REPORT OF THE 2018 ICCAT BLUE MARLIN DATA PREPARATORY MEETING
(Madrid, Spain 12-16 March, 2018)

1. Opening, adoption of agenda and meeting arrangements

The meeting was held at the ICCAT Secretariat in Madrid March 12 to 16, 2018. Mrs. Fambaye Ngom (Senegal), the Species Group ("the Group") rapporteur and meeting Chairman, opened the meeting and welcomed participants. Dr. Miguel Neves dos Santos (Assistant Executive Secretary) adressed the Group on behalf of the ICCAT Executive Secretary, welcomed the participants and thanked Mrs. Ngom for having assumed the new responsabilities as Group rapporteur. The Chair proceeded to review the Agenda, which was adopted with a few changes (**Appendix 1**).

The List of Participants is included in **Appendix 2**. The List of Documents presented at the meeting is attached as **Appendix 3**. The abstarcts of all SCRS documents presented at the meeting are included in **Appendix 4**. The following served as rapporteurs:

Sections	*Rapporteur*
Items 1, 8	M. Neves dos Santos
Item 2	C. Palma, J. Hoolihan, M. Ortiz,
Item 3	M. Schirripa, B. Morato ,P. De Bruyn
Item 4	M. Schirripa, F. Forrestal, M. Ortiz
Item 5	J. Hoolihan, D.Die, M. Neves dos Santos
Item 6	F. Ngom
Item 7	D. Die, F. Ngom

2. Review of data held by the Secretariat

2.1 Biology data

Age and growth studies

A progress report (SCRS/P/2018/001) on age and growth analysis was presented for blue marlin sampled during 2003-2005 from the Venezuelan longline fishery. Transverse sections of the second anal fin spine from 694 males, 273 females, and 36 of unknown sex were scored for observed growth bands and back-calculated bands lost to vascular erosion of the spine core. Males ranged in size from 153 to 289 cm LJFL and exhibited a maximum age of 31.3 yrs for observed bands, and 37.3 yrs when including back-calculated lost bands. Females ranged in size from 156 to 289 cm LJFL and exhibited a maximum age of 29.7 yrs for observed bands, and 36.7 yrs when including back-calculated lost bands. Growth rates were estimated using the von Bertalanffy growth function (**Figure 1**). Notably, this project is ongoing and at this time lacks specimens larger than 300 cm LJFL. A revised analysis that includes larger individuals is expected prior to the 2018 blue marlin stock assessment. Assuming a maximum age of 37 yrs, a value of 0.122 for M (**Figure 2**) is attained using the equation of Hewitt and Hoenig (2005), in contrast to the M (0.139, 30 yrs.) used in the previous assessment.

Biological Parameters considered for stock assessment

The Group considered constant rates of natural mortality vs age dependent rates (e.g., Lorenzen method), and agreed that a constant rate of M would be used for the 2018 assessment. The Group discussed the variation in M rates. An M value of 0.139 was used in the previous assessment. The Group agreed that for the 2018 assessment three scenarios would be considered. 1) M = 0.139 (30 yrs) for continuity testing with 2011 assessment (Hoenig, 1983); 2) M = 0.122 (37 yrs) to account for new findings (above); and, 3) M = 0.100 (45 yrs) for sensitivity testing (Hewitt and Hoenig, 2005) (**Table 1**).

The Group discussed the need to consider various biological parameters pertinent to the 2018 assessment. These included length, size, length-weight relationships (**Table 2**), maturity at length (**Table 3**), and coefficient of variation for size at age from recent aging work (**Table 4**). A value of 0.5 was assumed for the sex ratio at recruitment.

2.2 Task I and II catch data

The Secretariat presented to the Group the most up-to-date Task I nominal catches (T1NC) of blue marlin (BUM) together with a list of possible improvements (already identified/discussed in recent meetings), namely catch series with gaps in some years, catches series with unknown gear (UNCL, representing about 5 to 10% of the total BUM catches in various years), list of carry overs (and other SCRS corrections/estimations made in the past) used as preliminary estimations to cover unavailable official statistics. These problematic BUM T1NC catch series were revised and corrected in its majority (some will require further work) by the Group. The detailed list of revisions made (affecting about 250 records, adopted by this Group) was registered in the ICCAT-DB system (available whenever required).

In addition, the new estimations presented by São Tomé and Príncipe (TROL 2009 to 2017) and Côte d'Ivoire (GILL 1988 to 2016), the historical revisions presented in document SCRS/2018/012 for Grenada (drift longline 1988 to 2014) and Dominican Republic (hand line 2000 to 2016), and, the preliminary estimates made by the Group for Liberia (described below) and the European ("MIX-FR+ES") PS tropical by-catch estimations of BUM (described below) allowed to greatly improve the overall BUM biomass removals (landings and dead discards) estimates for the entire period (**Table 5**). The comparison of the T1NC BUM catches before (similar to the BUM estimations presented at the 2017 SCRS meeting) and after this revision is shown in **Figure 3**. The increase in more than 20% the total catches observed after 2011 (always near and above 2,000 t), are mostly due to the inclusion of the catch series of PS MIX-ES+FR, Liberia estimations, and, the Brazilian LL preliminary updates provided at the meeting. The total T1NC catches by major gear (UNCL gear now represents less than 5% in weight, on average) and year are shown in **Figure 4**.

Despite this improvement in T1NC, the Group considers that some large scale LL catch series still incomplete (Belize, China (People's Rep.), Korea Rep., Panama, and Philippines) and will require future revisions. Similar doubts exist on the recreational/sport fisheries component (various flags) in both Atlantic and Mediterranean Sea. Efforts should be made by the ICCAT CPCs to recover those missing/incomplete catch series in the future.

During the meeting preliminary estimates of catch (Task I) for Liberia artisanal fisheries for the 2004-2016 period were calculated. Liberia reported catches of blue marlin (Task I) for the period 1995-2003 ranging from 87 to 712 tons with an average of 302 tons per year. However, after 2004 catches of blue marlin and other billfishes have not been reported. In 2017 a Liberian scientist submitted size distribution data for blue marlin from the sampling program for the years 2013, 2014 and 2016. The monitoring program of artisanal fleets and catches included the visit twice a week, and sampling of all landed catch for 2 vessels of the main fishing group vessels (Fanti and Mixed) through the year in 5 regions of the country covering the main landing ports through the coast. This program has also provided estimates of the number of vessels in each group/fleet category and average number of fishing days per vessel per year (fishing effort). From the size sampling annual data it was possible to estimate an average catch per vessel group per fishing day (**Table 6**). With this estimate for each year, it is possible to estimate the total annual catch as the average catch per fishing day per fishing group times the number of total fishing days for each vessel group for 2013, 2014 and 2016. These estimates ranged from 196 to 234 tons of blue marlin catches. For the period 2004-2012 (and 2015), a comparable fishery fleet-gear type was selected; Ghana artisanal catches and an average ratio of catches was estimated for the overlapping years when both Ghana and Liberia had reported Task I (**Table 5**) to ICCAT. On average Ghana catches are 2.5 times the catches of Liberia, which roughly agree with their respective artisanal fleet sizes. Thus, the catches for Liberia 2004-2012 were estimated as the product of this ratio times the annual catch of Ghana. **Table 6a and 6b** and **Figure 5** present the estimated catch series for 2004 to 2016.

At the meeting, it was noted that BUM by-catches from the PS tropical and tuna FAD fishery (EU-Spain, EU-France and NEI-ETRO) have not been reported since 2010 (except for EU-France PS in 2017). However, during the 2000's the monitoring of by-catch from this important fishery reported on average 470 t of billfish, of which 150 t were blue marlin. The Working Group decided to estimate the unreported catches for the period 2011 to 2016 and to be included in the best estimates of total removal for blue marlin stock evaluation. The estimates were calculated using the ratio BUM/(SKJ+YFT+BET) from the 2000-2010 period (0.166%) when an observer program was in place for the by-catch and "faux poisson" monitoring of the tropical purse seine fisheries. **Table 7** shows the estimated BUM catch for the PS tropical tunas fishery 2011-2016.

The billfishes unclassified (BIL) catches have increased over the last decade (**Table 8**). These catches were revised by the Group. The BIL catches of São Tomé and Príncipe (2011-2016) and Chinese Taipei (2012-2014), were eliminated from T1NC, because these amounts were afterwards officially submitted disaggregated by species. In two cases (EU-Italy LL 2015-2016: BIL reclassified as MSP; Namibia LL 2002-2009: BIL reclassified as BUM) the species was recoded. Only in one case (EU-Portugal LL 2011 BIL) the catches were split by species (ratios of 2011 for LL EU-Portugal-Mainland: BUM 29%, SAI 56%, SPF 5%, and, WHM 10%) and the estimations recorded under the flag "NEI-BIL" (standard procedure adopted by this Group in the past). The BIL overall revision reduced substantially the unclassified BIL catches in all the T1NC time series (1970 to 2016).

Three scientific documents presented revisions to Task I nominal catches of billfish species, all related to artisanal fisheries. All these T1NC revisions were acknowledged and adopted by the Group.

Document SCRS/2018/012 presented the interim report on the advances of the comprehensive study of strategic investments related to artisanal fisheries data collection in ICCAT fisheries of the Caribbean/Central American region, which included a detailed description of the work plan that will follow a three step process including a questionnaire to be completed by the selected countries in the study, a comprehensive review of the available literature, and on-site visits to countries identified as of high interest. The document presented preliminary results from two selected countries, Grenada (ICCAT CPC) and Dominican Republic (non-ICCAT CPC), which showed the contrast between target species, modes of fishing, data limitations and areas for strategic investments. It also provided time series of historical catches of blue marlin for each of the countries that would contribute to fill the gaps in the ICCAT Task I data base. In addition, total catches of blue marlin and effort from the artisanal drift-gillnet fishery of Venezuela were recovered for 2015 and 2016 and reported in the document.

Document SCRS/2018/021 presented a complete revision of the fisheries statistics (T1NC) of the Côte d'Ivoire multi specific artisanal fishery (canoes using gillnets near coastal waters). Billfishes (including BUM) were monitored (counted and measured) at the main landing sites in Abidjan. This study presents a revision of the data collected from 1988 to 2016. The results indicate that the species occurs throughout the year. The nominal catch oscillated significantly over the years (as also the fishing effort and the nominal CPUE). Catches were, however, slightly higher in the warmer season and dominated by smaller specimens. In contrast, larger Blue Marlin dominated the catches during the cooler season.

The presentation SCRS/P/2018/05 described the São Tomé and Príncipe artisanal fisheries and the associated data collection system in place since 2015, with the financial/technical support of the ICCAT-JCAP-EPBR Programmes. A revision of the billfish catches (BUM, SAI, and WHM) and SWO (trolling as the major fishing gear, but also minor catches of drifting longlines) was presented covering the period 2009 to 2017. The new estimations officially reported to ICCAT) substantially improved the billfish catches for São Tomé and Príncipe.

2.3 Task II effort and size data

The SCRS catalogue of BUM (T1NC *vs* availability of T2CE [Task II catch & effort] and T2SZ [Task II size samples], with the fisheries ranked by order of importance of total catches) covering the period 1996 to 2016, was updated and presented (**Table 9**) to the Group. It shows that the improvements made to T1NC, was not followed by similar improvements in any of the two Task II datasets (T2CE, T2SZ).

Important T2CE (yearly and quarterly datasets are not shown) and T2SZ datasets (yearly datasets now shown) are still missing or require revisions (**Table 10** shows the T2CE datasets requiring revisions, and, **Table 11** shows the T2SZ datasets requiring revisions) in the future. The Secretariat should explicitly request these datasets (in conformity with the current SCRS quality standards) to the respective CPCs as soon as possible.

The Secretariat presented a summary and preliminary review of the size data (Task II) available at the Secretariat for blue marlin.

A total of over 130 thousand samples are available since 1970. **Figure 6** shows the available size samples by main gear type and compared to the total catch of blue marlin. All size data was standardised to LJFL size bins using current weight/length conversion factors. Overall there is good size sampling from 1980's forward and in particular in the 1990's. However, size sampling has substantially decreased in recent years, with the reductions of catches. It was noted that most size sampling were collected from the South Atlantic, and the Caribbean region. The overall size frequency distributions shows catches of blue marlin between 130 and 350 LJFL cm (95% quartile), with a median at about 205 cm (**Figure 7**). By main type gear, longline shows the wider size distribution, while the rod and reel catches larger size fish. **Figure 8** shows the annual trends of mean size by main gear type, in general indicating a reduction in the mean size since 1970 for the longline and gillnet components. In contrast, the mean size of the rod and reel fisheries seems to increase in the 1980's, although with larger variations. It was also noted that in the last decade, the mean size trends shows larger variations that in prior periods, further analyses indicated that these variations respond mostly to differences in reporting between CPCs/feets, rather than trends of population. In 2017 size sampling data was provided by Liberia scientist from their artisanal fisheries for 2013, 2014 and 2016 years. The size frequency of this fleet is small compared to similar fisheries in the area, after discussion it was recommended to confirm species identification of the landings for blue marlin. At the meeting preliminary size data was also presented from the artisanal fisheries of São Tomé and Príncipe for 2016 and 2017 (preliminary datasets provided to the Secretariat).

As the blue marlin size frequency data will be used in the assessment model (Stock Synthesis), it was agreed that a quality control and minimum size sample be applied prior to the input in the model in collaboration between the modeller scientist and the Secretariat.

2.4 Tagging data

The BUM conventional tagging data available in the ICCAT database is presented in **Table 13**. There are a total of 47,155 BUM individuals released between 1940 and 2015. The total number of individuals recovered is 716, which represents on average a recovery ratio of about 1.5%. The apparent movement (straight displacements between release and recovery positions) shown in **Figure 9** (complemented by the release and recovery density maps of **Figure 10**) indicates that the largest number of releases have occurred in the western Atlantic and Caribbean. Tag recaptures are also concentrated in the western Atlantic and Caribbean.

It was noted that there has been a large reduction in the number of tags deployed since 2000, and particularly since 2008. It was suggested that the reduction in tagging since 2000 was due to a reduction in distribution of conventional tags by the Billfish foundation, who had been extremely active in the late 1990s. In addition, the global economic crisis in 2008 resulted in less recreational fishing, further reducing the number of tag deployments over this time period. It was noted that the number of deployments in recent years appears extremely low. The Secretariat subsequently received several tagging files from the US scientists. It was agreed that the secretariat will investigate why these data do not appear in the conventional tagging database if they have previously been submitted.

