Report of the 2024 ICCAT Atlantic Blue Marlin Data Preparatory Meeting

(hybrid/Miami, United States, 11-15 March 2024)

The results, conclusions and recommendations contained in this report only reflect the view of the Billfish Species Group (BIL 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 University of Miami Rosenstiel School of Marine and Atmospheric Science in Miami, United States, and online, from 11 to 15 March 2024. Ms. Fambaye Ngom Sow (Senegal), the Species Group ("the Group") rapporteur and meeting Chair, opened the meeting and welcomed participants. Mr. Camille Manel, ICCAT Executive Secretary, welcomed the participants, thanked the United States and the University of Miami for hosting the meeting, and wished them success in their meeting.

The Chair 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, A. Kimoto
Item 2	D. Angueko, K. Geddes, D. Die
Item 3	C. Mayor, F. Fiorellato, J. Garcia
Item 4	J. Carlson, A. Kimoto
Item 5	D. Die, A. Kimoto
Item 6	M. Fernandez, G. Diaz
Item 7	C. Brown, F. Sow
Item 8	F. Sow, C. Brown, M. Ortiz

2. Review of historical and new information on biology

The Group examined and discussed two new studies on the growth of Atlantic blue marlin, a recent study where age was estimated from otolith sections collected in the east and equatorial sides of the Atlantic (SCRS/P/2024/007) and a study of spine sections from samples of the western Atlantic (Hoolihan *et al.*, 2019).

The study on otolith sections (SCRS/P/2024/007) was conducted as part of the Enhanced Program for Billfish Research (EPBR). Two rounds of otolith sampling and analysis were carried out by the Portuguese Institute for Sea and Atmosphere (IPMA) and the Centre de Recherche Océanographique de Dakar (CRODT), with additional assistance from the Laboratoire de Recherche sur l'Âge et la Longévité for the second round. An initial comparison of otolith weight versus fish length suggested that there might be sex-specific growth in blue marlin. After the first round, the authors concluded that daily aging of otoliths is necessary to obtain better-estimated parameters, that sampling should be limited to otoliths from early larval and juvenile samples (<150cm), and that sampling should focus on collecting otoliths from very small and very large individuals. During the second round of sampling, the authors reported that traditional aging methods are not suitable for blue marlin. Male and female fish were consistent in terms of position and location of otolith zones. However, some samples seem to differ in the location of the zones, which are relatively narrow. The authors question whether these are true annuli and if they are not this could potentially alter estimates of maximum longevity. A Von Bertalanffy growth curve based on decimal age was fitted to the otolith data (combined sexes) and led to the following estimates of k= 0.43, t_0=-1.78, and L_{inf} =273.99 cm Lower Jaw Fork Length (LJFL).

The Group discussed the von Bertalanffy growth curve parameter estimates from this study and noted how length increases very rapidly in the early years. The Group noted the significant improvement in growth information that this study represents, especially as it also confirms differences in growth rates between sexes.

The Group also examined the study of blue marlin growth based on spines and otoliths (Hoolihan *et al.*, 2019), which was not available during the last assessment. This study used age estimates from spine sections where age is estimated from the number of visible rings corrected by the estimated number of rings that have disappeared due to vascularization of the spine core. It also used data from otoliths for younger ages. This study is extremely valuable due to its large number of samples and range of ages estimated. The method of aging spines, however, contains age corrections due to vascularization and is therefore fundamentally different from the aging method used by SCRS/P/2024/007. The study reports the difficulty of using the simple 3-parameter Von Bertalanffy model to describe the growth of blue marlin for the entire range of ages, from birth to adulthood. The reason for this is that blue marlin growth in length is extremely fast in the first two years of life but slows down considerably after that. This study provides estimates of Von Bertalanffy obtained solely from the spine data (Figure 14A in Hoolihan *et al.*, 2019).

Male: Lt=209.6(1-exp (-0.222(t + 6.5))
Female: Lt=302.2(1-exp (-0.052(t + 15.1))
Sex-combined: Lt=265.9(1-exp (-0.075(t + 12.5))

The Group compared the growth patterns from the two studies (**Figure 1**) and noted that length at age from Hoolihan *et al.*, (2019) and SCRS/P/2024/007 diverges substantially, with the otolith data suggesting greater lengths at age than the spine data. The Group discussed the different hypotheses that could explain these differences and the limitations of the age validations conducted by these two studies. The Group agreed it was not possible to determine which hypothesis may be valid and that it was not appropriate to combine these data sets to estimate a single growth curve. The Group agreed that these two data sets should be considered as separate hypotheses about the growth of Atlantic blue marlin and that research should focus on explaining the reasons for such differences.

In 2018, the Group initially evaluated scenarios assuming three alternative fixed values for natural mortality (M). Ultimately, M was estimated by the assessment model (SS3). For the 2024 evaluation, the M value estimated in 2018 of 0.148 will be used with a coefficient of variance (CV) of 0.018 as an initial value. The Group will attempt to estimate M as was done during the 2018 ICCAT Blue Marlin Stock Assessment (Anon., 2018a).

The Group discussed the available information on length at 50% maturity. The ICCAT Manual contains an estimate of 256.4 cm for this parameter, but the Group noted that this estimate was probably an overestimate of $L_{50\%}$, as maturity was determined by external and macroscopic observations of ovaries and not histology. The Group also noted that for Pacific blue marlin a value of 179.76 cm is used for this parameter (Sun *et al.*, 2009; ISC, 2021). The Group agreed to continue using the value of 206 cm LJFL (Shimose *et al.*, 2009) used in the 2018 Stock Assessment. It was noted that this $L_{50\%}$ corresponds to females, and although high in comparison to the L_{inf} of around 300 cm, is still plausible.

3. Review of fishery statistics/indicators

The ICCAT Secretariat presented to the Group the most up-to-date fishery statistics, biological data, and tagging information of blue marlin (*Makaira nigricans*, BUM) for the entire Atlantic (unique stock) available in the ICCAT database system (ICCAT-DB). The datasets reviewed include Task 1 nominal catches (T1NC), Task 2 catch and effort (T2CE), Task 2 size frequencies (T2SZ), and the most recent catch distribution (CATDIS) estimations (T1NC catches of blue marlin distributed by quarter and 5x5 degrees grids, between 1950 and 2022). The existing blue marlin conventional and electronic tagging information was also presented and reviewed by the Group.

Three documents with blue marlin fisheries statistics (SCRS/2024/020 and SCRS/2024/027) and biological sampling (SCRS/2024/025) and a presentation on tagging (SCRS/P/2024/006), were presented to the Group in this section.

3.1 Task 1 catches and discards data and spatial distribution of catches

The updated blue marlin T1NC statistics (landings plus dead discards) by stock and gear, are presented in **Table 1** and **Figure 2**. The updated SCRS catalogues of blue marlin (**Table 2**), showing both Task 1 (T1NC) and Task 2 (T2CE and T2SZ) paired series for the last 30 years (1994-2023) ranked by order of importance (i.e., % of T1NC by each CPC to the total T1NC in the last 30 years) were also presented to the Group. These SCRS catalogues allow the Group to identify potential data inconsistencies and gaps in both stocks. The T1NC dashboard with all billfish species for interactively querying T1NC information, was also made available to the Group. The latest CATDIS estimations (dataset and maps) with blue marlin, reflecting T1NC information available as of 31 January 2024, was also made available to the Group. The CATDIS maps of blue marlin were also published in the ICCAT Statistical Bulletin Vol. 49 on the ICCAT website.

The ICCAT Secretariat informed that only a small portion of ICCAT CPCs have reported T1NC for 2023, that the official catches for the recent period (2020-2022) are still incomplete, and it identified those potential missing gaps in the SCRS catalogue (**Table 2**, with missing catches indicated with "shaded light blue"). The Group recommended a detailed analysis aimed at correcting and completing the blue marlin catch series with preliminary estimates during the meeting. Agreeing with the incompleteness of catch data for 2023 (not required in the workplan) the Group agreed to use 2022 as a terminal year for the assessment and suggested focusing the gap completion study on the last period (10 years) ending in 2022.

Due to some questions raised by the Group concerning the T1NC pivot standard structure presented (aggregated by species and stock area), the ICCAT Secretariat recalled that its standard structure can be arranged in a multitude of ways, for instance by adding the *fleet* and *gear* dimensions to the pivot-table, whereby gaps and inconsistencies in the time series become more evident.

The Secretariat recalled that T1NC billfish data also include aggregated catches of billfish species (BIL) potentially containing some quantities of blue marlin and the presence of "unclassified" gears (UNCL) in the blue marlin catch series. These two issues can be observed using the T1NC dashboard using the billfish data category. The Group agreed that despite both issues representing relatively low quantities, these will require effort from the concerned CPCs to be properly broken down into the respective species and gear components to be used for stock assessment purposes.

The Group also reviewed the current reporting of blue marlin live releases (DL) time series in T1NC (**Table 3**) which are consistently provided by very few fleets, notably the U.S. longline fleet.

In light of the importance of having a robust and comprehensive nominal catch time series, the Group discussed the possibility of including the estimation of post-release mortality in the calculation of the total removed biomass. The Group was informed of a meta-analysis on post-release mortality of *Istiophoridae* billfishes (Musyl *et al.*, 2015) which could be of potential interest for further advancing on this topic. However, currently available studies are either very specific (often limited to a single gear type from a specific fleet, or a single type of hook) or from other oceans and therefore less than optimal for this purpose.

It was also highlighted the presence of gaps in the time series of landed catches which might be explained, for some fleets, by the entry into force of retention bans for the species, as in the case of Morocco. Yet, in this circumstance, the lack of information on discards (either dead or alive) seems not to corroborate the hypothesis. The Group considered this to be a reporting issue instead. Document SCRS/2024/020 provided the rationale and results from a revision of catch statistics of blue marlin from the EU-France overseas territories (Guadeloupe and Martinique) mostly harvested by small-scale vessels using handlines (HAND) and trolling (TROL) and operating around moored fish aggregating devices (MFADs). This revision aims to update the corresponding catch series available in the ICCAT-DB system and includes estimates based on new information collected through an exhaustive sampling scheme started in 2014. It also corrects historical catches by removing duplicate data for longline (LL) (2018-2019) and by using the lower bound of previous estimates (up to 2014) instead of the upper bound as currently included in the ICCAT-DB.

The Group noted how the presence of recent catches attributed to rod-and-reel (RR) might be instead an artifact of the data collation and reporting process, and that those catches should indeed be attributed to vessels fishing using longlines (LL-deri). EU-France acknowledged the problem and confirmed their ongoing efforts to ensure that data provided to ICCAT (including historical information) will be harmonized and reported consistently in the future using the recommended spatio-temporal stratification.

Document SCRS/2024/027 provides a summary of the analysis performed on blue marlin data collected by the Uruguayan and Japanese longline fleets operating in the southern Atlantic from 1998 to 2019. This document highlights how the two fleets under study operated different types of longline, namely shallow longlines targeting swordfish in the case of the Uruguayan fleet, and deep-water longlines in the case of the Japanese fleet. The total number of blue marlins captured in the timeframe considered was relatively low, with only 152 individuals caught in 119 of about 3400 sets (3.5%) in total. The results of the study indicated that the frequency of occurrences of blue marlin increases with sea-surface temperature, with a higher number of occurrences recorded in waters between 27°and 29° C, although only 1.7% of total sets were observed at these temperatures. Another result from this study suggests that specimens captured by deep-water longlines are on average larger than those captured by shallow longlines, which could be explained by spatial segregation between 0-100m and 100-200m in the water column, with a preference for larger individuals inhabiting deeper waters. The study also presented the spatial distribution by size of the blue marlin observed, larger individuals were found in southern latitudes, and smaller individuals were more restricted to latitudes closer to warmer waters. Although the fleet operated up to latitudes close to 50°S, captures were only observed up to near 37°S. The authors noted that the results of these analyses are based on a limited number of individuals and that therefore should be interpreted with caution.

Overall, as requested by the Group, the Secretariat estimated the catches of blue marlin (landings and dead discards, with the resolution required to be stored in the ICCAT-DB) for the following fleets and fisheries:

- Liberia (LL, 2017-2022), with re-estimations to be performed by the Secretariat using the same methodology adopted in the past (i.e. a constant ratio of Ghana gillnet catches being 2.5 times larger than Liberia),
- Dominican Republic (HL, 2017-2022), with catch level to be recovered from the official data submitted to FAO for years until 2021, and by performing a carry-over of the previous three years to determine catch levels for 2022,
- Venezuela (2010-2022), with official Venezuela updates provided during the meeting,
- EU-France (Guadeloupe and Martinique), with official updates by national scientists during the meeting, with the fishing gear breakdown pending from national scientists but all catches allocated to the Moored Fish Aggregating Device (MFAD) fishing mode,
- Morocco (2018-2019, 2021-2022), with linear interpolations (first series) and carry-over of three previous years (last series),
- EU-Spain – with linear interpolations (first series) and carry-over of three previous years (last series). National scientists confirmed that EU-Spain is working on updating the estimates of catches of blue marlin from the different fleets to be presented to the SCRS. At this point, however, it is not confirmed if the updates will be available in time for inclusion in the stock assessment.

All the updates were revised and finally adopted (**Table 4**) by the Group as SCRS preliminary estimates. The comparison of T1NC catch series before and after the updates are provided in **Figure 3**.

The Group adopted the updated CATDIS catch matrices as the best scientific estimates of the total removals, deferring the detailed revision and improvement of blue marlin catch estimations (both T1NC and CATDIS) for a future blue marlin meeting session.

3.2 Task 2 catch and effort

The T2CE detailed catalogue, with important information (metadata and quantities) on blue marlin and other billfish species, 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 (errors, poor time-area resolution, inconsistencies, etc.) and provide improved updates for the existing datasets. The blue marlin standard SCRS catalogues (**Table 2**) summarize the T2CE data (DSet=”t2”, character “a”) using only T2CE datasets that have sufficient time (by month) and area (5x5 lat-lon squares or better for longline gears, and 1x1 lat-lon squares or better for the surface gears) resolution.

The Secretariat reminded that the CATDIS estimates rely completely on the availability and quality of T2CE information. The Group encouraged the ICCAT CPC scientists to revise their T2CE statistics using the SCRS catalogues, as recommended by the SCRS (**Table 5**).

3.3 Task 2 size data

The T2SZ detailed catalogue, with information (metadata and quantities) on blue marlin and other billfish species, was also prepared for the meeting. It is intended as a tool for the ICCAT CPC scientists to revise their series in the search for possible series incompleteness (missing datasets) or potential series improvement (updates for the existing datasets). The blue marlin standard SCRS catalogues (**Table 2**) summarize the availability of both T2SZ (character "b"). Since the last assessment, the T2SZ blue marlin dataset updates were provided for the Venezuelan gillnet artisanal fishery (2010-2022) and surface longline fishery (2013-2018).

The ICCAT Secretariat noted the existence of some blue marlin Task 2 catch-at-size datasets (T2CS) estimated/reported by CPCs to ICCAT in the past. Reporting catch-at-size for blue marlin is not required, and therefore available data of this type will be removed from the ICCAT-DB when equivalent T2SZ dataset exists. The SCRS catalogues do not include T2SZ datasets with poor quality (poor time-area detail, size/weight bins larger than 5 cm/kg) either. Overall, T2SZ information on blue marlin still has missing datasets (**Table 6**). On the positive side, the ICCAT Secretariat informed of a trend of reports of T2SZ with higher resolution for the majority of the ICCAT species including blue marlin in the last decade.

Document SCRS/2024/025 summarizes the revisions and updates to the available, fleet-specific blue marlin detailed catch and size frequency data up to 2022 and was prepared as a follow-up to the request from the Group to provide input data for the assessment of the species, with the same fleet structure as used during the last ICCAT 2018 Blue Marlin Stock Assessment. The document had two objectives: to update the data series until the most recent year for which comprehensive information is available and to assess the CPCs that report both live and dead discards.

The collated size data were reviewed, standardized, and revised from the last assessment. The adopted fleet structure is comprised of five fleets: i) The commercial longline fleets for which blue marlin is a non-target bycatch species. It was noted that compared to the 2023 Sailfish Stock Assessment (Anon., 2023), in the case of blue marlin, there was no attempt at categorizing longline fleets between surface and deep fishing; ii) The "artisanal" fleet that includes mainly gillnet operating in the east and west Atlantic, together with beach seines from Benin and Côte d'Ivoire; iii) The "moored FAD" fleet includes data from rod-and-reel and handlines from Guadeloupe and Martinique only, even though it is likely that other fisheries in the Caribbean might be using the same fishing method; iv) The sport fisheries fleet with size-frequency data from 1970 onwards, although the level of this information appears to be declining in recent years; and, v) the fleet category "Other" gears that include catches from purse seines which in the past were considered initially as a separate fleet, although with no practical benefits in the model assessment. The Group was informed by Uruguay scientists that an updated size data for blue marlin will be provided to the Secretariat before the stock assessment meeting.

The presented time series of catches by fleet used for SS3 purposes covers the years from 1956 to 2022 and is current as of 1 March 2024 (reported as Task 1NC).

The Secretariat informed the Group of reports of data for aggregated billfish (BIL) in recent years, whereas at the beginning of the time series, the BIL catches were disaggregated by species by this Group in previous meeting(s) and stored in the ICCAT-DB under the code FlagName = NEI (BIL).

Table 7 presents a proposal to address the need to split the catches reported as unclassified billfish using the proportion of the respective annual catches by species. The Group agreed to this proposal and to include the corresponding blue marlin catches in the assessment input. **Table 3** presents a summary of available data on dead and live discards by year and flag.

The size distributions were compiled and standardized by the Secretariat. When needed, the original data were converted to straight lower-jaw fork length (SLJFL) using equations approved by the SCRS. Summary statistics for this data set were also provided to summarize the extent and quality of the available information, it confirmed the limited information available on the gender of the measured individuals. The spatial distribution of the samples indicates a good coverage of the Gulf of Mexico, the central Atlantic, and western African waters (mostly coming from artisanal fisheries).

The provided analysis of size samples by fleet and year included several diagnostic indicators and confirmed that few observations are available of blue marlin less than 60 cm in SLJFL. All the presented size information will be used to inform the SS3 assessment model together with other biological parameters depending on the specificities of the considered assessment models.

3.4 Tagging data

The Secretariat presented a summary of Atlantic blue marlin conventional tagging data. **Table 8** shows releases and recoveries per year and **Table 9** shows the number of recoveries grouped by number of years at liberty. Three additional figures summarize geographically the blue marlin conventional tagging available in ICCAT. The density of releases in 5x5 squares is shown in **Figure 4**, the density of recoveries in 5x5 squares is hown in **Figure 5**, and the blue marlin apparent movements (arrows from release to recovery locations) are shown in **Figure 6**. Additionally, two blue marlin dashboards were prepared to examine dynamically and interactively the tagging data. The first one (snapshot in **Figure 7**) with conventional tags, shows a summary of released and recovered tags. The second one (**Figure 8**) with electronic tags, shows a summary with data extracted from the meta-database held in ICCAT. The dashboards for the conventional tagging and electronics tags metadata are published on the ICCAT website. The Secretariat thanked the support of scientists in the production of the dashboards presented.

The Secretariat informed the Group on the current difficulties on the incorporation of the conventional tagging data reported by the U.S. between 2009 and 2019 (all species including blue marlin) due to various reasons. Aiming to solve this situation in the mid-term, collaborative work has begun involving the Secretariat and the U.S. tagging correspondents for working on the full cross-validation of both conventional and electronic tagging databases. The Secretariat will be updating the ICCAT tagging databases during the revision process. 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.

Presentation SCRS/2024/P/006 provided a summary of the results of a campaign for tagging blue and white marlin with satellite tags (PSAT) during a sport fishing tournament in southern Portuguese waters. Three out of the seven PSAT tags were deployed, exclusively on white marlins (although blue marlins were spotted during the campaign it was not possible to implant PSAT tags). The duration of the PSAT tag detachment was expected to be around 240 days, however, all tags popped up between 27 and 108 days after tagging. The information collected (depth and temperature) was incomplete, mostly due to problems associated with the duration of the batteries. This issue seems to be quite common with the Wildlife Computer's latest series of tags and the Group recommended bringing these problems to the attention of the SCRS. Nevertheless, the information collected for the individual tagged fish for which reasonably consistent and sufficient data was collected provided interesting insights into their migration patterns. This is the first-time observation of a white marlin moving from the eastern North Atlantic off the Iberian Peninsula to the western tropical Atlantic, close to the northeast coast of Brazil.

The Group noted that previous studies targeting blue marlins and using both satellite and conventional tags have been mostly focused on the western Atlantic (U.S. releases and Venezuela recaptures) and agreed on the importance of increasing tagging levels in the eastern Atlantic. However, it was mentioned that some efforts were already in place for promoting tagging in the eastern Atlantic, for example, tagging programs from the IGFA (Andrzejaczek *et al.*, 2023), and the releases of PSAT-tagged blue marlins from coastal fisheries in western Africa.

It was also highlighted how catch and effort from sports fisheries are generally not well monitored in the eastern Atlantic region and that it is important to assess the level of activity of these fisheries before promoting further tagging activities.

The Group agreed that the remaining four PSAT tags available could be deployed by taking advantage of a planned shark-tagging campaign that will take place in equatorial waters during this year. Finally, the Group was informed that biological data for blue marlin in the southwest Atlantic have been collected as part of a master thesis (Crespo Neto, 2016) as well as through tagging campaigns performed by Brazil resulting in the deployment of 16 electronic tags. The Group recommended that this information be integrated with all other tagging data to provide the basis for a global analysis.

4. Review of available indices of relative abundance by fleet

Presentation SCRS/P/2024/008 provided an update of the Brazilian Rod and Reel Tournament index up to 2021. Catch per unit effort (counts/total number of operating boats per tournament day) was modeled assuming a Tweedie distribution with the selection of predictors (year, tournament, cluster/target) in a forward stepwise approach. The authors noted that 35% of tournament days captured no blue marlin and there was an increase in catches from 2005-2015.

The Group inquired about the fishing effort unit and whether it was considered other effort units such as the number of hooks, but the authors responded that it was not available. There was considerable discussion by the Group on the use of cluster analysis as a proxy for determining target species, especially when the intended species classification is included in the cluster, as was done for this analysis (**Figure 9**).

