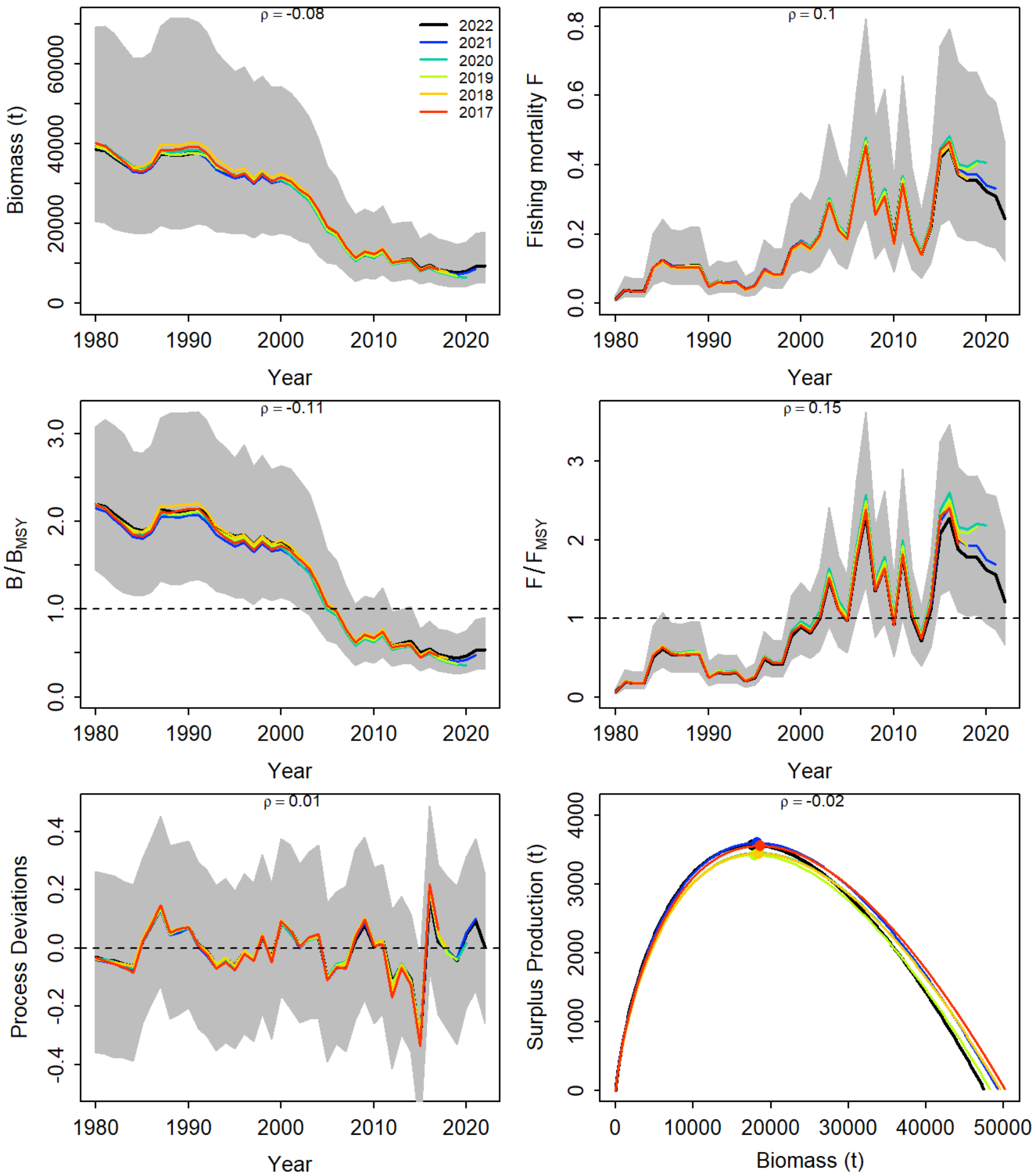


Figure 25. Retrospective analysis performed for the Mediterranean albacore scenario S12, by removing one year at a time sequentially (n=5) and predicting the trends in biomass and fishing mortality (upper panels), biomass relative to B_{MSY} (B/B_{MSY}) and fishing mortality relative to F_{MSY} (F/F_{MSY}) (middle panels) and biomass relative to K (B/K) and surplus production curve (bottom panels) for each scenario from the Bayesian state space surplus production model fits to Mediterranean albacore stock.

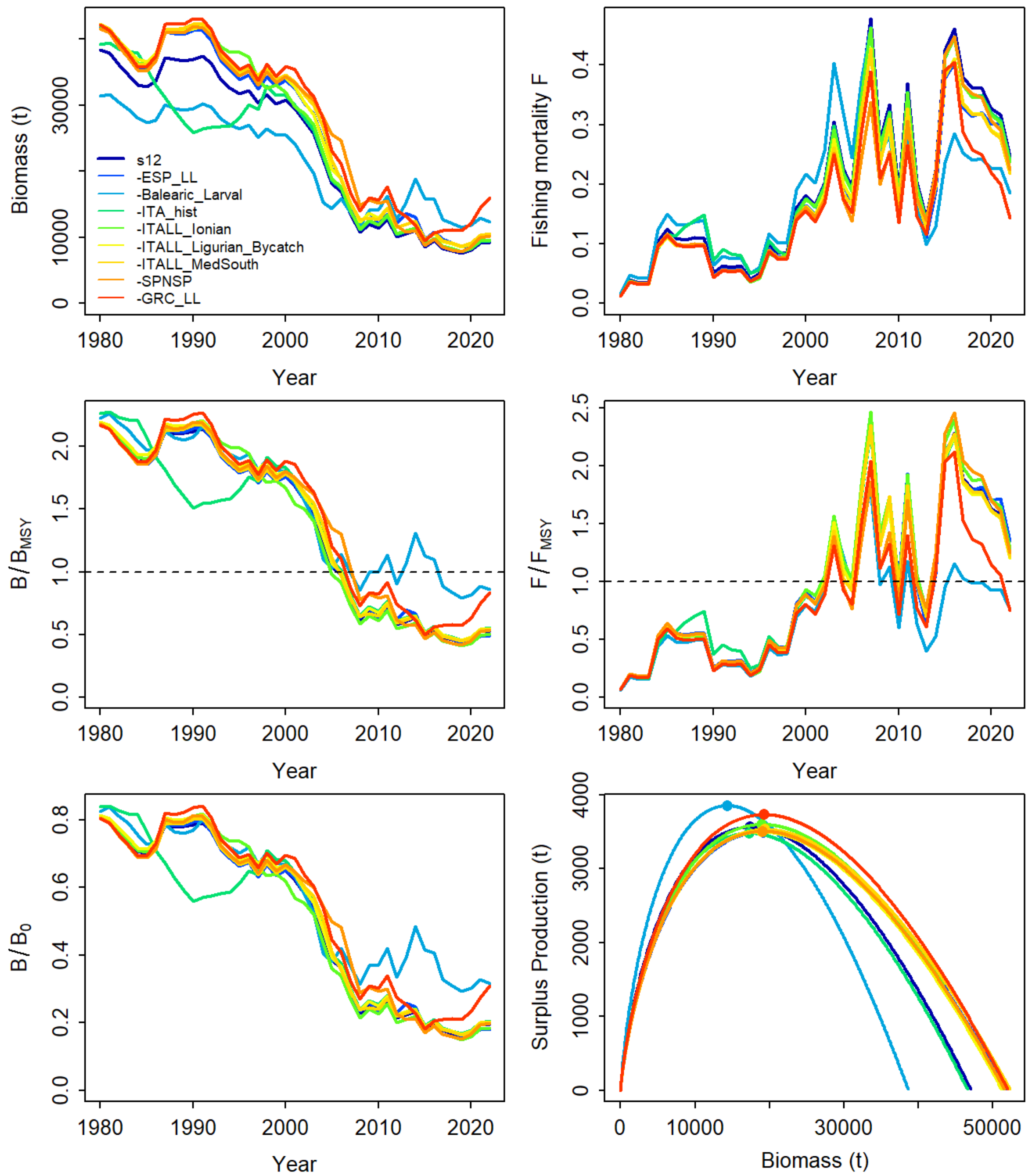


Figure 26. Jackknife index analysis performed on the Mediterranean albacore scenario S12, by removing one index at a time and predicting the trends in biomass and fishing mortality (upper panels), biomass relative to B_{MSY} (B/B_{MSY}) and fishing mortality relative to F_{MSY} (F/F_{MSY}) (middle panels) and biomass relative to K (B/K) and surplus production curve (bottom panels) for each scenario from the Bayesian state space surplus production model fits to Mediterranean albacore stock.

