FINAL

ISC/21/ANNEX/07

ANNEX 07

21st Meeting of the
International Scientific Committee for Tuna
and Tuna-Like Species in the North Pacific Ocean
Held Virtually
July 12-21, 2021

REPORT OF THE BILLFISH WORKING GROUP WORKSHOP

July 2021

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ANNEX 07

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International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean

6-7, 10, and 13 November 2020
Virtual Meeting

1. OPENING AND INTRODUCTION

1.1. Welcoming Remarks

Hirotaka Ijima, Billfish Working Group chair opened the data preparatory meeting for the Pacific blue marlin stock assessment. Chinese Taipei, Japan, United States of America (USA), Pacific Community Oceanic Fisheries Program, and the Inter-American Tropical Tuna Commission (IATTC) participated in the meeting. The participating scientists are listed in Attachment 1.

1.2. Introduction

The Billfish Working Group (WG) of the International Scientific Committee for Tuna and Tuna-Like Species in the North Pacific Ocean held a virtual three-day meeting by webinar. The goal of the meeting was to agree on the input data and the model settings for conducting a benchmark stock assessment for Pacific blue marlin using Stock Synthesis 3.

1.3. Standard Meeting Protocols

The WG chair introduced protocols for the webinar meeting. Cisco Webex and Zoom were used for this meeting, and working papers on the agenda were presented and discussed.

2. ADOPTION OF AGENDA AND ASSIGNMENT OF RAPPORTEURS

Prior to the meeting, The WG adopted the draft agenda of the data preparatory meeting (Attachment 2). The WG Chair assigned the rapporteurs for three agenda items as follows:

Item	Rapporteurs
1-3	H. Ijima
4	(WP01, WP02, WP03, WP04) M. Kanaiwa and M. Sculley
5	(WP05, WP07, WP08) N. Barth and S. Griffiths
6	YJ. Chang
7-10	H. Ijima

3. NUMBERING WORKING PAPERS AND DISTRIBUTION POTENTIAL

The WG chair distributed numbered working papers (Attachment 3). The WG agreed to post the finalized papers on the ISC website and make them publicly available.

4. ABUNDANCE INDICES

Update of Japanese longline abundance index of Pacific blue marlin (Makaira nigricans) estimated by the habitat model. Hirotaka Ijima (ISC/20/BILLWG-03/01)

This paper reports the updated Japanese CPUE indices used in the previous Pacific blue marlin stock assessment in 2016. Data sets were used from Japanese longline logbook data and NOAA oceanic environmental data. The habitat model was used to standardize Pacific blue marlin CPUE as in the previous analysis of Kai et al. (Year). Differences from the previous analysis are; 1.) Coastal longline data were removed following the SS3 fishery definition; 2.) All years of environmental data were updated; and 3.) A part of aggregation methods of environmental data was changed, and errors were fixed. The standardized CPUE showed a flat trend as before, but the range of variability has increased. Looking at Japanese offshore and distant water longliners' size selectivity, it is reasonable that CPUE of Pacific blue marlin would fluctuate from year to year because the Japanese longline mainly catches an immature blue marlin.

Discussion

The WG members asked about the differences between the standardization analyses in 2016 and the current study. The author noted that there were changes and updates in the environmental data used in the habitat model. Some of the environmental datasets had incurred substantial changes. The WG asked if the 2019 CPUE data were analyzed using the 2016 habitat model. It was noted that there were some issues with the environmental data in the 2016 habitat model that prohibited its use in the 2016 model. The authors presented an analysis of the 2016 data using the updated environmental data and showed that the updated data did not substantially change the CPUE trend compared to 2016.

The WG clarified that the habitat model is a different approach for CPUE standardization compared to a traditional GLM. The results derived from the habitat model depend on many assumptions regarding the biology and habitat preferences of blue marlin and this makes it difficult to compare the results of the habitat model with those from the GLM approach.

Preliminary analysis for the CPUE standardization of the Pacific blue marlin using Japanese longline logbook and the R software package R-INLA. Hirotaka Ijima and Haruko Koike (ISC/20/BILLWG-03/02)

We analyzed Japanese longline logbook data to obtain indicators of the historical trends of the Pacific blue marlin. We applied the spatiotemporal model for the CPUE standardization because the Japanese longline area coverage shrinks year by year. We used an R-INLA package and WAIC to make an appropriate model selection for the random effect model. At first, we tried the pan-Pacific analysis similar to the Habitat model used in the previous stock assessment. However, this model did not converge. Secondly, considering the average catch-weight spatial pattern, we extracted the area that fish of the size corresponds to the SS3 model's selectivity. The smallest WAIC among the converged models was the seasonal geo-statistical model. However, various problems have been identified with this model. The randomized quantile residuals indicated overestimation in the 1990s population. In detail, the spatial trends of randomized quantile residuals differed between 1994 and 2018. In other words, the model validation suggests the need to build a spatiotemporal model. However, the spatiotemporal model could not be estimated the fixed effect of season and intercept. Also, we need to perform a statistical analysis to determine the analysis area because the trend of standardized CPUE strongly depends on the area definition. From these results, we judged that the results of this study are preliminary.