The Group commented that in some cases these can lead to hyperstability in the catch trend, especially when one cluster is dominated by the target species. However, it was also noted by the Group that simulation studies have shown that the use of cluster analysis did not affect the model. Thus, the use of cluster analysis is still debatable on its effect on the abundance trend. The author commented that the cluster analysis was used to help define target species, and if they did not use cluster, there would only be 2 variables for this analysis. The author agreed to explore excluding the cluster variable from the GLM model and provided the requested analysis during the meeting (**Figure 10**). The authors also noted that in the later part of the series (after 2015), catch and effort information came from a few tournament days, which explained the high coefficient of variation.

SCRS/2024/021 presented a standardized index of relative abundance for blue marlin using a combination of two data sources, the Venezuelan Pelagic Longline Observer Program (1991-2011), and the Venezuelan National Observer Program (2012-2018).

The Group asked if the area where the fishery operated was a spawning or feeding area for blue marlin. The authors responded that there is no spawning there, adding that it is not well-known where blue marlin spawning occurs in the Atlantic. It was noted that this time series represents an area outside the Japanese logbook catch per unit effort (CPUE) data. And the Group suggested that in future analysis the catch and effort data from all longline series could be combined to strengthen the index.

SCRS/2024/023 describes a standardized index of relative abundance from 1991 to 2022 estimated using a generalized linear mixed model approach with a lognormal distribution from data from the Venezuelan artisanal drift-gillnet fishery targeting billfish. The data is from the Venezuelan billfish hotspot "El Placer de La Guaira". The authors noted that the declining trend from 2017 could be explained by economic hardships and later reduced effort because of COVID restrictions.

SCRS/2024/026 described an abundance index of blue marlin caught by the Japanese tuna-longline fishery from logbook data from 1994 to 2022 using the spatio-temporal generalized linear mixed model (GLMM) within Vector Autoregressive Spatio-Temporal (VAST). It was noted that in the case of this standardization, the target of the longline set was determined by both cluster analysis and hooks per basket (i.e. more hooks per basket would be indicative of a deeper set targeting bigeye tuna).

Initial questions by the Group were relative to whether the CPUE estimation includes live and dead discards because Japan has a catch limit for blue marlin in the latter part of the time series. The author confirmed that throughout the CPUE series only retained fish in numbers was used in the estimation of CPUE. The author stated that recent logbook data contains discards in weight and that the number of dead discards has been low compared to the retained catch, thus the abundance index would not be biased by discards.

During the presentation, the Group also discussed the abundance index from Japanese longline fishery for the period 1956-1998 using logbook data (gear configuration data started in 1975) standardized using a generalized linear model (Yokawa *et al.*, 2001). Although the generalized linear model has some issues, the authors stated long-term time series is useful for the stock assessment of blue marlin and recommended using the index from the early period for the 2024 Stock Assessment.

The Group also noted that peak and sharp decline in the early part of the time series in the 1960s. It was stated that the 2018 Stock Assessment used the Japanese historical index from the early years and that there were many hypotheses on this early peak followed by the sharp decline. It was noted that catches were high relative to the high productivity of the stock in these years with high CPUE. While catches were high during this period, the sharp decline was likely due to a change in target from shallow sets to deeper sets. Unfortunately, gear configuration data (e.g. hooks per float) were not available during the early years of this time series to be used in the model standardization.

SCRS/2024/030 presented updated standardized CPUEs of blue marlin for the Chinese Taipei distant-water tuna longline fishery in the Atlantic Ocean for the period 1968-2023. The document showed a sharp increase in the trend in the last three years. During the discussions, it was suggested that this increase may be due to a decrease in fishing effort associated with the pandemic.

The Group discussed the time blocks considered by the authors to address the issue of targeting change in this fishery and agreed, as was done for the 2018 Stock Assessment, that these periods follow shifts in targeting from albacore to tropical tunas, particularly between the first and third blocks. Questions followed regarding the definition of catch unit in the estimation of nominal CPUE, and if the authors included different components of catch (retained and discards) over time. The authors confirmed that the standardizations were conducted using only the number of fish in the logbook data (i.e. retained). There were also questions regarding whether there was any potential for misidentification of billfish species in the logbook data, but the authors indicated that there was not.

SCRS/2024/029 provided updated standardized indices of relative abundance for blue marlin in the northwest Atlantic Ocean from the U.S. pelagic longline and the recreational tournament fisheries. The indices represent a continuity analysis of the indices presented in the previous assessment (Lauretta and Goodyear, 2018).

The Group asked that, since the proportion of positives was declining until around 2003 for the longline data series, why was a negative binomial chosen to model the data instead of a delta lognormal. The author indicated the model fits the data better with a negative binomial. Regarding the recreational tournament data, the Group first noted that abundance significantly increased around 2000, very similar to the sailfish analysis that occurred in 2023. Questions specific to the tournament data included whether the rules of the tournaments have changed over time and fishers could either be targeting bigger fish or have switched to catching more numbers of smaller fish. Authors indicated that most U.S. billfish tournaments are now catch and release exclusively. It was also enquired on how the circle hook type requirement affected catchability and if the effort unit of nominal CPUE included hours fished. On the later question, the authors noted that effort has declined in recent years, but the number of marlins caught has increased, which would support the hypothesis that technology is helping fishers to catch more marlins. Because it was a relatively long-term index (starting in 1974), potential ways forward with using this index in the assessment included truncating the time series or using the proportion positives in place of CPUE as the index.

The Group received a brief presentation (Schueller *et al.*, 2023) of changes in recreational vessel fishing power as supplemental information to the U.S. billfish tournament index (SCRS/2024/029). This document was discussed at the 2023 Sailfish Stock Assessment Meeting (Anon., 2023) and examined changes in vessel size, conservation attitudes, and electronic equipment which could have led to changes in the recreational fishery for billfish over time and impacted the fishery's ability to catch fish.

Discussion by the Group included that while vessel size was used as a proxy for fishing power in the model, it was explained that it was not just the size of the vessel but also advances in technology and electronics (e.g. GPS, sonar) that have helped recreational fishers become better at finding and catching billfishes. It was noted that these technological advances are across all recreational fisheries and may not be exclusive to U.S. fishers. The Group pointed out that the way to account for that is to correct the indices of abundance that are related to that component and modify the catchability within the model that would reflect that.

However, the Group agreed not to use this catchability adjustment at this time, and not to use the U.S. recreational tournament fisheries CPUE as an index of abundance in the assessment models. The Group recommended further work be done to properly account for changes in the fishing power of these fleets.

Discussion on CPUE Selection

Based on the revisions of the CPUE documents presented above, the Group discussed the CPUE evaluation tables completed for each series (**Table 10**). Available CPUE time series are provided in **Table 11**. The Group further discussed which CPUEs among all available indices to be used in the 2024 Stock Assessment, and the following indices were recommended (**Figure 11**):

- Japanese historical longline: 1959 - 1993
- Japanese longline: 1994 - 2022
- Chinese Taipei longline: 1968 - 1989
- Chinese Taipei longline: 1990 - 1997
- Chinese Taipei longline: 1998 - 2022
- U.S. pelagic longline: 1993 - 2022
- Venezuelan longline: 1991 - 2018
- Venezuelan artisanal drift-gillnet: 1991 - 2022
- Venezuelan rod and reel recreational: 1961 - 2001
- Brazilian longline: 1978 - 2005
- Ghanaian gillnet: 2000 - 2009

It was decided that the Japanese historic longline be used in the 2024 Stock Assessment, but as the GLM did not account for changes in catchability of the fishery, it will be allowed to vary in time during the whole period according to the yellowfin/bigeye tuna ratio as a proxy for the historic shifting of targeting species in this fishery (**Figure 12**). Regarding the current Japanese longline analysis (SCRS/2024/026), the Group concluded that the modeling approach was an improvement over the 2018 Stock Assessment with sufficient diagnostics, and the series should be used in this assessment. Following the author's suggestion, the Group agreed to use the entire time series of the recent Japanese index since 1994, and the historical index will be used up to 1993 because the quality of logbook data improved around that period.

The Group discussed the current Chinese Taipei longline series and agreed to use all three series (1968-1989, 1990-1997, and 1998-2022). The Group discussed whether the historic peaks in the Chinese Taipei longline indices between 1968 and 1997 also occurred due to a change in targeting from yellowfin to bigeye tuna. Examination of Task 1NC indicated that the proportion of yellowfin tuna in the catch was higher when catches of blue marlin were high also (**Figure 12**). As the yellowfin/bigeye tuna ratio for Chinese Taipei appears also correlated with catches of blue marlin as in the case of the Japanese index, the Group decided to use this ratio as a proxy for the historic shifting of targeting species. The Group also agreed to explore different scenarios based on stock assessment diagnostics, namely for which period of years the catchability adjustment should be applied for both the Japanese historical index and Chinese Taipei longline indices.

The Group agreed to use the updated U.S. pelagic longline fishery abundance index in the 2024 Stock Assessment. Regarding the U.S. recreational tournament index, the Group had considerable discussion on whether to recommend the index for the assessment. The Group was reminded that this index was not used in the 2018 Blue Marlin Stock Assessment (Anon., 2018a) because the model could not solve the changes in catchability of this index, although the Group originally recommended using it at the Data Preparatory meeting. The Group discussed further truncating the time series because it is a relatively long-term index. However, terminating the index at a somewhat arbitrary year or based on when the index began to significantly increase was deemed inappropriate. The authors indicated that changes in catchability likely occurred that cannot be fully quantified, even considering the analysis presented in (Schueller *et al*., 2023), therefore the authors recommended that this index should not be used. The Group agreed not to use the U.S. Recreational Tournament index in the 2024 Stock Assessment.

The Group discussed the Venezuelan longline time series, noting that the time series was used in the 2018 Stock Assessment. It was noted that the Venezuela longline ended in 2018, and the Venezuela Rod and Reel Recreational index ended in 2001. The Venezuela artisanal drift-gillnet is the only series that was updated until 2022, noting the index was developed from an area of high abundance of blue marlin and was recommended for use in the 2024 assessment. The Group stressed that even though this is a small fishery, they are catching between 40 to 100 tons per year of blue marlin and that it represents a significant portion of the catch limit. Thus, even though the index is limited spatially it represents a significant portion of the catches.

The Brazilian longline time series from the previous assessment will also be used in the 2024 Stock Assessment. This index will be used up to 2005 because the latter years were affected by domestic regulations that prohibited the retention of blue marlin. The Group noted a very small sample size and high uncertainty at the end of the time series for the Brazilian recreational time series. A further examination of the whole time series noted other earlier years with small sample size and the Group could not decide what is a low sample size and it would be arbitrary to drop off data with a low sample size if there was no quantitative way to determine it. The Group agreed not to use the Brazilian recreational index for the 2024 Stock Assessment.

The Ghanaian gillnet time series from the previous assessment will also be used in the 2024 Stock Assessment. However, it was noted that this series has not been updated since 2009. The Group discussed that for this series the methods used to develop CPUE were based on a periodic census of fleets, with sampling in the ports where they operate. Nominal CPUE consists of monthly catches of blue marlin with monthly fleet effort and appears sound and robust. It is also the only available information for the East Atlantic where a quarter of the catch of marlin comes from this fleet. It was requested that the Secretariat contact the Ghanaian fisheries department to see if any new data is available and an updated analysis be conducted intersessionally to be made available for the stock assessment meeting.

5. Review of Assessment models for evaluation, specifications of data inputs, and modeling options

Model selection

The Group discussed the three models that were used in the 2011 Blue Marlin Stock Assessment (Anon., 2012) and the 2018 Blue Marlin Stock Assessment (Anon., 2018a), A Stock Production Model Incorporating Covariates (ASPIC), a Bayesian surplus production model (BSP), and Stock Synthesis (SS). The Group decided to consider SS and Just Another Bayesian Biomass Assessment (JABBA), which were the basis of the management recommendation in 2018. The Group noted that ASPIC did not provide good model diagnostics in the 2018 Blue Marlin Stock Assessment, however, if new results from ASPIC are presented during the assessment, the Group will consider them. A summary of detailed settings proposed for both SS and JABBA is provided in **Table 12**. These settings will be used as a guide for any other alternative assessment platform to be used in the 2024 Stock Assessment.

Catch *(See Section 3)*

The Group will use landings and reported dead discards from Task 1NC for the initial run. The Group will explore three different scenarios of post-release mortality on live discards as sensitivity analyses, but the Group agreed not to use such scenarios for management recommendations for reasons of the uncertainty associated with estimates of mortality of live discards. Sensitivity analyses will apply minimum or maximum post-release mortality from the literature on reported live discards from the longline fleet and apply 0.05 post-release mortality on estimated live releases from the rod and reel fleet as was done in the 2018 Blue Marlin Stock Assessment Meeting. The Group suggested that the additional mortality from these scenarios be calculated before incorporation in the assessment models to provide greater clarity about the magnitude of such additional removals. The magnitude of these removals is of great interest to the Commission as it is related to many of the recent management actions aiming at the improvement of these resources.

It was agreed to use the same fleet structure and selectivity models as the 2018 Blue Marlin Stock Assessment, five fleets: artisanal fleets, longline, moored fish aggregating device (FAD), sport fisheries, and others (**Table 13**).

Size data

For the Stock Synthesis model size data for each fleet will be used following the same criteria of inclusion as used in the 2018 Blue Marlin Stock Assessment. Selectivity will be modeled as double normal for all fleets. The appropriate variance reweighting of the length will be explored during the modeling process.

Biology *(See Section 2)*

The Group acknowledged that two new sources of information on aging studies by spines (Hoolihan *et al.*, 2019) and otoliths (SCRS/P/2024/007) became available since the 2018 Blue Marlin Stock Assessment. Following the discussions in Section 2, the Group agreed that it is not appropriate to combine the samples from the two different studies to estimate a new growth curve. The Group agreed to use the two sets of studies and their samples (spines or otoliths) separately as two growth hypotheses for the 2024 assessment. In SS models, age and length data from each of the two studies will be used as an input to the model, and mean size at age will be estimated internally. In JABBA models, sex-specific growth parameters from spine data or combined-sex growth parameters from otolith data will be used to estimate *r* priors together with other biological parameters. Additional sensitivity scenarios will be run for SS and JABBA with alternative growth parameters. For SS, these sensitivity runs will directly use the growth parameters for otoliths and spines estimated by the respective studies rather than the age, and length data itself. For JABBA the estimates of growth obtained internally from SS will be used as sensitivity analysis to estimate *r* priors.

The Group agreed to maintain the same values of the parameters for maturity and life span used during the 2018 Blue Marlin Stock Assessment; 206 cm LJFL for the 50% maturity length (Shimose *et al.*, 2009, for Pacific BUM), and 42 years for the maximum age.

CPUE selection *(See Section 4)*

As the Group stated in Section 4, the Group agreed to use the following list of CPUEs for the 2024 Stock Assessment (**Table 11**):

- Japanese historical longline: 1959 - 1993
- Japanese longline: 1994 - 2022
- Chinese Taipei longline: 1968 - 1989
- Chinese Taipei longline: 1990 - 1997
- Chinese Taipei longline: 1998 - 2022
- U.S. pelagic longline: 1993 - 2022
- Venezuelan longline: 1991 - 2018
- Venezuelan artisanal drift-gillnet: 1991 - 2022
- Venezuelan rod and reel recreational: 1961 - 2001
- Brazilian longline:1978 - 2005
- Ghanaian gillnet: 2000 - 2009

The same procedure agreed upon during the 2018 Blue Marlin Stock Assessment will be used to associate the coefficient of variance CV to each of the CPUEs. When available, annual CVs estimated during the standardization will be used as long as their value is 0.3 or greater. For years where the CV is less than 0.3, a value of 0.3 will be used. For CPUEs of Chinese Taipei (1968-1989) and Japanese longline (1959-1993), time-varying *q* based on fishery target species ratio (YFT/(BET+YFT)) in catch will be explored by the modelers.

Natural mortality

The Group recognizes the difficulties of estimating natural mortality in general. For the initial run, the Group suggests applying a prior on M = 0.148 with SD = 0.018 which was estimated by SS in the 2018 Blue Marlin Stock Assessment. The Group also supports exploring estimating this parameter in Stock Synthesis.

Steepness

During the 2018 Blue Marlin Data Preparatory Meeting (Anon., 2018b), the Group had extensive discussions and examined various studies of steepness and decided to use three values for steepness 0.4, 0.5, and 0.6. In the final models, however, steepness was estimated in SS and was fixed at 0.5 to estimate JABBA *r* prior. The lower bound of 0.4 was selected based on the value estimated in the 2011 Blue Marlin Stock Assessment (Anon., 2012). The upper bound was based on the informed decision that white marlin are more productive than blue marlin. The ICCAT estimated value of steepness for white marlin is approximately 0.6.

For the 2024 Stock Assessment, the Group felt that the middle steepness value of 0.5 seems to be small for this species and suggested trying higher steepness values. Therefore, the range of values was broadened to 0.4, 0.5, and 0.7. The Group agreed to also explore the possibility of letting SS estimate steepness.

6. Recommendations on research and statistics

1. The Group recommends that CPCs review historical catches reported as unclassified billfish (i.e., BIL) and make an effort to report those catches at the species-specific level.

2. The Group recommends that CPCs review blue marlin historical catches reported for 'unclassified gear' (i.e., UNK) and try to report those catches by the specific gear type.

3. The Group recommends that CPCs review historical Task 2 Catch and Effort data and report them by month and the requested spatial resolution and effort type required for each gear type.

4. The Group recommends that CPCs follow the SCRS general recommendation to replace as soon as possible the SCRS preliminary catch statistics (T1NC) with their official catches of all species (separating landings, dead discards, and live discards) in live weight equivalent.

5. The Group reiterates the Commission request in the *Recommendation by ICCAT to establish rebuilding programs for blue marlin and white marlin/roundscale spearfish* (Rec. 19-05) para 15 for CPCs to provide to the SCRS documentation on their methodology for estimating dead and live discards.

6. The Group recommends a high priority be placed on biological research and collecting and reporting information on fisheries statistics for Mediterranean Sea billfish species.

7. Countries that use moored FADs should review the reports provided to ICCAT about catches associated with these devices. Gear type is not always clearly defined in the reports provided to ICCAT and the catches are not consistently reported.

8. The Group recommends that catch and effort data for sport fisheries in the South Atlantic be thoroughly revised and updated to provide a standardized CPUE series for the next billfish assessments.

9. The Group recommends that scientific efforts for both conventional and electronic tagging be conducted in the Atlantic and Mediterranean Sea. These efforts should take advantage of opportunities offered by the collaboration with other tagging initiatives in ICCAT.

10. The Group further noted a recommendation to reinitiate the activities of the SCRS *Ad-hoc* Working Group on Tagging coordination.

11. The Group recommends that CPCs carry out studies of post-release mortality not only by gear category (e.g., longline, purse seine) but also by gear type, for example, shallow longline vs. deep longline.

12. The Group recommends updating the estimates of maturity and reproductive capacity at size/age for Atlantic blue marlin.

13. The Group recommends exploring growth models that can describe the entire growth pattern for blue marlin, including the initial phase of fast growth.

14. The Group recommends a study to elucidate the reasons for the differences in length at age between the spine readings from the west and otolith readings from the east Atlantic. This study could include:

    a. Further analysis of growth from tagging data.
    b. Further validation of age readings for a wider set of ages.
    c. Collection and analysis of spine and otolith samples from the same fish and from both sides of the Atlantic.

7. Responses to the Commission

7.1 The SCRS shall review these data and determine the feasibility of estimating fishing mortality by commercial fisheries, Rec. 16-11, para. 2.

Background: *CPCs shall enhance their efforts to collect data on catches of sailfish, including live and dead discards, and report these data annually as part of their Task 1 and 2 data submission to support the stock assessment process. The SCRS shall review these data and determine the feasibility of estimating fishing mortality by commercial fisheries (including longline, gillnets and purse seine), recreational fisheries and artisanal fisheries.*

The request is related to sailfish. Fishing mortality was estimated at the 2023 Sailfish Stock Assessment. A response was provided in 2023 (*Report for Biennial Period, 2022-23, Part II, Vol. 2,* item 19.37).

For blue marlin, the Group will conduct a Stock Assessment in 2024. As part of the assessment, the Group will determine the feasibility of estimating fishing mortality by commercial fisheries (including longline, gillnets and purse seine), recreational fisheries and artisanal fisheries and provide this information as well.

7.2 Revise the statistical methodology used to estimate dead and live discards and provide feedback to CPCs, Rec. 19-05 para 16.

Background: *"No later than 2020, CPCs shall present to the SCRS the statistical methodology used to estimate dead and live discards. CPCs with artisanal and small-scale fisheries shall also provide information about their data collection programmes. The SCRS shall review these methodologies and if it determines that a methodology is not scientifically sound, the SCRS shall provide relevant feedback to the CPCs in question to improve the methodologies. The SCRS shall also determine if one or more capacity building workshops are warranted to help CPCs to comply with the requirement to report total live and dead discards. If so, the Secretariat in coordination with the SCRS should begin organizing the SCRS-recommended workshop(s) in 2021 with a view to convening them as soon as practicable."*

The Group agreed to create an Ad hoc subgroup formed by F. Ngom (Billfish Species Group Rapporteur), M. Schirripa (Chair of the Working Group on Stock Assessment Methods (WGSAM)), D. Die (Bigeye Tuna Rapporteur and lead instructor for both the 2023 and 2024 Workshops for the Improvement of Statistical Data Collection and Reporting on Small Scale (Artisanal) Fisheries), and M. Ortiz (ICCAT Secretariat) to provide a draft in advance of the SCRS Species Group meeting in September 2024 using outcomes from:

- SCRS Documents provided by CPCs on their monitoring and estimation of live and dead discards for billfishes.
- Two workshop reports for the improvement of statistical data collection and reporting on small-scale artisanal fisheries (2023) in Côte d'Ivoire for the East Atlantic, and (2024) in Panama for the Caribbean and West Atlantic.
- Relevant outcomes of the proposed 2024 Workshop on the Bycatch Estimation Tool intended for CPCs use and implementation.
- The SCRS reports on the minimum standards for Electronic Monitoring Systems (EMS), for dead and live discards in both LL and PS.

Excluding item one, the list above is simply a list of alternative sources for the CPCs' consideration. It does not imply, however, that they are necessarily the only possible estimation procedures to be used by CPCs.

8. Other matters

SCRS Strategic Plan

The Group discussed what might be needed regarding billfish related components of the planned new SCRS Strategic Plan. The SCRS Chair explained that the new Strategic Plan is intended to cover a six-year period and is expected to include tables showing the tentative schedule of meetings over that period as well as a table showing the timing and duration of planned research activities, to facilitate long term planning.