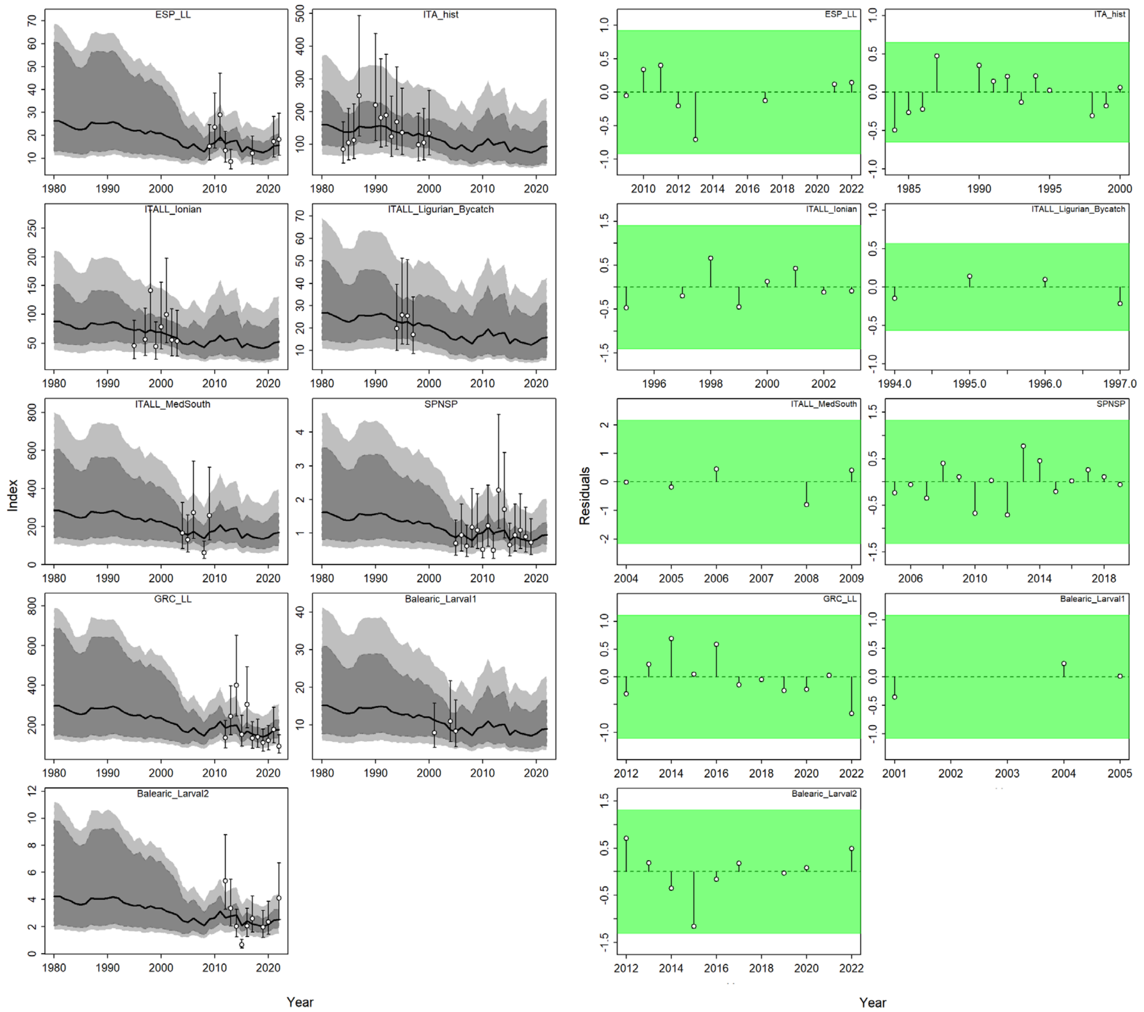


Figure 27. Time-series of observed (circle) with error 95% CIs (error bars) and predicted (solid line) CPUE (left) and Runs tests to quantitatively evaluate the randomness of the time series of index residuals (right) for the Mediterranean albacore scenario S19. On the left panel, the dark shaded grey areas show 95% credibility intervals of the expected mean CPUE and light shaded grey areas denote the 95% posterior predictive distribution intervals. On the right panel, green areas indicate no evidence of lack of randomness of time-series residuals (p>0.05) while red panels (not shown here) indicate the opposite. The inner shaded area shows three standard errors from the overall mean and red circles identify a specific year with residuals greater than this threshold value (3- sigma rule).

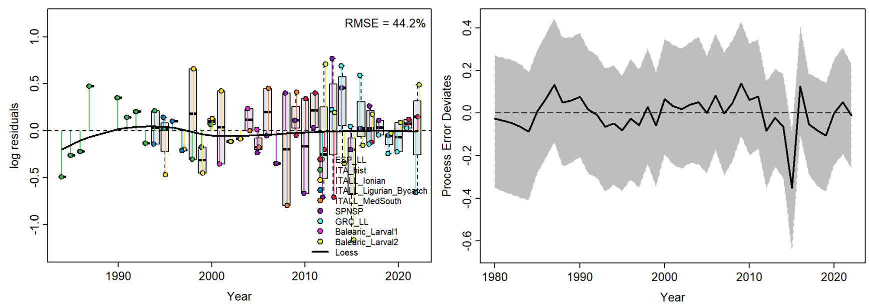


Figure 28. JABBA residual diagnostic plots of relative abundance indices (left panel) and process error deviation (right panel) for the Mediterranean albacore scenario S19. Left panel: Boxplots indicating the median and quantiles of all residuals available for any given year, and solid black lines indicate loess smoother through all residuals. Right panel: Process error deviation (median: solid line) with a shaded grey area indicating 95% credibility intervals.

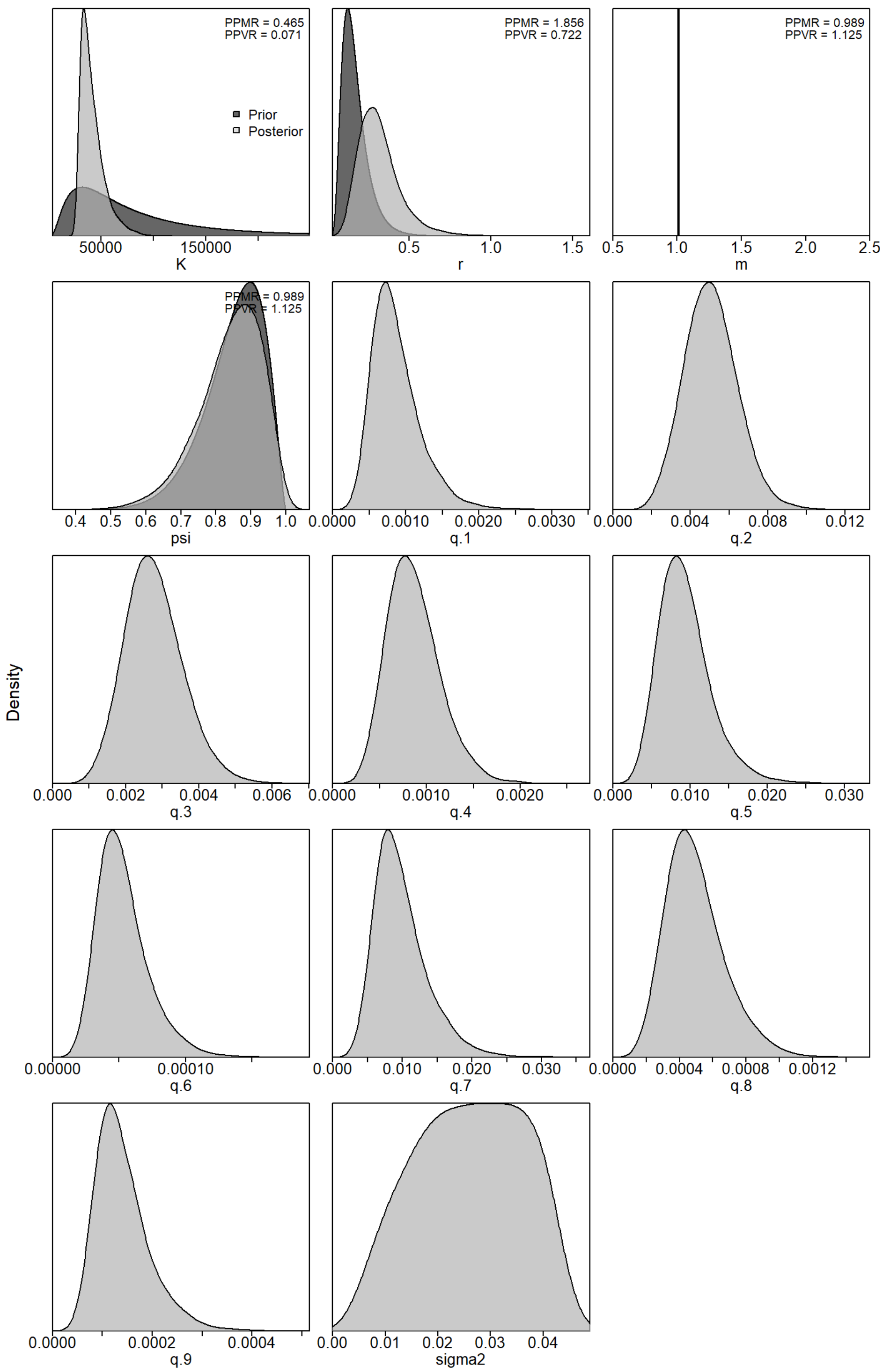


Figure 29. Prior and posterior distributions of various model and management parameters for the scenario S19 for Mediterranean albacore. PPRM: Posterior to Prior Ratio of Means; PPRV: Posterior to Prior Ratio of Variances.