Discussion

A downward trend in the standardized CPUE over time was observed. Howver, this trend was not evident in the nominal CPUE, although the WG noted that a similar downward trend was also observed in other CPUE standardization models. The WG noted that the standardized index from the spatiotemporal model was quite different from that of the habitat model and that this could be due to the structural differences between the standardization methods. It was also noted that the downward trend could be partially driven by a negative bias in the residuals present at the beginning of the time-series.

The WG noted that the model using year as a random effect was preferred, because the models using year as a fixed effect appeared to be overfitting the data.

It was suggested to include annual spatial variability in the model in addition to seasonal spatial variability. In order to decrease the computational time needed to fit the model, it may be necessary to subsample the data. It was also suggested that the relevant environmental data be included in the spatiotemporal model to facilitate comparisons with the habitat model.

CPUE standardization of blue marlin (Makaira nigricans) for the Taiwanese distant-water tuna longline fishery in the Pacific Ocean during 1971–2019. Jhen Hsu and Yi-Jay Chang (ISC/20/BILLWG-03/03)

Reliable indices of population abundance are an important type of data for stock assessment. This report provides annual changes in the standardized catch rate of blue marlin caught by the Taiwanese distant-water tuna longline fishery (DWLL) (1971– 2019) in the Pacific Ocean. Catch rates were standardized using Vector-Autoregressive Spatio- Temporal Model (VAST), and the standardization models were conducted for three periods, 1971–1978, 1979–1999, and 2000–2019, due to the heterogeneity of quality and quantity of the dataset and changes in the fishery such as targeting. The model with various catchability covariates, such as vessel, quarter, and HPB (only for 2000–2019) included in the VAST model were considered as the best model. Results indicated the standardized index of the Pacific blue marlin decreased slightly over 1980–2000, thereafter increased gradually between 2001 and 2014. However, a decreasing trend of the standardized index was observed since 2015 except the recent increase in 2019.

Discussion

The WG expressed concerns about breaking the time series into three indices. It was clarified that both the US and Japanese CPUE time series are continuous across the breaks in the Taiwanese CPUE time series. The WG noted that because there was heterogeneity in the quality and quantity of the dataset (e.g., species misidentification in the earliest time period) and there were changes in the fishery characteristics, such as varying target species, it was reasonable to estimate the indices and their CV independently. The higher uncertainty during the earliest time-period was well captured by the estimated CV in the model.

Standardization of Pacific Blue Marlin Catch Per Unit Effort in the Hawaii Longline Fishery from 1995-2019. Michelle Sculley and Jon Brodziak. (ISC/20/BILLWG-03/04)

This working paper provides the standardization of the Hawaii-based longline fishery blue marlin (*Makaira mazara*) catch per unit effort (CPUE) data. Three different distributions with up to 14 different explanatory variables were explored for the combined and deep-set sector dataset. The lognormal generalized linear mixed model (GLMM) provided the best fit to the data based upon percent deviance explained. Results showed that the deep-set sector standardized CPUE was very similar to the combined dataset except in the first few years of the time series. The shallow-set CPUE series was higher than the other CPUE time series and highly variable making it a poor candidate for inclusion in the assessment model. The diagnostics of the deep-set dataset do not suggest any problems with poorly fitted data; therefore, it was recommended to use the deep-set dataset GLMM standardized CPUE for the 2021 blue marlin base-case assessment model.

<u>Discussion</u>

The WG clarified that the likelihood ratio test was not used to compare non-nested models that used different data or distributions. Instead, the significance of the addition of a variable to a simpler model was tested. The WG asked about the use of positive catch data only, since a zero-inflated model was used in 2016. The dataset used in the present analysis was the most recent data available from the Hawaii longline observer data, which contains 99% positive catches. It was noted that this differed somewhat from the dataset used in 2016, although the trend in the standardized CPUE was similar. This was likely be due to improved data filtering approaches used the current study. The current analysis used the same filtering process as was used in the 2018 swordfish and 2019 striped marlin assessments. The WG noted that there were no clear relationships between the CPUE observations and the environmental covariates of SST, SOI, and PDO for this bycatch species. The WG also noted that there was a consistent bias of Pearson residuals across explanatory factors (i.e. year, month, and bait type) and discussed what might be the potential causes of these residual patterns.