The Group focused their discussion on the expected scheduling of future assessment meetings and research needs. The SCRS Chair noted that, if the most recent gap in timing of billfish assessments were maintained, then the next white marlin assessment would take place in 2025 (and has already been tentatively scheduled for that year), sailfish in 2029, and blue marlin in 2030. But he stressed that this is up to the Group to review in the future, taking into account factors such as stock status, life history and trends observed in the data and fishery indicators. Although it is understood that the number of assessments that the SCRS can undertake each year is limited, there was agreement that the Group should base its proposed assessment schedule focusing on billfish needs, and that overall prioritization of assessment scheduling across Species Groups will be considered at the SCRS Plenary.

Although there was concern expressed about the long gaps between stock assessments for stocks that are overfished, considering the important data gaps and research needs that should be addressed to improve management advice the Group agreed to a tentative assessment schedule of white marlin in 2025, sailfish in 2029, and blue marlin in 2030 to propose for the Strategic Plan.

Research needs

The Group identified various important research needs as part of the Enhanced Programme for Billfish Research (ERBP) for the short and long term to be included in the next SCRS Strategic Plan, as shown below:

- Growth integration of spines and otoliths for blue marlin. Validation C14, OTC, sampling of hard parts in both East and West Atlantic. A comprehensive review of growth patterns of billfish species.
- Reproductive biology analysis and maturity of blue marlin, white marlin and sailfish, and other less common billfishes (*Tetrapturus belone* (MSP), *T. audax* (MLS), *T. angustirostris* (SSP), *T. georgii* (RSP)) in the wide Atlantic including the Mediterranean Sea. Considering also sampling DNA, bioaccumulation of contaminates, and long-term sampling storage.
- Evaluation of Climate Change impacts in the habitat of billfish, growth patterns, and spatial distribution.
- Reinitiate tagging programs (conventional and electronic) in the Atlantic. Review the data and requirements for the use of tagging data sources. Extend tagging programs across several species in ICCAT with common objectives and resources.
- Improve statistics of billfish landings, and discards (dead & live) in the wide Atlantic including the Mediterranean Sea.
- Research studies on the post-release mortality for different gears and gear configurations.

It was recommended that interested scientists work intersessionally with the billfish Rapporteur, in the context of the ERBP, to develop more fully a research plan identifying research needs in greater detail, including prioritization and timing over the upcoming six years. This plan will be presented to the Billfish Species Group for consideration at its September 2024 meeting.

Climate Change considerations

The Group recommended deferring the discussion of the impacts of Climate Change across billfish species to the 2024 SCRS Workshop.

Working plan leading to the June 2024 stock assessment meeting

To facilitate intersessional modeling works, the Group set a working plan until the stock assessment meeting between 17-21 June 2024:

- Any catch and size data revisions by CPCs should be provided to the Secretariat by 29 March 2024.
- Catch and size input data including sensitivity scenarios will be provided by the Secretariat by 5 April 2024.
- Preliminary stock assessment results for the Group should be provided and posted on the Next Cloud at least two weeks (3 June 2024) prior to the stock assessment meeting.

9. Adoption of the Report and closure

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

References

Andrzejaczek S., Mikles C.S., Dale J.J., Castleton M., Block B.A. 2023. Seasonal and diel habitat use of blue marlin *Makaira nigricans* in the North Atlantic Ocean. ICES J. Mar. Sci., Vol. 80 (4): 1002–1015. https://doi.org/10.1093/icesjms/fsad020

Anonymous. 2012. Report of the 2011 ICCAT Blue Marlin Stock Assessment and White Marlin Data Preparatory Meeting (Madrid, Spain, 25-29 April 2011). Collect. Vol. Sci. Pap. ICCAT, 68(4): 1273-1386.

Anonymous. 2018a. Report of the 2018 ICCAT Blue Marlin Stock Assessment (Miami, United States, 18-22 June 2018). Collect Vol. Sci. Pap. ICCAT 75(5): 813-888.

Anonymous. 2018b. Report of the 2018 ICCAT Blue Marlin Data Preparatory Meeting (Madrid, Spain, 12-16 March 2018). Collect Vol. Sci. Pap. ICCAT 75(5): 743-812.

Anonymous. 2023. Report of the 2023 ICCAT Sailfish Data Preparatory and Stock Assessment Meeting (Online, 5-10 June 2023). Collect Vol. Sci. Pap. ICCAT 80(8): 1-166.

Crespo Neto, O. 2016. Utilização de habitat e movimentos migratórios do Agulhão Negro (*Makaira nigricans*) no oceano Atlântico Sul. Dissertação apresentada ao Programa de Pós-Graduação em Oceanografia da Universidade Federal de Pernambuco (PPGO-UFPE), como requisito para obtenção do título de Mestre em Oceanografia.

Hoolihan J.P., Luo J., Arocha F. 2019. Age and growth of blue marlin *Makaira nigricans* from the central western Atlantic Ocean. Fisheries Research, Vol. 220, 105346. https://doi.org/10.1016/j.fishres.2019.105346

ICCAT. 2024. Statistical Bulletin Vol. 49 (1950-2022).

ISC. 2021. Stock assessment report for Pacific blue marlin (*Makaira nigricans*) through 2019. 21st Meeting of the International Scientific Committee for Tuna and Tuna-Like Species in the North Pacific Ocean Held Virtually July 12-20, 2021. ISC/21/ANNEX/10

Lauretta M., Goodyear P. 2018. Blue marlin (*Makaira nigricans*) standardized indices of abundance from the U.S. Pelagic Longline and recreational tournament fisheries. Collect. Vol. Sci. Pap. ICCAT 75(5): 948- 964.

Shimose T., Fujita M., Yokawa K., Saito H., Tachihara K. 2009. Reproductive biology of blue marlin *Makaira nigricans* around Yonaguni Island, southwestern Japan. Fish Sci, Vol. 75: 109–119. https://doi.org/10.1007/s12562-008-0006-8

Sun C.L., Chang Y.J., Tszeng C.C., Yeh S.Z., Su N.J. 2009. Reproductive biology of blue marlin (*Makaira nigricans*) in the western Pacific Ocean. Fish. Bul., Vol 107: 420-432.

Schueller A.M., Snodgrass D.J.G., Orbesen E.S., Schirripa M. 2023. An index of vessel fishing power for the billfish tournament fleet (1982-2021). Document SCRS/2023/080. Withdrawn.

Yokawa K., Takeuchi Y., Okazaki M., Uozumi Y. 2001. Standardizations of CPUE of blue marlin and white marlin caught by Japanese longliners in the Atlantic Ocean. Collect. Vol. Sci. Pap. ICCAT 53: 345–355.

Table 1. Estimated catches (landings + dead discards, t) of Atlantic blue marlin (*Makaira nigricans*) by main gear and flag (source T1NC).

				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
TOTAL	A+M			4216	4187	5366	5670	5637	5326	5395	4376	3807	4316	3106	3470	3070	4263	3602	3121	3005	2750	2758	2143	2769	2075	2128	2694	2075	2098	2158	2184	1732
Landings	A+M		Longline	3115	3000	3835	4302	3721	3513	3253	2595	1924	2227	1824	1963	1940	2369	2479	2069	1977	1438	1339	991	1300	1268	1207	1539	1262	1400	1206	990	935
			Other surf.	870	956	1267	1098	1734	1658	2014	1635	1618	1765	1073	1430	989	1672	815	839	832	1019	1055	951	1212	584	636	780	489	495	743	984	558
			Sport (HL+RR)	120	77	68	132	130	72	69	123	216	305	174	51	103	179	269	152	177	237	289	142	200	112	220	276	255	134	136	152	156
Landings(FP)	A+M		Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31
Discards	A+M		Longline	111	153	197	139	51	83	60	22	37	19	34	24	38	42	37	40	19	56	70	55	54	106	52	73	44	55	58	45	38
			Other surf.	0	0	0	0	1	0	0	2	11	0	1	1	0	0	1	21	1	0	5	4	3	5	13	27	23	15	16	12	15
Landings	A+M	CP	Angola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0	0	0	0	0	
			Barbados	19	31	25	30	25	19	19	18	11	11	0	0	25	0	0	0	9	13	14	11	12	34	11	24	21	13	22	12	9
			Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	3	3	7	47	19	8	5	13	1	6	0	2	0	
			Brazil	81	180	331	193	486	509	467	780	387	577	195	612	298	262	182	150	130	63	48	114	105	89	79	64	37	20	13	2	3
			Canada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Cape Verde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	
			China PR	62	73	62	78	120	201	23	92	88	89	58	96	99	65	13	77	100	99	61	45	40	44	50	40	42	46	37	4	10
			Curaçao	40	40	40	40	40	40	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	44	2	20	15	2	6
			Côte d'Ivoire	151	134	113	157	66	189	288	208	111	171	115	21	8	132	66	72	54	17	48	48	87	15	72	44	32	163	41	148	6
			EU-España	55	40	158	122	195	125	140	94	28	12	51	24	91	38	55	160	257	131	190	147	209	287	225	321	293	272	250	226	203
			EU-France	149	154	197	232	257	285	305	329	340	340	345	360	361	358	395	265	281	284	263	162	303	190	167	209	152	170	282	131	170
			EU-Portugal	11	10	7	3	61	20	22	18	8	32	27	48	105	135	158	106	140	54	55	25	23	46	50	57	74	18	28	37	36
			El Salvador	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
			FR-St Pierre et Miquelon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Gabon	2	0	304	5	0	0	0	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Ghana	441	471	422	491	447	624	639	795	999	415	470	759	405	683	191	140	116	332	234	163	236	88	44	162	60	44	53	278	121
			Great Britain	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Grenada	52	50	26	47	60	100	87	104	69	72	45	42	33	49	54	32	69	53	32	63	63	56	53	54	62	69	49	30	30
			Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	23	0	15	0	
			Japan	1523	1409	1679	1349	1185	790	883	335	267	442	540	442	490	920	1028	822	731	402	430	189	280	293	296	430	287	357	293	284	333
			Korea Rep	56	56	144	56	2	3	1	1	0	0	1	6	33	64	91	36	85	57	34	24	10	3	26	25	25	13	20	12	10
			Liberia	0	87	148	148	701	420	712	235	158	115	188	304	162	274	76	56	46	133	94	178	293	35	127	65	24	18	21	119	25
			Maroc	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0	4	7	82	64	46	27	46	39
			Mexico	13	13	13	13	27	35	68	37	50	70	90	86	64	91	81	93	89	68	106	86	67	72	66	60	68	51	39	43	29
			Namibia	0	0	0	0	0	0	0	0	3	0	5	9	57	0	50	2	23	10	0	8	36	8	32	57	84	53	51	70	8
			Panama	0	0	0	0	0	0	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	21	0	14	12	
			Philippines	0	0	0	0	7	71	38	0	0	0	0	0	0	0	8	0	3	4	1	2	2	0	0	0	0	0	0	0	
			Russian Federation	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			S Tomé e Príncipe	28	33	36	35	33	30	32	32	32	32	9	21	26	66	68	70	72	74	76	78	81	11	10	13	5	88	34	109	75
			Senegal	9	0	2	5	0	0	0	11	24	32	11	1	5	91	114	61	41	64	164	45	72	10	82	39	25	21	358	73	38
			South Africa	0	0	0	0	0	0	0	1	4	0	0	0	0	2	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0
			St Vincent and Grenadine	2	2	1	1	0	1	0	0	20	0	0	0	0	1	3	2	1	0	0	2	0	0	0	2	2	1	2	2	
			Trinidad and Tobago	16	28	14	50	16	20	51	17	16	9	11	7	14	16	34	26	22	25	46	48	48	35	19	0	0	0	0	1	
			UK-Bermuda	15	15	15	3	5	1	2	2	2	2	2	2	2	2	2	0	1	2	2	3	3	3	2	1	2	1	1	1	1
			UK-British Virgin Islands	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			UK-Sta Helena	0	2	2	1	2	4	4	3	4	1	1	2	2	3	4	2	2	2	12	2	1	1	0	0	0	0	0	0	
			UK-Turks and Caicos	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			USA	88	43	43	46	50	37	24	16	17	19	26	16	17	9	13	6	4	6	14	9	1	9	19	13	20	17	17	22	22
			USSR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Uruguay	3	1	1	26	23	0	0	0	1	5	3	2	8	5	0	6	1	0	0	0	0	0	0	0	0	0	0	0	
			Venezuela	122	117	148	142	226	240	125	84	88	120	101	160	172	222	130	120	155	122	161	123	158	144	180	197	132	116	73	96	123
		NCC	Chinese Taipei	663	467	660	1478	578	486	485	240	294	319	315	151	99	233	148	195	153	199	133	78	62	61	75	73	74	40	70	76	40
			Costa Rica	0	0	0	0	0	3	2	2	0	0	2	1	3	2	11	9	12	19	14	19	34	53	48	74	35	27	15	24	11
			Guyana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	128	39	75	81
		NCO	Benin	5	5	5	5	5	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Cuba	39	85	43	53	12	38	55	56	34	3	4	7	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Dominica	0	0	0	0	0	0	0	64	69	75	36	44	55	58	106	76	76	60	0	0	85	62	49	74	52	45	64	54	54
			Dominican Republic	0	0	0	41	71	29	23	23	115	207	142	30	38	47	67	60	65	100	98	99	96	73	170	183	176	87	58	72	72
			Jamaica	0	0	0	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Mixed flags (FR+ES)	133	126	96	82	80	83	147	151	131	148	171	150	136	135	139	164	178	186	181	191	173	176	0	0	0	0	0	0	
			NEI (BIL)	0	0	0	0	0	0	53	184	258	167	89	7	160	209	205	177	0	34	0	0	0	0	0	0	0	0	0	0	
			NEI (ETRO)	326	362	435	548	803	761	492	274	17	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Saint Kitts and Nevis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	8	12	0	2	5	4
			Sta Lucia	0	0	0	4	1	0	10	5	9	18	17	21	53	46	70	72	58	64	119	99	111	53	91	134	93	82	78	61	85
			Togo	0	0	0	23	0	73	53	141	103	775	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Ukraine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Vanuatu	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	7	8	6	3	2	0	0	0	0	0	0	0	
Landings(FP)	A+M	CP	EU-España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19
			EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
Discards	A+M	CP	Brazil	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Canada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0
			Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	1	0	
			EU-España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	0	0	1	4	3	5	7	6	6	7	6	6	7
			EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	1	0	0	6	11	12	9	5	5	8
			Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	2	0	
			Japan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	8	16	8	4
			Korea Rep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	1	1	0	0	0	0	0	0	
			Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	2	0	
			UK-Bermuda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			USA	111	153	197	139	52	83	60	25	49	19	35	25	36	42	38	42	19	50	39	55	53	81	25	47	22	24	20	9	16
		NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32	0	0	24	27	26	16	22	21	20	18

Table 2. Standard SCRS catalogues on statistics (Task 1 and Task 2) of blue marlin (BUM) by stock, major fishery (flag/gear combinations ranked by order of importance) and year (1994 to 2023). Only the most important fisheries (±95% of Task 1 total catches) are shown. For each data series, Task 1 (DSet= "t1", in tonnes) is matched against its equivalent Task 2 (DSet= "t2") availability scheme (concatenation of characters: "-1"= none; "a"= T2CE exists; "b"= T2SZ exists; "c"= CAS exists) in ICCAT-DB. The cells shaded in light blue indicate possible gaps, with the most important ones estimated during the meeting. Information for 2023 is preliminary.

Table 15. BUM-A stock (AT + MD)

15

Score: 3.910

Speci	Stc	Stat	FlagName	GearG	DS	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	Σ(1994-23)
				T1 Total		4216	4187	5366	5670	5637	5326	5395	4376	3807	4316	3106	3470	3070	4263	3602	3121	3005	2750	2758	2143	2769	2075	2128	2694	2075	2098	2158	2184	1732	568				Ok 10006
BUM	A+M	CP	Japan	LL	t1	1523	1409	1679	1349	1185	790	883	335	267	442	540	442	490	920	1028	822	731	402	430	189	280	293	296	430	293	365	309	292	337	476	1	19.2%	19%	1922
BUM	A+M	CP	Japan	LL	t2	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	a	a	a	a	a	a	a	a	1			
BUM	A+M	CP	Ghana	GN	t1	441	471	422	491	447	624	639	795	999	415	470	759	405	683	191	140	116	332	234	163	236	88	44	162	60	44	53	278	121		2	10.3%	30%	1032
BUM	A+M	CP	Ghana	GN	t2	a	a	-1	b	ab	b	ab	ab	ab	ab	ab	ab	ab	ab	a	ab	a	a	a	a	a	a	a	a	a	-1	-1	-1	-1		2			
BUM	A+M	NCC	Chinese Taipei	LL	t1	663	467	660	1478	578	486	485	240	294	319	315	151	99	233	148	195	153	199	165	78	62	85	102	99	90	62	91	96	58	84	3	8.2%	38%	823
BUM	A+M	NCC	Chinese Taipei	LL	t2	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	3			
BUM	A+M	CP	EU-France	LL	t1	149	154	197	232	257	285	305	329	340	340	345	360	360	352	382	258	239	258	220	145	272	158	114	161	116	138	260	83	119		4	6.9%	45%	692
BUM	A+M	CP	EU-France	LL	t2	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	ab	-1	a	a		4			
BUM	A+M	CP	Brazil	LL	t1	79	169	308	165	340	509	467	780	387	577	194	610	241	149	120	75	47	62	47	112	105	89	79	64	37	20	13	2	3		5	5.8%	51%	584
BUM	A+M	CP	Brazil	LL	t2	a	a	a	a	a	ab	ab	ab	a	a	a	ab	ab	ab	ab	ab	ab	ab	ab	a	a	a	a	a	a	a	-1	-1	a		5			
BUM	A+M	CP	Liberia	GN	t1		87	148	148	701	420	712	235	158	115	188	304	162	274	76	56	46	133	94	178	293	35	127	65	24	18	21	111	25		6	5.0%	55%	495
BUM	A+M	CP	Liberia	GN	t2		-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	b	-1	-1	-1		6			
BUM	A+M	NCO	NEI (ETRO)	LL	t1	326	362	435	548	803	761	492	274	17	14																					7	4.0%	60%	403
BUM	A+M	NCO	NEI (ETRO)	LL	t2	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1																					7			
BUM	A+M	NCO	Mixed flags (FR+ES)	PS	t1	133	126	96	82	80	83	147	151	131	148	171	150	136	135	139	164	178	186	181	191	173	176									8	3.2%	63%	315
BUM	A+M	NCO	Mixed flags (FR+ES)	PS	t2	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1									8			
BUM	A+M	CP	EU-España	LL	t1	55	40	158	122	195	125	140	94	28	12	51	24	91	38	55	60	165	16	34	44	137	212	140	233	210	187	164	141	118		9	3.1%	66%	309
BUM	A+M	CP	EU-España	LL	t2	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	-1	-1	b	b	b	b	-1	b	-1	b	b	b		9			
BUM	A+M	CP	Venezuela	GN	t1	58	48	71	86	175	190	80	57	50	55	57	110	118	184	105	69	98	69	105	72	117	83	98	100	70	55	30	54	51		10	2.5%	68%	251
BUM	A+M	CP	Venezuela	GN	t2	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	b	b	b	b	b	b	b	b		10			
BUM	A+M	CP	Côte d'Ivoire	GN	t1	151	134	113	157	66	189	288	208	111	171	115	21	8	132	66	49	44	15	45	42	87	15	48	25	18	24	3	121			11	2.5%	71%	246
BUM	A+M	CP	Côte d'Ivoire	GN	t2	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	-1	-1	a	-1	-1	-1	a	a	a	ab	a	a	ab	-1	a	-1	-1			11			
BUM	A+M	NCO	Dominican Republic	HL	t1				41	71	29	23	23	115	207	142	30	38	47	67	60	65	100	98	99	96	73	170	183	176	87	58	72	72		12	2.2%	73%	224
BUM	A+M	NCO	Dominican Republic	HL	t2				-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		12			
BUM	A+M	CP	China PR	LL	t1	62	73	62	78	120	201	23	92	88	89	58	96	99	65	13	77	100	99	61	45	40	44	50	40	42	46	37	4	10		13	1.9%	75%	191
BUM	A+M	CP	China PR	LL	t2	-1	-1	-1	-1	-1	-1	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a		13			
BUM	A+M	CP	Mexico	LL	t1	13	13	13	13	27	35	68	37	50	70	90	86	65	91	82	93	89	68	106	86	67	72	66	60	68	51	39	43	29		14	1.7%	77%	168
BUM	A+M	CP	Mexico	LL	t2	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	ab	ab	ab	ab	ab	ab	ab	ab		14			
BUM	A+M	CP	Venezuela	LL	t1	59	64	72	56	51	50	45	27	38	65	44	51	53	37	25	51	57	53	56	52	41	60	83	97	62	60	42	43	72		15	1.6%	78%	156
BUM	A+M	CP	Venezuela	LL	t2	ab	ab	ab	ab	ab	ab	ab	b	b	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	a	a	a	a		15			
BUM	A+M	CP	USA	LL	t1	111	153	197	139	51	83	60	22	37	19	34	24	36	42	37	40	19	50	38	55	53	81	25	47	22	24	20	9	16		16	1.5%	80%	154
BUM	A+M	CP	USA	LL	t2	a	a	a	a	a	ab	a	a	ac	a	a	a	a	a	a	a	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab		16			
BUM	A+M	NCO	NEI (BIL)	LL	t1							53	184	258	167	89	7	160	209	205	177		34													17	1.5%	81%	154
BUM	A+M	NCO	NEI (BIL)	LL	t2							-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		-1													17			
BUM	A+M	CP	Grenada	LL	t1	52	50	26	47	60	100	87	104	69	72	45	42	33	49	54	32	69	53	32	63	63	51	49	43	46	56	41	18	19		18	1.5%	83%	152
BUM	A+M	CP	Grenada	LL	t2	-1	-1	-1	-1	-1	-1	-1	-1	-1	a	a	a	a	a	a	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		18			
BUM	A+M	NCO	Sta Lucia	TR	t1									9	18	17	21	53	46	70	72	58	64	119	99	111	53	91	134	93	82	78	61	85		19	1.4%	84%	143
BUM	A+M	NCO	Sta Lucia	TR	t2									-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		19			
BUM	A+M	CP	EU-España	PS	t1																118	93	116	157	107	75	80	92	95	89	92	92	91	110		20	1.4%	86%	140
BUM	A+M	CP	EU-España	PS	t2																-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		20			
BUM	A+M	CP	EU-Portugal	LL	t1					20	17	4	8	6	31	27	48	105	135	157	106	139	54	53	25	22	45	50	57	74	18	27	37	36		21	1.3%	87%	130
BUM	A+M	CP	EU-Portugal	LL	t2	b				a	a	a	a	a	a	a	a	a	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	a	ab	a		21			
BUM	A+M	NCO	Togo	GN	t1				23		73	53	141	103	775																					22	1.2%	88%	116
BUM	A+M	NCO	Togo	GN	t2				-1		-1	-1	-1	-1	-1																					22			
BUM	A+M	CP	S Tomé e Príncipe	TR	t1	28	33	36	35	33	30	32	32	32	32	9	21	26	66	68	70	72	74	76	78	81	11	10	13							23	1.0%	89%	99
BUM	A+M	CP	S Tomé e Príncipe	TR	t2	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1							23			
BUM	A+M	CP	Korea Rep	LL	t1	56	56	144	56	2	3	1	1		0	1	6	33	64	91	36	85	62	34	24	11	5	26	25	25	13	20	12	10		24	0.9%	90%	90
BUM	A+M	CP	Korea Rep	LL	t2	-1	a	a	a	a	a	-1	a		a	a	a	a	a	a	a	a	a	a	abc	ab	ab	a	ab	a	ab	a	ab	a		24			
BUM	A+M	NCO	Dominica	HL	t1								64	69	75			41	23	85	46	76	57			34	25	18	45	31	15	37	28	32		25	0.8%	91%	80
BUM	A+M	NCO	Dominica	HL	t2								-1	-1	-1			a	a	a	a	-1	a			a	a	-1	a	a	a	a	-1	-1		25			
BUM	A+M	CP	USA	RR	t1	87	43	35	46	50	37	24	16	17	19	26	16	17	9	13	6	4	6	14	9	1	9	19	13	20	17	17	22	22		26	0.6%	91%	63
BUM	A+M	CP	USA	RR	t2	ab	ab	ab	ab	ab	ab	ab	a	ab	ab	ab	ab	a	b	-1	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab		26			
BUM	A+M	CP	Senegal	HL	t1				5				6			3			84	96	37	29	64	154	25	62		4	10			0	11	7		27	0.6%	92%	59
BUM	A+M	CP	Senegal	HL	t2				-1				-1			-1			ab	-1	a	a	a	a	a	a		a	-1			-1	-1	-1		27			
BUM	A+M	CP	Namibia	LL	t1									3		5	9	57		50	2	23	10		8	36	8	32	57	84	53	49	70	8		28	0.6%	93%	56
BUM	A+M	CP	Namibia	LL	t2									-1		-1	-1	-1		-1	-1	-1	a		-1	-1	a	a	a	a	a	a	a	a		28			
BUM	A+M	CP	Trinidad and Tobago	LL	t1	16	28	12	49	15	20	46	14	9	9	10	7	12	14	34	19	22	25	45	48	48	35	19					1			29	0.6%	93%	55
BUM	A+M	CP	Trinidad and Tobago	LL	t2	-1	-1	-1	-1	-1	-1	-1	-1	-1	a	a	a	a	a	a	a	a	a	a	a	a	a	a					a			29			