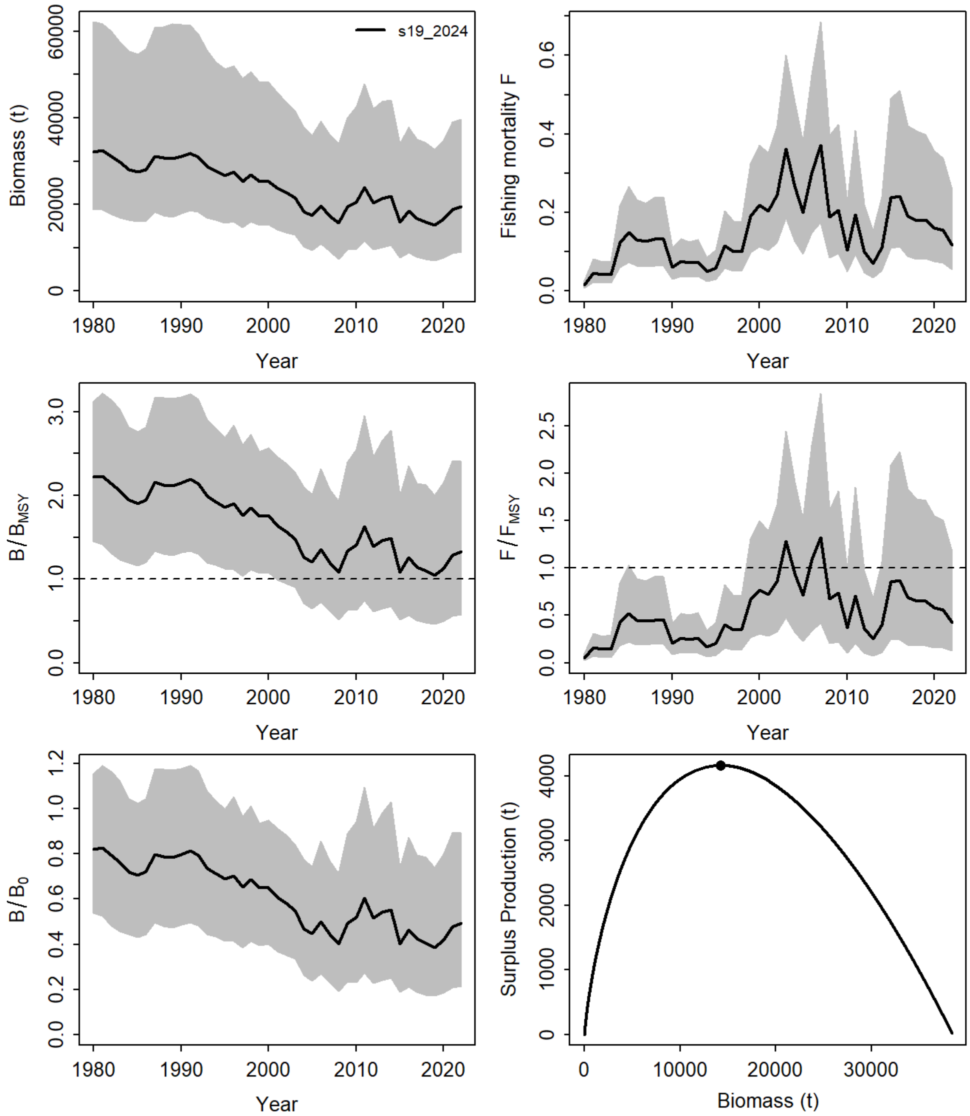


Figure 30. JABBA Mediterranean albacore stock assessment scenario S19 results. Upper panels: estimated biomass and fishing mortality with associated 95% credibility interval; middle panels: biomass relative to B_{MSY} (B/B_{MSY}) and fishing mortality relative to F_{MSY} (F/F_{MSY}); bottom panels: biomass relative to B_0 (B/B_0) and surplus production curve.

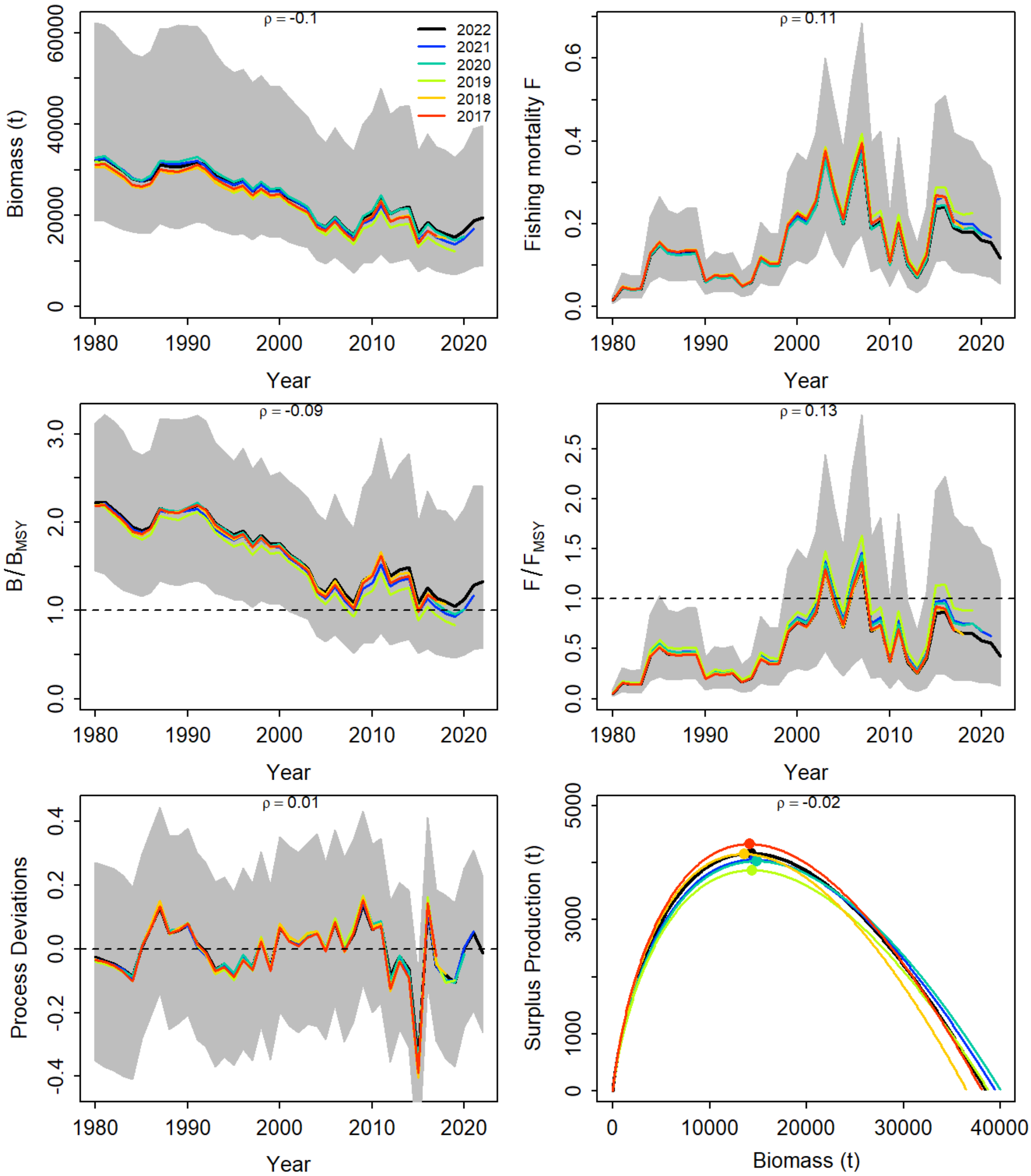


Figure 31. Retrospective analysis performed for the Mediterranean Albacore scenario S19, by removing one year at a time sequentially (n=5) and predicting the trends in biomass and fishing mortality (upper panels), biomass relative to B_{MSY} (B/B_{MSY}) and fishing mortality relative to F_{MSY} (F/F_{MSY}) (middle panels) and biomass relative to K (B/K) and surplus production curve (bottom panels) for each scenario from the Bayesian state space surplus production model fits to Mediterranean albacore stock.