SCRS/2018/014 provided information on catch rates based on Brazilian sport fishing tournaments (1996-2018). In this presentation it was noted that many of the fish in the study are tagged and released alive. The Group noted that data for recent years (after 2014) have been collected but not submitted to the ICCAT Secretariat. As such the Group strongly urged the author to provide the tagging information to the Secretariat in the future.

2.5 Other relevant data

No other relevant data was made available for the assessment.

3. Review of relative indices of abundance (CPUEs)

Document SCRS/2018/014 provided information on how daily radio logbook records from recreational tournaments of yacht clubs from São Paulo, Rio de Janeiro, Espírito Santo and Bahia, including 289 tournament days, from 1996 to 2018, were used to generate a standardized CPUE series, by a GLM, using the tweedie distribution.

The author noted that only values up to and including 2014 are worth including in assessment models as after this period, there is an increasing trend, resulting in unusually high blue marlin catches due to a change in the fishing ground, with the boats operating much closer to the oil platforms in recent years in front of the State of Rio de Janeiro. Also, the variance becomes very large and thus the catch rates can be considered unreliable. The author also discussed that there is interesting catch data presented in the document which could be provided for ICCAT Task I recreational fisheries, noting that the information is just a sample of the total catch. The Group, however, observed that it is difficult to get an estimation of total catch from the available data and therefore is not suitable for Task I. Of greater use is the information regarding tagging, as mentioned in the previous section.

In SCRS/2018/015, catch and effort data from 99,376 sets done by the Brazilian tuna longline fleet, including both national and chartered vessels, in the equatorial and southwestern Atlantic Ocean, from 1978 to 2016, were analyzed to develop a standardized CPUE series for the Brazilian pelagic longline fleet.

The author noted the last years in the series are not suitable for use. In this case, the information becomes unreliable after 2005. This drop in catches may be due to the implementation of management regulations in 2005. As such, the Group agreed that the data after 2005 should not be included in the assessment models.

Document SCRS/2018/016 describes how logbook and observer effort data from the US pelagic longline fishery were used in a longline simulator (LLSIM) to simulate catch datasets from a known population of blue marlin. The CPUE index obtained from the logbook data provided a better estimate of the true population as compared to the observer CPUE index, however, both data sources were able to capture the overall true population trend.

The Group noted that the trends for observer and logbook simulated series are very different for the last few years (after 2010). It was noted that this may be due to several factors including the low percentage of observed sets as well as non-random distribution of observers across the fishing area. Thus, the observers are to some degree a non-random subset of the logbook recorded sets. It is generally considered that observer data is more reliable than logbook data, particularly with regard to species identification, reporting and fate, but other Groups have concluded that the low sample size and non-random distribution of sampling may offset these benefits. It was also concluded that despite changes in effort and distribution, the inclusion of environmental variables appears to allow the series to track the population trend sufficiently.

In document SCRS/2018/017 the Group was presented with a paper that introduced a theoretical method of incorporation of habitat information into the standardization of CPUE information. This work was in direct response to the same topic being worked on by the Working Group on stock Assessment Methods (WGSAM). Including the habitat coefficient into the standardization improved the fit of the estimated trend in abundance to that of the simulated population trend. The authors let it be known that this habitat information (by lat, lon, depth, month and year) is available since 1950 from the authors for any scientist to use in their own standardization purposes.

A continuation of the above presentation revisited the corrections made to the historical Japanese series as was done after the 2011 assessment. Based on a reduced log likelihood the author concluded that the model that allowed for time varying catchability was superior to the model that did not. The Group agreed with the authors' conclusions that the ratio of YFT/BET could be a suitable proxy for depth (and therefore habitat) and so would be a good factor to include in the correction of the Japanese CPUE which does not contain information on hooks per basket for the entire time series. YFT is considered to be more appropriate, as YFT habitat is more similar to BUM habitat.

Catch and effort data of blue marlin for the Chinese Taipei distant-water tuna longline fishery in the Atlantic Ocean were standardized in document SCRS/2018/022 for the whole period (1968-2016) and by period using a generalized linear model (GLM). Four periods of 1968-2016, 1968-1990, 1990-2016 and 1998-2016 and information on operation type (the number of hooks per basket, HPB, for the model of 1998-2016) were considered in the CPUE (catch per unit effort) standardization to address the issue of targeting change in this fishery.

The Group discussed the time blocks considered by the authors and agreed these periods follow shifts in targeting from albacore to tropical tunas, particularly between the first and second blocks. The third block is justified by the inclusion of hooks per basket information, not available for the previous two time-series. The Group suggested possibly using the correction factor described for the Japanese CPUE series (above), but also concluded that there was no simple switch in targeting as was the case with Japan, but rather an expansion from targeting albacore to include targeting of tropical species. Therefore, a simple correction using a proxy may not be appropriate and that maintaining the split in the series would be preferable. The Group did however request that the authors rerun the analysis using the zero catch information, using an appropriate model to incorporate this information in the standardisation, due to the fact that the proportion positive sets was below 70%. The authors promptly responded with a revised analysis, using a delta log-normal model to account for the zero catch sets. The Group thanked the authors for their rapid response and collaboration, despite not being able to attend the meeting and agreed that the revised values should be used in the assessment.

Updated standardized CPUE for Atlantic blue marlin caught by Japanese longliners was submitted in document SCRS/2018/019. The same standardization procedure as Kimoto and Yokawa, 2011 that was agreed by billfish species group was used for the period 2010 to 2016 and the standardized period between 2001 and 2016.

Firstly the Group noted that the series only updates the data from 2001 and so does not affect the historic Japanese time series that will continue to be used as was presented in 2011. The Group stressed that the paper did not include any diagnostics for evaluating the series. The basic information required for filling in the standard CPUE evaluation table was not available. Although the author noted that the analysis included comments from the Group made in 2011, it is not clear how these were taken into account in the new estimations. This lack of diagnostics was acknowledged by the author in the self-evaluation of the CPUE series sent using the CPUE evaluation table. As such the Group concluded that this series is not suitable for use in the assessment models. Suggestions for future improvement include compensating for the lack of hooks per basket information by using a proxy such as that suggested above for the historic series or similar habitat descriptive factor.

A brief presentation was provided in document SCRS/2018/018 that applied the theory presented in the paper SCRS/2018/017 to real logbook data from the US fishery. The finding here is important because the two approaches used, either a habitat effect or an area effect, provided the same answer with high precision. That is evidence for using the habitat coefficient elsewhere. The resulting CPUE was presented for consideration for use the in the stock assessment.

It was noted that the variables presented in this study appear to be a reasonable proxy for habitat implying the area classification overlaps closely with changes in habitat. The authors noted too, that using environmental data may allow the dropping of the factors area and month as they appear to provide the same information. Using environmental data may be more beneficial, as areas may be incorrectly classified, negatively impacting the standardization process. The Group noted that neither habitat nor the area and month information appear to have much explanatory value in this case, but both were found to be significant in the model fitting despite the gear information having far more effect on the standardized series.

The Group did note that some diagnostic information is missing from this paper, and no model selection was conducted. As such, it was not considered to be a full standardization procedure. In addition, this standardization overlaps with the standardization conducted in document SCRS/2018/020 (below) which includes additional information. As such, the Group decided not to use this series in the assessment and the authors agreed it is still largely a study in its conceptual phase. The Group suggested that the series may be improved by considering interaction terms in the future.

Standardized indices of relative abundance for blue marlin in the northwest Atlantic Ocean are presented in document SCRS/2018/020 for two U.S. fisheries, the pelagic longline by-catch fishery and the recreational billfish tournament fishery. 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.

The authors subsequently provided a revised document (SCRS/2018/020 revised) in response to several questions by the Group. The revisions were based on recommendations to remove the first year of data in which the US pelagic longline observer program was developed as sampling intensity was lower compared to the rest of the time series. Additionally, a more appropriate treatment of spatial areas was included using the National Marine Fisheries Service defined biological areas rather than ICCAT areas. The Group acknowledged that several of the uncertainties raised regarding the initial document were addressed by this revised manuscript. The Group noted with interest that in 2007 observer coverage increased, and this coincides with CPUE increase in the revised estimations.

With regards to the recreational series, it was explained that the inclusion of at tournament effect factor and rodeo tournament data (tournaments over extended periods), which were not included in the 2011 assessment, explain the clear difference in the revised CPUE when compared to the past CPUE series.

Updated indices for Venezuelan rod and reel and gillnet were not provided during the meeting. CPC scientists from Venezuela communicated during the meeting that the series presented in 2011 were updated in Babcock and Arocha 2015 and that the revised values in that document should be used in the assessment. The Group agreed with this communication and therefore these values were adopted for use.

Summary of CPUEs

Based on the revisions of the CPUE documents presented above, the Group discussed the CPUE evaluation tables completed for each series. The agreed information for each series is provided in **Table 13**. A discussion was also held regarding which historic CPUE series (those presented in 2011) will be carried forward into the current assessment. **Table 14** provides the final list of CPUEs available for inclusion in the assessment models. **Figure 11** depicts all CPUE series plotted together and **Figure 12** shows each CPUE independently, including a loess smooth fitting regression to visualize trends among them.

4. Discussion on models to be used during the assessment and their assumptions and remaining issues in preparation for the June stock assessment meeting

4.1 CPUE Selection

The available historical and current CPUE time series were discussed and included the Japanese LL, Chinese Taipei LL, USA LL, USA Rec, Brazilian LL and recreational, Venezuelan LL and Ghanaian gillnet (**Table 13**). It was decided that the Japanese historic longline would be used as in the 2011 assessment, but that the catchability of the fishery will be allowed to vary in time according to the YFT/BET ratio as proxy for the historic shifting of targeting species of this fishery. Regarding the current Japanese longline, the Group was in agreement with the author's diagnosis and comments, and the Group concluded that this time series should not be used for the 2018 stock assessment session. The Group decided to use the current Chinese Taipei longline, the USA longline observer, and the USA recreational time series as presented.

The Group discussed the Venezuelan longline time series, noting that there is now new information on the series. The Group noted that a revision of the Venezuelan gillnet and rod and reel (Babcock and Arocha, 2015) had been presented at the 2014 Intersessional meeting of the Billfish Species Group (Anon. 2015). Based on the authors concerns and advice the continuous time CPUE time series will not be used, but rather the time series (including the additional years) broken into two sets (gillnet and rod & reel) will be used in the current assessment.

The Ghanaian gillnet time series from the previous assessment will also be used in the 2018 assessment. It was noted that this series was not updated. The Group discussed that this time series and others used in the 2011 assessment were not evaluated in the same format the time series presented at this meeting. The reason being that the CPUE evaluation tools utilized were implemented after 2011. However, the historic time series were subjected to evaluation at the 2011 assessment, thus the Group decided it was reasonable to retain for the 2018 assessment.

4.2 Model Selection

The Group discussed the three models that were used in the 2011 assessment, ASPIC, a Bayesian surplus production model and Stock Synthesis. While three models were run, only the Stock Synthesis model was used for management advice and the two production models were used for sensitivity explorations. It was noted that in the 2011 assessment ASPIC had problems converging when all parameters were estimated. It was proposed that three models should be presented again at the 2018 blue marlin stock assessment, Stock

Synthesis, ASPIC and a Bayesian production model. A length-model (NZ50, Goodyear 2015) was proposed that would provide qualitative information using length-composition data. This model can provide an estimated trend of total mortality which could be used to compare the estimates of F from the other models utilized in the assessment. It was noted that this method has been approved by WGSAM and has been published in a peer-reviewed journal. The evaluated indices from Section 3 and the approved historical indices will be included in the models (**Table 14**); the Group set a deadline (30 March 2018) to receive the indices that need to be updated before they can be included. It was noted that the Group encouraged alternative assessment models that promote involvement by maximizing the participation of other scientists.

4.3 Steepness

As in all previous assessments, during the 2011 blue marlin stock assessment (Anon. 2012), it was reported that there is little information on steepness for this species. During such assessment steepness was allowed to be estimated by SS3 with an information prior of 0.5 (SD 0.05) resulting in an estimate of 0.411 (SD 0.062). The assessment team acknowledged, however, that the estimate of steepness was influenced by the bounds placed in recruitment deviations and that without such bounds the model had difficulties converging.

The SCRS has often noted that steepness is difficult to estimate for most of the ICCAT stocks as the data has little information that allows for estimation of this parameter without major assumptions. However, this is not unusual for pelagic stocks. In a scientific review, Harley (2011) fitted Beverton and Holt and Ricker Stock recruitment relationships to several data on tuna stock assessment results compiled by ISSF (2011) to empirically estimate the steepness parameter. Point estimates of steepness from Beverton and Holt S/R curves ranged from 0.45-1.0 and from Ricker S/R curves from 0.37-0.94. Excluding the results for the southern Pacific albacore the ranges were much narrower, 0.64-1.0 for Beverton and Holt S/R and 0.60-0.94 for Ricker S/R.

Mangel *et al.* (2010) developed a method to estimate steepness through a population model applied by simulation to southern bluefin tuna. This method relies on biological parameters of the early and adult life history of the species, including maturity, longevity, but notably also survival of early life history stages. Survival estimates were obtained from the empirical relationship for estimating daily mortality rates during the early life history of McGurk's (1986). Brodziak and Mangel (2011) used this method to estimate steepness for North Pacific striped marlin, obtaining a mean value of 0.87 (S.D. 0.05). Such estimate was contingent on the assumption that survival of larvae and juveniles of striped marlin were similar to those of southern bluefin tuna. The authors investigated how sensitive steepness was to values of reproductive parameters and found values of steepness ranging from 0.73 to 0.92. Davies *et al.* (2012) fixed steepness to 0.8 in their assessment of southwest Pacific striped marlin even though in the 2006 assessment of the same stock, steepness had been estimated to be 0.51. ISC (2013, 2016) used a value for steepness of 0.87 estimated for striped marlin by Brodziak and Mangel (2011) in their assessment of Pacific striped marlin but conducted sensitivity runs for values of (h=0.65, 0.75, and 0.95).