Table 3. Reported live discards (DL, t) of Atlantic blue marlin (BUM) by year, major gear, and flag (source: T1NC – Task 1 Nominal Catches).

Sum of Qty_t				YearC																	
Species	**GearGrp**	**FlagName**	**2004**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
BUM	HL	EU-France									0									0
		Maroc													0					
		Barbados																		0
	LL	Canada													0	1	0	0		0
		EU-France																		0
		Korea Rep												0	0				0	0
		Mexico		0	1	1	1	1	1	1	0	0	1	1	1	1	1	0	1	1
		UK-Bermuda															1	2	1	
		UK-Turks and Caicos									0									
		Trinidad and Tobago							0	0	0			0						
		Maroc													0					
		Brazil		47	58	19														
		USA					58	30	108	110	138	93	142	72	94	63	66	30	24	26
		Uruguay									0									
		South Africa										0								
		Guyana																	0	
		Barbados																		0
	PS	Curaçao													0					
		EU-España					1		2		1		1	0	0					
		EU-France		0	0	0	0	0	0	0	0	0	1	0	0	1	0		0	0
		Panama													0					
		Maroc													0					
		Guatemala													0					
	RR	EU-France																		0
		UK-Bermuda										0			27	55	12	15	10	20
		UK-Turks and Caicos	2																	
		Trinidad and Tobago								0	0									
		UK-Sta Helena																	0	
		Brazil		0																
	TR	EU-France																		0
		Saint Kitts and Nevis											0	0	0					
	UN	EU-France																		0
		USA						0		5										
TOTAL			**2**	**47**	**59**	**20**	**60**	**31**	**111**	**116**	**140**	**94**	**144**	**73**	**123**	**120**	**80**	**48**	**36**	**47**

Table 4. Species Group preliminary estimates of blue marlin catch (t) to complete missing official reported catches (2017 to 2022), applying the SCRS standard methodology (detailed in the text) used in gap completion analyses. The Liberian catch series for the entire period 1995-2022 was reallocated to gillnet. Information stored in ICCAT-DB as preliminary (must be revised by the CPCs).

	BUM-AT													
	Dominican Republic	EU-España			EU-France		Grenada	Guyana	Liberia	Maroc			Venezuela	TOTAL
	DOM	EU.ESP-ES-ETRO		EU.ESP-ES-SWO	EU.FRA-FR		GRD	GUY	LBR	MAR			VEN-VE-ARTPVER	
	HL	PS		LL	HL	LL	TR	LL	GN	HL	LL	PS	GN	
Year	L	DD	L	L	L	L	L	L	L	L	L	L	L	
1995									87					87
1996									148					148
1997									148					148
1998									701					701
1999									420					420
2000									712					712
2001									235					235
2002									158					158
2003									115					115
2004									188					188
2005									304					304
2006									162					162
2007									274					274
2008									76					76
2009									56					56
2010									46				98	144
2011									133				69	202
2012									94				105	199
2013									178				72	250
2014									293				117	410
2015						0			35				83	119
2016						0			127				98	224
2017	183								65				100	347
2018	176	6	83	210		0			24	16	31	17	70	633
2019	87	7	85	187	0	0			18	11	22	12	55	485
2020	58	6	86	164	0	0			21				30	366
2021	72	6	85	141			12		111	11	22	12	54	527
2022	72	7	85				11	81	25	10	19	11	51	372

Table 5. T2CE datasets requiring revisions (having BUM and other billfish species) due to their poor resolution (by year and large grids) and without effort reported.

GearGrpCode	FlagName	FleetCode	TimeStrata	GeoStrata	EffortUnit	CatchTypeCode	ProductTypeCode	1990	1992	1994	1995	1996	1997	1998	1999	2002	2008	2009	2010	2011	2012	2013	2014
GN	**Benin**	BEN	yy	1x1	**NO.BOATS**	L	LW	26000															
LL	**Brazil**	BRA	yy	5x5	**NO.HOOKS**	L	NR												437				
	Venezuela	VEN	yy	1x1	**NO.HOOKS**	L	LW									50118							
	China PR	CHN	yy	5x5	**NO.HOOKS**	L	LW			76500	90000	57500	94100	144100	247500								
							NR			1252	1430	1229	1485	2273	4031								
RR	**UK-Bermuda**	UK.BMU	yy	1x1	**NO.BOATS**	L	LW						3100										
				5x5	**NO.BOATS**	L	LW					14700											
TW	**Ukraine**	UKR	yy	10x10	**-none-**	L	LW		5000														
UN	**EU-France**	EU.FRA-FR-GP	yy	1x1	**NO.TRIPS**	L	LW										289		102000	100000	93000	67000	86462
		EU.FRA-FR-MQ	yy	1x1	**NO.TRIPS**	L	LW											288000	221000	279000	237000	145000	306079
TOTAL								**26000**	**5000**	**77752**	**91430**	**73429**	**98685**	**146373**	**251531**	**50118**	**289**	**288000**	**323437**	**379000**	**330000**	**212000**	**392540**

Table 6. BUM size frequencies (T2SZ) datasets requiring revisions due to its poor resolution (by year and trimester).

Sum of NrFish							**YearC**																								
TimeStrata	**Stock**	**FlagName**	**GearCode**	**GeoStrata**	**FreqTypeCode**	**SzInterval**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
qq	A+M	Chinese Taipei	LL	ICCAT	SLJFL	5	412	55	312	313	988	2252	3520	2036	1079	923	389	600	1631	1345	1065	1262									
		Japan	LL	10x10	EYF	1						19	112		5	1															
						5				10	3	19																			
					SLJFL	1									5	1			3				3								
				10x20	EYF	1						406	591		445	690										331	289				
						5	712	402	125	118	182	270														79	317				
					SLJFL	1									445	690	428	164	285	333	352	423	154	175	166						
					WGT	1																					2				
						5				32		29																			
		USA	LLD	ICCAT	SLJFL	1										50											33		53	83	
		EU-España	LLSWO	5x5	SLJFL	5																								6	66
		EU-France	UNCL	1x1	WGT	5																				66	176	129	116	41	18
yy	A+M	Côte d'Ivoire	GILL	5x5	SLJFL	1																	1349								
		EU-France	UNCL	5x5	WGT	5																			170						
Grand Total							**1124**	**457**	**437**	**473**	**1173**	**2995**	**4223**	**2036**	**1979**	**2355**	**817**	**764**	**1919**	**1678**	**1417**	**1685**	**1506**	**175**	**336**	**476**	**817**	**129**	**169**	**130**	**84**

Table 7. Proposed distribution of unclassified billfish (BIL) catches between the main billfish spp, blue and white marlin, sailfish, and round-scale spearfish.

	Species						Percent BUM/WHM(RSP)/SAI			Splitted BIL					
YearC	BIL (unclass)	BUM	WHM	SAI	RSP	Total	%Bum	%WH	%SAI	Year C	BUM	WHM	SAI	RSP	Total
1956		39.00	19.00	0.66		58.66	66%	32%	1%	**1956**	39.00	19.00	0.66	-	58.66
1957		764.00	160.00	95.15		1,019.15	75%	16%	9%	**1957**	764.00	160.00	95.15	-	1,019.15
1958		772.00	161.00	98.59		1,031.59	75%	16%	10%	**1958**	772.00	161.00	98.59	-	1,031.59
1959		841.00	112.00	9.48		962.48	87%	12%	1%	**1959**	841.00	112.00	9.48	-	962.48
1960		2,815.00	313.00	226.26		3,354.26	84%	9%	7%	**1960**	2,815.00	313.00	226.26	-	3,354.26
1961		4,083.00	830.00	523.35		5,436.35	75%	15%	10%	**1961**	4,083.00	830.00	523.35	-	5,436.35
1962		7,308.00	2,064.00	581.31		9,953.31	73%	21%	6%	**1962**	7,308.00	2,064.00	581.31	-	9,953.31
1963		9,038.00	2,614.00	584.81		12,236.81	74%	21%	5%	**1963**	9,038.00	2,614.00	584.81	-	12,236.81
1964		8,011.00	3,735.00	797.61		12,543.61	64%	30%	6%	**1964**	8,011.00	3,735.00	797.61	-	12,543.61
1965		6,156.00	4,906.00	1,776.29		12,838.29	48%	38%	14%	**1965**	6,156.00	4,906.00	1,776.29	-	12,838.29
1966		3,863.00	3,513.00	1,189.23		8,565.23	45%	41%	14%	**1966**	3,863.00	3,513.00	1,189.23	-	8,565.23
1967		2,246.00	1,427.00	1,540.81		5,213.81	43%	27%	30%	**1967**	2,246.00	1,427.00	1,540.81	-	5,213.81
1968		2,527.00	2,049.00	1,791.80		6,367.80	40%	32%	28%	**1968**	2,527.00	2,049.00	1,791.80	-	6,367.80
1969		3,106.00	2,272.00	1,713.89		7,091.89	44%	32%	24%	**1969**	3,106.00	2,272.00	1,713.89	-	7,091.89
1970		2,886.00	2,147.00	1,885.99		6,918.99	42%	31%	27%	**1970**	2,886.00	2,147.00	1,885.99	-	6,918.99
1971		3,398.00	2,266.00	2,159.60		7,823.60	43%	29%	28%	**1971**	3,398.00	2,266.00	2,159.60	-	7,823.60
1972		2,414.00	2,289.00	1,674.69		6,377.69	38%	36%	26%	**1972**	2,414.00	2,289.00	1,674.69	-	6,377.69
1973		3,226.00	1,868.00	1,318.54		6,412.54	50%	29%	21%	**1973**	3,226.00	1,868.00	1,318.54	-	6,412.54
1974		3,095.00	1,775.00	4,325.87		9,195.87	34%	19%	47%	**1974**	3,095.00	1,775.00	4,325.87	-	9,195.87
1975		3,271.00	1,761.00	6,010.83		11,042.83	30%	16%	54%	**1975**	3,271.00	1,761.00	6,010.83	-	11,042.83
1976		2,419.00	1,839.00	6,249.93		10,507.93	23%	18%	59%	**1976**	2,419.00	1,839.00	6,249.93	-	10,507.93
1977		2,181.00	1,150.30	2,356.54		5,687.84	38%	20%	41%	**1977**	2,181.00	1,150.30	2,356.54	-	5,687.84
1978		1,642.00	975.20	3,308.30		5,925.50	28%	16%	56%	**1978**	1,642.00	975.20	3,308.30	-	5,925.50
1979		1,527.30	1,039.10	4,096.82		6,663.22	23%	16%	61%	**1979**	1,527.30	1,039.10	4,096.82	-	6,663.22
1980		1,847.60	976.36	2,909.94		5,733.90	32%	17%	51%	**1980**	1,847.60	976.36	2,909.94	-	5,733.90
1981	116.00	2,032.31	1,240.80	3,050.06		6,439.18	32%	20%	48%	**1981**	2,069.60	1,263.56	3,106.02	-	6,439.18
1982		2,707.60	1,100.22	3,838.19		7,646.01	35%	14%	50%	**1982**	2,707.60	1,100.22	3,838.19	-	7,646.01
1983		2,141.79	1,779.77	4,891.92		8,813.48	24%	20%	56%	**1983**	2,141.79	1,779.77	4,891.92	-	8,813.48
1984		2,888.15	1,213.44	3,595.77		7,697.37	38%	16%	47%	**1984**	2,888.15	1,213.44	3,595.77	-	7,697.37
1985		3,399.19	1,729.87	3,273.54		8,402.59	40%	21%	39%	**1985**	3,399.19	1,729.87	3,273.54	-	8,402.59
1986		2,099.79	1,688.57	3,316.15		7,104.51	30%	24%	47%	**1986**	2,099.79	1,688.57	3,316.15	-	7,104.51
1987	5.00	2,276.40	1,612.45	3,746.33		7,640.18	30%	21%	49%	**1987**	2,277.89	1,613.51	3,748.78	-	7,640.18
1988	1.00	2,867.08	1,472.14	3,251.80		7,592.02	38%	19%	43%	**1988**	2,867.46	1,472.33	3,252.22	-	7,592.02
1989	1.00	4,323.32	1,922.73	2,761.96		9,009.01	48%	21%	31%	**1989**	4,323.80	1,922.94	2,762.27	-	9,009.01
1990	1.00	4,590.92	1,738.61	3,550.00		9,880.53	46%	18%	36%	**1990**	4,591.38	1,738.78	3,550.36	-	9,880.53
1991		4,195.92	1,743.22	2,700.65		8,639.79	49%	20%	31%	**1991**	4,195.92	1,743.22	2,700.65	-	8,639.79
1992		3,076.56	1,557.40	3,239.03		7,873.00	39%	20%	41%	**1992**	3,076.56	1,557.40	3,239.03	-	7,873.00
1993	27.00	3,135.08	1,680.72	3,228.35		8,071.14	39%	21%	40%	**1993**	3,145.60	1,686.36	3,239.18	-	8,071.14
1994		4,216.13	2,201.90	2,292.32		8,710.35	48%	25%	26%	**1994**	4,216.13	2,201.90	2,292.32	-	8,710.35
1995		4,186.61	1,879.76	2,445.04		8,511.42	49%	22%	29%	**1995**	4,186.61	1,879.76	2,445.04	-	8,511.42
1996		5,366.15	1,679.34	3,022.95		10,068.45	53%	17%	30%	**1996**	5,366.15	1,679.34	3,022.95	-	10,068.45
1997		5,670.39	1,512.91	2,604.15		9,787.45	58%	15%	27%	**1997**	5,670.39	1,512.91	2,604.15	-	9,787.45
1998		5,637.12	1,945.39	2,977.58		10,560.09	53%	18%	28%	**1998**	5,637.12	1,945.39	2,977.58	-	10,560.09
1999		5,325.85	1,786.19	2,922.26		10,034.30	53%	18%	29%	**1999**	5,325.85	1,786.19	2,922.26	-	10,034.30
2000	37.42	5,395.44	1,535.21	3,975.96		10,944.03	49%	14%	36%	**2000**	5,413.95	1,540.48	3,989.60	-	10,944.03
2001	25.20	4,376.28	1,078.16	4,603.05		10,082.69	44%	11%	46%	**2001**	4,387.24	1,080.86	4,614.58	-	10,082.69
2002	1.72	3,806.84	1,011.88	4,411.18		9,231.62	41%	11%	48%	**2002**	3,807.55	1,012.07	4,412.00	-	9,231.62
2003	9.39	4,315.73	844.55	4,136.54		9,306.21	46%	9%	44%	**2003**	4,320.09	845.40	4,140.72	-	9,306.21
2004	31.53	3,106.44	841.14	4,338.58	2.30	8,319.99	37%	10%	52%	**2004**	3,118.26	844.35	4,355.08	2.30	8,319.99
2005	103.66	3,469.70	767.53	4,059.33	2.80	8,403.01	42%	9%	49%	**2005**	3,513.03	777.15	4,110.03	2.80	8,403.01
2006		3,070.24	611.73	3,854.92	5.90	7,542.79	41%	8%	51%	**2006**	3,070.24	611.73	3,854.92	5.90	7,542.79
2007	9.35	4,263.16	747.58	4,138.46	1.90	9,160.44	47%	8%	45%	**2007**	4,267.51	748.34	4,142.68	1.90	9,160.44
2008	12.84	3,601.61	710.65	3,962.68	5.12	8,292.90	43%	9%	48%	**2008**	3,607.20	711.76	3,968.83	5.12	8,292.90
2009	26.56	3,121.35	752.96	3,754.84	4.16	7,659.87	41%	10%	49%	**2009**	3,132.22	755.59	3,767.90	4.16	7,659.87
2010	28.99	3,000.72	503.78	3,082.73	4.00	6,620.23	46%	8%	47%	**2010**	3,013.92	506.01	3,096.29	4.00	6,620.23
2011	121.93	2,744.02	529.83	2,889.71		6,285.49	45%	9%	47%	**2011**	2,798.31	540.31	2,946.88	-	6,285.49
2012	106.81	2,740.36	464.32	2,868.85	2.77	6,183.11	45%	8%	47%	**2012**	2,788.53	472.53	2,919.27	2.77	6,183.11
2013	6.38	2,131.12	639.65	2,325.24	8.40	5,110.79	42%	13%	46%	**2013**	2,133.78	640.46	2,328.14	8.40	5,110.79
2014	0.88	2,749.25	436.33	2,046.89	15.87	5,249.22	52%	9%	39%	**2014**	2,749.71	436.41	2,047.23	15.87	5,249.22
2015	2.70	2,086.90	516.24	2,250.58	11.71	4,868.13	43%	11%	46%	**2015**	2,088.05	516.53	2,251.83	11.71	4,868.13
2016	52.52	2,133.19	457.64	2,840.17	22.36	5,505.88	39%	9%	52%	**2016**	2,153.73	462.26	2,867.53	22.36	5,505.88
2017	107.60	2,454.14	431.25	3,066.93	36.49	6,096.41	41%	8%	51%	**2017**	2,498.23	439.66	3,122.03	36.49	6,096.41
2018	71.07	1,632.87	257.46	2,624.66	10.74	4,596.80	36%	6%	58%	**2018**	1,658.51	261.67	2,665.88	10.74	4,596.80
2019	28.16	1,918.44	277.03	3,720.78	11.10	5,955.51	32%	5%	63%	**2019**	1,927.56	278.40	3,738.46	11.10	5,955.51
2020	15.49	1,879.46	183.21	2,497.20	2.43	4,577.79	41%	4%	55%	**2020**	1,885.84	183.84	2,505.68	2.43	4,577.79
2021	70.09	1,740.56	127.86	2,579.93	1.13	4,519.57	39%	3%	58%	**2021**	1,767.97	129.89	2,620.57	1.13	4,519.57
2022	13.02	1,386.05	148.45	2,234.01	6.32	3,787.83	37%	4%	59%	**2022**	1,390.83	148.98	2,241.71	6.32	3,787.83
2023		568.01	10.65	43.47		622.13	91%	2%	7%	**2023**	568.01	10.65	43.47	-	622.13

Table 8. Summary of BUM conventional tagging data available in ICCAT. Number of BUM releases by year and associated recoveries by year. Also shown, is the number of recoveries without recovery dates (unk).