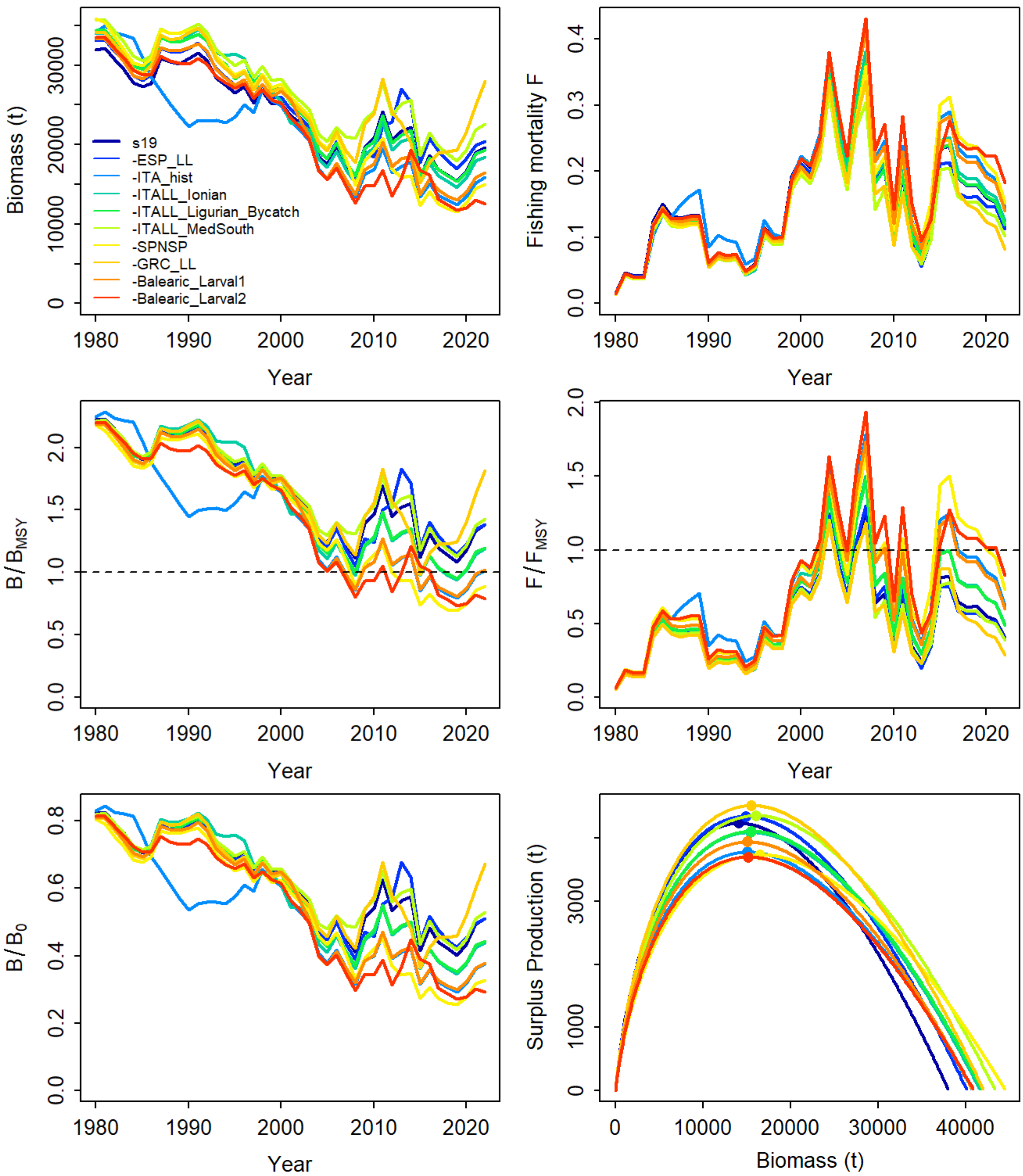


Figure 32. Jackknife index analysis performed on the Mediterranean albacore scenario S19, by removing one index at a time and predicting the trends in biomass and fishing mortality (upper panels), biomass relative to B_{MSY} (B/B_{MSY}) and fishing mortality relative to F_{MSY} (F/F_{MSY}) (middle panels) and biomass relative to K (B/K) and surplus production curve (bottom panels) for each scenario from the Bayesian state space surplus production model fits to the Mediterranean albacore stock.

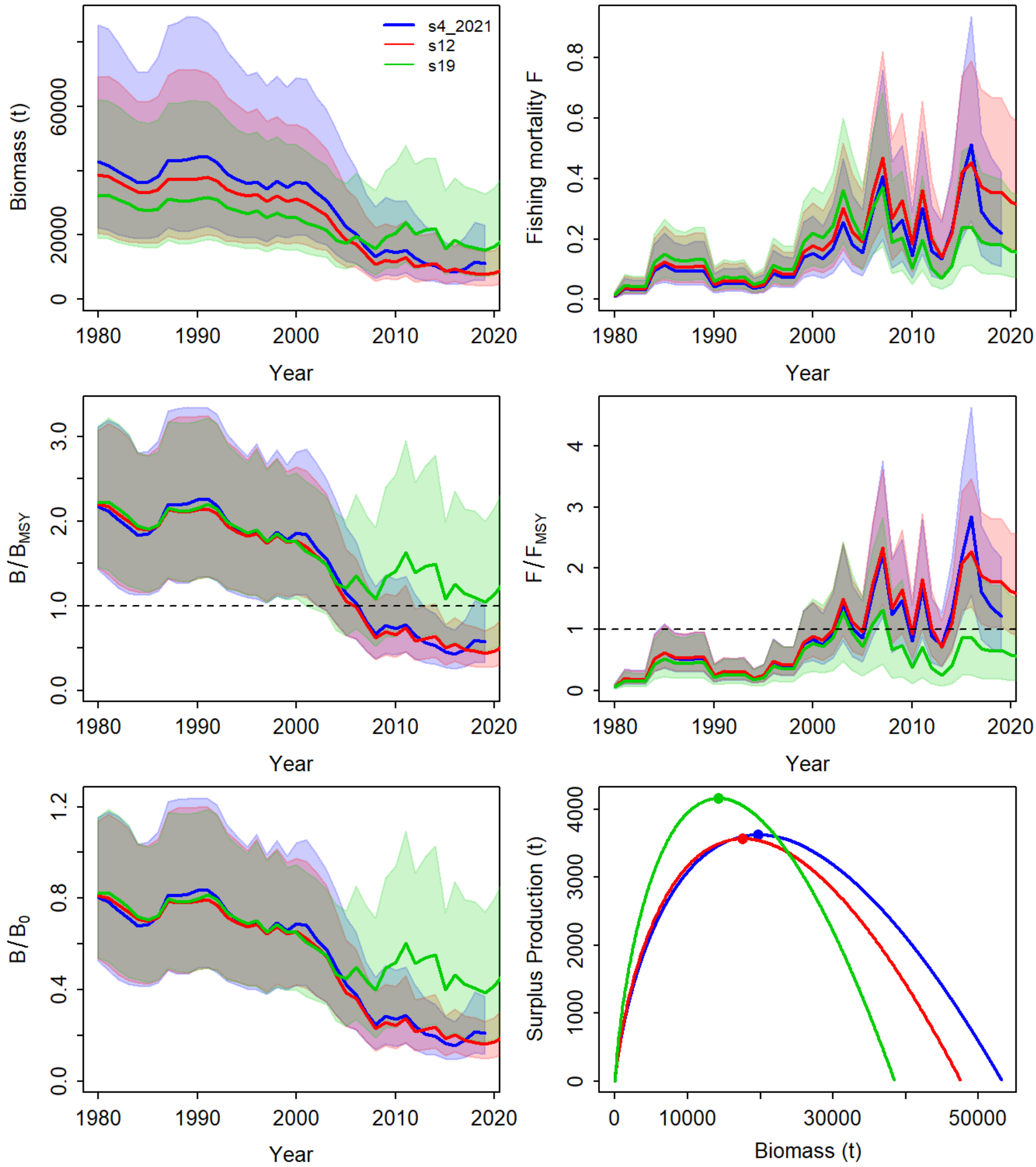


Figure 33. Comparison stock trajectory estimates for the Mediterranean albacore scenarios S12 (red line) and S19 (green line) with the 2021 final model (blue line, Anon., 2021a), showing trends in biomass and fishing mortality (upper panels), biomass relative to B_{MSY} (B/B_{MSY}) and fishing mortality relative to F_{MSY} (F/F_{MSY}) (middle panels) and biomass relative to K (B/K) and surplus production curve (bottom panels).