For Atlantic stocks Simon *et al.* (2012) used a similar procedure to that of Mangel *et al.* (2010) and applied it to Atlantic bluefin tuna obtaining a median estimate of steepness of 0.99 with 95% confidence interval of (0.38 and 0.99). These authors highlight that the most important parameter affecting estimates of steepness is the survival of young of the year, and again argued that estimates from McGurk (1986) were the best available for such survival. ICCAT (2013) estimated steepness to be 0.654 within SS3 for white marlin. ICCAT (2015) fixed steepness at 0.9 during the 2014 assessment of skipjack tuna on the basis of the use of that same value in the assessment of western Pacific skipjack and yellowfin tuna. ICCAT (2016) used values of steepness of 0.7, 0.8 and 0.9 in the 2015 assessment of bigeye tuna. ICCAT (2017) used values of steepness of 0.75, 0.85 and 0.95 for production models and fixed it to 0.9 for SS3 in the 2016 assessment of yellowfin tuna. ICCAT 2017, estimated a steepness of 0.8 for the western stock of sailfish from a Bayesian production model. Recently, Sharma and Arocha (2017) estimated the resilience of the north Atlantic swordfish stock by applying through the population model of Mangel *et al.* (2010) to different values of steepness ranging from 0.6 to 1.0, but assuming a base value of 0.8. The swordfish species group agreed to initially fix steepness (0.7, 0.8 and 0.9) for the assessment of northern Atlantic SWO conducted with SS3. When an informative prior was provided for steepness in SS3, steepness of NSWO was able to be estimated resulting on a value of 0.88 (S.D. 0.03).

In summary, as reported by Harley (2011) it is often argued that fishery data used in stock assessments are not informative enough to estimate steepness, so it is difficult to argue that the metadata analysis he conducted on empirically estimated steepness values should be considered reliable. Moreover, it is unclear how many of the assessments from which the data compiled by ISSF (2011) used priors or fixed steepness in the assessment process. Alternative methods based on population models such as those proposed by Mangel and Brodziak (2010) and Simon et al (2012) depend on survival estimates of early life history stages which are very hard to obtain. In fact, almost all authors use the single study on survival young fish by McGurk 1986 in their steepness calculations. The ICCAT SCRS has usually preferred to fix steepness in their recent assessments of tunas and used values of between 0.8 and 0.9 for their base case and use ranges (between 0.7 and 0.95) for sensitivity analyses. In the last assessments of Atlantic billfish, however, steepness was estimated through Bayesian production models or SS3, obtaining values of 0.411 for BUM, 0.65 for WHM and 0.8 for sailfish. For billfishes in the Pacific Ocean, the most common value of steepness used, as a fixed parameter was 0.87 (Brodziak *et al*., 2011).

The discussions of the Group concluded that the values of steepness based on simulation studies (approximately 0.87) do not necessarily represent the best prior for Atlantic blue marlin. Based on these discussions the Group decided to use the three possible values for steepness of 0.4, 0.5 and 0.6. The lower bound was selected based on the value estimated in the last blue marlin assessment. 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. A 0.5 steepness value was adopted as the base case value.

5. Enhanced Program for Billfish Research (EPBR)

The SCRS Chair and the Secretariat provided detailed explanation on the decisions taken by the Commission in November 2017 regarding the Enhanced Program for Billfish Research (EPBR) and the science budget for 2018 and 2019. In doing so, the ERPB and its dedicated budget line created in 1986 was ended.

The science budget proposed for 2018 includes new ICCAT funds provided by the Commission (€50,000), and the leftover funds that had been previously committed to EPBR. The funds allocated for 2018, however, were not sufficient to cover all the research requests proposed by the SCRS in September 2017. As a result the ICCAT Secretariat took the initiative to approach a willing CPC for additional funding. This funding was obtained recently from the EU, for strengthening the scientific basis for decision-making in ICCAT. These additional funds have been provided for a specific list of activities that was developed on the basis of the SCRS Sub-Committees and Working Group work plans for 2018.

In order to access these funds in 2018, working groups will have to define specific research activities that require funding. The Secretariat will then liaise with the SCRS Chair and the Species Groups rapporteurs to define terms of reference (TORs) required for developing call for tenders that will subsequently be advertised by ICCAT. In a few, very specific cases, funds can be allocated for activities that had been initiated prior to 2018, without a call for tenders. TORs should contain specific milestones and deliverables to be achieved as part of all funded activity. Contracts issued through call for tenders have the advantage that initial partial payments can be provided shortly after the contract is signed.

Additionally, the Group was informed of other available funding (i.e. Data Fund; Capacity building) that could be used for enhancing the collection of data on billfishes. Since in the past EPBR contained activities aimed at improving the basic fishery data (e.g. catch, effort, sizes) that cannot be funded from the new ICCAT research budget, scientists from developing country CPCs were encouraged to create regional consortia to propose such data improvement projects to the Secretariat. The Group agreed to prepare and submit to the Secretariat before the end of March 2018, proposal(s) requesting financial support for such activities through the ICCAT Data Fund.

The Group stressed the importance of continuing such support activities to improve the quality of data on billfish collected from artisanal fisheries [Rec. 15-05, Paragraph 10] and the difficulty to achieve such goals without a multi-annual program, as these activities have to be carried out over a period exceeding the bi-annual timeframe of the ICCAT science budget. It was also stressed that such support could be aimed at expanding data collection, improving the design of collection activities and recovering data sets, but that the funds could not be considered as a permanent source of support for data collection because that is a responsibility of the CPCs.

For 2018 activities, such project proposals should be aimed at the ICCAT data improvement fund. For 2019 activities, proposals could also be aimed at ICCAT/Japan Capacity-Building Assistance Project (JCAP). The Group agreed to also develop a proposal to the JCAP to support these activities in 2019. Such proposals should be developed prior to the June stock assessment meeting, so that they can be reviewed and submitted to JCAP in preparation for the October 2018 Steering Committee meeting that will evaluate submitted proposals.

The new research funding structure in place for 2018, has designated specific amounts be applied to billfish genetics and age/growth studies during 2018, as well as to the project titled *Comprehensive study of strategic investments related to artisanal fisheries data collection in ICCAT fisheries of the Caribbean/ Central American region* (details provided in SCRS/2018/012).

The genetics study, which was designed to delineate the ranges and catch ratios of white marlin to roundscale spearfish, has had a low return rate of DNA samples. The Group concluded that the best use for 2018 allocated funds would be to purchase additional DNA sampling kits for distribution in order to obtain an adequate sample size. The Group nominated Dr. John Hoolihan (USA) as leader of this research activity.

The original objective for the EPBR age and growth study was to collect anal fin spines from billfish captured in the eastern Atlantic, because no previous billfish aging studies have been conducted in this region. For that purpose, the SCRS Chair and the Species Group rapporteur will develop TORs, including a more comprehensive sampling protocol that includes age and growth as well as other biological parameters.

Under the new research funding system, the Group was urged to form a research consortium to apply to a call for tenders to be circulated by the Secretariat aimed at an age and growth study. The Group agreed that said consortia would be best served if headed by an individual having local knowledge of the fisheries and logistical procedures needed for project success.

The overall budget available for the billfishes Species Group and related decisions taken by the Group are summarized below:

Activity	***Amount (€)***	***Status/action***
Comprehensive study of strategic investments related to artisanal fisheries data collection in ICCAT fisheries of the Caribbean/Central American region	40,000	Contract awarded (Dr. Freddy Arocha) Work ongoing (interim report provided as SCRS/2018/012)
Genetics study for species and stock differentiation	5,000	More genetic kits to be purchased and distributed to national scientists Dr. John Hoolihan (USA) will lead this research activity
Age and growth study	10,000	Draft ToR to launch a Call for tenders
Sampling collection and shipping	10,000	Draft ToR for a Call for tenders aiming the collection of samples for age and growth of billfishes

6. Other matters

The Group discussed and draft the tentative agenda for the blue marlin stock assessment session to be held 18-22 June 2018. The agenda is contained in **Appendix 5** to this report.

7. Recommendations

7.1 To the Commission

Given the need for continued support of the collection of fishery data on billfish catches landed by artisanal fleets, as recognized in [Rec. 15-05], and the termination of the ERPB; recommend that the Commission and

CPCs considers supporting the collection of fishery data on billfish when providing funds in support of the SCRS work.

It was recommended that the Commission develops a process which can support funding of research programs for longer than biannual budget limits, as most tuna and other ICCAT research programs require multiannual and multiregional initiatives. The ICCAT Strategic research plan recognizes that such longer term commitment is essential for improving scientific advice.

7.2 To CPCs with catches of billfish

The SCRS recommends that countries that are engaged in fishing on moored FADs should report on their Annual Reports the prevalence of such mode of fishing and whenever possible the evolution of such fishing practice, including the number of moored FADs been used, the gear used around them and the species caught in them.

The ICCAT Secretariat has again started to receive reports of billfish unclassified catches from some CPCs. The Group reminds the CPCs that they should report these catches by species to facilitate the assessments and compliance on billfish recommendations on catch limits [Rec. 15-05]. The Group noted that reports of Task I billfish catches in the Mediterranean and from many sport fishing fleets are not being provided on a regular basis.

Some scientists were partially effective in participating and engaging in the blue marlin data preparatory meeting through remote communication. It is, however, essential that CPCs that have significant catches of billfish send scientists to attend the billfish data preparatory and assessment meetings.

7.3 To the SCRS

The SCRS should investigate billfish catches reported to FAO by non-member countries in ICCAT and not included in ICCAT statistics with a view of improving the ICCAT Task I and Task II databases.

Recommend that the Sub-Committee on Statistics, considers:

a) adding a moored FAD fishing mode to the ICCAT codes;
b) requesting that countries fishing on moored FADs report catch and effort of Task II by specifying a fishing mode: FAD or non-FAD.

Recommend that SCRS scientists engaged in standardization of CPUE of blue marlin consider using data on blue marlin habitat generated from Goodyear (2016) as a covariate in CPUE standardization. Such habitat data is available for 1950-2012 and it is best used in conjunction with data on depth of hooks.

Recommend CPC scientists provide information at the blue marlin stock assessment meeting on relevant management measures adopted in response to [Rec. 15-05].

Recommend support for a more comprehensive biological sampling from artisanal fisheries to facilitate the study of genetics and age and growth of billfish. Also recommend scientists from CPCs with industrial fisheries facilitate obtaining similar samples.

It was noted that some CPUE series that are critical to the stock assessment (e.g. Ghana gillnet, EU longline, Venezuela longline, Venezuela gillnet) were not updated. The Group reminds the SCRS that historical CPUE series used in billfish assessments have to be regularly updated by all relevant CPCs.

8. Adoption of the report and closure

The report was adopted by the Group and the meeting was adjourned.

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Table 1. Natural mortality rates to be considered in 2018 assessment.

Natural Mortality Estimators	Continuity (2011) 30 yrs	Revised (2018)* 37 yrs	Sensitivity* 45 yrs
M	0.139	0.122	0.100

*Based on (Hewitt and Hoenig, 2005).

Table 2. Length – weight conversions for blue marlin based on (Prager *et al*., 1995).

Equation	**N**	**Sex**	**LJFL range (cm)**
$RWT = 2.4682 \times 10^{-6}\ LJFL^{3.2243}$	1978	Male	23.0-378.5
$RWT = 1.9034 \times 10^{-6}\ LJFL^{3.2842}$	3267	Female	23.0-277.0
$RWT = 1.1955 \times 10^{-6}\ LJFL^{3.3663}$	5245	Combined sex	23.0-378.5

Table 3. Maturity at length estimates for blue marlin.

Maturity at length	Reference
50% of female fish mature at 256.43 cm LJFL	(Arocha and Marcano, 2006)
First maturity of female fish at 180 cm LJFL	(Erdman, 1968)
First maturity of female fish at 237.9 cm LJFL	(deSylva and Breder, 1997)

Table 4. Coefficient of variation for LJFL for age groups 2-15 of Atlantic blue marlin aged using the second anal fin spine (Hoolihan *et al*., pers obs).

Female

Age	Number	Mean LJFL	Stdev	CV
2	5	194.80	10.38	5.329
3	14	192.79	10.79	5.597
4	24	198.38	10.96	5.525
5	22	203.00	11.99	5.906
6	13	204.62	21.46	10.488
7	25	210.48	15.67	7.445
8	17	216.94	13.26	6.112
9	25	214.60	15.05	7.013
10	8	222.63	13.27	5.961
11	16	221.06	14.48	6.550
12	11	221.09	15.23	6.889
13	9	223.11	15.19	6.808
14	10	230.10	14.97	6.506
15	9	227.33	18.87	8.301

Male

Age	Number	Mean LJFL	Stdev	CV
2	30	184.30	11.97	6.495
3	52	187.23	10.36	5.533
4	52	191.17	9.35	4.891
5	51	194.96	12.23	6.273
6	58	196.95	13.57	6.890
7	39	200.21	10.50	5.244
8	48	203.25	12.53	6.165
9	53	201.49	11.86	5.886
10	45	203.38	9.97	4.902
11	44	206.93	12.69	6.133
12	39	207.90	11.48	5.522
13	26	209.69	13.82	6.591
14	14	204.86	8.81	4.300
15	14	207.57	12.50	6.022

Table 5. Task I catches (landings and dead discards, t) of Atlantic blue marlin (BUM, *Makaira nigricans*) by area, gear and flag.