	Releases	Recoveies																																															
Year	Total	Total	1968	1969	1971	1972	1974	1975	1977	1979	1980	1981	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2008	2009	2010	2011	2012	2013	2014	2015	2018	2019	2020	2021	2022	Unk
1940	5																																																	
1955	4																																																	
1956	9																																																	
1958	1																																																	
1959	2																																																	
1960	5																																																	
1961	3																																																	
1962	14																																																	
1963	86																																																	
1964	56																																																	
1965	46																																																	
1966	40																																																	
1967	43																																																	
1968	67	1	1																																															
1969	101	2		1	1																																													
1970	67	1					1																																											
1971	113	1				1																																												
1972	113	1						1																																										
1973	93																																																	
1974	96	1						1																																										
1975	96																																																	
1976	142	1							1																																									
1977	163	1												1																																				
1978	302	2								1	1																																							
1979	282																																																	
1980	477																																																	
1981	435	5										2		1					1			1																												
1982	364																																																	
1983	420	3											1	2																																				
1984	520	2													1			1																																
1985	612	7													1	2	1		1		1			1																										
1986	800	3															1	1	1																															
1987	1375	6															1	1	1	1		1	1																											
1988	1687	6																2	2		1	1																												
1989	2027	16																	5	5	2			1					1		1	1																		
1990	2060	19																		3	7	4	3	1		1																								
1991	2560	40																			7	9	3	8	3	2	5	2	1																					
1992	2467	31																				5	7	6	2	3	6			1		1																		
1993	2973	28																					4	6	3	3	3	4	4						1															
1994	2899	43																						8	11	8	3	3	4	3	1	2																		
1995	3056	59																							8	18	13	11	6	3																				
1996	3646	125																								19	48	25	21	8	2	2																		
1997	2856	65																									17	18	18	6	3	2		1																
1998	2803	82																										18	41	16	2	4			1															
1999	3915	98																											44	30	11	9	3	1																
2000	2470	24																												11	7	2	1	2				1												
2001	1593	8																												1	3	3	1																	
2002	1758	10																														6	1		1	1	1													
2003	724	7																																2	3	1														1
2004	274	4																																4																
2005	79	1																																		1														
2006	266																																																	
2007	174	1																																						1										
2008	27																																																	
2009	1	1																																									1							
2010	4	1																																									1							
2012	4	1																																									1							
2013	5	2																																									1	1						
2014	1	1																																										1						
2015	5	3																																										2		1				
2016	1	1																																															1	
2017	2																																																	
2019	506	8																																												8				
2020	482	8																																													8			
2021	957	32																																														12		20
2022	24	0																																																
Unk	149	146																1											1		13	6	1	7	23	18	24	10	17	4	5	10	3							3
(blank)	15	15																	1	1		2																							7	4				
Total	49422	923	1	1	1	1	1	2	1	1	1	2	1	4	2	2	3	6	12	10	18	23	18	31	27	54	95	81	141	79	43	38	7	17	29	21	25	11	17	5	5	10	7	4	7	13	8	12	1	24

Table 9. Summary of BUM 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 Atlantic blue marlin (*Makaira nigricans*)												
			Years at liberty									
Year	Releases	Recaptures	< 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 10	10+	Unk	ERROR	% recapt*
1940	5	0										
1955	4	0										
1956	9	0										
1958	1	0										
1959	2	0										
1960	5	0										
1961	3	0										
1962	14	0										
1963	86	0										
1964	56	0										
1965	46	0										
1966	40	0										
1967	43	0										
1968	67	1	1									1.5%
1969	101	2	1		1							2.0%
1970	67	1					1					1.5%
1971	113	1	1									0.9%
1972	113	1			1							0.9%
1973	93	0										
1974	96	1		1								1.0%
1975	96	0										
1976	142	1	1									0.7%
1977	163	1						1				0.6%
1978	302	2		2								0.7%
1979	282	0										
1980	477	0										
1981	435	5	2			1		1	1			1.1%
1982	364	0										
1983	420	3	3									0.7%
1984	520	2		1		1						0.4%
1985	612	7	3	1		1		2				1.1%
1986	800	3	1		1	1						0.4%
1987	1375	6	2		2		1	1				0.4%
1988	1687	6	3	1		2						0.4%
1989	2027	16	9	3				2	2			0.8%
1990	2060	19	8	5	3	2		1				0.9%
1991	2560	40	13	5	6	6	1	9				1.6%
1992	2467	31	10	5	3	3	5	4	1			1.3%
1993	2973	28	9	1	3	5	5	4	1			0.9%
1994	2899	43	17	8	5	3	4	6				1.5%
1995	3056	59	16	17	13	7	5	1				1.9%
1996	3646	125	57	28	21	13	4	2				3.4%
1997	2856	65	30	17	11	1	3	3				2.3%
1998	2803	82	35	30	10	1	4	1			1	2.9%
1999	3915	98	63	17	9	8	1					2.5%
2000	2470	24	14	4	3	1	1	1				1.0%
2001	1593	8	4	3							1	0.5%
2002	1758	10	6	1		2		1				0.6%
2003	724	7	1	3	1	1				1		1.0%
2004	274	4	3							1		1.5%
2005	79	1	1									1.3%
2006	266	0										
2007	174	1					1					0.6%
2008	27	0										
2009	1	1					1					100.0%
2010	4	1					1					25.0%
2012	4	1		1								25.0%
2013	5	2		1	1							40.0%
2014	1	1	1									100.0%
2015	5	3	2				1					60.0%
2016	1	1						1				100.0%
2017	2	0										
2019	506	8	8									1.6%
2020	482	8	8									1.7%
2021	957	32	10							22		3.3%
2022	24	0										
Unk	149	146								146		98.0%
(blank)	15	15								15		100.0%
Grand Total	49422	923	343	155	94	59	39	41	5	185	2	1.9%

Table 10. Criteria table for available abundance indices in Atlantic blue marlin stock in 2024.
* Modelers' discretion on time-varying catchability in Japanese and Chinese Taipei longline indices.

Application to the 2024 assessment	Use 1959-1993, with time varying q for the entire time series*	No	Use 1994-2022	Use 1968-1989, with time varying q for the entire time series*	Use 1990-1997	Use 1998-2022	Use 1993-2022
Use in stock assessment?	Yes	No	Yes	Yes	Yes	Yes	Yes
SCRS Doc No.	SCRS/2000/081	SCRS/2018/017	SCRS/2024/026	SCRS/2024/030	SCRS/2024/030	SCRS/2024/030	SCRS/2024/029
Index Name:	Japanese LL hist	US and Japanese LL	Japanese LL	Chinese Taipei	Chinese Taipei	Chinese Taipei	US PLL
Data Source (state if based on logbooks, observer data etc)	logbooks	logbooks	logbooks	logbooks	logbooks	logbooks	scientific observers
Do the authors indicate the percentage of total effort of the fleet the CPUE data represents?	NA	Yes	Yes	Yes	Yes	Yes	Yes
If the answer to 1 is yes, what is the percentage?		91-100%	61-70%	21-30%	21-30%	81-90%	0-10%
Are sufficient diagnostics provided to assess model performance??	Sufficient	Sufficient	Sufficient	Sufficient	Sufficient	Sufficient	Sufficient
How does the model perform relative to the diagnostics ?	Well	Well	Well	Well	Well	Well	Well
Documented data exclusions and classifications?	Yes		Yes	Yes	Yes	Yes	Yes
Data exclusions appropriate?	Yes	Yes	Yes	No	No	No	Yes
Data classifications appropriate?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Geographical Area	Tropical	Atlantic	Tropical	Atlantic	Atlantic	Atlantic	Atl NW
Data resolution level	Set	Set	OTH	OTH	OTH	OTH	Set
Ranking of Catch of fleet in TINC database (use data catalogue)	1-5	1-5	1-5	1-5	1-5	1-5	11 or more
Length of Time Series	longer than 20 years	longer than 20 years	longer than 20 years	longer than 20 years	6-10 years	11-20 years	longer than 20 years
Are other indices available for the same time period?	Few	Many	Many	Few	Few	Few	Few
Are other indices available for the same geographic range?	Few	Many	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.)	Yes	Yes	No	No	No	Yes	Yes
Estimated annual CV of the CPUE series	Low		Low	Low	Low	Low	Low
Annual variation in the estimated CPUE exceeds biological plausibility	Likely	Possible	Possible	Possible	Possible	Unlikely	Unlikely
Is data adequate for standardization purposes	Yes	Yes	Yes	No	No	Yes	Yes
Is this standardised CPUE time series continuous?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
For fisheries independent surveys: what is the survey type?							
For 19: Is the survey design clearly described?							
Other Comments	Annual variation in CPUE exceeds biological plausibility at the beginning of the series		Only landings are included in logbooks, but the discards are relatively low				

Table 10. Continued.

Application to the 2024 assessment	No	Use 1991-2018	Use 1991-2022	Use 1961-2001	Use 1978-2005	No	Use 2000-2009
Use in stock assessment?	No	Yes	Yes	Yes	Yes	No	Yes
SCRS Doc No.	SCRS/2024/029	SCRS/2024/021	SCRS/2024/023	SCRS/2014/065	SCRS/2018/015	SCRS/P/2024/008 SCRS/2018/014	2011 Assess App4
Index Name:	US RR Rec	Venezuela LL	Venezuela artisanal drift-gillnet	Venezuela RR Rec	BRA LL	BRA RR Rec	Ghana Gillnet
Data Source (state if based on logbooks, observer data etc)	tournament logs	Observer data	Port sampler	Port master	logbooks	Sport fishing	Artisanal gillnet
Do the authors indicate the percentage of total effort of the fleet the CPUE data represents?	Yes	Yes	Yes	Yes	No	No	NA
If the answer to 1 is yes, what is the percentage?	91-100%	0-10%	91-100%	91-100%			
Are sufficient diagnostics provided to assess model performance??	Sufficient	Sufficient	Sufficient	Sufficient	Sufficient	Sufficient	Sufficient
How does the model perform relative to the diagnostics ?	Well	Mixed	Well	Well	Well	Well	Well
Documented data exclusions and classifications?	Yes	Yes	Yes	NA	NA	NA	No
Data exclusions appropriate?	Yes	Yes	Yes	NA	NA	NA	NA
Data classifications appropriate?	Yes	Yes		NA	NA	NA	NA
Geographical Area	Atl NW	Tropical	Localised (< 10 x 10 degrees)	Localised (< 10 x 10 degrees)	Atl S	Atl SW	Tropical
Data resolution level	OTH	Set	Set	trip	Set	OTH	trip
Ranking of Catch of fleet in TINC database (use data catalogue)	11 or more	11 or more	6-10	11 or more	1-5	11 or more	1-5
Length of Time Series	longer than 20 years	longer than 20 years	longer than 20 years	longer than 20 years	longer than 20 years	longer than 20 years	6-10 years
Are other indices available for the same time period?	Few	Many	Many	Few	None	None	Many
Are other indices available for the same geographic range?	Few	Few	Few	Few	None	None	None
Does the index standardization account for Known factors that influence catchability/selectivity? (eg. Type of hook, bait type, depth etc.)	Yes	Yes	Yes	Yes	Yes	Yes	No
Estimated annual CV of the CPUE series	Low	High	Medium	Variable	Variable	Variable	Medium
Annual variation in the estimated CPUE exceeds biological plausibility	Likely	Possible	Possible	Possible	Likely	Likely	Possible
Is data adequate for standardization purposes	Yes	Yes	Yes	Yes	No after 2015	Yes	Yes
Is this standardised CPUE time series continuous?	Yes	Yes	Yes	No	Yes	Yes	Yes
For fisheries independent surveys: what is the survey type?							
For 19: Is the survey design clearly described?							
Other Comments	observed increasing trend in fishing power since 2020 (Schueller et al 2023)			Tournament data, missing the value in 1990	Regulation after 2005		only year, season factors were used, the index relate to the fish availablity

Table 11. Available abundance indices for Atlantic blue marlin in 2024 Stock Assessment. *Venezuelan and Ghanaian gillnet fleets land all catch, Brazilian longline fleet not allowed to retain BUM after 2004.

Use in 2024	Use 1959-1993		Use 1994-2022			Use 1968-1989		Use 1990-1997		Use 1998-2022			Use 1993-2022	
Name	JPN_LL_hist		JPN_LL			CTP_LL_early		CTP_LL_mid		CTP_LL_late			USA_LL	
Fleet	Japan		Japan			Chinese Taipei		Chinese Taipei		Chinese Taipei			USA	
Gear	LL		LL			LL		LL		LL			LL	
Docs	SCRS/2000/081		SCRS/2024/026		Task1	SCRS/2024/030		SCRS/2024/030		SCRS/2024/030		Task1	SCRS/2024/029	
Catch definition	Retained		Retained			Retained		Retained		Retained			Retained/Discards	
Units	Num.	CV	Num.	CV	%YFT	Num.	CV	Num.	CV	Num.	CV	%YFT	Num.	CV
1956					98%									
1957					97%									
1958					98%									
1959	2.221	0.125			97%									
1960	1.964	0.125			95%									
1961	3.820	0.125			79%									
1962	3.456	0.125			73%							93%		
1963	2.777	0.125			73%							89%		
1964	1.776	0.125			68%							88%		
1965	1.216	0.125			58%							100%		
1966	1.005	0.125			61%							65%		
1967	0.974	0.125			68%							55%		
1968	1.176	0.125			67%	0.304	0.095					60%		
1969	1.299	0.125			57%	0.334	0.083					59%		
1970	1.048	0.125			48%	0.231	0.080					48%		
1971	0.652	0.125			41%	0.185	0.087					44%		
1972	0.747	0.125			39%	0.149	0.102					49%		
1973	0.579	0.125			34%	0.159	0.122					41%		
1974	0.966	0.125			35%	0.115	0.100					43%		
1975	0.699	0.125			25%	0.065	0.111					37%		
1976	0.485	0.125			50%	0.120	0.127					35%		
1977	0.558	0.125			29%	0.032	0.130					10%		
1978	0.590	0.125			25%	0.029	0.134					11%		
1979	0.601	0.125			20%	0.044	0.142					29%		
1980	0.733	0.125			14%	0.057	0.100					21%		
1981	0.651	0.125			21%	0.049	0.096					31%		
1982	0.827	0.125			19%	0.042	0.094					22%		
1983	0.741	0.125			22%	0.029	0.111					25%		
1984	0.828	0.125			18%	0.033	0.102					41%		
1985	0.873	0.125			20%	0.025	0.101					43%		
1986	0.605	0.125			20%	0.034	0.102					56%		
1987	0.663	0.125			25%	0.059	0.114					38%		
1988	0.640	0.125			20%	0.088	0.162					56%		
1989	0.674	0.125			19%	0.083	0.154					48%		
1990	0.524	0.125			18%			0.096	0.139			56%		
1991	0.358	0.125			17%			0.054	0.148			23%		
1992	0.366	0.125			12%			0.082	0.147			28%		
1993	0.479	0.125			8%			0.096	0.120			24%	1.282	0.142
1994	0.503	0.125	1.990	0.120	11%			0.117	0.108			25%	1.150	0.165
1995	0.472	0.125	0.940	0.090	13%			0.100	0.114			21%	1.194	0.149
1996	0.513	0.125	1.750	0.100	14%			0.106	0.106			23%	1.633	0.172
1997	0.459	0.125	1.650	0.100	12%			0.087	0.107			19%	1.430	0.169
1998	0.475	0.125	1.780	0.090	18%					0.037	0.105	25%	0.863	0.196
1999			1.450	0.070	13%					0.038	0.091	21%	1.165	0.172
2000			1.480	0.080	14%					0.041	0.091	25%	1.095	0.176
2001			0.620	0.090	13%					0.039	0.088	23%	0.508	0.198
2002			0.440	0.100	12%					0.035	0.083	20%	0.919	0.175
2003			0.610	0.070	12%					0.022	0.091	23%	0.563	0.183
2004			0.520	0.070	25%					0.013	0.087	25%	0.742	0.159
2005			0.700	0.070	23%					0.014	0.085	23%	1.212	0.160
2006			0.860	0.130	23%					0.014	0.094	30%	1.320	0.171
2007			1.150	0.100	33%					0.017	0.089	14%	1.100	0.156
2008			1.340	0.080	27%					0.014	0.096	10%	1.161	0.151
2009			1.090	0.090	23%					0.014	0.092	9%	1.104	0.146
2010			0.850	0.110	23%					0.010	0.095	6%	0.829	0.157
2011			0.590	0.090	27%					0.010	0.088	11%	1.032	0.153
2012			0.580	0.110	23%					0.008	0.094	9%	1.061	0.149
2013			0.410	0.110	25%					0.008	0.102	11%	0.908	0.150
2014			0.650	0.160	22%					0.007	0.105	7%	0.603	0.157
2015			0.920	0.170	22%					0.007	0.108	7%	1.001	0.154
2016			0.980	0.210	25%					0.007	0.105	7%	0.733	0.153
2017			0.900	0.190	22%					0.008	0.104	6%	1.376	0.158
2018			0.640	0.200	24%					0.007	0.103	8%	0.871	0.165
2019			0.700	0.180	30%					0.007	0.117	6%	0.826	0.180
2020			0.880	0.190	23%					0.009	0.115	9%	1.072	0.195
2021			0.930	0.180	26%					0.019	0.127	10%	0.598	0.223
2022			1.600	0.190	26%					0.015	0.130	8%	0.737	0.198
2023										0.012	0.108		0.912	0.186

Table 11. Continued.

Use in 2024	No		Use 1991-2018		Use 1991-2022		Use 1961-2001		Use 1978-2005		No		Use 2000-2009	
Name	USA_Rec		VEN_LL		VEN_GIL		VEN_Rec		BRA_LL		BRA_Rec		GHA_GIL	
Fleet	USA		Venezuela		Venezuela		Venezuela		Brazil		Brazil		Ghana	
Gear	Recreational		LL		GIL		Recreational		LL		Recreational		GIL	
Docs	SCRS/2024/029		SCRS/2024/021		SCRS/2024/023		SCRS/2014/065		SCRS/2018/015		SCRS/P/2024/008		2011 Assess App4	
Catch definition	Retained/Discards		Retained/Discards*		Retained/Discards*		Retained/Discards*		Retained/Discards*		Retained/Discards		Retained/Discards*	
Units	Num.	CV	Wt.	CV	Wt.	CV	Num.	CV	Num.	CV	Num.	CV	Wt.	CV
1956														
1957														
1958														
1959														
1960														
1961							0.09	0.444						
1962							0.14	0.357						
1963							0.08	0.375						
1964							0.06	0.333						
1965							0.05	0.400						
1966							0.12	0.417						
1967							0.08	0.375						
1968							0.09	0.333						
1969							0.1	0.400						
1970							0.09	0.444						
1971							0.03	0.667						
1972							0.02	0.500						
1973							0.02	0.500						
1974	0.652	0.196					0.03	0.333						
1975	0.677	0.154					0.01	1.000						
1976	0.698	0.141					0.01	1.000						
1977	0.765	0.136					0.01	1.000						
1978	0.655	0.136					0.01	1.000	0.102	0.950				
1979	0.719	0.136					0.02	0.500	0.203	1.189				
1980	0.753	0.129					0.03	0.333	0.158	1.534				
1981	0.862	0.120					0.06	0.333	0.270	1.379				
1982	0.719	0.124					0.02	0.500	0.261	1.147				
1983	0.781	0.104					0.06	0.333	0.392	1.220				
1984	0.992	0.112					0.1	0.400	0.139	1.131				
1985	0.858	0.116					0.05	0.400	0.074	1.717				
1986	0.821	0.116					0.04	0.500	0.132	1.156				
1987	0.878	0.114					0.05	0.400	0.289	0.884				
1988	0.680	0.105					0.03	0.333	0.129	1.242				
1989	0.655	0.105					0.05	0.400	0.193	1.079				
1990	0.588	0.108							0.077	3.048				
1991	0.618	0.108	2.480	0.356	9.787	0.780	0.04	0.500	0.112	0.979				
1992	0.654	0.106	1.484	0.387	2.081	0.856	0.05	0.400	0.119	1.016				
1993	0.736	0.115	0.839	0.458	15.073	0.820	0.05	0.600	0.138	2.237				
1994	0.898	0.114	1.810	0.360	23.637	0.731	0.15	0.467	0.087	1.044				
1995	0.997	0.110	1.615	0.353	29.401	0.722	0.18	0.444	0.111	1.002				
1996	0.996	0.111	1.349	0.377	18.492	0.741	0.03	0.333	0.143	0.949	0.307	0.435		
1997	0.810	0.111	1.568	0.376	28.757	0.670	0.04	0.500	0.206	0.852	0.237	0.304		
1998	0.815	0.115	1.185	0.397	38.281	0.711	0.02	1.000	0.149	0.907	0.203	0.298		
1999	1.064	0.108	1.505	0.419	64.792	0.705	0.02	1.000	0.164	0.893	0.142	0.380		
2000	0.949	0.102	1.346	0.415	23.032	0.712	0.05	0.600	0.225	0.859	0.118	0.255	1.941	0.249
2001	0.720	0.105	0.986	0.496	16.342	0.722	0.08	0.500	0.244	0.926	0.210	0.230	2.648	0.257
2002	0.749	0.107	0.774	0.510	15.165	0.714			0.104	1.050	0.136	0.254	1.869	0.250
2003	0.732	0.105	0.523	0.553	18.157	0.717			0.045	1.395	0.106	0.268	1.303	0.256
2004	1.024	0.100	0.337	0.676	21.898	0.704			0.199	0.985	0.058	0.304	0.540	0.280
2005	1.017	0.100	0.307	0.708	20.708	0.723			0.170	1.002	0.030	0.793	1.102	0.258
2006	1.263	0.103	0.947	0.486	26.605	0.709					0.037	0.816	0.658	0.276
2007	1.093	0.105	1.015	0.578	30.559	0.718					0.144	0.568	0.502	0.287
2008	0.954	0.118	0.901	0.583	23.868	0.706					0.250	0.523	0.116	0.440
2009	0.878	0.126	0.520	0.770	16.718	0.771					0.012	0.724	0.121	0.431
2010	0.848	0.150	0.645	0.678	28.051	0.733					0.201	0.368		
2011	1.168	0.133	0.298	0.909	15.200	0.732					0.087	0.478		
2012	2.229	0.134	0.813	0.601	21.756	0.704					0.242	0.466		
2013	1.125	0.136	0.835	0.596	22.079	0.701					0.094	0.240		
2014	0.763	0.144	0.699	0.660	24.676	0.709					0.206	0.371		
2015	1.304	0.157	0.877	0.642	22.202	0.706					0.404	0.685		
2016	1.194	0.156	0.652	0.695	23.935	0.708					0.571	0.734		
2017	1.669	0.195	0.737	0.766	17.756	0.707					0.514	0.654		
2018	1.302	0.159	0.953	0.830	16.419	0.703					0.779	0.603		
2019	1.311	0.149			12.298	0.711					0.187	0.210		
2020	1.586	0.195			7.820	0.794					0.373	0.382		
2021	1.482	0.174			16.807	0.702					0.327	0.459		
2022	2.278	0.171			13.888	0.715								
2023	2.017	0.165												

Table 12. A summary of model settings hypotheses with an asterisk (*) will be used for the initial run, and some items with asterisks (**) are at the modelers' discretion.