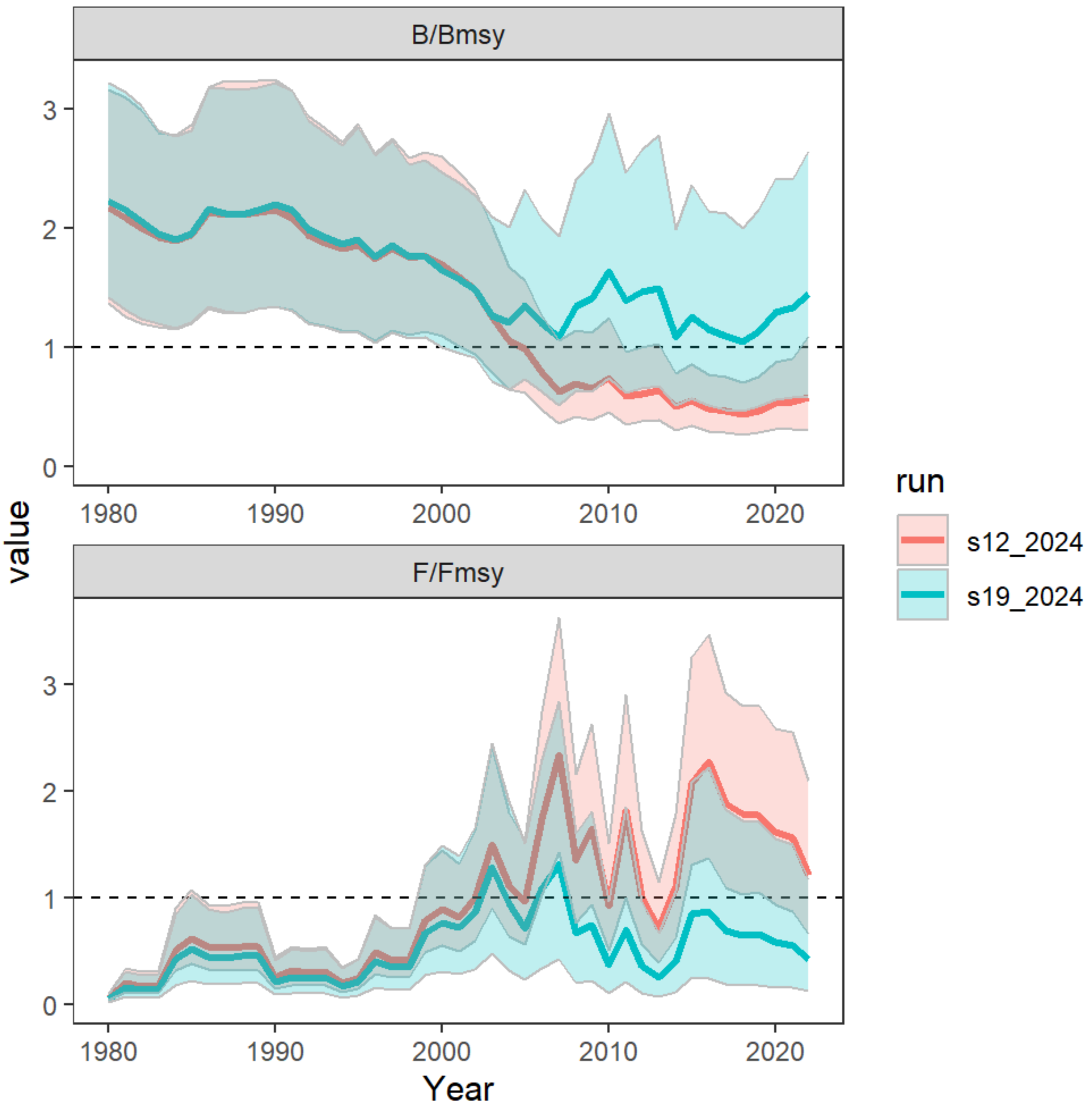


Figure 34. Stock status trajectories of B/B_{MSY} and F/F_{MSY} over time (1980-2022) for S12 (red line) and S19 (green line) with 95% credibility intervals for Mediterranean albacore stock.

S12 **S19**

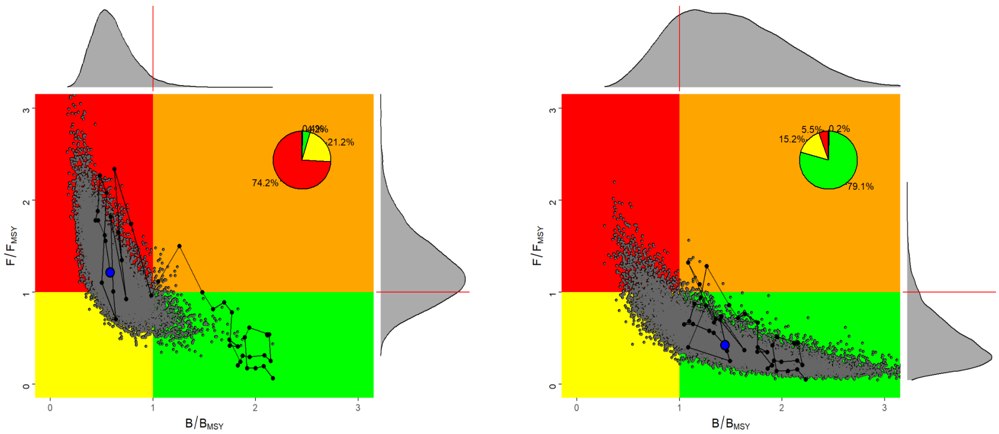


Figure 35. Kobe plot with Mediterranean albacore stock status trajectories of B/BMSY and F/FMSY over time (1980-2019) with uncertainty around the current estimate for S12 (left figure) and S19 (right figure), as well as the probability of being overfished and overfishing (red), of being neither overfished nor overfishing (green), of being overfished but not overfishing (yellow) and of overfishing but not overfished (orange).

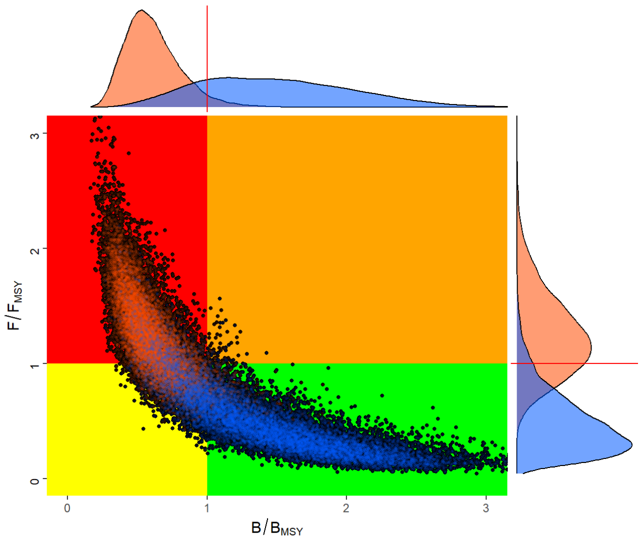


Figure 36. Kobe plot overlaid S12 (orange) and S19 (blue).

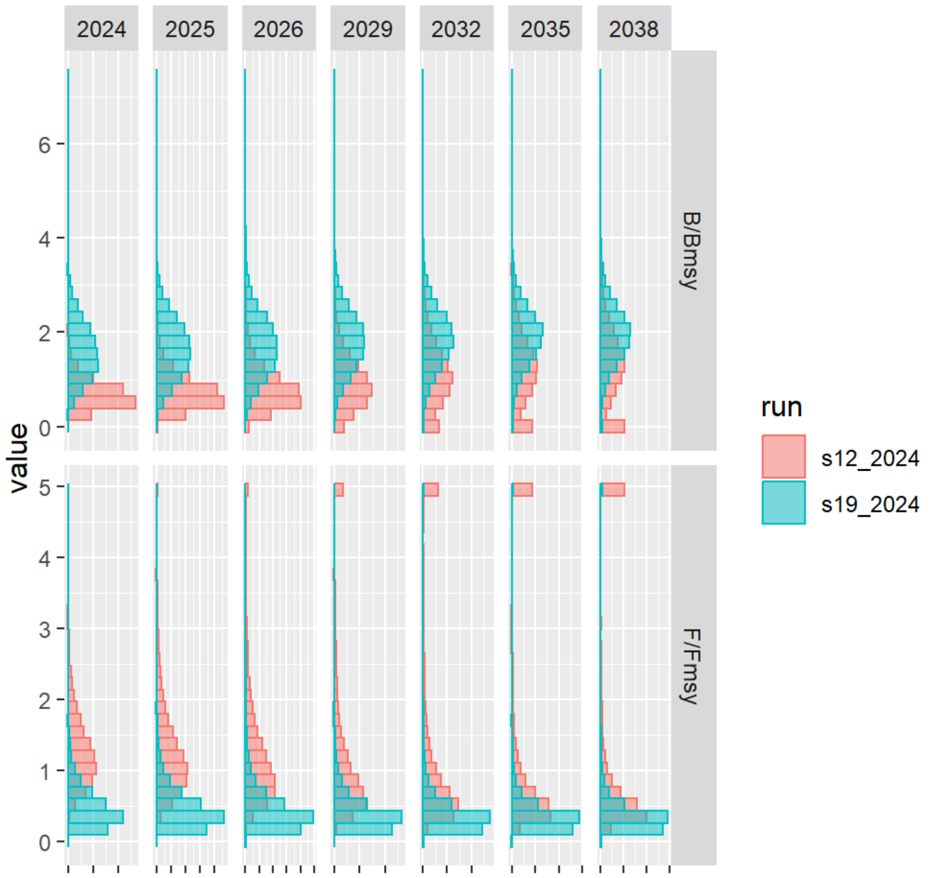


Figure 37. Histogram of B/B_{MSY} and F/F_{MSY} with 2500t constant catch scenario by year (2024, 2025, 2026, 2029, 2032, 2035, and 2038) and stock assessment scenario (S12 and S19) for Mediterranean albacore stock.