				1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
TOTAL BUM				2886	3398	2414	3226	3095	3271	2419	2181	1642	1527	1848	2032	2708	2142	2888	3403	2104	2290	2881	4339	4612	4220	3099	3175	4258	4228	5418	5735	5696	5390	5481	4471	3906	4418	3208	3577	3174	4296	3776	3227	2962	2785	2698	1958	2730	2107	2036
Landings	A+M		Longline	2653	3184	2173	2967	2597	2792	1911	1615	1079	970	1142	1223	1996	1360	1915	2595	1420	1418	2015	3041	3618	3463	2319	2167	2966	2934	3786	4218	4151	3632	3658	2498	1743	2001	1666	1906	1677	2289	2100	1859	1776	1294	1198	909	1287	1047	1124
			Other surf.	22	31	48	49	262	236	240	267	260	257	402	507	411	583	766	622	453	503	504	898	698	453	428	588	870	869	1118	950	1033	1237	1302	1400	1459	1650	884	1126	888	1327	787	675	647	740	748	641	799	443	519
			Sport (HL+RR)	211	183	193	210	236	243	268	299	303	300	303	302	301	199	207	185	230	231	237	210	136	161	205	293	311	272	318	428	460	437	462	548	655	747	623	520	571	637	851	650	521	696	680	352	590	511	340
Discards	A+M		Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	138	124	191	159	142	146	127	111	153	197	139	51	83	60	22	37	19	34	24	38	42	37	40	19	56	70	55	54	106	52
			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	1	0	0	2	11	0	1	1	0	0	1	2	0	0	1	0	0	0	
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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	
			Barbados	0	0	0	0	183	150	120	81	72	51	73	117	99	126	126	10	14	13	46	3	18	12	18	21	19	31	25	30	25	19	19	18	11	11	0	0	25	0	0	0	9	13	14	11	12	34	11
			Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	3	3	7	47	19	8	5	13
			Brazil	39	14	17	4	15	15	41	100	49	34	23	28	30	27	32	33	46	51	74	60	52	61	125	147	81	180	331	193	486	509	467	780	387	577	195	612	298	262	182	150	133	63	48	17	105	89	79
			Canada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			China PR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	62	73	62	78	120	201	23	92	88	89	58	96	99	65	13	77	100	99	61	45	40	44	50
			Curaçao	0	0	0	0	0	0	0	0	50	50	50	50	50	50	50	50	50	50	50	50	50	40	40	40	40	40	40	40	40	40	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Côte d'Ivoire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	100	100	100	87	45	67	76	56	104	151	134	113	157	66	189	288	208	111	171	115	21	8	132	66	72	54	17	48	48	87	15	72
			EU.España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	4	1	0	8	23	6	14	47	44	55	40	158	122	195	125	140	94	28	12	51	24	91	38	55	60	165	16	34	44	137	212	245
			EU.France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	15	50	50	62	85	98	115	179	191	197	252	299	333	370	397	428	443	443	450	470	470	461	585	498	344	461	395	212	393	406	165
			EU.Portugal	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	8	12	8	2	5	1	4	2	15	11	10	7	3	47	8	22	18	8	32	27	48	105	135	158	106	140	54	53	25	23	46	50
			FR.St Pierre et Miquelon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Gabon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	304	5	0	0	0	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	
			Ghana	0	0	0	0	0	0	0	0	0	0	119	129	52	216	166	150	16	5	7	430	324	126	123	236	441	471	422	491	447	624	639	795	999	415	470	759	405	683	191	140	116	332	234	163	236	88	44
			Japan	1005	1395	420	346	284	608	264	135	69	134	308	468	1132	440	833	1100	509	440	823	1555	1217	900	1017	926	1523	1409	1679	1349	1185	790	883	335	267	442	540	442	490	920	1028	822	731	402	430	189	280	293	297
			Korea Rep.	488	479	466	989	834	658	566	663	325	145	94	126	50	131	344	416	96	152	375	689	324	537	24	13	56	56	144	56	2	3	1	1	0	0	1	6	33	64	91	36	85	57	34	24	10	3	26
			Liberia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	87	148	148	701	420	712	235	158	115	188	304	162	274	76	56	46	133	94	178	293	35	127
			Maroc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0	4	7
			Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	13	13	13	13	27	35	68	37	50	70	90	86	64	91	81	93	89	68	106	86	67	72	66
			Namibia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	5	9	57	0	50	2	23	10	0	8	36	8	32
			Panama	0	0	22	452	134	95	154	190	74	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Philippines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	71	38	0	0	0	0	0	0	0	8	0	3	4	1	2	2	0	
			Russian Federation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
			S. Tomé e Príncipe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28	19	17	18	21	25	28	33	36	35	33	30	32	32	32	32	9	21	26	0	68	70	72	74	76	78	81	11	10
			Senegal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	4	8	0	9	0	2	5	0	0	0	11	24	32	11	1	5	91	114	61	41	64	164	45	72	10	82
			South Africa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	0	0	0	0	2	0	0	1	0	0	0	1	1	0
			St. Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	2	2	2	0	1	0	0	0	0	20	0	0	0	0	1	3	2	1	0	0	2	0	0	
			Trinidad and Tobago	0	0	0	0	0	0	0	0	0	0	0	0	0	15	20	3	43	93	45	13	11	6	1	2	16	28	14	49	15	20	51	17	16	9	11	7	14	16	34	26	22	25	46	48	48	35	19
			U.S.A.	204	179	191	209	234	241	265	295	295	312	313	342	329	215	280	295	273	291	221	124	29	33	51	80	88	43	43	46	50	37	24	16	17	19	26	16	17	9	13	6	4	6	14	9	1	9	19
			U.S.S.R.	14	17	43	62	9	18	1	10	5	0	0	1	0	0	0	7	23	45	32	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			UK.Bermuda	0	0	0	0	0	1	2	2	5	2	4	1	2	7	8	9	11	6	8	15	17	18	19	11	15	15	15	3	5	1	2	2	2	2	2	2	2	2	2	0	1	2	2	3	3	3	2
			UK.British Virgin Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
			UK.Sta Helena	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	12	2	1	1	0
			UK.Turks and Caicos	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	
			Uruguay	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	3	1	1	26	23	0	0	0	1	5	3	2	8	5	0	6	1	0	0	0	0	0	
			Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	7	8	6	3	2	0	
			Venezuela	36	182	190	125	85	83	79	80	94	134	81	106	83	172	117	219	221	63	81	155	75	56	67	86	122	117	148	142	226	240	125	84	88	120	101	160	172	222	130	120	151	116	143	111	139	150	185
		NCC	Chinese Taipei	929	935	928	692	552	527	409	171	258	190	289	202	250	172	172	313	215	317	292	473	1704	1672	824	685	663	467	660	1478	578	486	485	240	294	319	315	151	99	233	148	195	153	199	133	78	62	61	75
		NCO	Benin	0	0	0	0	0	0	0	0	0	0	0	0	6	8	0	9	10	7	4	12	0	6	6	6	6	5	5	5	5	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Cuba	149	166	89	298	686	789	409	320	210	336	349	286	436	396	373	451	214	205	285	151	202	189	204	69	39	85	43	53	12	38	55	56	34	3	4	7	7	0	0	0	0	0	0	0	0	0	
			Dominica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	64	69	75	36	44	55	58	106	76	76	60	0	0	85	62	49
			Dominican Republic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	41	71	29	23	23	115	207	142	30	38	47	67	60	65	100	98	99	96	73	170
			Grenada	0	0	0	0	0	0	0	0	0	0	1	1	12	6	8	11	36	33	21	23	30	36	30	33	52	50	26	47	60	100	87	104	69	72	45	42	33	49	54	32	69	53	32	63	63	0	
			Jamaica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Mixed flags (FR+ES)	22	31	48	49	79	86	109	134	136	126	144	169	174	167	118	122	135	132	137	144	199	137	116	146	133	126	96	82	80	83	147	151	131	148	171	150	136	135	139	164	178	186	181	191	173	176	
			NEI (BIL)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	128	78	68	94	74	103	18	20	38	0	0	0	0	0	0	0	53	184	258	167	89	7	160	209	205	177	0	34	0	0	0	0	
			NEI (ETRO)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	174	326	362	435	548	803	761	492	274	17	14	0	0	0	0	0	0	0	0	0	0	0	0	
			Saint Kitts and Nevis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
			Sta. Lucia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	0	10	5	9	18	17	21	53	46	70	72	58	64	119	99	111	53	88
			Togo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	0	73	53	141	103	775	0	0	0	0	0	0	0	0	0	0	0	0	
			Ukraine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Discards	A+M	CP	Brazil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	
			EU.France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Korea Rep.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	1	1	
			Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			U.S.A.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	138	124	191	159	142	146	127	111	153	197	139	52	83	60	25	49	19	35	25	36	42	38	42	19	50	39	55	53	81	25
		NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32	0	0	24	27

Table 6a. Liberia artisanal fishery fleet information, estimated fishing effort (fishing days) and size sampling intensity. Blue marlin is caught only by the Fanti and Mix category vessels equipped with motor board engines capable to get further offshore.

Fishing group	Total N canoes	Total Fishing days / yr	Annual Fishing days per Fishing group	Size Sampling intensity
Fanti	174	232	40368	2 per week 52 weeks 5 ~ 114 ports / 22 samplers
Mix (Fanti & Kru)	315	208	65520	
Kru	3398	192	*	

YearC	Wgt Sampled kg	N fish Sampled	Avg catch/ boat /fishing day	Avg catch Fanti	Avg catch Mix	Annual Catch Fanti	Annual Catch Mix	Total Catch t BUM
2013	1636	59	3.146153846	1.11949033	2.026663521	45191.58546	132786.9939	177.98
2014	2695	63	5.182692308	1.84414818	3.338544125	74444.57386	218741.411	293.19
2016	1166	30	2.242307692	0.79787636	1.444431336	32208.67277	94639.1411	126.85
** 2017	88	1	0.169230769					

* Vessels in this group does not catch BUM.
** 2017 size sampling is partial, thus it was not estimated total catch.

Table 6b. Working group estimates of Liberia total catch of blue marlin from the artisanal fleet 1995-2016. Data from 1995 to 2003 are from the Task I NC ICCAT, while catches from 2004 to 2016 (highlighted cells) represent estimates of catch based on size sampling (2013-2016) or catch ratio of similar fishery/fleet in the region (2004-2013).

Year	Task I Liberia t
1995	87.26
1996	148.10
1997	148.32
1998	700.90
1999	419.74
2000	711.98
2001	234.82
2002	158.38
2003	114.61
2004	188.44
2005	304.03
2006	162.32
2007	273.59
2008	76.47
2009	56.27
2010	46.33
2011	133.05
2012	93.69
2013	177.98
2014	293.19
2015	35.22
2016	126.85

Table 7. Blue marlin catch series (BUM T1NC) estimated by the Group for the EU PS tropical fishery (MIX-FR+ES). 2016 estimations already remove 42 tones reported by EU FRA officially.

Year	Species	MIX.FR+ES PS fleet catch (t) estimated
2011	BUM	185.63
2012	BUM	181.00
2013	BUM	191.15
2014	BUM	173.12
2015	BUM	175.95
2016	BUM	148.05

Table 8. Work done on the revision (mostly reduction) on the BIL unclassified Task I catches.

			1980	1990	2000										2010							
Species	**Status**	**Flag**			**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Remarks/action**
BIL	**CP**	Belize														9	7	2	3			?
		Brazil	21		18		1	4	28							116	79					none
		Canada																		0	0	?
		EU.España		0		0	1	1		0		3	6	17	5	2	3	3	1	1	0	ESP-CANARY (BB) ?
		EU.France	0											1		0	1	1	0		1	?
		EU.Italy																		14	7	reclassified as MSP
		EU.Netherlands											0			0						?
		EU.Portugal	7	29	1	25	1	0		97		0	0		5	117	24	3				split 2011
		Gabon	116	0																		?
		Guinea Ecuatorial																0				?
		Korea Rep.		0										1						2	3	?
		Liberia		27																		?
		Mauritania																			0	?
		Namibia					3		5	9	57		50	2								reclassified as BUM (unique series)
		S. Tomé e Príncipe														254	247	280	347	251	167	official data by species (deleted duplication)
		Senegal										2										?
		Sierra Leone														1						?
		St. Vincent and Grenadines		4	0	1																?
		Trinidad and Tobago	0	4				5	3	7		7	6	8	8	5	2	0	0		0	BUM ?
		U.S.A.	49																			?
		UK.Bermuda		4																		?
		UK.British Virgin Islands									1											?
		UK.Sta Helena		11	4	3	4	1														?
		UK.Turks and Caicos										1										BUM ?
		Vanuatu																1				?
	NCC	Chinese Taipei		0											9	5	151	237	144			official data by species (deleted duplication)
		Guyana																			48	?
	NCO	Seychelles			16		0															?
		Sta. Lucia			4		9															?
		Ukraine		5																		?
TOTAL			**193**	**84**	**43**	**29**	**19**	**11**	**36**	**113**	**58**	**12**	**63**	**28**	**28**	**508**	**514**	**527**	**494**	**268**	**226**	

Table 9. Standard SCRS catalogues on statistics (Task-I and Task-II) of blue marlin (BUM). Major fishery (flag/gear combinations ranked by order of importance) and year (1996 to 2016). Only the most important fisheries (representing ±95% of Task-I total catch) are shown. For each data series, Task I (DSet= "t1", in tonnes) is visualised against its equivalent Task II availability (DSet= "t2") scheme. The Task-II colour scheme, has a concatenation of characters ("a"= T2CE exists; "b"= T2SZ exists; "c"= CAS exists) that represents the Task-II data availability in the ICCAT-DB. See the legend for the colour scheme pattern definitions.