Item	Hypothesis	SS3	JABBA
Fleet structure		for SS3, 5 fleets: Artisanal fleets, longline, moored FAD, sport fisheries, and others (SCRS/2024/025, Table 1)	
selectivity assumption		double normal for all fleets	
CV catch		1%	
CV CPUE		any observed annual CV less than 0.3 is equal to 0.3, and observed annual CV higher than 0.3 are maintained, same as 2018 stock assessment	
effective sample size for size composition		The appropriate variance reweighting of the length will be explored during the modeling process**	
JABBA priors**			shape parameter, r prior, k prior, Initial depletion lognormal prior (beta distribution) will be similar to 2018 stock assessment
Catch	1*	Landings + reported dead discards	
Catch	2 (sensitivity)	Landings+ dead discards+ live discards * min from the literatures of post-release mortality on LL (estimate externally from the model, be provided by the Secretariat)	
Catch	3 (sensitivity)	Landings+ dead discards+ live discards * max from the literatures of post-release mortality on LL (estimate externally from the model, be provided by the Secretariat)	
Catch	4 (sensitivity)	Landings+ dead discards+ apply 0.05 post-release mortality on RR fleet as in 2018 stock assessment (estimate internally	-
growth	1*	estimate internally size at age using spine data, by sex-specific (Fleet 1: artisanal fishery)	To estimate r prior, use growth parameter by sex-specific by spine data (Fig14-A in Hoolihan et al. 2019) Male: k=0.222, t0=-6.5, Linf=209.6 Female: k=0.052, t0=-15.1, Linf=302.2 Sex-combined: k=0.075, t0=-12.5, Linf=265.9
growth	2	estimate internally size at age using otolith data by sex-specific or combine**	To estimate r prior, use growth parameter (combined sex) by otolith data k=0.426648, t0=-1.78392, Linf=279.9903
growth	3 (sensitivity, if time permits)	Use growth curve externally using spine data (same as the 1st hypothesis for JABBA)	Use estimated growth in SS3 (from hypothesis 1 from SS3) by spine data
growth	4 (sensitivity, if time permits)	Use growth curve externally using otolith data (same as the 2nd hypothesis for JABBA)	Use estimated growth in SS3 (from hypothesis 2 from SS3) by otolith data
L 50% maturity		206cm JLFL (Shimose et al., 2009, Pacific BUM)	
Natural mortality	1*	fix M at 0.148, estimated in SS3 in 2018 assessment as initial value	
	2	estimate M with a prior of 0.148 with SD = 0.018	-
steepness (h)	1	0.4	
	2*	0.5	
	3	0.7	
	4	estimate h	-
maximum age		42	

Table 13. Fleet structure for Atlantic blue marlin for the Stock Synthesis models in 2024 based on the structure used in the 2018 Stock Assessment.

Fleet ID	Fleet Name	Catch		Size Samples		Gear	Flags / Fleets
		Year Start	Year End	Year Start	Year End		
ART	Artisanal fisheries	1980	2022	1990	2021	GN, BS,	Benin, Brazil, Côte d'Ivoire, Dominica, EU-España, EU-France, Gabon, Ghana, Liberia, NEI (BIL), Senegal, Togo, Venezuela
LL	Longline	1956	2022	1970	2022	LL	Angola, Barbados, Belize, Brazil, Canada, China PR, Chinese Taipei, Costa Rica, Côte d'Ivoire, Cuba, Dominica, EU-España, EU-France, EU-Portugal, FR-St Pierre et Miquelon, Grenada, Guyana, Japan, Korea Rep, Liberia, Maroc, Mexico, Namibia, NEI (BIL), NEI (ETRO), Panama, Philippines, Russian Federation, Senegal, South Africa, St Vincent and Grenadines, Trinidad and Tobago, UK-Bermuda, UK-British Virgin Islands, UK-Sta Helena, Uruguay, USA, USSR, Vanuatu, Venezuela
mFAD	moored FAD	1985	2022	2008	2012	HL, RR	EU-France- Guadaloupe / Martinique
SPT	Sport fisheries	1960	2022	1971	2022	RR, SP, HL	Barbados, Brazil, Costa Rica, Côte d'Ivoire, Dominica, Dominican Republic, EU-France, EU-Portugal, Great Britain, Grenada, Maroc, S Tomé e Príncipe, Saint Kitts and Nevis, Senegal, St Vincent and Grenadines, Sta Lucia, Trinidad and Tobago, UK-Bermuda, UK-Sta Helena, UK-Turks and Caicos, USA, Venezuela
OTH	Others	1963	2022	2020	2022	PS, TR, HL, UNK	Barbados, Brazil, Canadá, Cape Verde, Costa Rica, Côte d'Ivoire, Curaçao, Dominica, El Salvador, EU-España, EU-France, EU-Portugal, Guatemala, Jamaica, Liberia, Maroc, Mixed flags (FR+ES), Namibia, Panamá, S Tomé e Príncipe, St Vincent and Grenadines, Trinidad and Tobago, Ucrania, USA

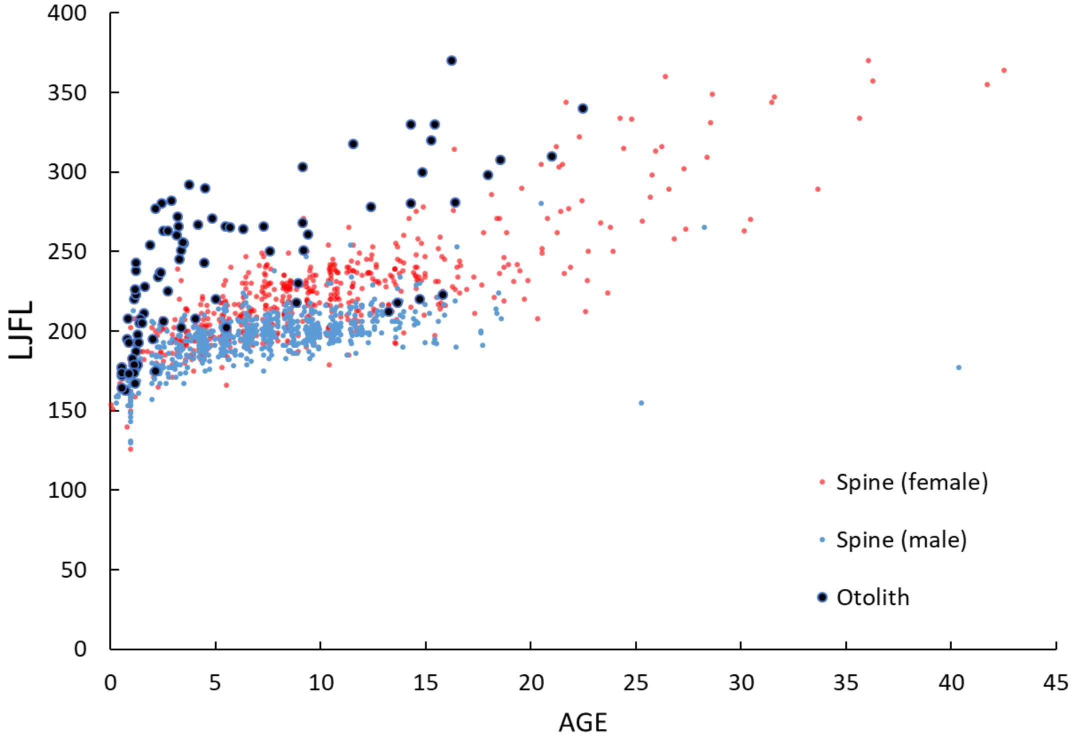


Figure 1. Blue marlin length at age (LJFL cm) data from spines by sex-segregated from Hoolihan *et al.,* (2019) and otoliths by sex-aggregated from SCRS/P/2024/007.

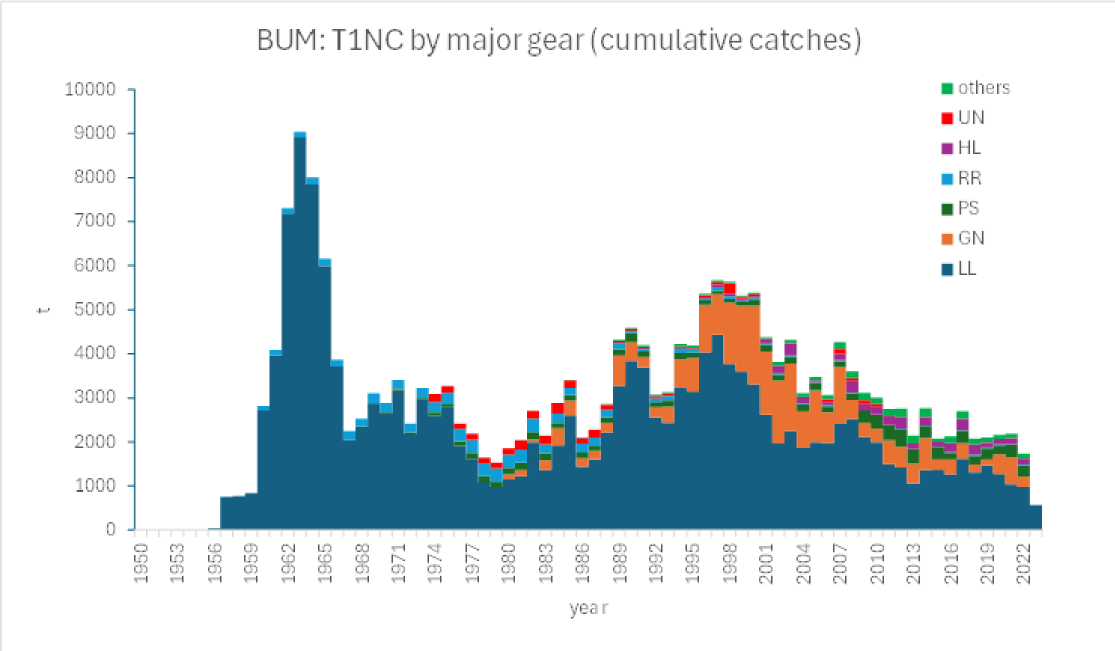


Figure 2. Blue marlin (BUM) Task 1 cumulative catch (t) by year and major gear.

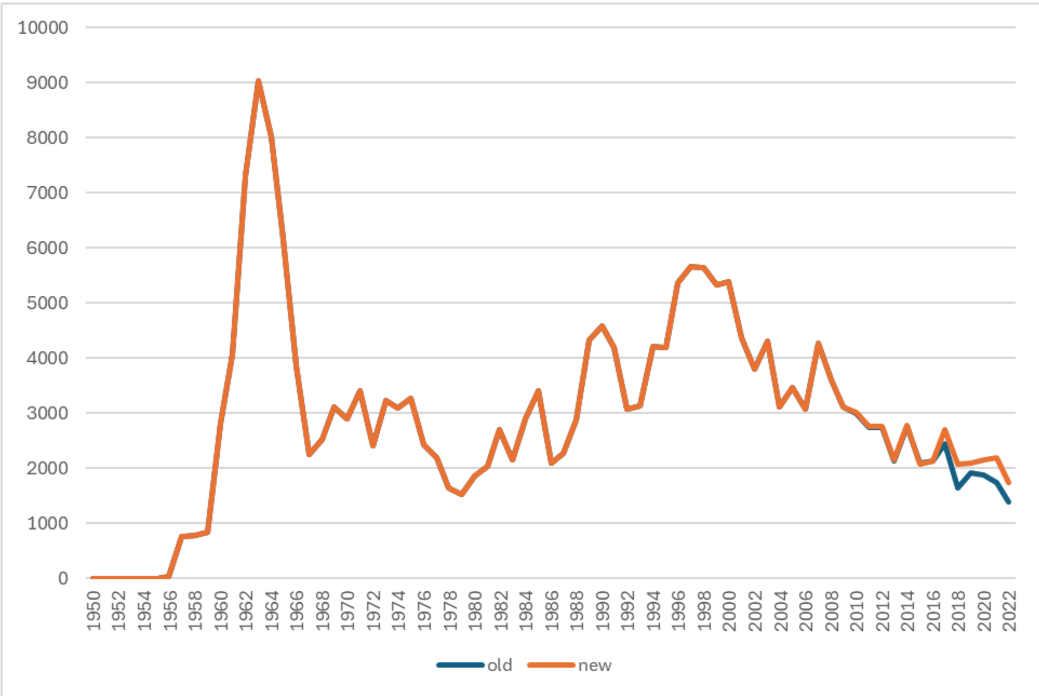


Figure 3. Comparison of total blue marlin removals (catch and dead discards) from the T1NC series before (old) and after the updates (new) approved by the Group during the meeting.

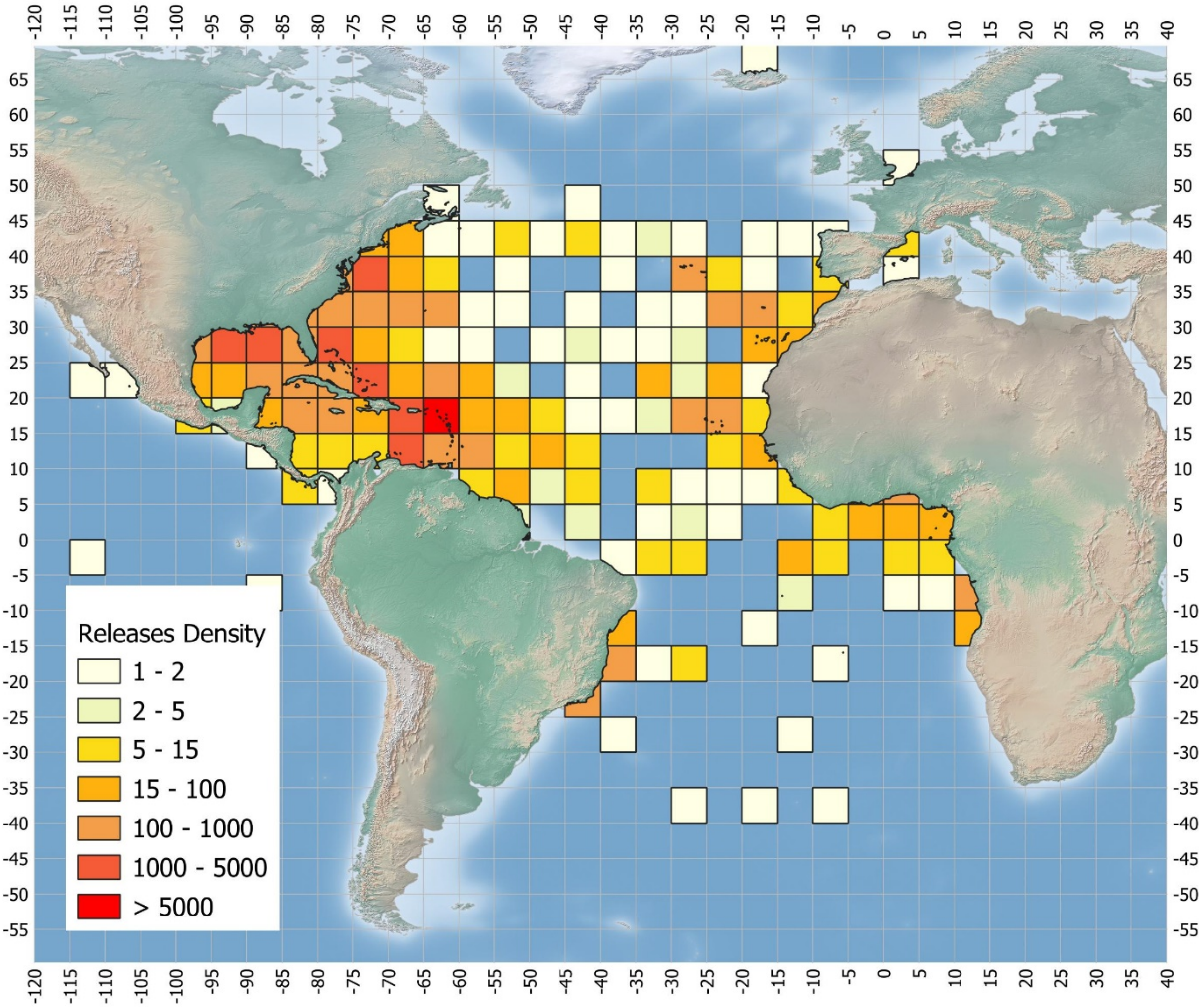


Figure 4. Blue marlin conventional tags, plot of the density of releases in 5x5 squares.

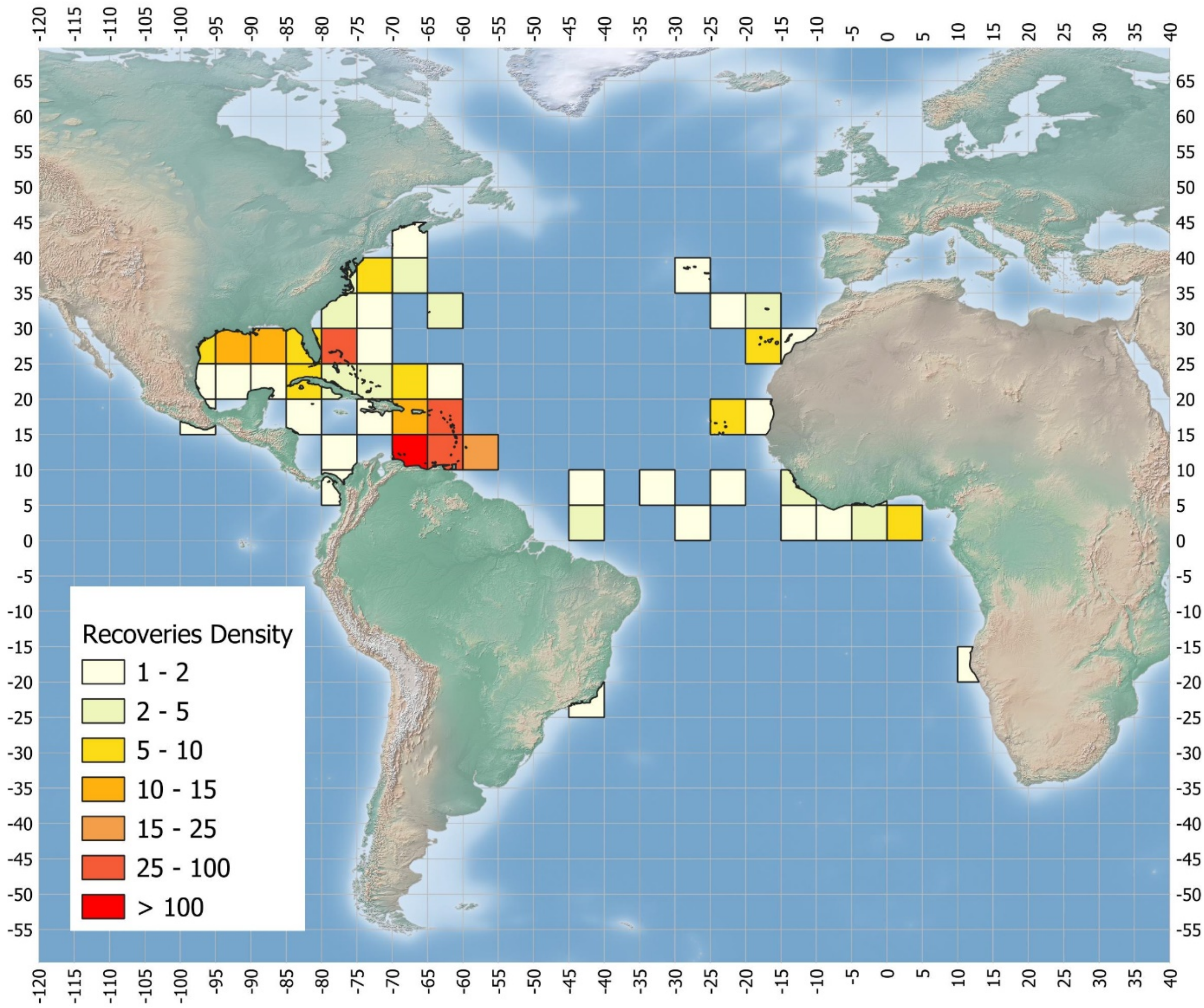


Figure 5. Blue marlin conventional tags, plot of the density of recaptures in 5x5 squares.

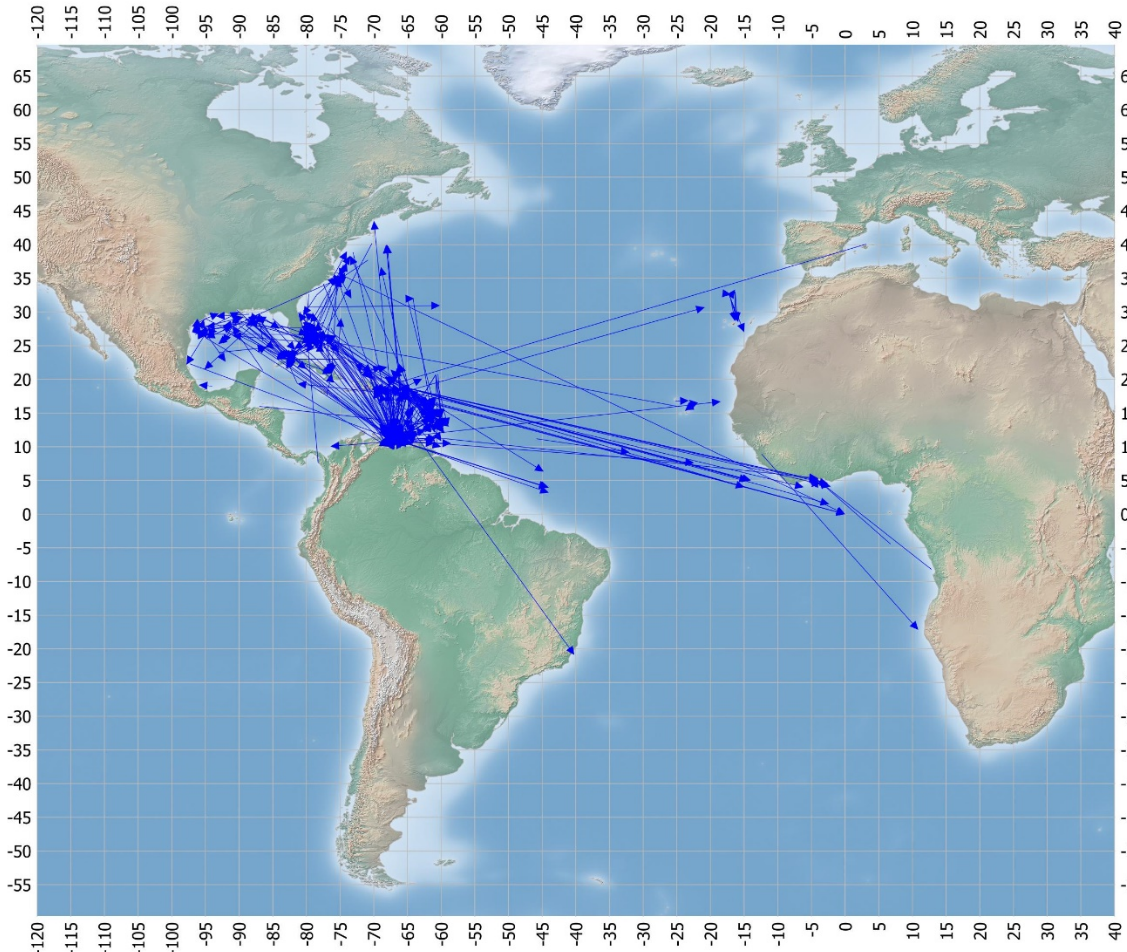


Figure 6. Summary of the implicit geographical straight displacement of tagged blue marlin release (start of line) and recapture (arrow end) from the conventional tag database for all years.