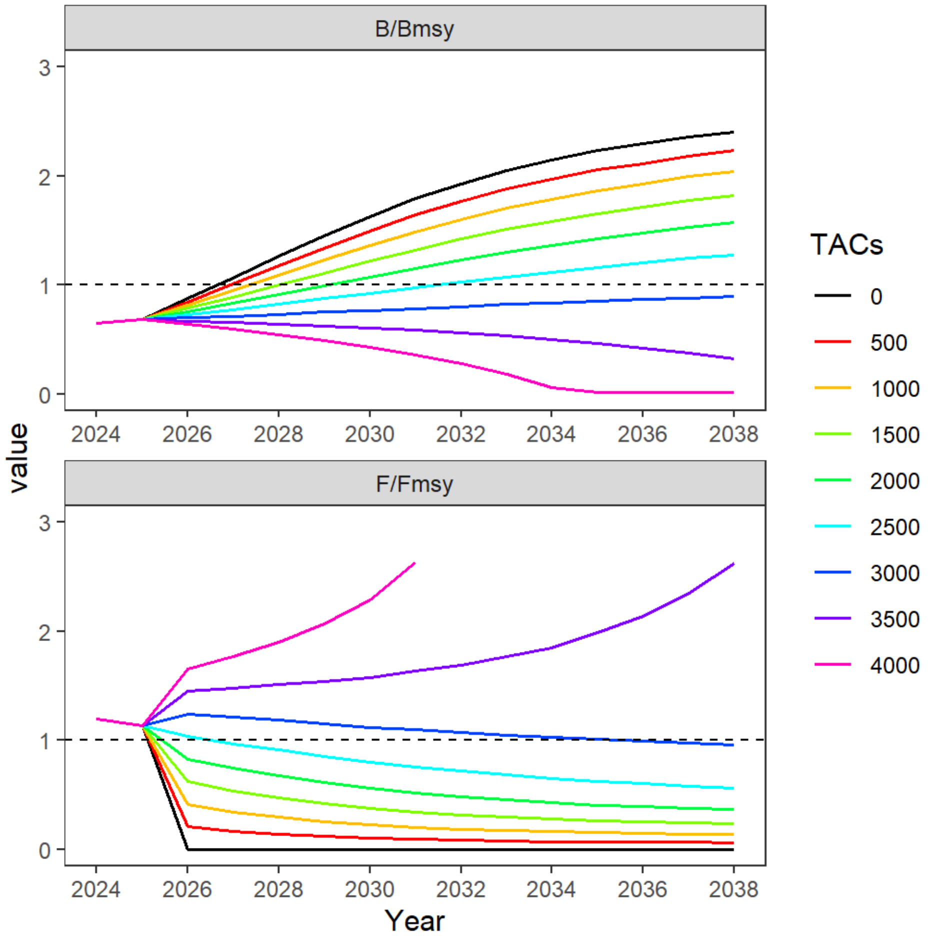


Figure 38. Trends of projected relative stock biomass (upper panel, B/BMSY) and fishing mortality (bottom panel, F/FMSY) for Mediterranean albacore under different fixed catch scenarios of 0–4,000 t based upon the projections of the Bayesian surplus production model S12. Each line represents the median of 15,000 MCMC iterations by the projected year.

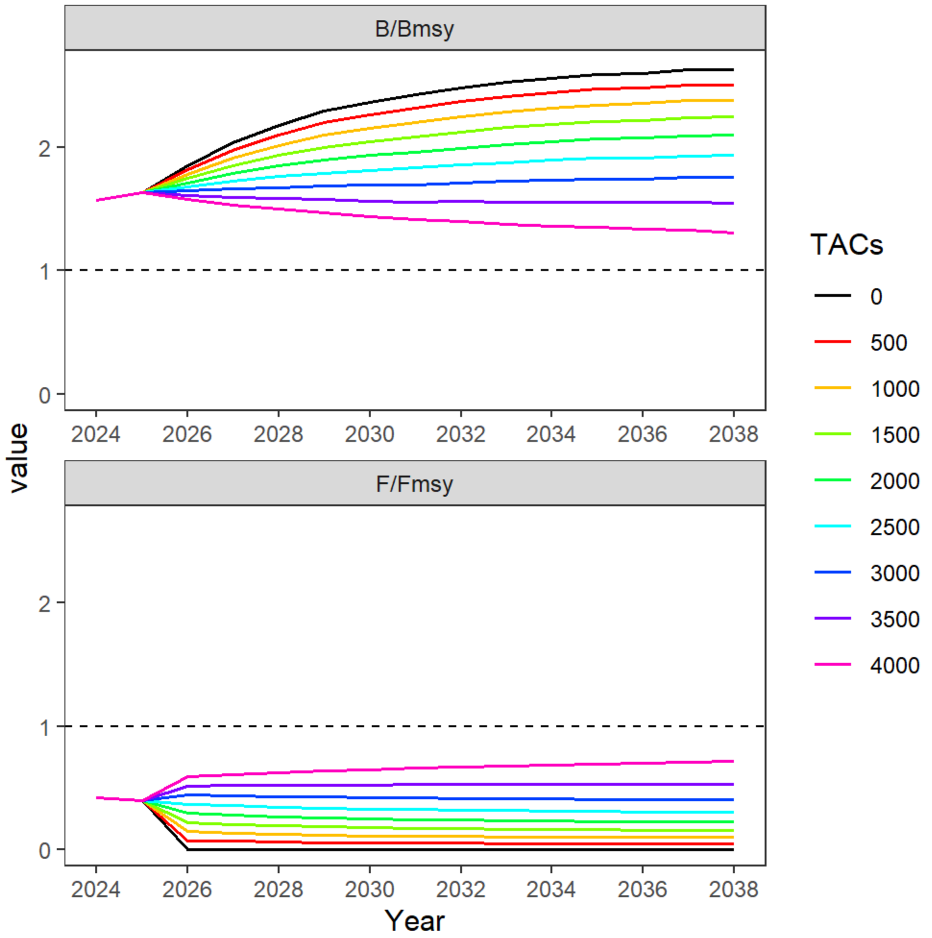


Figure 39. Trends of projected relative stock biomass (upper panel, B/B_{MSY}) and fishing mortality (bottom panel, F/F_{MSY}) for Mediterranean albacore under different fixed catch scenarios of 0–4,000 t based upon the projections of the Bayesian surplus production model S19. Each line represents the median of 15,000 MCMC iterations by the projected year.

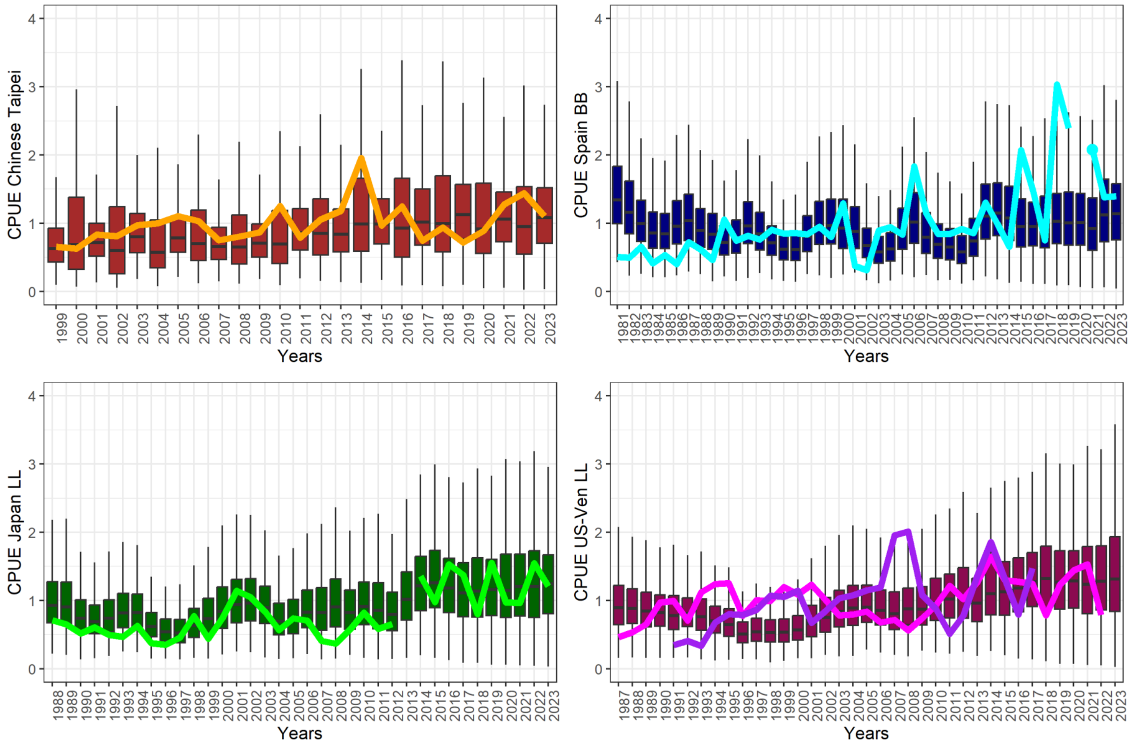


Figure 40. Updated northern albacore CPUE series (solid lines) and CPUE simulated in the MSE for the same periods.