Stock	Status	FlagName	GearGrp	DSet	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Rank	%
			T1 Total		5418	5735	5696	5390	5481	4471	3906	4418	3208	3577	3174	4296	3776	3227	2962	2785	2698	1958	2730	2107	2036		
A+M	CP	Japan	LL	t1	1679	1349	1185	790	883	335	267	442	540	442	490	920	1028	822	731	402	430	189	280	293	297	1	17.5%
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	a	1	
A+M	CP	Ghana	GN	t1	422	491	447	624	639	795	999	415	470	759	405	683	191	140	116	332	234	163	236	88	44	2	11.0%
A+M	CP	Ghana	GN	t2	-1	b	ab	b	ab	ab	ab	ab	ab	ab	ab	ab	a	ab	a	a	a	a	a	a	a	2	
A+M	CP	EU.France	HL	t1	252	299	333	370	397	428	443	443	450	470	470	461	584	498	344	461	395	212	393	400	123	3	10.4%
A+M	CP	EU.France	HL	t2	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	3	
A+M	NCC	Chinese Taipei	LL	t1	660	1478	578	486	485	240	294	319	315	151	99	233	148	195	153	199	165	78	62	85	102	4	8.3%
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	4	
A+M	CP	Brazil	LL	t1	308	165	340	509	467	780	387	577	194	610	241	149	120	75	50	62	47	16	105	89	79	5	6.8%
A+M	CP	Brazil	LL	t2	a	a	a	ab	ab	ab	a	a	a	ab	ab	ab	ab	ab	ab	ab	ab	a	a	a	-1	5	
A+M	CP	Liberia	LL	t1	148	148	701	420	712	235	158	115	188	304	162	274	76	56	46	133	94	178	293	35	127	6	5.8%
A+M	CP	Liberia	LL	t2	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	b	b	-1	b	6	
A+M	NCO	NEI (ETRO)	LL	t1	435	548	803	761	492	274	17	14														7	4.2%
A+M	NCO	NEI (ETRO)	LL	t2	-1	-1	-1	-1	-1	-1	-1	-1														7	
A+M	NCO	Mixed flags (FR+ES)	PS	t1	96	82	80	83	147	151	131	148	171	150	136	135	139	164	178	186	181	191	173	176		8	3.7%
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		8	
A+M	CP	Venezuela	GN	t1	71	86	175	190	80	57	50	55	57	110	118	184	105	69	94	63	88	60	98	89	102	9	2.5%
A+M	CP	Venezuela	GN	t2	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	a	a	a	a	a	-1	-1	9	
A+M	CP	Côte d'Ivoire	GN	t1	113	157	66	189	288	208	111	171	115	21	8	132	66	49	44	15	45	42	87	15	48	10	2.5%
A+M	CP	Côte d'Ivoire	GN	t2	ab	ab	ab	ab	ab	ab	ab	ab	ab	-1	-1	a	-1	-1	-1	a	a	a	ab	ab	ab	10	
A+M	CP	EU.España	LL	t1	158	122	195	125	140	94	28	12	51	24	91	38	55	60	165	16	34	44	137	212	140	11	2.5%
A+M	CP	EU.España	LL	t2	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	-1	-1	b	b	b	-1	11	
A+M	CP	China PR	LL	t1	62	78	120	201	23	92	88	89	58	96	99	65	13	77	100	99	61	45	40	44	50	12	2.0%
A+M	CP	China PR	LL	t2	-1	-1	-1	-1	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	12	
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	13	2.0%
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	13	
A+M	NCO	NEI (BIL)	LL	t1					53	183	258	167	89	7	98	209	143	177		34						14	1.8%
A+M	NCO	NEI (BIL)	LL	t2					-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		-1						14	
A+M	CP	Mexico	LL	t1	13	13	27	35	68	37	50	70	90	86	65	91	82	93	89	68	106	86	67	72	66	15	1.7%
A+M	CP	Mexico	LL	t2	a	a	a	a	a	-1	-1	a	a	a	a	a	a	a	a	a	a	a	a	ab	ab	15	
A+M	NCO	Togo	GN	t1		23		73	53	141	103	775														16	1.5%
A+M	NCO	Togo	GN	t2		-1		-1	-1	-1	-1	-1														16	
A+M	CP	U.S.A.	LL	t1	197	139	51	83	60	22	37	19	34	24	36	42	37	40	19	50	38	55	53	81	25	17	1.4%
A+M	CP	U.S.A.	LL	t2	a	a	a	ab	a	a	ac	a	a	a	a	a	a	a	ab	ab	ab	ab	ab	ab	ab	17	
A+M	NCO	Grenada	LL	t1	26	47	60	100	87	104	69	72	45	42	33	49	54	32	69	53	32	63	63			18	1.4%
A+M	NCO	Grenada	LL	t2	-1	-1	-1	-1	-1	-1	-1	a	a	a	a	a	a	-1	-1	-1	-1	-1	-1			18	
A+M	CP	Venezuela	LL	t1	72	56	51	50	45	27	38	65	44	51	53	37	25	51	57	53	56	52	41	60	83	19	1.4%
A+M	CP	Venezuela	LL	t2	ab	ab	ab	ab	ab	b	b	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	a	a	a	a	19	
A+M	CP	EU.Portugal	LL	t1			6	5	4	8	6	31	27	48	105	135	157	106	139	54	53	25	22	45	50	20	1.3%
A+M	CP	EU.Portugal	LL	t2			a	a	a	a	a	a	a	a	a	ab	ab	ab	ab	ab	ab	ab	ab	ab	ab	20	
A+M	NCO	Sta. Lucia	TR	t1							9	18	17	21	53	46	70	72	58	64	119	99	111	53	88	21	1.1%
A+M	NCO	Sta. Lucia	TR	t2							-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	21	
A+M	CP	S. Tomé e Príncipe	TR	t1	36	35	33	30	32	32	32	32	9	21	26		65	70	72	74	76	78	81	11	10	22	1.1%
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	b	b	22	
A+M	CP	Korea Rep.	LL	t1	144	56	2	3	1	1		0	1	6	33	64	91	36	85	62	34	24	11	5	26	23	0.9%
A+M	CP	Korea Rep.	LL	t2	a	a	a	a	-1	a		a	a	a	a	a	a	a	a	-1	a	abc	ab	ab	a	23	
A+M	NCO	Dominica	HL	t1						64	69	75			41	23	85	46	76	57			34	25	18	24	0.8%
A+M	NCO	Dominica	HL	t2						-1	-1	-1			a	a	a	a	-1	a			-1	-1	-1	24	
A+M	CP	Brazil	UN	t1			146						1	0	57	104	62	74	83	1	1					25	0.7%
A+M	CP	Brazil	UN	t2			-1						-1	-1	-1	-1	-1	-1	-1	-1	-1					25	
A+M	CP	Trinidad and Tobago	LL	t1	12	49	15	20	46	14	9	9	10	7	12	14	34	19	22	25	45	48	48	35	19	26	0.6%
A+M	CP	Trinidad and Tobago	LL	t2	-1	-1	-1	-1	-1	-1	-1	a	a	a	a	a	a	a	a	a	a	a	a	a	a	26	
A+M	CP	Senegal	SP	t1													96	37	29	64	154	24	62			27	0.6%
A+M	CP	Senegal	SP	t2													-1	a	a	a	a	a	a			27	
A+M	CP	U.S.A.	RR	t1	35	46	50	37	24	16	17	19	26	16	17	9	13	6	4	6	14	9	1	9	19	28	0.5%
A+M	CP	U.S.A.	RR	t2	ab	ab	ab	ab	ab	a	ab	ab	ab	ab	a	b	-1	ab	ab	ab	ab	ab	ab	ab	ab	28	

Table 10 Available T2CE (Task II catch & effort) datasets in ICCAT-DB but identified as requiring revisions according to the new SCRS standards. Those datasets (having billfish species in the species catch composition) are not shown in the BUM catalogue (Table 10).

Sum of recs				Decade Year																
				1990								2000				2010				
Status	Flag	Time strata	GeoStrata	1990	1992	1994	1995	1996	1997	1998	1999	2001	2002	2008	2009	2010	2011	2012	2013	2014
CP	Brazil	yy	5x5													1				
	China PR	yy	5x5			1	1	1	1	1	1									
	EU.France	yy	1x1											1	1	1	1	1	1	1
	Mexico	qq	5x5			1						1	1							
	UK.Bermuda	yy	1x1						1											
			5x5					1												
	Venezuela	yy	1x1										1							
NCO	Benin	yy	1x1	1																
	Ukraine	yy	10x10		1															

Table 11. Task II size samples (T2SZ) of blue marlin (BUM) reported officially to ICCAT but requiring revisions (following the new SCRS minimum standards) in the future.

total number of fish sampled							Decade Year																																			
							1970	1980										1990										2000										2010				
TimeStrata	FlagName	FleetCode	GeoStrata	GearCode	FreqTyp3	SzInterval	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	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	Chinese Taipei	TAI	5x5	LL	EYEFORK	5					457																															
			ICCAT	LL	EYEFORK	5		212	223	88																																
					LJFL	5			794	673	380	790	559	442	181	117	181	412	55	312	313	988	2252	3520	2036	1079	923	389	600	1631	1345	1065	1262									
	Cuba	CUB	ICCAT	LL	LJFL	5							60																													
	EU.España	EU.ESP-ES-SWO	5x5	LLHB	LJFL	5																																			6	66
	EU.France	EU.FRA-FR-GP	1x1	UNCL	WGT	5																																31	8	22	18	
		EU.FRA-FR-MQ	1x1	UNCL	WGT	5																															66	145	121	94	23	18
	Japan	JPN	10x10	LL	EYEFORK	1																	19	112		5	1															
						5		5	9	2	1	4		1		4					10	3	19																			
					LJFL	1																				5	1			3				3								
			10x20	LL	EYEFORK	1																	406	591		445	690										331	289				
						5	3	208	83	313	247	662	862	153	100	464	885	712	402	125	118	182	270														79	317				
					LJFL	1																				445	690	428	164	285	333	352	423	154	175	166						
					WGT	1																																2				
						5															32		29																			
	U.S.A.	USA	ICCAT	LLD	LJFL	1																					50															
		USA-Com	ICCAT	LLD	LJFL	1																																33		53	83	50
yy	Chinese Taipei	TAI	none	LL	LJFL	2								217																												
	Côte d'Ivoire	CIV	5x5	GILL	LJFL	1																												1349								
	Cuba	CUB	1x1	LLFB	LJFL	2								52																												
			ICCAT	LL	LJFL	5						35																														
	EU.France	EU.FRA-FR-GP	5x5	UNCL	WGT	5																														45						
		EU.FRA-FR-MQ	5x5	UNCL	WGT	5																														125						
	Panama	PAN	1x1	LLFB	LJFL	2								20																												
			none	LLFB	LJFL	2								117																												

Table 12. Blue marlin conventional tagging summary table available with times at liberty in ICCAT-DB, with the number of individuals released at-sea and recovered.

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	9	4								4		44.4%
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	39	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	95	1		1								1.1%
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	611	7	3	1		1		2				1.1%
1986	799	3	1		1	1						0.4%
1987	1375	6	2		2		1	1				0.4%
1988	1685	6	3	1		2						0.4%
1989	2025	16	9	3				2	2			0.8%
1990	2058	19	8	5	3	2		1				0.9%
1991	2550	40	13	5	6	6	1	9				1.6%
1992	2454	31	10	5	3	3	5	4	1			1.3%
1993	2958	28	9	1	3	5	5	4	1			0.9%
1994	2894	43	17	8	5	3	4	6				1.5%
1995	3032	59	16	17	13	7	5	1				1.9%
1996	3640	125	57	28	21	13	4	2				3.4%
1997	2847	65	30	17	11	1	3	3				2.3%
1998	2799	82	35	30	10	1	4	1			1	2.9%
1999	3910	98	63	17	9	8	1					2.5%
2000	2468	24	14	4	3	1	1	1				1.0%
2001	1589	8	4	3							1	0.5%
2002	1754	10	6	1		2		1				0.6%
2003	718	7	1	3	1	1				1		1.0%
2004	269	3	3									1.1%
2005	74	1	1									1.4%
2006	265	1								1		0.4%
2007	174	1					1					0.6%
2008	27	0										
2009	1	1					1					100.0%
2010	3	1					1					33.3%
2012	4	1		1								25.0%
2013	2	2		1	1							100.0%
2014	1	1	1									100.0%
2015	2	2	2									100.0%
Grand Total	47155	716	317	155	94	59	38	40	5	6	2	1.5%

Table 13. CPUE evaluation table for CPUE series presented during the meeting.

	Use in stock assessment?	Use up to 2014	Use up to 2005	No	No	No	No	Yes	Yes	Yes	Yes	Yes
	SCRS Doc No.	**SCRS/2018/014**	**SCRS/2018/015**	**SCRS/2018/016**	**SCRS/2018/017**	**SCRS/2018/018**	**SCRS/2018/019**	**SCRS-2018-020**	**SCRS-2018-020**	**SCRS-2018-022 (early)**	**SCRS-2018-022 (middle)**	**SCRS-2018-022 (late)**
	Index Name:	**BRA RR**	**BRA LL**	**US PLL**	**US and Japanese LL**	**US LL**	**Japanese LL**	**US PLL**	**US RR TOURNAMENT**	**Chinaese Taipei**	**Chinaese Taipei**	**Chinaese Taipei**
	Data Source (state if based on logbooks, observer data etc)	**Sport fishing**	**logbooks**	**logbooks and observer**	**Logbooks**	**ased on logbook**	**Based on logbook**	**scientific observers**	**tournament logs**	**logbooks**	**logbooks**	**logbooks**
1	Do the authors indicate the percentage of total effort of the fleet the CPUE data represents?	No	No	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes
2	If the answer to 1 is yes, what is the percentage?			0-10%	0-10%	91-100%		0-10%		0-10%	31-40%	81-90%
3	Are sufficient diagnostics provided to assess model performance??	Sufficient	Sufficient	Sufficient	Sufficient	Incomplete	Incomplete	Incomplete	Incomplete	Sufficient	Sufficient	Sufficient
4	How does the model perform relative to the diagnostics ?	Well	Well	Well	Well	Mixed	Poorly	Well	Well	Well	Well	Well
5	Documented data exclusions and classifications?	NA	NA	NA		Yes	Yes	Yes	Yes	Yes	Yes	Yes
6	Data exclusions appropriate?	NA	NA	NA	Yes	Yes	Yes	Yes	Yes	No	No	No
7	Data classifications appropriate?	NA	NA	NA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8	Geographical Area	Atl SW	Atl S	Atlantic	Atlantic	Atl NW	Tropical	Atl NW	Atl NW	Atlantic	Atlantic	Atlantic
9	Data resolution level	OTH	Set	OTH	Set	Set	OTH	Set	OTH	OTH	OTH	OTH
10	Ranking of Catch of fleet in TINC database (use data catalogue)			11 or more	11 or more	11 or more	1-5	11 or more	11 or more	1-5	1-5	1-5
11	Length of Time Series	longer than 20 years	longer than 20 years	longer than 20 years	longer than 20 years	longer than 20 years	11-20 years	longer than 20 years	longer than 20 years	longer than 20 years	6-10 years	11-20 years
12	Are other indices available for the same time period?	None	None	Many	Many	Few	Few	Few	Few	Few	Few	Few
13	Are other indices available for the same geographic range?	None	None	Many	Many	Few	Few	Few	Few	Few	Few	Few
14	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	No	Yes	Yes	No	No	Yes
15	Estimated annual CV of the CPUE series	Variable	Variable	Variable		Medium	Low	Low	Medium	Low	Low	Low
16	Annual variation in the estimated CPUE exceeds biological plausibility	Likely	Likely	Unlikely	Possible	Unlikely	Likely	Possible	Possible	Possible	Possible	Unlikely
17	Is data adequate for standardization purposes	Yes	No after 2005	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes
18	Is this standardised CPUE time series continuous?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
19	For fisheries independent surveys: what is the survey type?											
21	For 19: Is the survey design clearly described?											

Table 14. Blue marlin standardized CPUE indices available to the 2018 stock assessment.