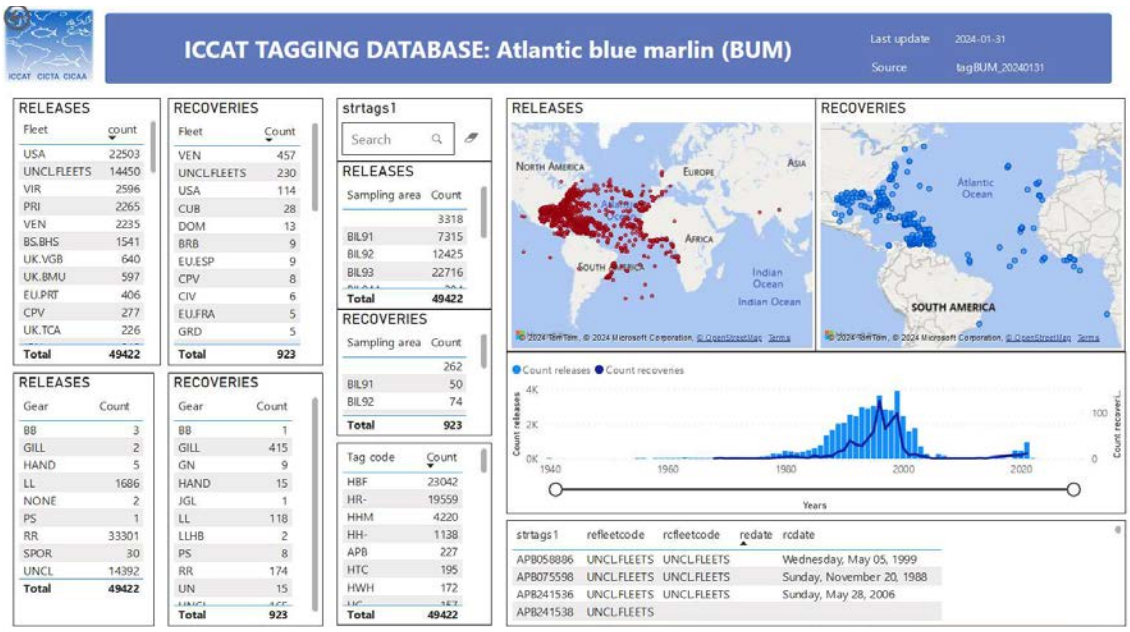


Figure 7. Snapshot of the ICCAT web dashboards with conventional tags, showing a summary of released and recovered tags for blue marlin.

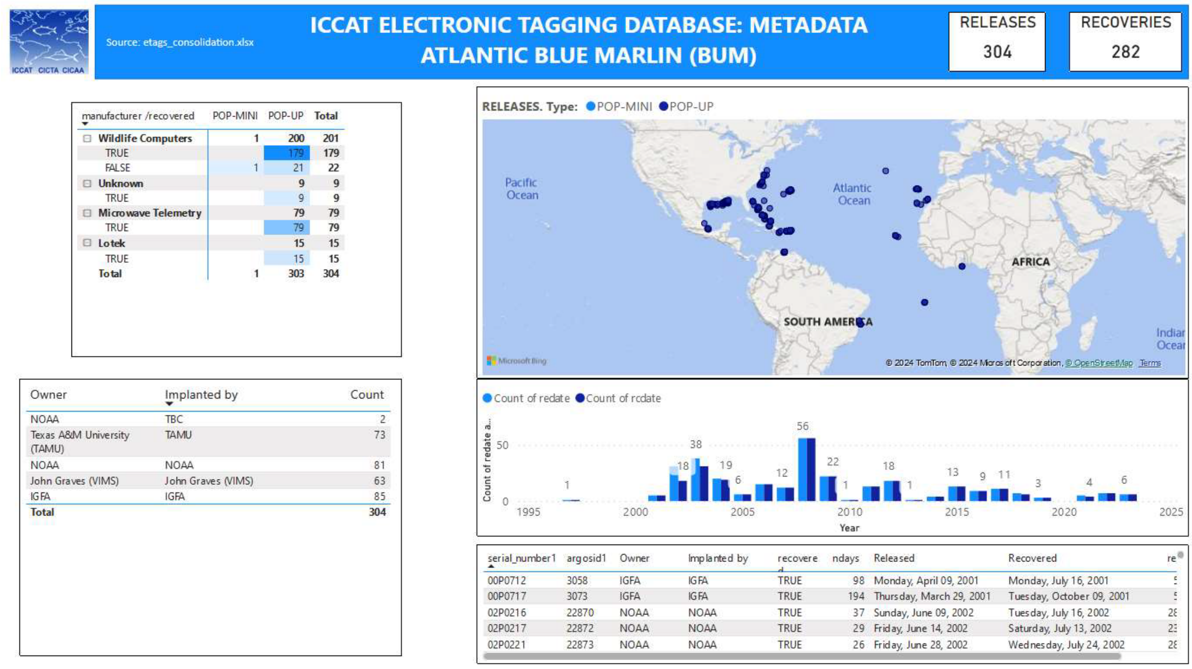


Figure 8. Snapshot of the ICCAT web dashboards for the electronic tags, showing a summary of released and recovered tags for blue marlin.

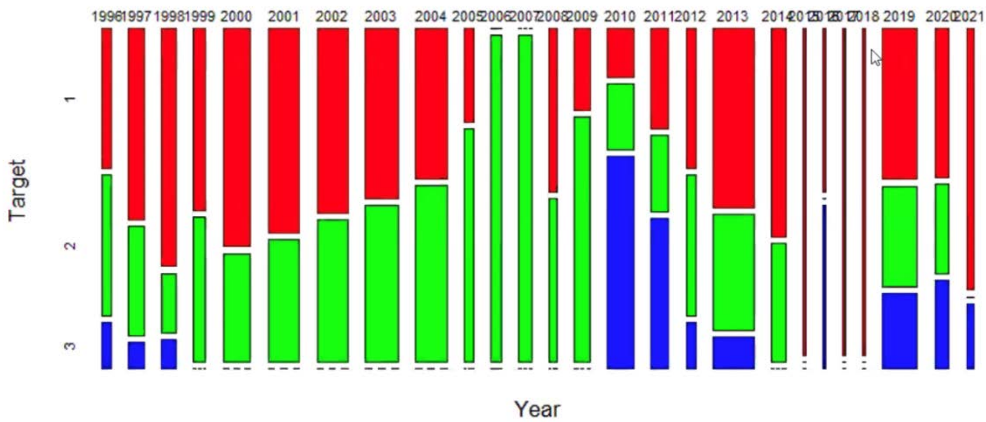


Figure 9. Cluster analysis used in the analysis of CPUE from the Brazilian billfish sport tournaments. Annual blue marlin catch proportions are indicated by the red columns, the width of each column is proportional to the number of observations (tournament days).

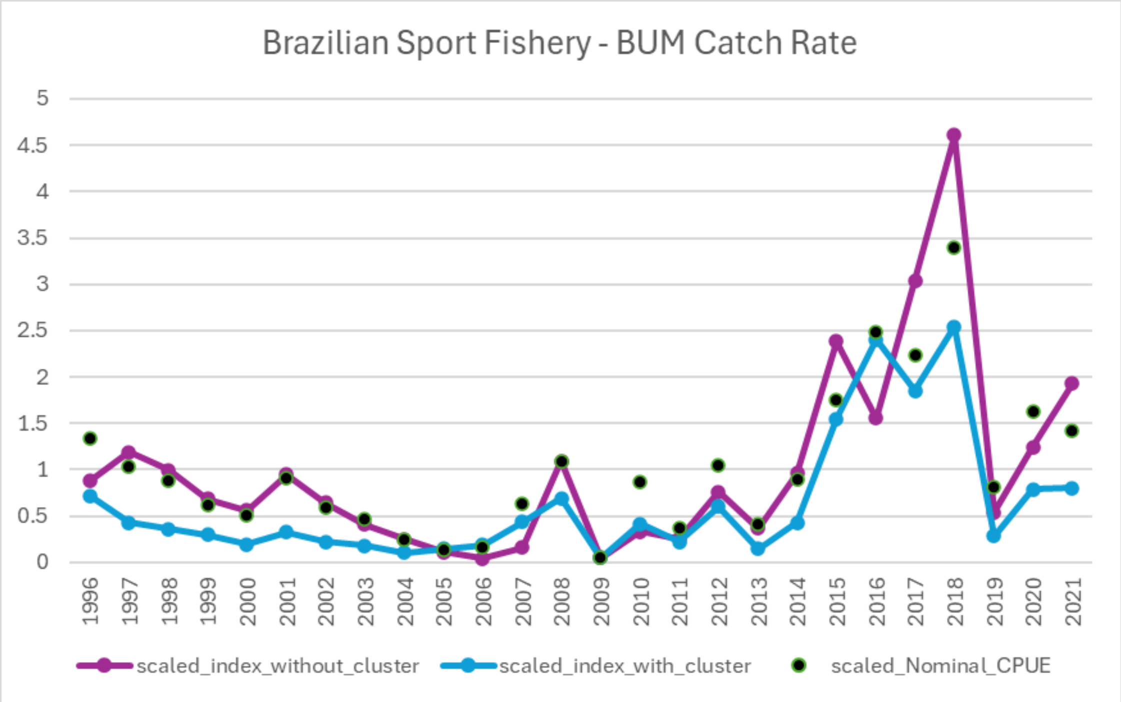


Figure 10. Additional analysis for the Brazilian recreational index by removing cluster factor requested by the Group (purple line), compared to the standardized index with cluster (blue line) presented in SCRS/P/2024/008 and its nominal CPUE (green dots).

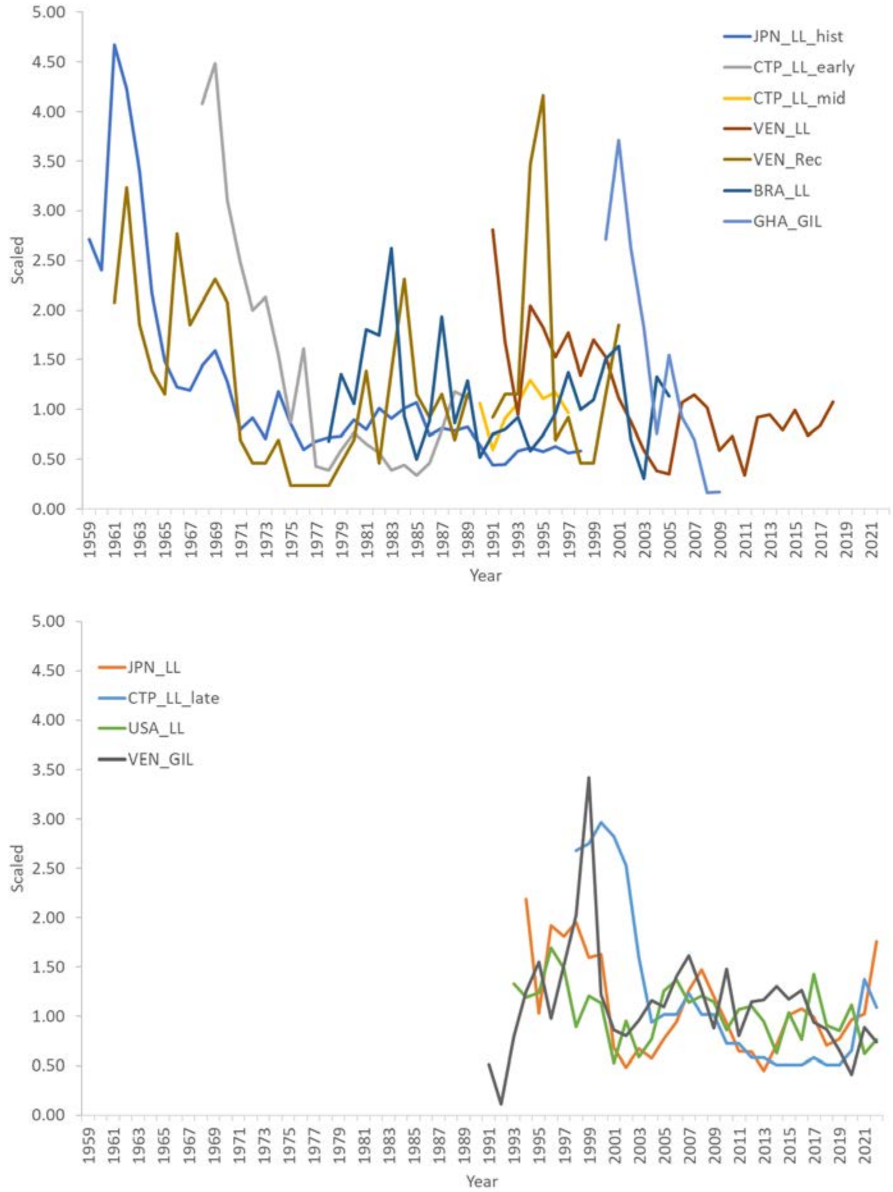
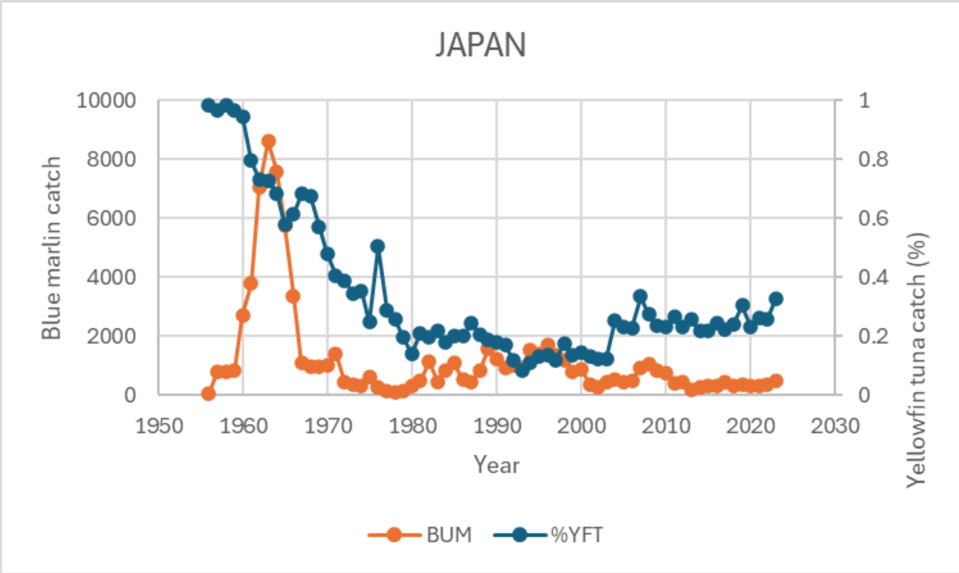


Figure 11. Plot of the recommended CPUEs for the 2024 BUM stock assessment. Indices are scaled to their overall mean for each series.



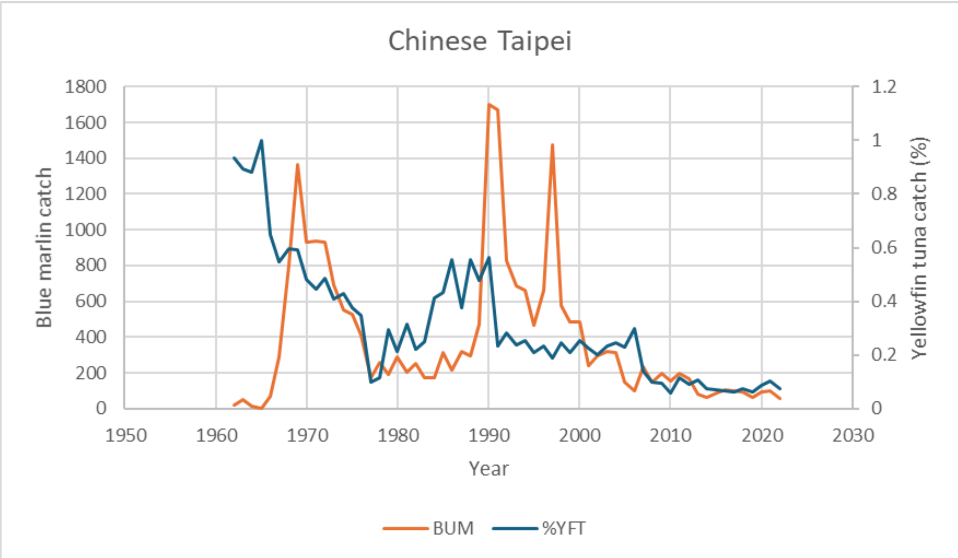


Figure 12. Annual trend of the proportions of yellowfin catch (right *y-axis*) compared with blue marlin catch (left *y-axis*) from Task1NC data for the Japanese longline and Chinese Taipei longline fisheries.

Appendix 1

Agenda

1. Opening, adoption of agenda and meeting arrangements

2. Review of historical and new information on biology

3. Review of fishery statistics/indicators

   3.1 Task 1 catches and discards data and spatial distribution of catches
   3.2 Task 2 catch and effort
   3.3 Task 2 size data
   3.4 Tagging data

4. Review of available indices of relative abundance by fleet

5. Review of Assessment models for evaluation, specifications of data inputs, and modeling options

6. Recommendations on research and statistics

7. Responses to the Commission

8. Other matters

9. Adoption of the Report and closure

Appendix 2

List of participants

CONTRACTING PARTIES

BRAZIL

Kikuchi Santos, Eidi
Federal University of Rio Grande - Institute of Oceanography, 96201-900 Rio Grande
Tel: +55 53 991 641 561, E-Mail: eidikikuchi@hotmail.com

Leite Mourato, Bruno
Profesor Adjunto, Laboratório de Ciências da Pesca - LabPesca Instituto do Mar - IMar, Universidade Federal de São Paulo - UNIFESP, Rua Carvalho de Mendoça, 144, Encruzilhada, 11070-100 Santos, SP
Tel: +55 1196 765 2711, Fax: +55 11 3714 6273, E-Mail: bruno.mourato@unifesp.br; bruno.pesca@gmail.com; mourato.br@gmail.com

CÔTE D'IVOIRE

Konan, Kouadio Justin
Chercheur Hidrobiologiste, Centre de Recherches Océanologiques (CRO), 29 Rue des Pêcheurs, BP V 18, Abidjan 01
Tel: +225 07 625 271, Fax: +225 21 351155, E-Mail: konankouadjustin@yahoo.fr

CURAÇAO

Suarez, Carl Michael
Senior operator of the Fishery Monitoring Centre, Ministry of Economic Development, Directorate of Economic Affairs, Amidos Building, Pletterijweg 43 A, Willemstad
Tel: +59 995 297 213, E-Mail: michael.suarez@gobiernu.cw

EUROPEAN UNION

Coelho, Rui
Researcher, Portuguese Institute for the Ocean and Atmosphere, I.P. (IPMA), Avenida 5 de Outubro, s/n, 8700-305 Olhão, Portugal
Tel: +351 289 700 508, E-Mail: rpcoelho@ipma.pt

Fernández Costa, Jose Ramón
Instituto Español de Oceanografía, Ministerio de Ciencia e Innovación - CSIC, Centro Costero de A Coruña, Paseo Marítimo Alcalde Francisco Vázquez, 10 - P.O. Box 130, 15001 A Coruña, España
Tel: +34 981 218 151, Fax: +34 981 229 077, E-Mail: jose.costa@ieo.csic.es

Fernández Llana, Carmen
Instituto Español de Oceanografía (IEO), Consejo Superior de Investigaciones Científicas, C/ Corazón de María, 8, 28002 Madrid, España
Tel: +34 91 342 11 32, E-Mail: carmen.fernandez@ieo.csic.es

Ramos Cartelle, Ana
Ministerio de Economía y Competitividad, Instituto Español de Oceanografia, C.O. De A Coruña, Paseo Marítimo Alcalde Francisco Vázquez, 10 - P.O. Box 130, 15001 A Coruña, España
Tel: +34 981 205 362; +34 981 218151, Fax: +34 981 229077, E-Mail: ana.cartelle@ieo.csic.es

Teixeira, Isabel
Chefe de Divisão de Recursos Externos da Direção-Geral de Recursos Naturais, Segurança e Serviços Marítimos, DGRM, Avenida Brasilia, 1449-030 Lisboa, Portugal
Tel: +351 919 499 229, E-Mail: iteixeira@dgrm.mm.gov.pt

Trigo, Patricia
DGRM, Avenida Brasilia ES8, 1449-030 Lisboa, Portugal
Tel: +351 969 455 882; +351 213 035 732, E-Mail: pandrada@dgrm.mm.gov.pt

Vigneau, Joël
IFREMER Laboratoire HMMN/LRHPB, Avenue du General de Gaulle, 14520 Port en Bessin, France
Tel: +33 231 616 500, E-Mail: Joel.Vigneau@ifremer.fr

GABON
Angueko, Davy
Chargé d'Etudes du Directeur Général des Pêches, Direction Générale des Pêche et de l'Aquaculture, BP 9498, Libreville Estuaire
Tel: +241 6653 4886, E-Mail: davyangueko83@gmail.com; davyangueko@yahoo.fr