Appendix 1

Agenda

1. Opening, adoption of the agenda, and meeting arrangements

2. Review of fisheries statistics

   2.1 Task 1 nominal catches data
   2.2 Task 2 catch-effort and size samples data
   2.3 Tagging data

3. Mediterranean albacore stock assessment

   3.1 Review of available and new information on biology and life-history
   3.2 Examination of relative abundance indices for incorporation into the stock assessment process
   3.3 Mediterranean albacore stock assessment update

      3.1.1 Bayesian State-Space Surplus Production Model (JABBA)
      3.1.2 Final Stock Status Advice

   3.4 Management recommendations for Mediterranean albacore

4. Advances in Mediterranean albacore research and new research proposals

   4.1 Mediterranean stock
   4.2 Atlantic stocks

5. Requests from the Commission regarding the Mediterranean Albacore stock, pending response from the Scientific Committee

6. North Atlantic Albacore

   6.1 Exceptional Circumstances based on catch and CPUE updates
   6.2 Update on the new MSE

7. Recommendations on research and statistics

8. Other matters

   8.1 Research funding

9. Adoption of the report and closure

Appendix 2

List of participants[1*]

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* Head Delegate
[1] Some delegate contact details have not been included following their request for data protection.

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Appendix 3

List of papers and presentations

Doc Ref	Title	Authors
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	Albacore (*Thunnus alalunga*) reproductive biology study for the North Atlantic stock: years 2023 and 2024	Ortiz de Zarate V., Macias D., Su N.J., Dheeraj B., Puerto M.J., Gomez M.J., Rodriguez E., Quelle P., Jaranay M.
SCRS/2024/066	Standardized catch per unit of effort of albacore (*Thunnus alalunga*) from the Spanish baitboat fleet for period: 1981-2023 in the North East Atlantic	Ortiz de Zarate V., Ortiz M.
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/2024/076	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/2024/080	Standardized CPUE rates from the Greek albacore fishery in the eastern Mediterranean	Tserpes G., Peristeraki P.
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/P/2024/027	Evaluation of exceptional circumstances for North Atlantic albacore in 2024	Merino G., Arrizabalaga H., Urtizberea A., Santiago J.
SCRS/P/2024/028	Operating Models for the new Management Strategy Evaluation framework for North Atlantic albacore	Urtizberea A., Arrizabalaga H., Merino G., Lauretta M., Morón Correa G., Ortiz de Zárate V., Brown C., Ortiz M., Kimoto A.
SCRS/P/2024/029	Observation Error Model for the new Management Strategy Evaluation framework for North Atlantic albacore	Urtizberea A., Morón Correa G., Merino G., Arrizabalaga H.
SCRS/P/2024/030	Evaluation of the performance of the North Atlantic albacore MP (Recommendation 21-04) under the new grid of Operating Models for North Atlantic albacore	Merino G.
SCRS/P/2024/035	Mediterranean albacore catch size composition analysis (Spanish LLALB-targeted fishery in the western Mediterranean)	Saber M., Macías D., Rueda L., Garcia-Barcelona S., Puerto M.A., Acosta-Cifuentes F.

SCRS/P/2024/039	Preliminary analysis of the Task 2 SZ data for Mediterranean albacore	Ortiz M., Kimoto A., Mayor C.
SCRS/P/2024/040	Albacore tuna *Thunnus alalunga* overview of available statistical data (1950-2022)	Fiorellato F., Mayor C., Garcia J.

Appendix 4

SCRS documents and presentations abstracts as provided by the authors

SCRS/2024/031 - Standardized relative abundance indices of albacore (*Thunnus alalunga* Bonnaterre, 1788) caught by the Spanish albacore-targeted surface longline (LLALB) in the western Mediterranean Sea were estimated for the period 2009-2022. Yearly standardized CPUE were estimated through Generalized Linear Mixed Effects Models (GLMM) under a negative binomial error distribution assumption. The main factors in the standardization analysis were year and season (quarter). The index shows an increasing trend from the beginning of the series (2009) to a maximum in 2011; following a decrease up to 2013, and a relatively stable trend fluctuating around a level three times lower (compared to the maximum abundance) for the period 2013-2019. For recent years, it shows an upward trend (1.5 times lower than the maximum abundance in 2011).

*SCRS/2024/*032 - Summary of the main features of the albacore (*Thunnus alalunga*) surface Spanish fishery in 2023 is presented. Fishing activity took place during summer from June to October operating in offshore waters of the Northeast Atlantic and in the Bay of Biscay. Albacore was targeted by the troll fleet mostly in offshore waters of Northeast Atlantic and by the baitboat in the Bay of Biscay. Size composition of catches taken by baitboat and troll fleets in 2023 showed the highest proportion of age 2 group, followed by age 3 group and age 1 age 4 group albacore to a lesser extent that corresponded to the minor proportion in the overall age composition. Monthly spatial distribution of nominal catch rates was presented for both fleets. Fishing season came to an end in mid-October due to the beginning of the albacore migration towards the Atlantic Ocean.

SCRS/2024/033 - The ICCAT North Atlantic Albacore (*Thunnus alalunga*) Research Program was established to enhance knowledge on albacore to provide more accurate scientific advice to the Commission. Funds are provided to the Albacore WG to develop research activities to accomplish several objectives. One of the research objectives is to increase knowledge on reproductive biology for the northern Atlantic stock, maturity schedules (L50) and egg production (size/age related fecundity). In March 2021, Terms of Reference were published by ICCAT. A Consortium integrated by Canada, Venezuela, Chinese Taipei and Spain presented an offer to collect gonad samples and spines throughout the year and carry out the study of reproductive biology for North Atlantic albacore stock. Results of histological analysis: maturity stages, batch fecundity and seasonal area of spawners are presented as well as the age determined of collected albacore individuals. Samples (gonads and spines) were analyzed including the albacore collected in 2023 and 2024.

SCRS/2024/066 - Nominal catch of number of fish per unit of effort (CPUEs) of the North Atlantic albacore (*Thunnus alalunga*) caught by the Spanish baitboat fleet in the North Eastern Atlantic were collected by trip for the period 1981-2023. Standardized index was estimated using Generalized Linear Random Effects Model (GLMM) with log-normal error distribution. The year*month interaction term and year*zone interaction term were included in the model as random effects to derive the annual standardized catch rates as relative index of abundance for 1981 – 2023.

SCRS/2024/068 - The albacore (*Thunnus alalunga*) fishery in the Mediterranean has always been quite problematic to understand, due to numerous factors influencing the data, but also to the fact that various CPCs do not report catches on a regular basis. While there are specific obligations for the latter problem, the exogenous factors influencing the fishing data are many. This paper attempts to summarise the knowledge we have and how the various factors may influence our 'reading' of fishing data and, consequently, the assessment of the species.

*SCRS/2024/*069 - Larval abundance indices express standardised larval densities obtained from ichthyoplankton surveys. In the framework of ICCAT, these indices are routinely incorporated into the population models that are used to assess the population status of various tuna species in the Gulf of Mexico and in the Balearic Sea. Their independence from the fisheries is the basis of the interest in continuing updating and actualising such indices. In the Balearic Sea, a retro-calculated albacore larval abundance index was first applied in 2017 to inform about the inter-annual changes of the species spawning stock biomass in the western Mediterranean. A strict update of this index was presented to ICCAT in 2021 with data until 2019. Here, we present an actualisation of the albacore retro-calculated larval index for the

Balearic Sea from surveys conducted from 2001 to 2022. The standardisation model has been updated with environmental information to increase model robustness and avoid bias of the estimates. Albacore showed a preference for recent Atlantic waters with lower salinities which are located eastwards the Balearic archipelago. The larval abundance index presents an increasing trend from 2019 until 2022.