Fleet	JAP	TAI	TAI	TAI	USA	USA	VEN	VEN	VEN	BRA	BRA	GHA
Gear	LL hist.	LL 1st	LL 2nd	LL 3rd	LL	Rec	LL	GIL	Rec	Rec	Rec	GIL
Units	Num.	Num.	Num.	Num.	Num.	Num.	Wt.	Wt.	Num.	Num.	Num.	Wt.
1959	2.22											
1960	1.96											
1961	3.82								0.09			
1962	3.46								0.14			
1963	2.78								0.08			
1964	1.78								0.06			
1965	1.22								0.05			
1966	1.01								0.12			
1967	0.97								0.08			
1968	1.18	0.18							0.09			
1969	1.30	0.20							0.10			
1970	1.05	0.14							0.09			
1971	0.65	0.11							0.03			
1972	0.75	0.09							0.02			
1973	0.58	0.10							0.02			
1974	0.97	0.07				0.57			0.03			
1975	0.70	0.04				0.60			0.01			
1976	0.49	0.07				0.55			0.01			
1977	0.56	0.02				0.68			0.01			
1978	0.59	0.02				0.56			0.01	0.10		
1979	0.60	0.03				0.55			0.02	0.20		
1980	0.73	0.03				0.52			0.03	0.16		
1981	0.65	0.03				0.64			0.06	0.27		
1982	0.83	0.03				0.54			0.02	0.26		
1983	0.74	0.02				0.54			0.06	0.39		
1984	0.83	0.02				0.68			0.10	0.14		
1985	0.87	0.02				0.66			0.05	0.07		
1986	0.61	0.02				0.63			0.04	0.13		
1987	0.66	0.04				0.65			0.05	0.29		
1988	0.64	0.05				0.57			0.03	0.13		
1989	0.67	0.05				0.55			0.05	0.19		
1990	0.52		0.09			0.49				0.08		
1991	0.36		0.05			0.54	0.63	9.89	0.04	0.11		
1992	0.37		0.07			0.58	0.34	2.11	0.05	0.12		
1993	0.48		0.09		1.34	0.63	0.23	14.53	0.05	0.14		
1994	0.50		0.11		1.30	0.70	0.43	29.79	0.15	0.09		
1995	0.47		0.10		1.18	0.82	0.38	29.22	0.18	0.11		
1996	0.51		0.10		1.54	0.75	0.31	21.04	0.03	0.14	0.19	
1997	0.46		0.08		1.17	0.70	0.33	28.23	0.04	0.21	0.13	
1998	0.48			0.08	0.94	0.63	0.31	38.80	0.02	0.15	0.12	
1999				0.08	1.15	0.99	0.22	65.67	0.02	0.16	0.09	
2000				0.08	1.08	0.84	0.30	23.34	0.05	0.23	0.07	1.94
2001				0.07	0.51	0.53	0.22	16.56	0.08	0.24	0.12	2.65
2002				0.07	0.83	0.59	0.21	15.37		0.10	0.08	1.87

2003	0.05	0.55	0.47	0.13	18.40		0.05	0.07	1.30
2004	0.03	0.70	0.76	0.11	22.20		0.20	0.04	0.54
2005	0.03	1.10	0.75	0.11	20.99		0.17	0.02	1.10
2006	0.03	1.19	1.03	0.33	26.97			0.03	0.66
2007	0.04	1.10	0.76	0.25	30.97			0.11	0.50
2008	0.03	1.13	0.73	0.35	24.19			0.20	0.12
2009	0.02	1.04	0.67	0.20	16.95			0.01	0.12
2010	0.02	0.92	0.52		28.43			0.13	
2011	0.02	1.11	0.80		15.41			0.07	
2012	0.02	0.96	1.32		22.05			0.17	
2013	0.02	0.69	0.78					0.08	
2014	0.03	0.55	0.59					0.13	
2015	0.02	0.93	1.01						
2016	0.02	0.73	0.75						

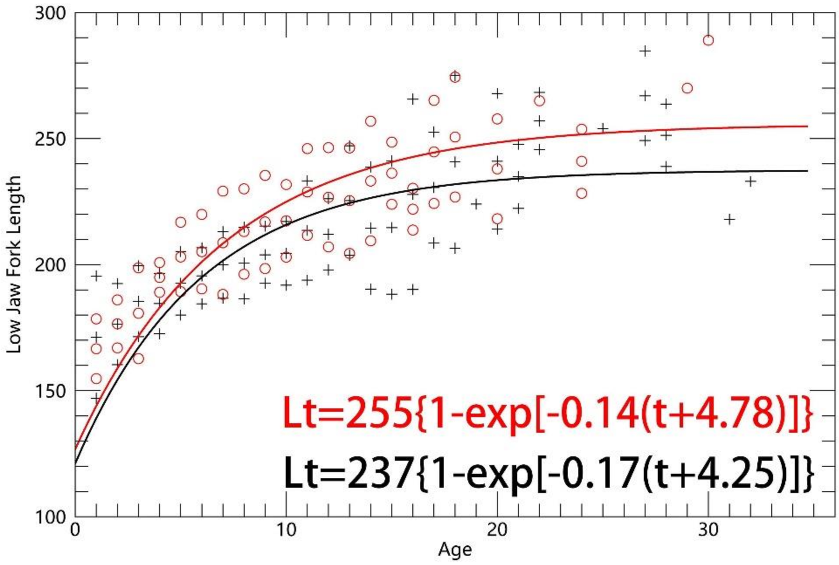

Figure 1. von Bertalanffy growth function of observed mean LJFL at age for female (red) and male (black) blue marlin.

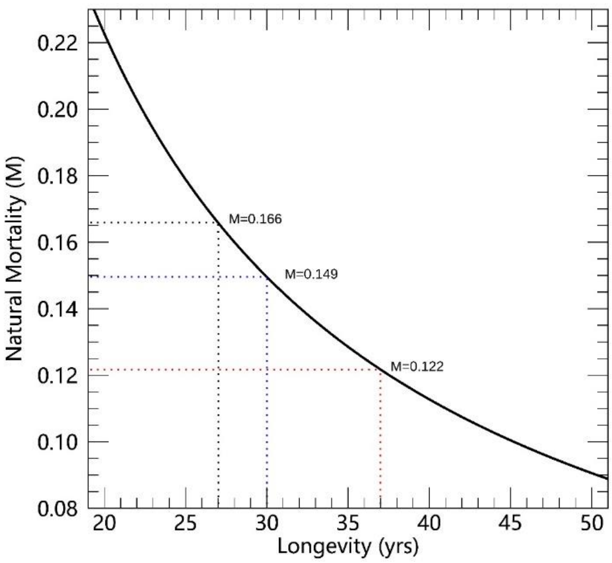

Figure 2. Rates of natural mortality (M) based on equation of Hewitt and Hoenig (2005).

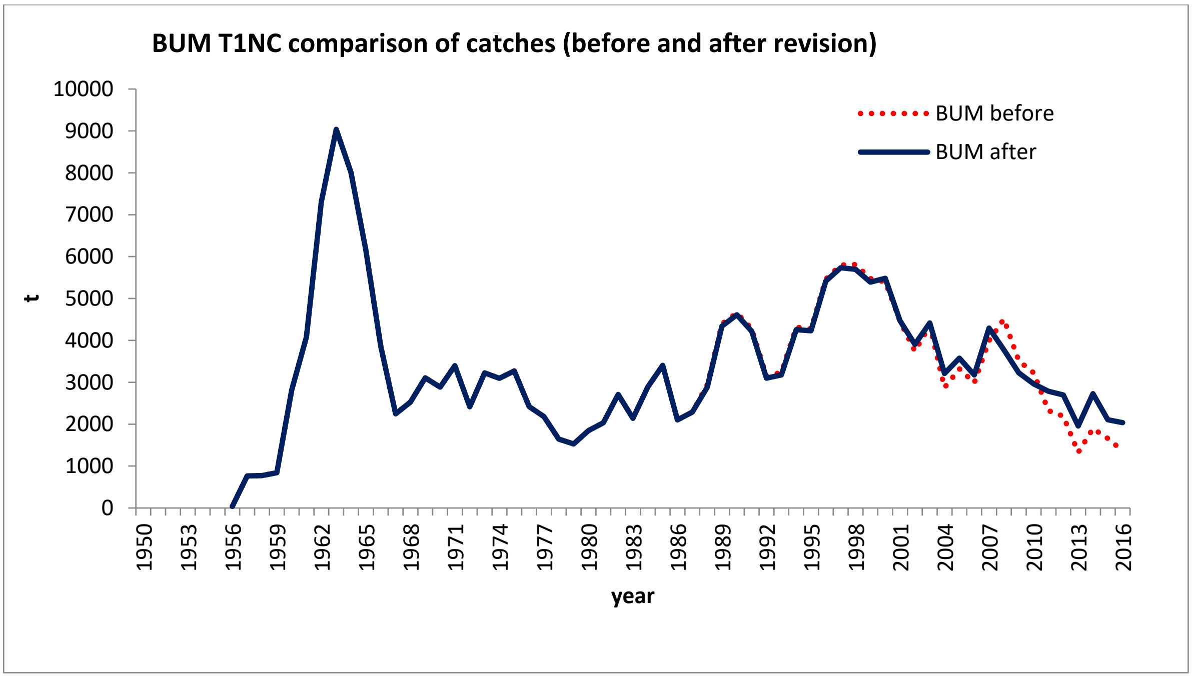

Figure 3. Comparison of BUM Task I catches (t) before (as of SCRS/2017) and after the updates made by the Group.

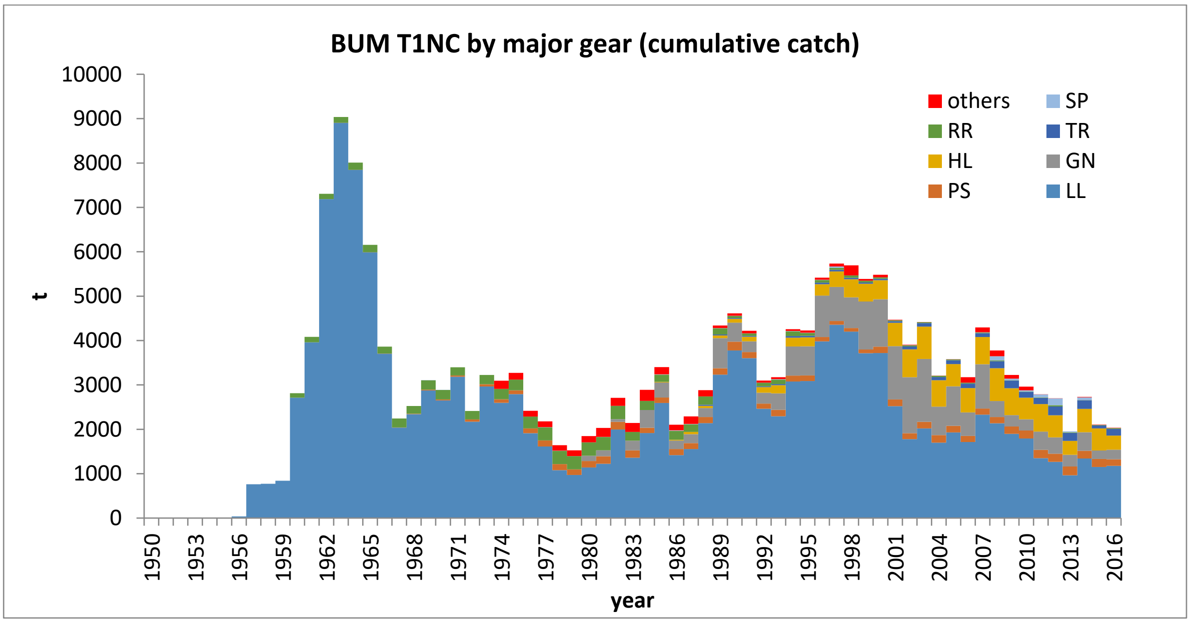

Figure 4. BUM Task I cumulative catches (t) by year and major gear.

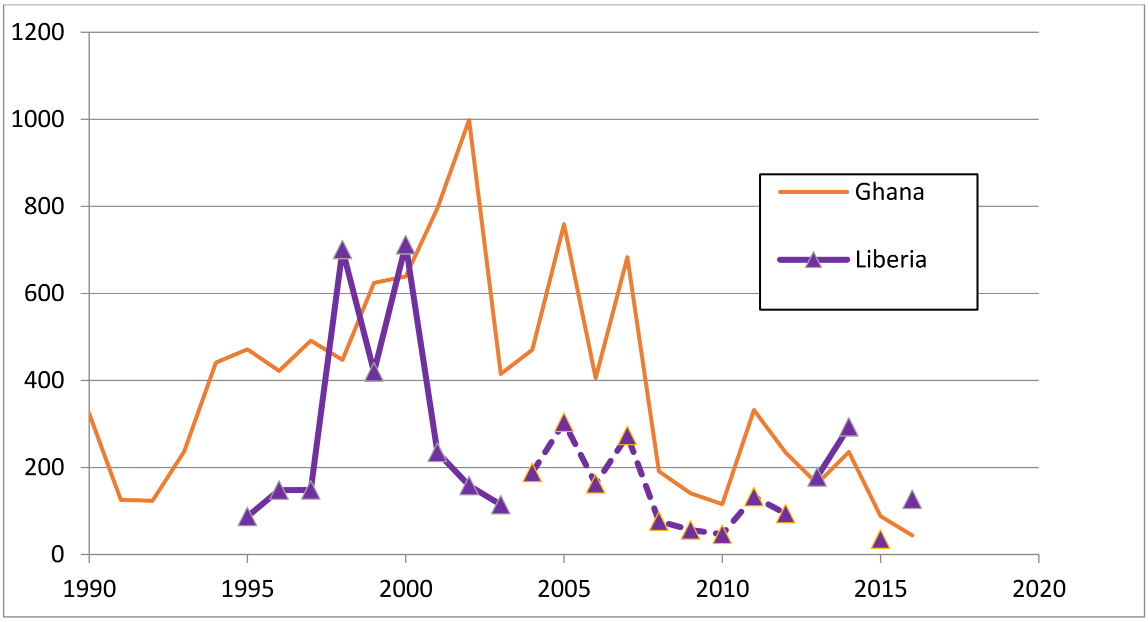

Figure 5. Annual trends of total BUM catches for Liberian artisanal fishery fleet 1995 - 2016. Solid line (1995-2003) correspond to Task I NC reported catch, broken line (2004 - 2016) are the WG estimates of total catch based on size sampling and ratio of catch compared to similar fishery/fleet in the same region (Ghana artisanal).