GUINEA (REP.)
Kolié, Lansana
Chef de Division Aménagement, Ministère de la Pêche et de l'Economie maritime, 234, Avenue KA 042 - Commune de Kaloum BP: 307, Conakry
Tel: +224 624 901 068, E-Mail: klansana74@gmail.com

JAPAN
Kai, Mikihiko
Scientist, Highly Migratory Resources Division, Fisheries Stock Assessment Center, Fisheries Resources Institute, Japan Fisheries Research and Education Agency, 5-7-1, Orido, Shimizu, Shizuoka 424-8633
Tel: +81 54 336 5835, Fax: +81 54 335 9642, E-Mail: kai_mikihiko61@fra.go.jp; kaim@affrc.go.jp; billfishkai@gmail.com

MAURITANIA
Habibe, Beyahe Meissa
Chef du Laboratoire Évaluation des Ressources Vivantes Aquatiques (LERVA), Institut Mauritanien de Recherches Océanographiques et des Pêches - IMROP, B.P. 22, Cite IMROP Villa Nº 8, Nouadhibou
Tel: +222 2242 1047, Fax: +222 574 5081, E-Mail: bmouldhabib@gmail.com; beyahem@yahoo.fr

MEXICO
Ramírez López, Karina
Instituto Mexicano de Pesca y Acuacultura Sustentables (IMIPAS), Centro Regional de Investigación Acuícola y Pesquera - Veracruz, Av. Ejército Mexicano No.106 - Colonia Exhacienda, Ylang Ylang, C.P. 94298 Boca de Río, Veracruz
Tel: +52 5538719500, Ext. 55756, E-Mail: karina.ramirez@imipas.gob.mx; kramirez_inp@yahoo.com

PANAMA
Molina, Laura
Autoridad de los Recursos Acuáticos de Panamá - ARAP, Calle 45 Bella Vista, edif. La Riviera, 0819-05850
Tel: +507 511 6036, E-Mail: lmolina@arap.gob.pa

Pino, Yesuri
Jefa encargada del Departamento de Evaluación de Recursos Acuáticos, Ministerio de Desarrollo Agropecuario, Autoridad de los Recursos Acuáticos de Panamá, Evaluación de los Recursos Acuáticos, Edificio Riviera, Ave. Justo Arosemena, Calle 45 Bella Vista, 05850
Tel: +507 511 6036, E-Mail: yesuri.pino@arap.gob.pa

Quiros, Vivian
Analista y Operadora de Cooperación Internacional, Dirección de Cooperación y Asuntos Pesqueros Internacional, Edificio la Riviera - Avenida Justo Arosemena y Calle 45, Bella Vista (Antigua Estación El Árbol)
Tel: +507 511 6008 Ext. 205, E-Mail: vquiros@arap.gob.pa

Torres, Modesta
Autoridad de los Recursos Acuáticos de Panama, Calle 45 Bella Vista, Edificio La Riviera, 7096
Tel: +507 511 6000, E-Mail: mtorres@arap.gob.pa

Vergara, Yarkelia
Directora encargada de Cooperación y Asuntos pesqueros, Ministerio de Desarrollo Agropecuario, Autoridad de los Recursos Acuáticos de Panamá, Cooperación Técnica y Asuntos pesqueros Internacional, Edificio Riviera, Ave. Justo Arosemena, Calle 45 Bella Vista, 0819-02398
Tel: +507 511 6008 (ext. 359), E-Mail: yvergara@arap.gob.pa; hsfs@arap.gob.pa

SÃO TOMÉ E PRÍNCIPE
Da Conceiçao, Ilair
Director das Pescas, Ministério da Agricultura, Desenvolvimento Rural e Pescas, Bairro 3 de Fevereiro - PB 59, Sao Tomé
Tel: +239 990 9315, Fax: +239 12 22 414, E-Mail: ilair1984@gmail.com

SENEGAL
Ba, Kamarel
Docteur en Sciences halieutiques et modélisation, Ministère de l'Agriculture et de l'Equipment Rural, Institut Senegalais de Recherches Agricoles (ISRA), Centre de Recherches Oceanographiques de Dakar Thiaroye (CRODT), Pôle de Recherches de Hann, Route du Front de Terre, 2241 Dakar
Tel: +221 76 164 8128; +221 766 055 999, Fax: +221 338 328 262, E-Mail: bakamarel@gmail.com; kamarel2@hotmail.com

Sow, Fambaye Ngom
Chercheur Biologiste des Pêches, Centre de Recherches Océanographiques de Dakar Thiaroye, CRODT/ISRA, LNERV - Route du Front de Terre - BP 2241, Dakar
Tel: +221 3 0108 1104; +221 77 502 67 79, Fax: +221 33 832 8262, E-Mail: ngomfambaye2015@gmail.com; famngom@yahoo.com

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND
Christopher, Abbi E
Asst Fisheries Officer, Ministry of Environment, Natural Resources and Climate Change, Fisheries Management Division, Paraquita Bay, Tortola, VG1120, Virgin Islands
Tel: +284 468 6146, E-Mail: AeChristopher@gov.vg

UNITED STATES
Carlson, John
NOAA Fisheries Service-Sustainable Fisheries Division, 3500 Delwood Beach Road, Florida Panama City 32408-7403
Tel: +1 850 624 9031, Fax: +1 850 624 3559, E-Mail: john.carlson@noaa.gov

Cass-Calay, Shannon
Director, Sustainable Fisheries Division, Southeast Fisheries Science Center, NOAA, National Marine Fisheries Service, 75 Virginia Beach Drive, Miami, Florida 33149
Tel: +1 305 361 4231, Fax: +1 305 361 4562, E-Mail: shannon.calay@noaa.gov

Díaz, Guillermo
NOAA-Fisheries, Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, Florida 33149
Tel: +1 305 361 4227; +1 305 898 4035, E-Mail: guillermo.diaz@noaa.gov

Die, David
Research Associate Professor, Cooperative Institute of Marine and Atmospheric Studies, University of Miami, 4600 Rickenbacker Causeway, Miami, Florida 33149
Tel: +1 305 421 4607, E-Mail: ddie@earth.miami.edu; dddejean@kutaii.com; ddie@rsmas.miami.edu

Fernández, Michelle
4600 Rickenbacker Causeway, Key Biscayne, FL 33149
Tel: +1 305 582 9112, E-Mail: maf45257@miami.edu

Forrestal, Francesca
NOAA Fisheries, Southeast Fisheries Science Center, Sustainable Fisheries Division, 75 Virginia Beach Dr., Miami Florida 33149
Tel: +1 305 903 4535, E-Mail: francesca.forrestal@noaa.gov

Geddes, Katie
University of Miami, 4600 Rickenbacker Causeway, Miami, FL 33149
Tel: +1 770 655 2236, E-Mail: bkg39@miami.edu

Orbesen, Eric
Research Fish Biologist, NOAA, 75 Virginia Beach Dr., Miami, Florida 33149
Tel: +1 786 368 7560, E-Mail: eric.orbesen@noaa.gov

Schirripa, Michael
Research Fisheries Biologist, NOAA Fisheries, Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, Florida 33149
Tel: +1 305 445 3130; +1 786 400 0649, Fax: +1 305 361 4562, E-Mail: michael.schirripa@noaa.gov

Serafy, Joseph
E-Mail: Joe.Serafy@noaa.gov

Snodgrass, Derke
Sustainable Fisheries Division, NOAA Fisheries, 75 Virginia Beach Drive, Miami FL 33149
Tel: +1 305 304 9731, E-Mail: derke.snodgrass@noaa.gov

URUGUAY

Domingo, Andrés *
Dirección Nacional de Recursos Acuáticos - DINARA, Laboratorio de Recursos Pelágicos, Constituyente 1497, 11200 Montevideo
Tel: +5982 400 46 89, Fax: +5982 401 32 16, E-Mail: dimanchester@gmail.com

Forselledo, Rodrigo
Investigador, Dirección Nacional de Recursos Acuáticos - DINARA, Laboratorio de Recursos Pelágicos, Constituyente 1497, CP 11200 Montevideo
Tel: +598 2400 46 89, Fax: +598 2401 3216, E-Mail: rforselledo@gmail.com

Jiménez Cardozo, Sebastián
Vice-Convenor of ACAP's Seabird Bycatch Working Group, Constituyente 1497, 11200 Montevideo
Tel: +598 997 81644, E-Mail: jimenezpsebastian@gmail.com; sjimenez@mgap.gub.uy

Mas, Federico
DINARA - Dirección Nacional de Recursos Acuáticos, Laboratorio de Recursos Pelágicos (LaRPe), CICMAR - Centro de Investigación y Conservación Marina, Constituyente 1497, CP 11200 Montevideo
Tel: +59 898 902 293, E-Mail: f.masbervejillo@gmail.com; federico.mas@cicmar.org

VENEZUELA

Arocha, Freddy
Asesor Científico, Instituto Oceanográfico de Venezuela, Universidad de Oriente, A.P. 204, 6101 Cumaná Estado Sucre
Tel: +58 424 823 1698; +58 412 692 8089, E-Mail: farochap@gmail.com

Evaristo, Eucaris del Carmen
Ministerio del Poder Popular de Pesca y Acuicultura, Corresponsal del Atlántico, Sector "EL Salado". frente a la redoma El Ferry, edificio PESCALBA, Cumaná, Caracas
Tel: +58 416 883 3781, E-Mail: eucarisevaristo@gmail.com

López de Pernia, Rosángela
Técnico Pesquero del Centro Nacional de Investigaciones Pesqueras y Acuícolas, Centro Nacional de Investigación de Pesca y Acuicultura, Caracas Venezuela. Avenida Lecuna torre Este Parque Central piso 13, 1015 Caracas
Tel: +584 161 950 974, E-Mail: rosa2602lopez@gmail.com

Narváez Ruiz, Mariela del Valle
Lab. 34, Edif. Instituto Oceanográfico de Venezuela, Universidad de Oriente, Departamento de Biología Pesquera, Av. Universidad, Cerro Colorado, DBP-31 Laboratory, 6101 Cumaná Estado Sucré
Tel: +58 412 085 1602, E-Mail: mnarvaezruiz@gmail.com

Novas, María Inés
Directora General de la Oficina de Integración y Asuntos Internacionales, Ministerio del Poder Popular de Pesca y Acuicultura - MINPESCA
Tel: +58 412 606 3700, E-Mail: oai.minpesca@gmail.com; asesoriasminv@gmail.com

OBSERVERS FROM COOPERATING NON-CONTRACTING PARTIES, ENTITIES, FISHING ENTITIES

CHINESE TAIPEI

Su, Nan-Jay
Associate Professor, Department of Environmental Biology and Fisheries Science, National Taiwan Ocean University, No. 2 Beining Rd., Zhongzheng Dist., 202301 Keelung City
Tel: +886 2 2462 2192 #5046, Fax: +886-2-24622192, E-Mail: nanjay@ntou.edu.tw

COSTA RICA

Pacheco Chaves, Bernald
Instituto Costarricense de Pesca y Acuicultura, INCOPESCA, Departamento de Investigación, Cantón de Montes de Oro, Puntarenas, 333-5400
Tel: +506 899 22693, E-Mail: bpacheco@incopesca.go.cr

OTHER PARTICIPANTS

SCRS CHAIRMAN

Brown, Craig A.
SCRS Chairman, Sustainable Fisheries Division, Southeast Fisheries Science Center, NOAA, National Marine Fisheries Service, 75 Virginia Beach Drive, Miami, Florida 33149, United States
Tel: +1 305 586 6589, E-Mail: craig.brown@noaa.gov

EXTERNAL EXPERT

Palma, Carlos

*****

ICCAT Secretariat

C/ Corazón de María 8 – 6th floor, 28002 Madrid – Spain
Tel: +34 91 416 56 00; Fax: +34 91 415 26 12; E-mail: info@iccat.int

Manel, Camille Jean Pierre
Ortiz, Mauricio
Mayor, Carlos
Kimoto, Ai
Fiorellato, Fabio
García, Jesús
De Andrés, Marisa

Appendix 3

List of papers and presentations

DocRef	*Title*	*Authors*
SCRS/2024/020	Revision of historical landings statistics of Blue marlin (*Makaira nigricans*) caught by the French fishing fleets in the North Atlantic	Vigneau J., Baudrier J., Demanèche S., Guyader O., and Rault J.
SCRS/2024/021	Standardized catch rates for blue marlin (*Makaira nigricans*) from the Venezuelan pelagic longline fishery off the Caribbean Sea and adjacent areas of the western Central Atlantic 1991-2018	Arocha F., Ortiz M.
SCRS/2024/023	Atlantic blue marlin standardized CPUE index from the artisanal drift-gillnet fishery operating at the billfish hotspot, off La Guaira, Venezuela (1991-2022)	Narvaez M., Evaristo E., Marcano L.A. and Arocha F.
SCRS/2024/025	Update of input data (catch and size) for the Atlantic blue marlin (*Makaira nigricans*) stock assessment models 2024	Ortiz M., Kimoto A., and Mayor C.
SCRS/2024/026	Spatio-temporal model for CPUE standardization: application to Atlantic blue marlin caught by Japanese tuna longline fishery from 1994 to 2022	Kai M.
SCRS/2024/027	Análisis de la información del marlín aguja azul (*Makaira nigricans*) obtenida por Uruguay en el Atlántico sur en el período 1998-2019	Domingo A., Forselledo R., Jiménez S., Mas F.
SCRS/2024/029	Blue marlin (*Makaira nigricans*) standardized indices of abundance from the U.S. pelagic longline and recreational tournament fisheries	Lauretta M., Carlson J., Goodyear P., Schirripa M., and Diaz G.A.
SCRS/2024/030	CPUE standardization of blue marlin (*Makaira nigricans*) for the Chinese Taipei tuna longline fishery in the Atlantic Ocean using delta approach	Su N-J., Chang C.X.
SCRS/P/2024/006	Satellite tagging of blue and white marlin in southern Portugal	Rosa D., Goes S., Barbosa C., and Coelho R.
SCRS/P/2024/007	Update on Age Estimation from Atlantic Blue Marlin otoliths	Krusic-Golub K., Sutrovic A., Rosa D., Ngom F., Andrews A., and Coelho R.
SCRS/P/2024/008	Updated Atlantic blue marlin catch rate for the Brazilian billfish sport fishing tournaments (1996-2021)	Mourato B., Amorim A.

Appendix 4

SCRS documents and presentations abstracts as provided by the authors

SCRS/2024/020 - Blue marlin is harvested in the French Antilles, mainly around moored fish aggregating devices (MFADs). This fishery started in the 80s and the commercial fishing fleet composed of small-scale vessels reached its full potential in the second half of the 2000s and then steadily declined. A catch assessment survey operated by the fisheries information system (SIH) of Ifremer, implemented from 2008, allows a robust estimation of catches and effort for all fisheries in the Antilles. The data on catch estimates of blue marlin are presented here to revise the historical catch statistics in the ICCAT database.

SCRS/2024/021 - A standardized index of relative abundance for blue marlin (*Makaira nigricans*) was developed by the combination of two data sources, ICCAT's EPBR Venezuelan Pelagic Longline Observer Program (1991-2011), and the Venezuelan National Observer Program (2012-2018). The index was estimated using Generalized Linear Mixed Models under a delta lognormal model approach. The standardization analysis procedure included year, vessel category, area, time, bait condition, and fishing depth as categorical variables. Diagnostic plots were used as indicators of overall model fitting. The time series show that the relative abundance of blue marlin caught by the observed Venezuelan longline fleet reflects a drop in the early period of the series (1991-1993), thereafter the catch rates increased (1994) followed by a decrease until 2004 when they recover somewhat in 2006 – 2008, but falling again in 2009 – 2011, since then the catch rates show a stable trend in the recent years.

SCRS/2024/023 - Standardized index of relative abundance for Atlantic blue marlin (*Makaira nigricans*) was estimated using a Generalized Linear Mixed Models approach assuming a lognormal model distribution. The data used corresponds to the artisanal drift-gillnet fishery of the Venezuelan billfish hotspot known as "El Placer de La Guaira" located off the central coast of Venezuela from 1991 up to 2022. The variables considered for the model were Year, Season and their interaction, with season as a random effect factor. Diagnostic plots were used as indicators of overall model fitting, finding in general, a good fitting for the final model. The standardized CPUE (in weight) shows a relatively stable trend from 2000 onwards, with lower catch rates from this year on.

SCRS/2024/025 - The Billfish Species Group (BILSG) is scheduled to evaluate the Atlantic blue marlin stock in 2024. In preparation, the BILSG established a modelers team to advance preliminary analyses for the assessment meeting. The BILSG requested the Secretariat to provide input data of catch and size until 2022 for Stock Synthesis and Surplus Production models based on the fleet structure used in 2018. This document summarizes the revision and update of the available detailed catch and size data per fleet up to 2022.

SCRS/2024/026 - Abundance indices of blue marlin caught by the Japanese tuna-longline fishery were estimated using logbook data from 1994 to 2022. The nominal CPUEs were standardized using the spatio-temporal generalized linear mixed model (GLMM) to provide the annual changes in the abundances. The author focused on spatial and interannual variations of the density in the model to account for spatially and annual changes in the fishing location due to the target changes of tuna and tuna-like species. Overall, the estimated annual CPUEs revealed a downward trend from 1994 to 2002 with sharp decline in 2001 and then those gradually increased until 2008, thereafter the estimated CPUEs revealed a moderate downward trend from 2008 to 2013 and then those showed an upward trend until 2022 with a sharp increase in 2022. The estimated CPUE using the spatio-temporal model with a large amount of data collected in the wide area in the Atlantic Ocean is very useful information about the spatiotemporal changes in the abundance of Atlantic blue marlin.

SCRS/2024/027 - En este trabajo se presenta la información obtenida en el marco del Programa Nacional de Observadores a bordo de la flota atunera de Uruguay, así como del Buque de investigación de la DINARA, sobre la captura de la aguja azul, M akaira nigricans durante el período 1998 2019. Se observaron un total de 7. 268.282 anzuelos en 3.634 lances de pesca. En aguas de la ZEE uruguaya, ubicada en el límite sur de la distribución de la aguja azul, las capturas de esta especie ocurr i e ro n principalmente durante el verano, cuando a umenta la temperatura del agua La CPUE observada para la flota uruguaya y japonesa fue similar, de 0, 009 a 0, 005 individuos cada 1000 anzuelos dentro de la ZEE, aunque fuera de la esta zona y a menores latitudes la flota uruguaya obtuvo valores superiores (0,028 ind./1 000 anz.) anz.). Los ejemplares capturados por la flota japonesa fueron de mayor porte, en promedio, que los capturados por la flota uruguaya 304 cm y 224 cm LMIH respectivamente). La proporción de sexos también varió, capturándose una mayor proporción de hembras en la flota japonesa.

SCRS/2024/029 - Indices of relative abundance for blue marlin in the Atlantic Ocean were updated for two U.S. fisheries, the pelagic longline bycatch fishery and the recreational billfish tournament fishery from the previous blue marlin assessment. The longline index is based on scientific observer reported catch and effort for individual longline sets; the tournament index is based on records of catch and effort aggregated by tournament. A continuity analysis based on previous model selection was performed with the final longline index including year, area, quarter, habitat, hook type, hooks between floats, and day/night effects. The final tournament index included year, area, quarter, and tournament effect. The precise location of fishing sets for longlines resulted in more accurate habitat assignment compared to tournaments, where only the fishing port was known.

SCRS/2024/030 - Catch and effort data of blue marlin (*Makaira nigricans*) for the Chinese Taipei distant-water tuna longline fishery in the Atlantic Ocean were standardized by period using a generalized linear model (GLM) based delta approach. Four periods of 1968-1989, 1990-1997, and 1998-2023 and information on operation type (the number of hooks per basket, HPB, for alternative model of 1998-2023) were considered in the CPUE (catch per unit effort) standardization to address the issue of targeting change in this fishery. Abundance indices developed for blue marlin for 1968-1989, 1990-1997, and 1998-2023 with HPB showed similar trends to those derived from the model of entire period (1968-2023). Results were insensitive to the inclusion of gear configuration (HPB) in the model as an explanatory variable. The standardized CPUE trend of blue marlin started to decrease in the 1970s, with a following increase to a higher level during the 1980s and early 1990s, but dropped gradually in the late 1990s and early 2000s. The trend then stabilized from 2004 until 2020, with an increasing jump in recent 3 years due to pandemic.

SCRS/P/2024/006 - Preliminary results of satellite tagging efforts in Southern Portugal under the EPBR are presented. Three white marlins were tagged in the Algarve coast, Portugal in October 2023. The three tags popped-up with time-at-liberty (TAL) ranging from 27 to 108 days. For one of the tags (TAL=41 days) only a pop-up location is available and no other information was transmitted for the tags. For the other two tags, it was possible to analyze geolocation data and temperature and depth data, although with gaps. Tagging in the eastern Atlantic complements the previous studies which have been mostly focused in the west Atlantic, for both conventional and satellite tagging of billfish. The fish with the longest TAL traveled to the west Atlantic in equatorial waters. White malins are surface oriented and spent most of their time in the first few meters of the water column, remaining in waters above 21º C both during the night and daytime. Efforts to tag blue and white marlin will continue in 2024.

SCRS/P/2024/007 - Work completed in Nov 2021 indicated that deriving age estimates from counting assumed annual growth increments on thin sectioned Atlantic blue marlin otoliths was possible and that the resultant age and growth estimates were reasonable. Caveats on that work were 1) the lack of samples available (limited to N = 46) and the absence of very small and very large fish within the sample. Considering that annual ageing of otoliths from billfish is possible, further sampling efforts have focused on collecting additional samples with an emphasis on targeting otoliths from very small and very large individuals.

The number of samples available to this study increased by 50 to a total of 96 samples (Female N = 61, male N = 23 and unsexed N = 10) and included 15 samples from fish greater than 300 cm (LJFL). Methods for otolith preparation and age interpretation followed those used in the earlier study. Age estimates from the new samples ranged from 0 to 22 years. These data were combined with the earlier age data and growth parameters were estimated from unadjusted zone counts (L_∞ = 283.50 cm, k = 0.34 year-1 and to = -2.71) and zone counts converted to a decimal age (L_∞ = 279.99, k = 0.43 year-1 and to = -1.78. Growth estimates were only estimated for the combined data and while both males and females can be estimated separately, the number of otoliths available from males is low and the resultant growth estimates would likely be poorly estimated.

SCRS/P/2024/008 - Not provided by the author/s.