5. CATCH AND LENGTH FREQUENCY DATA

Update Japanese catch and length-frequency data of Pacific blue marlin (Makaira nigricans) during 1971-2018. Hirotaka Ijima (ISC/20/BILLWG-03/05)

According to the same fishery definitions as the 2014 stock assessment of Pacific blue marlin, this study updated the catch and length-frequency data. The catch data were compiled in essentially the same methodology as in the previous working paper. However, for coastal longline (F3_JPNCLL) since 1994, I propose to use quarterly data rather than the annual data because the quarterly catch is available. The size data were also compiled in the same way as in the previous study. Both catch and size data were updated consistently with little difference from the last stock assessment.

<u>Discussion</u>

The WG members questioned why the bait fishery catch changed in recent years. The author explained that the the yearbook data for recent years are considered preliminary, but the data quality should be sufficient for use in 2–3 years. In the previous stock assessment, the WG carried over the data from 2013.

The WG noted the Japanese longline fishery caught larger fish in the EPO and along higher latitudes in the North Pacific Ocean. In the previous stock assessment, the WG did not separate the Japanese longline fleet based on size composition of the catch.

A WG member indicated that it seems like some exceptionally large fish are present in the Japanese size data. The WG member also noted these large male fish around 400 cm is biologically unrealistic. The author explained that the information on sex comes from the training vessel. These data are collected by high school students, and so data reliability may be questionable. The WG confirmed the presence of a single large fish (over 400 cm) in quarter two in 2008. The WG noted that it excluded large fish (>320 cm) in the previous stock assessment.

A WG member asked how discarded fish are accounted for in Japanese longline catch statistics. The author explained that the official Japanese statistics did not currently include discards, however, observers record billfish discards, which can be explored further in future work.

[Withdraw (ISC/20/BILLWG-03/06)]

U.S. Commercial fisheries for marlins in the North Pacific Ocean. Russell Y. Ito and Michelle Sculley (ISC/20/BILLWG-03/07)

This report summarizes historical trends and recent developments for U.S. commercial fisheries taking marlins and related billfish species (*Istiophoridae*) in the North Pacific Ocean. Five species of marlins are caught by U.S. commercial fisheries in the North Pacific Ocean. These are striped marlin (*Kajikia audax*), blue marlin (*Makaira nigricans*), shortbill spearfish (*Tetrapturus angustirostris*), sailfish (*Istiophorus platypterus*), and black marlin (*Istiompax indica*). The first two species are predominant in the commercial landings. The description of fisheries in this report will serve as background information for stock assessment and standardization models developed in the ISC Billfish Working Group.

<u>Discussion</u>

A WG member asked for more details about the troll fishery data. The presenter explained that the US troll fishery has reported catch and effort, and sport fishing was included in these statistics. The sport fishery catches some incredibly large blue marlin, which is most likely attributed local oceanographic features. It is believed they probably tag and release more fish than any of the other fisheries in the US. Some boats fish commercially or recreational and share their billfish catch with family and friends, while a smaller proportion of small boats that fish consistently typically sell almost all of their catch. Many fishers who have commercial licenses sell just enough fish to cover their expenses for the charter boat. The fish are retained and the crew either sells the fish or gives them away. This is considered to be a tip for the crew. The charter boats report their catches to the state of Hawaii but this fishery is not necessarily separated from the other troll fleets in catch statistics. The WG suggested standardizing the CPUE of the troll fishery because this fishery potentially has information related to adult fish.

The WG noted that there was an increasing trend in blue marlin catch, with a historical high being reached in 2019. The WG also noted that the length-frequency data had shifted slightly towards smaller fish. Considering the increasing trend of catch, and that most blue marlin are caught in the southern area, the WG asked if there had been any change in fishing effort from shallow sets to deep sets in recent years. The author answered the weight-frequency distribution is similar from year to year, and there are a few years when there is a higher frequency of very large fish. The southern exclusion zone was closed for almost two years, which is a relatively productive area for longliners but a small part of the overall fishing grounds. As a result, one would expect that closing these grounds would have a moderate effect on catches. It was suggested that the increasing trend in catch may be due to fewer shallow longline sets as a result of sea turtle take limits. These incidental take limits are often reached early in the year, so many boats switch to deep-set fishing. This trend is also compounded by the increase in the number of vessels and hooks deployed in the Hawaii longline fishery. There were a record number of hooks set last year. An increase in effort is probably the reason for the increase in recent catches, even as CPUE has slightly decreased.