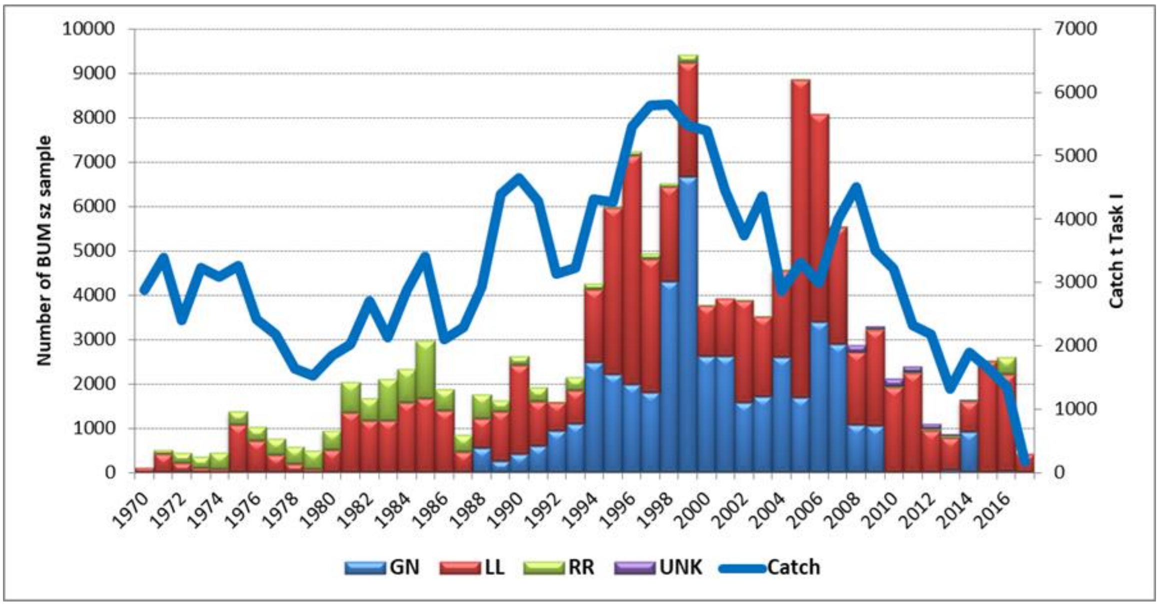

Figure 6. Blue marlin size sample data by main gear type (columns, left y-axis) and annual trends of total catch (line right y-axis). Data for 2017 is incomplete.

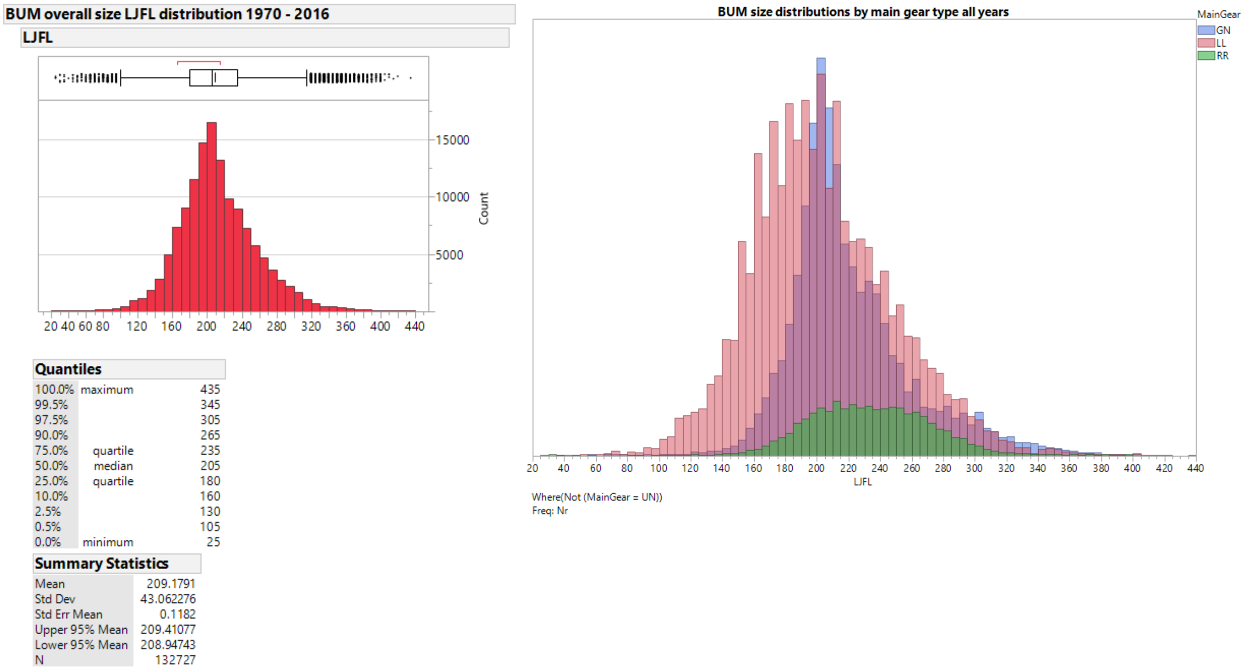

Figure 7. Blue marlin size frequency distribution 1970-2016 (left plot) and by main gear type (right plot).

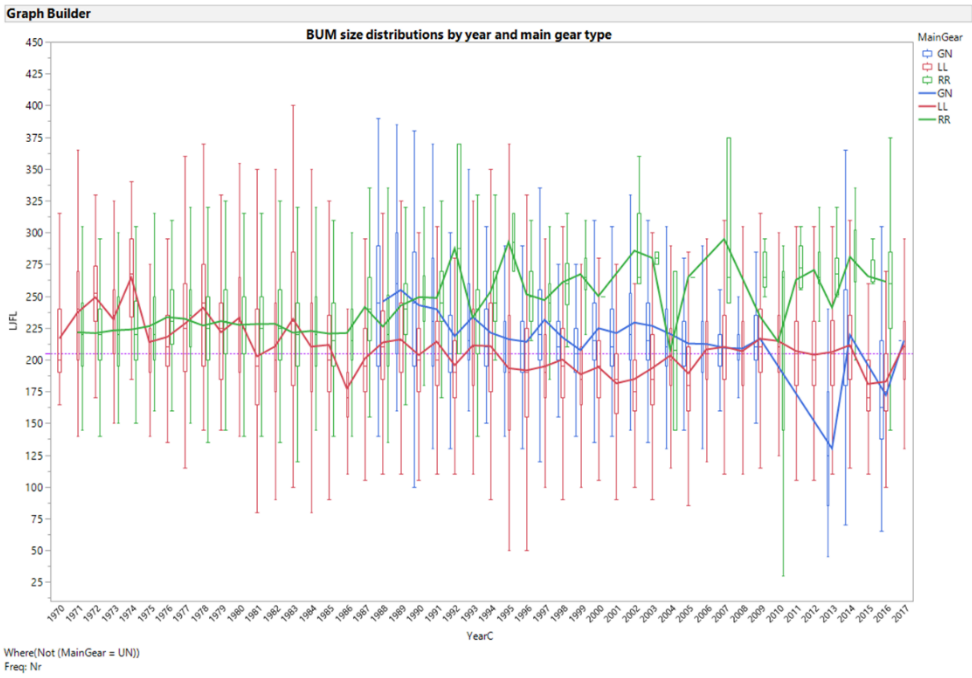

Figure 8. Annual trends of mean size for size sampled blue marlin by main gear type. Lines connect the mean size for each boxplot, broken line represents the overall mean size of catches (210 LJFL cm) of the complete series.

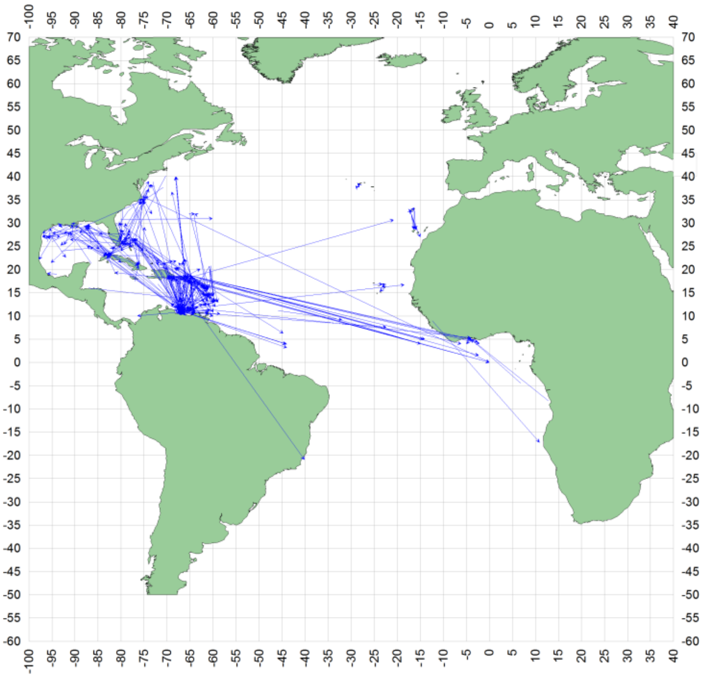

Figure 9. Straight displacements between release and recovery positions (apparent movement), from conventional tagging of blue marlin.

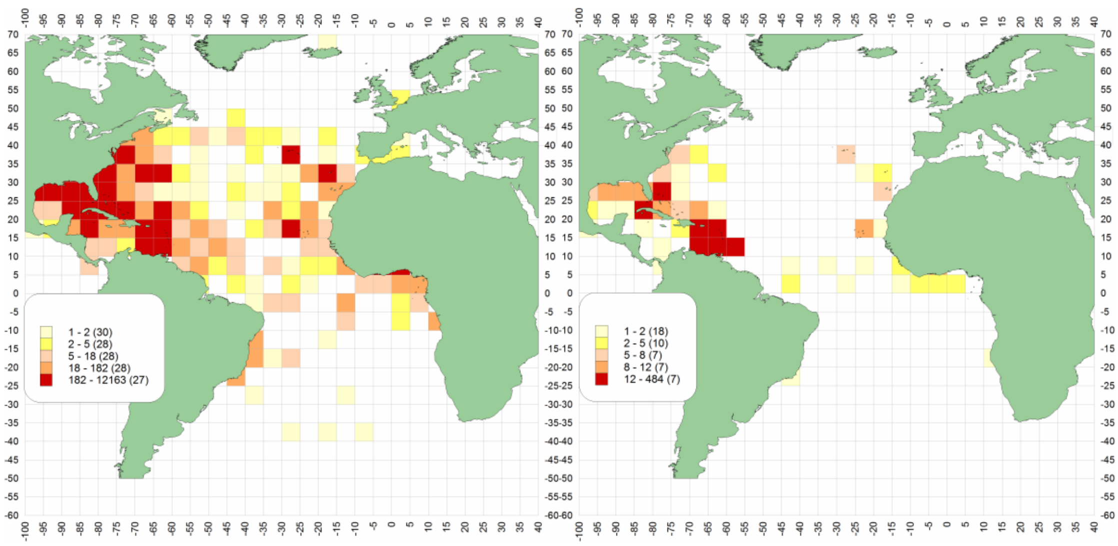

Figure 10. Density (5 by 5 degrees squares) of blue marlin releases (left) and recoveries (right).

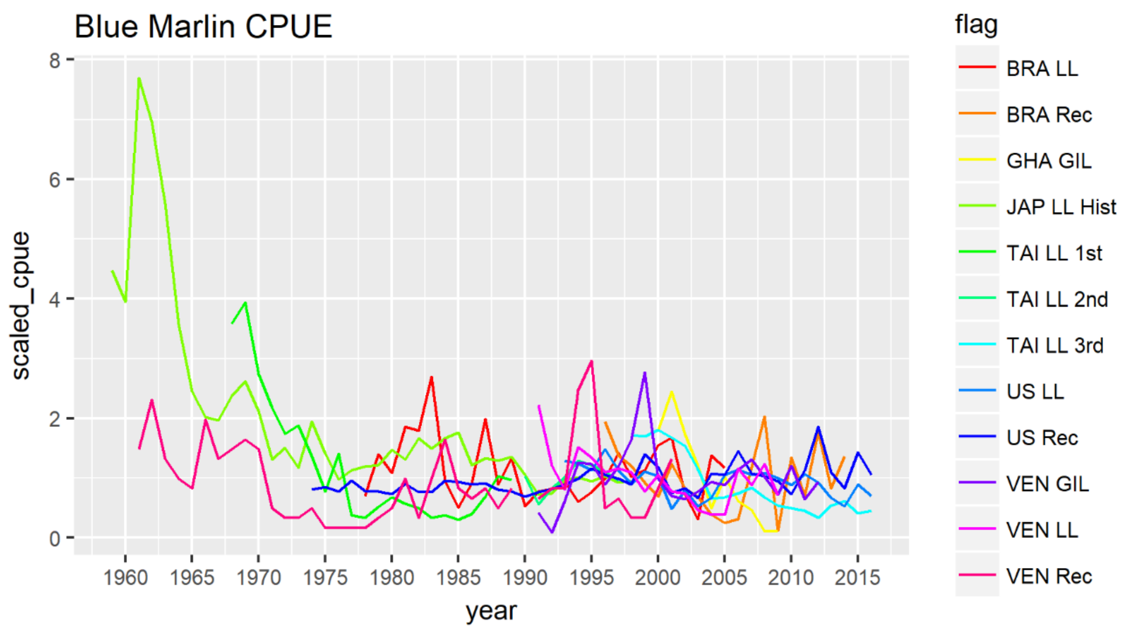

Figure 11. Plot of all approved CPUE series for the Atlantic blue marlin assessment.