SCRS/2024/070 - This document reviews the adequacy of ichthyoplankton sampling strategies over the past two decades in the Balearic Sea, to inform about the interannual trends of albacore (*Thunnus alalunga*) abundances in early life stages (preflexion and postflexion notochord stages). Methodologically, the review identifies relevant scientific literature and assesses how ichthyoplankton surveys adapt to factors such as timing of spawning and larval development, spatial representativeness, and vertical distribution of larvae. The results section highlights insights into the timing of the maturation cycle of albacore, indicating peak spawning months in June and July, aligning with ichthyoplankton survey timing. The spatial distribution of albacore spawning grounds near the Balearic Sea is supported by various studies, including onboard sampling of longline fisheries and research on egg and larval distribution. Hydrodynamic studies suggest favorable conditions for the retention of albacore larvae around the archipelago, enhancing the effectiveness of current sampling designs. Time series of larval abundances, calculated from standardized bongo 90 sampling oblique tows, reveal larvae distributed in surface waters down to 20 meters depth. Conclusively, the scientific literature supports the adequacy of current sampling strategies in the Balearic Sea for monitoring interannual changes in early albacore life stages. Key ecological aspects assessed include the timing of sampling, spatial representativeness concerning reproductive aggregations, dispersion, and vertical distribution of albacore larvae.

SCRS/2024/076 - The 2023 SCRS planned to conduct a simple update of stock assessment of the Mediterranean albacore (*Thunnus alalunga*) stock in 2024. This document provides the updated model of the 2021 JABBA assessment with the 2024 Task 1 catch data in April and updated indices provided to the modeling group at least one week before the meeting. Among the indices used in the 2021 assessment, Spanish longline CPUE, and fisheries-independent western Mediterranean larval density index were updated. We evaluated model plausibility using four objective model diagnostics: (1) model convergence, (2) fits to the data, (3) consistency (e.g. retrospective patterns), and (4) prediction skill. Results suggest that a simple update model (S1) improved diagnostics slightly from the 2021 model with the updated catch in 2024. This document also examined additional scenarios that incorporated the updated Greek longline CPUE. Jackknife analyses revealed that removing the Med-W larval index had strong effects on the stock status estimates.

SCRS/2024/077 - Alterations in ocean properties derived from climate change, have a significant impact on the marine ecosystems, and thus on fisheries. The understanding of marine ecosystems responses to global climate change plays an important role in predicting future potential impacts on fisheries. The most prominent ecological response for fish populations are changes in the distribution and productivity. In the case of tunas, this is highly important since tunas exert top-down pressure in the ecosystems worldwide and sustain some of the world's most valuable fisheries. Albacore is a highly migratory temperate species distributed in all oceans. Therefore, changes in albacore distribution and abundance would suppose changes in worldwide albacore fisheries, with the subsequent impact on global economy. The present work compiles information on the preferred environmental characteristics of albacore stocks in the Atlantic Ocean, Pacific Ocean, Indian Ocean, and the Mediterranean Sea. Additionally, climate change effects on marine ecosystems are summarized, highlighting the potential future impacts on albacore stocks.

SCRS/2024/078 - The data used in the estimation of catch rates of albacore (*Thunnus alalunga*) for the Italian drifting longline in 2021 are compared to the time series available within the ICCAT dataset Task2CE to evaluate the comparability of the two datasets. Additionally, the Task2CE dataset is further explored to evaluate potential limitations and biases within the data to avoid biasing the estimation of the catch rate. The low representation of the samples compared to the total landings is discussed as a potential limitation in using an index within the assessment of the albacore Mediterranean stock. Finally, an updated CPUE for the albacore drifting longline Italian fishery is not presented due to the data issues highlighted in this paper.

SCRS/2024/080 - Indices of albacore abundance, expressed in terms of biomass (kg) per 1000 hooks, are estimated from the Greek drifting surface longline fisheries targeting albacore in the eastern Mediterranean in the period 2012-2022. Annual standardized indices were estimated by means of Generalized Additive Modeling techniques and the predictor variables included the Year and the interaction of Semester by Area. Catch Per Unit Effort (CPUE) estimates for the most recent years (particularly for 2022) are relatively lower than the earlier period.

SCRS/2024/082 - Indices of abundance of albacore from the Cypriot longline fisheries operating in the Levant Sea are presented for the period 2014-2023. Annual standardized indices were estimated by means of Generalized Linear Modelling techniques including as predictor variables the Year, Month and Vessel ID. The findings revealed that Catch Per Unit Effort (CPUE) rates, whether measured by weight or number, exhibit four distinct phases. Beginning with the historically highest value in 2014, there was a decrease in 2015. Subsequently, a rising trend was observed from 2016 to 2018, followed by a return to 2015 values in 2020. However, from 2020 onwards, there is a decline leading to the historically lowest values of the index in 2022. In 2023, a reverse increasing pattern emerges. The cumulative trend of the time series mostly decreases over time.

SCRS/2024/083 - Catch and effort data of albacore tuna (*Thunnus alalunga*) were standardized for the Chinese Taipei tuna longline fishery in the North Atlantic Ocean using a generalized linear model (GLM). The recent period from 1999 to 2023 was considered in the CPUE (catch per unit of effort) standardization for albacore, which potentially takes the issue of historical change in targeting for this fishery into account. Regionally based abundance indices of albacore separated at 30ºN were developed using data in recent years, which showed different trends to those from the other regions. The standardized CPUE of albacore in the south of the North Atlantic Ocean started to increase slightly from late 1999 until 2014 and then decreased to a relatively stable level during 2015-2023. However, the trends for the northern North Atlantic Ocean remain relatively consistent over the past decade, with a slightly increasing trend during 1999-2014.

*SCRS/P/2024/027 - S*howed the updated abundance indices on top of the CPUE values estimated from the OMs used in the MSE. Overall, all the CPUE series presented fall within the 2.5% and 97.5% percentiles of the simulated values except for the Spanish baitboat where the CPUE exceeds the range marginally in 2018 (Figure 6.3.1). As the updated CPUE data indicate a larger than the estimated relative abundance (i.e. above the 97.5% percentile of the simulated OM in the MSE) the Group agreed that this is not a source of concern.

SCRS/P/2024/028 - Presented an update of the Operating Models. The presentation covered the progress made by the MSE subgroup that met online in December 2023 and February 2024, with the aim to review, report, and receive feedback from the main albacore Working Group. The presentation covered the inclusion of additional age-length data and a proposal on criteria (based on likelihood, Bratio, and convergence thresholds) to exclude and discard unrealistic simulation runs.

*SCRS/P/2024/029- P*resented a new observation error model for the albacore MSE, that considered both historical and future uncertainty in CPUEs, as well as autocorrelation. Most longline indices (all except JPLLN and TAILLN) showed significant autocorrelation, but the baitboat index did not. The Group agreed that it would be simpler to consider autocorrelation to all longline indices. Autocorrelation parameters were very similar between OMs, thus, the Group agreed to use the same (average) autocorrelation parameters for all four OMs.

SCRS/P/2024/030 - Presented the performance of the current management procedure with new set of OMs that include 10 more years of data. FLR objects (OMs conditioned with SS3 results) were built and projected under F_{MSY} as well as the current MP, showing expected behaviour with oscillations and future stabilization of catch values. The authors are working on the implementation of the MSE in FLBEIA.

SCRS/P/2024/035 - Provided information on fisheries statistics (catches, catch, and effort) and biological size sampling of the Spanish pelagic longline fishery targeting albacore (LLALB) in the western Mediterranean, for the period 2009 to 2022. It also covered analyses of biological indicator trends (mean size, size at first maturity, L50, etc.), with some important results. For the analysed period (2009-2023) the mean size observed on the catches was 77.66 cm SFL. For the analysed period, on average, the percentage of sizes exceeding the size at first maturity (optimum length) was 85.62%, 92.19%, and 95.14% (Arena, Saber, and Froese reference levels, respectively).

SCRS/P/2024/039 - Provided a summary and preliminary analysis of the ICCAT Task 2 size data (T2SZ) available in the ICCAT database. A total of about 130 thousand size samples have been available since 1974, with most samples from the longline fleets followed by samples from gillnets, baitboat, troll, and other gears. The overall size distribution indicated catches from 58 to 98 cm SFL (97.5% percentile) with a mean of 74 cm straight fork length (SFL) close to a normal distribution. A preliminary analysis indicated some seasonality of size catches, with smaller fish caught in the 1st and 4th quarter of the year. However, this was found not to be statistically significant. On the existing T2SZ data, about 20% of the fish caught and sampled is immature (assuming 66.6 cm SFL as L50 Maturity). However, it is important to consider that the total weight reported on T2CE and T2SZ represents only about 21% of the total weight of T1NC.

SCRS/P/2024/040 - The available T1 nominal catch, T2 catch and effort, size and catch at size statistics were summarised in various forms to identify potential inconsistencies and incompleteness issues in the existing catch series over time. For the three albacore stocks (ALB-N, ALB-S and ALB-M) only minor revisions were made to the most recent years when compared to the corresponding ALB statistics adopted at the 2023 SCRS annual meeting. No updates were adopted by the Group during the meeting.