The WG asked whether fishers retain all blue marlin caught or were allowed to discard them. During times of recruitment when many small fish are available, longliners are more likely to discard blue marlin, especially if the fish is halued back alive. By contrast, if a large fish is caught early in the trip, it has a higher chance of being discarded because retaining it would use a lot of ice that could be used for more valuable target species caught later in the trip. There may be some high-grading early in some trips and higher retention later in the trip to fill any remaining space in the fish holds.

The WG asked whether it is possible to separate the catch from sport and subsistence fishers by permit in the trolling fishery. The federal government requires a license for vessels fishing outside of state waters (3 nm). It is unknown how many federal recreational permits NOAA issues annually. Catch data from the sport fishery is mainly collected by the state of Hawaii and recorded in the DAR reporting system.

The WG asked about the level of post-release mortality incurred from tag and release. The WG noted a few studies from Hawaii using pop-up satellite archival tags and the post-release mortality rate was believed to be around 30%, but varies by gear and fight time. The WG noted that the Musyl et al. (2015) estimated that the average post-release mortality of blue marlin was 10.3% with a 95% confidence interval of(5.6%,18.3%).

Update of Pacific blue marlin (Makaira nigricans) catch and size statistics from the WCPFC and the IATTC. Hirotaka Ijima (ISC/20/BILLWG-03/08)

This study organizes the Pacific blue marlin catch and size data submitted to the WCPFC and IATTC and prepares the Stock Synthesis 3 (SS3) input data for the next stock assessment. This paper also proposes the new aggregation method and new fleet definition. In the 2016 stock assessment, the BILLWG excluded the double counted catch of OthLL in the overlap area from 2011-2014. I suggested that the double counted catch for all years be excluded using WCPFC Category II data. Although the Category II data tended to be underreported, the revised OthLL catch data was more accurate than the previous one. I also propose eliminating the EPOOth and defining the WCPFCOth fleet that reflects the WCPFC Category I data update. The EPOOth included just a French Polynesia's catch. However, the WCPFC Category I data has updated other fisheries catch that include French Polynesia, Philippine and, Indonesia. When the BILLWG uses the new fleet definition, a significant change will occur in Pacific blue marlin's total catches. The BILLWG needs to consider this profound change of catch when running the stock assessment model. The update size data showed a similar distribution to the previous data. It was considered that SS3 would estimate similar size selectivity in the next stock assessment.

Discussion

The WG discussed the updated WCPFC catch statistics. The WG noted the Philippines catch is dominant in the updated catch statistics and was concerned with the reliability of the Philippines blue marlin catch data. The WG consulted the WCPFC science provider (SPC) about the catch statistics during the meeting. The SPC provided feedback about the quality of the catch data, and the WG made a decision about how to treat it in the stock assessment.

The WG agreed to use the current WCPFC statistics and this document will be revised using the latest catch information.

6. MODEL CONFIGURATIONS

6.1. Version of the Stock Synthesis 3

The WG discussed the version of Stock Synthesis 3. **Although the WG used V3.24f in the 2016 stock assessment, the WG agreed to use the latest version V3.30.16 and the most recent version of the r4ss package.**

6.2. Fleet definition and data sets

The WG Chair proposed that the definition of the SS fleets be based on the 2016 stock assessment (Table 1). **The WG agreed that the scheduled stock assessment include the same 16 fleets as**

the previous assessment. However, F16 was changed from EPO's “other fisheries” to WCPFC's “other fisheries”. The “other” EPO fisheries only include French Polynesia longline, but the WCPFC also reports their catches due to the small overlapping area of the IATTC and WCPFC Convention areas. The “other WCPFC fisheries” was not included in the previous assessment but the input catch data will be updated retroactively.