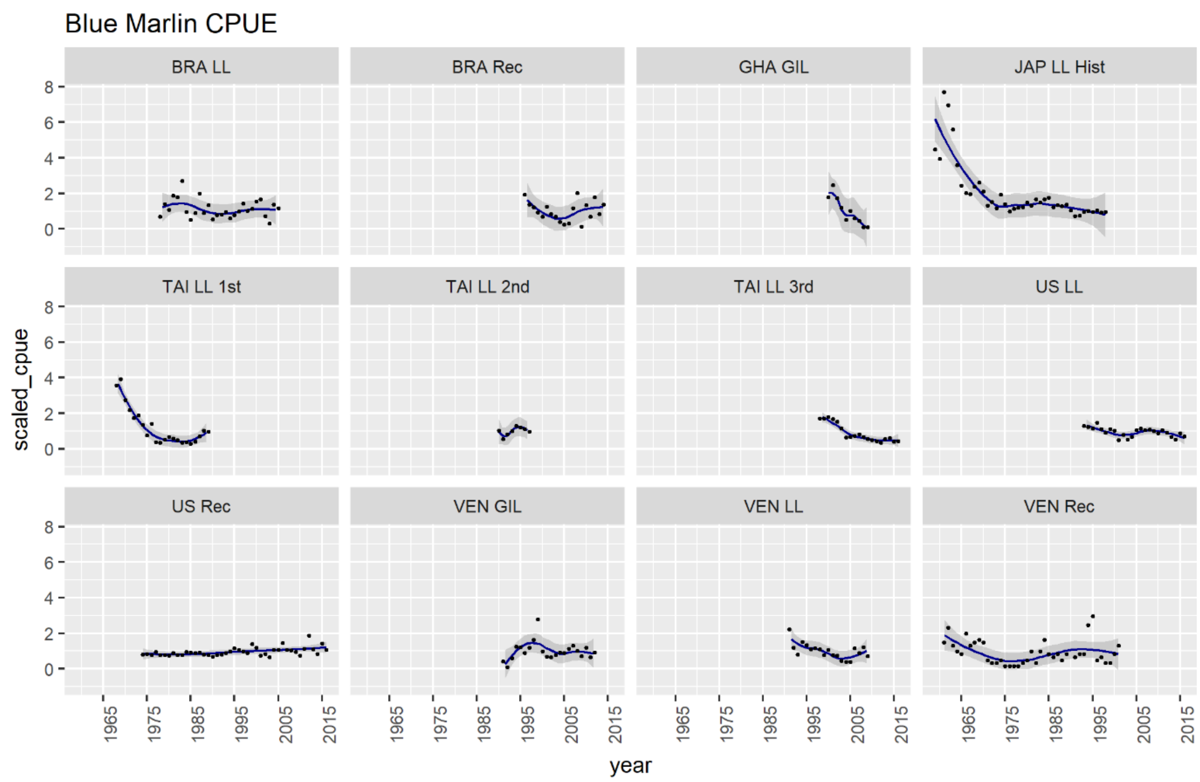

Figure 12. Plot of individual approved CPUE series for the Atlantic blue marlin assessment, including a LOESS smoother.

Appendix 1

Agenda

1. Opening, adoption of the Agenda and meeting arrangements.
2. Review of available data for the assessment
   2.1. Biology
   2.2. Task I and II catch data
   2.3. Task II effort and size data
   2.4. Tagging data
   2.5. Other relevant data
3. Review of relative indices of abundance (CPUEs)
4. Discussion on models to be used during the assessment and their assumptions and remaining issues in preparation for the June stock assessment meeting
5. Enhanced Program for Billfish Research (EPBR)
6. Other matters
7. Recommendations
8. Adoption of the report and closure

Appendix 2

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Appendix 3

List of Papers and Presentations

Reference	Title	Authors
SCRS/2018/012	Comprehensive study of Strategic Investments related to Artisanal Fisheries Data Collection in ICCAT Fisheries of the Caribbean/Central American Region: Interim Report (Part 1)	Arocha F.
SCRS/2018/014	Assessing blue marlin catch rates based on Brazilian sport fishing tournaments (1996-2018), using a generalized linear model with tweedie distribution	Mourato B.L., Hazin H., Hazin F., Travassos P., and Amorim A.F.
SCRS/2018/015	Catch rate standardization for blue marlin caught by the Brazilian pelagic longline fleet (1978-2016)	Mourato B.L., Hazin H., Amorim A.F., Travassos P., and Hazin F.
SCRS/2018/016	Comparison of logbook data to observer data using a longline simulator with blue marlin as an example	Forrestal F., Schirripa M., and Goodyear C.P.
SCRS/2018/017	Habitat covariates for standardizing longline CPUE: an example with blue marlin	Goodyear C.P., Schirripa M., Forrestal F., and Lauretta M.
SCRS/2018/018	Standardizing us blue marlin longline CPUE using habitat covariates	Goodyear C.P., Forrestal F., Schirripa M., and Lauretta M.
SCRS/2018/019	Updated standardized CPUE of the Atlantic blue marlin caught by Japanese longliners	Ijima H.
SCRS/2018/020	Blue marlin (*Tetrapturus albidus*) standardized indices of abundance from the U.S. pelagic longline and recreational tournament fisheries	Lauretta M., and Goodyear C.P.
SCRS/2018/021	Catches of blue marlin *Makaira nigricans* (Lacepède, 1802) by artisanal fishers from Côte d'Ivoire, 1988-2016	Bahou L., Diaha C.N., Kouadio J.K., and Amandé J.M.
SCRS/2018/022	CPUE standardization of blue marlin (*Makaira nigricans*) for the Taiwanese distant-water longline fishery in the Atlantic Ocean for 1968-2016	Nan-Jay S., and Yi-Sin L.

SCRS/P/2018/001	Preliminary Results: Age and Growth for Atlantic Blue marlin	Hoolihan J.P., Luo J., and Arocha F.
SCRS/P/2018/002	Size class of Atlantic blue marlin in Liberia fisheries waters	Wehye A.S.
SCRS/P/2018/003	Blue marlin (*Makaira nigricans*) size sampling data review 1970-2016	Ortiz M.
SCRS/P/2018/004	A metier approach of sustainable development: an active cooperation between ICCAT and WECAFC	Reynal L.

Appendix 4

SCRS Document Abstracts

SCRS/2018/012 - In 2014, ICCAT funded a Strategic Investment Inventory for artisanal fisheries of West Africa. Using that study as a model, this present project aims to get a clear understanding of existing data collection programs and investments related to artisanal fisheries of the Caribbean/Central American region targeting ICCAT species (giving priority to those targeting billfish and shark species), in order to avoid duplication of effort and maximize the effectiveness of ICCAT's capacity building funds. The present report, presents the work plan and how the study will be approached, by providing a comprehensive view of two countries (Grenada and Dominican Republic) selected from the scope of the Terms of Reference (ToRs) of the study. The information and data presented for the two countries selected represent a comprehensive view of what the complete catalog by country would include that will offer the necessary information to maximize the effectiveness of ICCAT's capacity building funds.

SCRS/2018/014 – In the present work, daily radio logbook records from recreational tournaments of Yacht Clubs from São Paulo, Rio de Janeiro, Espírito Santo and Bahia, including 289 tournament days, from 1996 to 2018, were used to generate a standardized CPUE series, by a GLM, using the tweedie distribution. The factors included were: "year" (1996 to 2018), "local" (off São Paulo, Rio de Janeiro, Espírito Santo and Bahia), and "target". The target species was estimated by a cluster analysis, based on the proportion of each species or group of species in relation to the total catch, using the "K Means" method. The standardized CPUE series showed a gradual decreasing trend until 2005, followed by an increasing trend between 2006 to 2018, particularly after 2011. However, this apparent rise in catch rates in recent years, i.e. after 2014, must be interpreted with great caution since the number of monitored tournament days was quite low (only 2 every year), and the variance was very large. These results indicate that this CPUE series is not suitable for the assessment of the condition of blue marlin stock in the South Atlantic, in recent years.

SCRS/2018/015 – n the present paper, catch and effort data from 99,376 sets done by the Brazilian tuna longline fleet, including both national and chartered vessels, in the equatorial and southwestern Atlantic Ocean, from 1978 to 2016, were analyzed. The fished area was distributed along a wide area of the equatorial and South Atlantic Ocean, ranging from 3ºW to 52oW of longitude, and from 011ºN to 40ºS of latitude. The CPUE of the blue marlin was standardized by a Generalized Linear Mixed Model (GLMM) using a Delta Lognormal approach. The factors used in the model were: year, quarter and area (A1 > 10ºS; A2 ≤ 10°S & ≥ 25°S; and A3 ≤ 25°S). The standardized CPUE series shows a gradual decreasing trend, particularly after the year 2004, reaching a low level from 2007-2010, and decreasing to an even lower level from 2011 to 2016. These drops in CPUE, however, were much more a consequence of a new regulation, in 2005, prohibiting the taking of marlins if they were alive by the time of gear retrieval, as well as their commercialization, if they were dead, than to an actual change in abundance. This means the signal of blue marlin abundance from this fishery is lost and the CPUE series after 2005 is not suitable for stock assessment purposes.

SCRS/2018/016 – Logbook and observer data based off the US pelagic longline fishery were used to in a longline simulator (LLSIM) to simulate catch datasets from a known population of blue marlin. The blue marlin population was simulated from a species distribution model that was built using PSAT data and environmental data obtained from the Community Earth Systems Model (CESM). The catch datasets derived from LLSIM were standardized using a delta lognormal approach. Bait type was omitted from the model using observer data but all other factors were retained in both the logbook and observer data. The logbook data had a better model fit to the true population (RMSE=0.13) than the observer data (RMSE=0.28).

SCRS/2018/017 – Species distribution models (SDM) integrate multiple habitat features to predict spatiotemporal patterns of population relative abundance. When appropriately scaled, the predictions constitute a continuous numerical variable suitable for inclusion as a covariate in analyses intended to standardize longline CPUE. Here we evaluate methods to incorporate such data into CPUE standardizations using simulated longline catches of blue marlin (Makaira nigricans) patterned after either US or Japanese fishing. Habitat relative densities (H) were obtained from a SDM, and a habitat coefficient for each set was estimated from H using hook depths of individual gears. Standardizations used GLMs fitted to suites of covariates including either a continuous synthetic habitat variable or traditional spatial and temporal factors (area, month) to represent habitat. Overall, SDM-derived numerical variables were superior to traditional habitat factors. However, the results for the US-based data were mixed, presumably because of better statistical balance in the habitat factors. The results also show that temperature should be useful as a continuous numeric covariate for standardizing blue marlin CPUE.

SCRS/2018/018 – The relative value of species habitat at the location of a longline set can be estimated with a species distribution model (SDM). These data can then be used as covariates in GLM CPUE standardizations to replace intra-annual spatiotemporal strata (area, season). We compared the two approaches using blue marlin (*Makaira nigricans*) data from US longline logbooks. GLM covariates included 1) gear features, month and area, or 2) gear features and either a habitat coefficient (w) or habitat relative density (H). Habitat relative densities were obtained from either of two SDMs, and habitat coefficients were estimated from H using hook depths of individual gears. All GLM standardized abundance predictions differed from the trend in nominal catch rates. The trends predicted with the habitat-based covariates for the baseline SDM were essentially the same as those from the standard approach using month and area (r^2=0.98, n=30). Those with covariates from the alternative SDM were also very similar (r^2=0.95-0.96). SDM-derived habitat covariates could obviate problems with statistical imbalance and improve standardizations in many situations.

SCRS/2018/019 – Provides an updated standardized CPUE of Atlantic blue marlin caught by Japanese longliners. The same standardization procedure used by Kimoto and Yokawa (2011) was applied as previously agreed by Billfish Species Group. The updated period is 2010 to 2016 and the standardized period is between 2001 and 2016. There is no update effect, and current CPUE shows a flat trend.

SCRS/2018/020 – Standardized indices of relative abundance for blue marlin in the Northwest Atlantic Ocean are presented for two U.S. fisheries, the pelagic longline bycatch fishery and the recreational billfish tournament fishery. 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. Model selection was performed on a set of defined models representing alternative hypotheses of covariate effects on catchability. The null model for both datasets was CPUE~Year+Area+Quarter, determined in previous modelling efforts. The null model was compared first with Year+Habitat and Year+Sea_Temperature models to determine primary factors for inclusion. A repeated measures model was also tested for tournaments, treating individual tournaments as random intercept effects. Additional factors for observer longline sets; which contained more detailed information on spatial, environmental, and gear attributes; were then tested for inclusion. The final longline index included year, area, quarter, habitat, hook type, and hook depth. The final tournament index included year, area, quarter, with a random tournament effect. Habitat was found to be highly significant for the longline catch rates, but not for the tournament data. The precise location of fishing sets for longlines likely resulted in more accurate habitat assignment compared to tournaments, where only the fishing port is known. Additionally, the random intercept modelled for individual tournaments was concluded to capture much of the variation that might be attributed to differences in habitat and other covariates.

SCRS/2018/021 – The multispecies artisanal fishery operating with canoes in continental shelf waters of Côte d'Ivoire has various target fishes. Blue Marlin specimens that were part of the fishes caught were counted and measured at the main landing sites in Abidjan on the fishers' return. Here, we present data collected from 1988 to 2016. The results indicate that the species occurs throughout the year. Fish sizes range from 140 cm (lower-jaw fork length, LJFL) to 390 cm. However, specimens measuring between 180 cm and 280 cm were commonest. Still, specimens larger than 390 cm LJFL are scarcely observed. The nominal catch and yield varied significantly depending on the year, as did the fishing effort and CPUE. Catches were, however, slightly higher in the warmer season and dominated by smaller specimens. In contrast, larger Blue Marlin dominated the catches during the cooler season.

SCRS/2018/022 – Catch and effort data of blue marlin (*Makaira nigricans*) for the Taiwanese distant-water tuna longline fishery in the Atlantic Ocean were standardized for whole period (1968-2016) and by period using a generalized linear model (GLM). Four periods of 1968-2016, 1968-1990, 1990-2016 and 1998-2016 and information on operation type (the number of hooks per basket, HPB, for the model of 1998-2016) 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 1968-1990, 1990-2016 and 1998-2016 showed almost identical trends to those derived from the model of entire period (1968-2016). 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, and then the trend stabilized from 2004 until present.

SCRS/P/2018/001 –Not provided by the authors.

SCRS/P/2018/002 – Not provided by the authors.

SCRS/P/2018/003 – Not provided by the authors.

SCRS/P/2018/004 – Not provided by the authors.

SCRS/P/2018/005 – Presented a brief overview of the artisanal fisheries in São Tomé and Príncipe targeting billfishes. Estimated catches (task I and II) of the different billfish species caught by the artisanal fleet are provided for the period 2009 to 2017. Additionally, Task II size data for blue marlin is presented for the period 2016-2017.

Appendix 5

Tentative Agenda for the Stock Assessment session

1. Opening, adoption of Agenda and meeting arrangements
2. Summary of updated data submitted after the Data Preparatory meeting, before the assessment data deadline (30 March 2018)

    2.1 Catches

    2.2 Indices of abundance

    2.3 Biology

    2.4 Length compositions

    2.5 Other relevant data
3. Methods relevant to the assessment

    3.1 Production models

    3.2 Length-based age-structured models: Stock Synthesis

    3.3 Other methods
4. Stock status results

    4.1 Production models

    4.2 Length-based age-structured models: Stock Synthesis

    4.3 Other methods

    4.4 Synthesis of assessment results
5. Projections
6. Recommendations

    6.1 Research and statistics

    6.2 Management
7. Responses to the Commission
8. Other matters
9. Adoption of the report and closure