The WG noted that the blue marlin catch by Vanuatu was included in the WCPFC “other fisheries” in the 2016 assessment. The WCPFC “other fisheries” were updated during the data preparation meeting; and their ratio to total catch was significantly lower. However, in 2017, Vanuatu caught about 3,000 mt, which is much higher than for any other year, and the WG questioned the reliability of this data point. The WG also discussed how to handle such catch data uncertainties. The WG member pointed out that it is necessary to make some assumptions about the catch data or adjust the catch data CV to account for the variability in the catch data. However, as there was no scientifically valid information at the time, **the WG agreed to undertake the forthcoming stock assessment using the unadjusted WCPFC statistics.**

The WG pointed out that the catches by the American Samoan longline and EPO purse seine fisheries were reported in numbers of fish caught in the 2016 assessment. The WG Chair mentioned that it is desirable to use the number of fish caught to improve precision in SS3. However, when the WG uses the number of fish caught, the WG needs the SS results to estimate the total catch. The WG indicated that the catches by these two fisheries are small, and **agreed to aggregate the catches by catch weight to make it easier to understand the total catch.**

The WG discussed how to handle the Taiwanese distant-water longline CPUE in the assessment model. Taiwan's CPUE was divided into three time series, but the US and Japanese CPUE time series would overlap the gaps in the CPUE time series. The **WG agreed to address the gap using time blocks to simplify the modeling work and maintain the Taiwanese CPUE index as a single fleet.** By using time blocks, SS3 can estimate different selectivities and catchability coefficients for each time block.

The WG pointed out that the size selectivity for F15 and F16 may be unrealistic (Table 1). F15 and F16 assume the same selectivity as the EPO purse seine fishery. However, the larger fish caught in the EPO is probably not applicable to the WCPFC area where smaller fish are generally caught. The **WG agreed to mirror F15 and F16 to F14 to be consistent with the previous stock assessment.** The WG noted that the impact of this change is likely to be relatively small because these fisheries account for a small proportion of the blue marlin catch.

6.3. Biological parameters

The WG agreed upon the biological parameters for the SS model. The WG agreed to fit two growth curves (Chang et al., 2013 and Chang et al., 2020) to the data, perform model diagnoses, and choose the most appropriate growth curve for the base case model. The WG pointed out that the growth curve parameter of Chang et al., 2020 needs to be modified for use in the SS model. **Dr. Yi-Jay Chang will provide these modified parameters for the stock assessment (Table 1 shaded).**

The WG also noted the need to consider natural mortality derived from the new growth curve. **Dr. Jon Brodziak will estimate the new natural mortality rate using the modified growth parameters (Table 1 shaded).**

6.4. Future projection

The WG discussed the future projections. **In the new stock assessment, the WG agreed to use the future projection function of SS.** The WG reviewed the projection scenarios in the 2016 stock assessment and agreed that the future projection scenarios are**: Scenario 1 ($F = F_{2003\text{-}2005}$), Scenario 2 ($F = F_{MSY}$), Scenario 3 ($F = F_{2017\text{-}2019}$), and Scenario 4 ($F = F_{30\%}$).**

6.5. Sensitivity analysis

In the 2016 stock assessment, the WG conducted a total of 18 sensitivity analyses. **The WG reviewed the previous sensitivity analyses and agreed to use the same scenarios for natural mortality, steepness, and maturity ogives (Table 3). The WG also agreed to consider alternative input data and growth curve scenarios after agreeing on a base case model (Table 3).**

7. DATE OF THE STOCK ASSESSMENT MEETINGS

The WG agreed that the stock assessment meeting for the Pacific blue marlin would be conducted as follows.

> **Date:** 9:00-13:00 6-10, 12 April 2021 (JST)
> **Venue:** Webinar using WebEx

8. OTHER ITEMS

The WG discussed concerns about billfish studies other than those of blue marlin. As a result, the **WG agreed that it is necessary to discuss 1) the rebuilding plan for the North Pacific striped marlin, 2) the stock boundary of swordfish in the North Pacific, and 3) Japanese driftnet catch.** An IATTC scientist explained that a benchmark stock assessment for southern EPO swordfish will be undertaken by the IATTC and begin in early 2021. The SPC will undertake a separate assessment on the southwestern Pacific swordfish beginning in 2021. Prior to the IATTC assessment taking place, the IATTC will be holding a preparation stock assessment workshop during December with one primary aim being to determine the northern stock boundary of the stock in the EPO. Although the stock assessment primarily involves the main swordfish nations that fish in the southern EPO, namely Chile and the European Union, the IATTC intends to invite ISC and SPC scientists in an attempt to ensure harmonization of the stock boundaries of swordfish throughout the Pacific Ocean. IATTC scientists accepted the invitation of the ISC to discuss the swordfish assessment in the EPO. **The WG agreed to hold a three-day workshop on swordfish stock structure and to confirm the progress of the Pacific blue marlin model construction before commencement of the stock assessmen**t. **An IATTC scientist accepted the invitation by the ISC to participate in the workshop.** The date of workshop is as follows.

> **Date:** 9:00-13:00 9-11, 16 March 2021 (JST)
> **Venue:** Webinar using WebEx

9. CIRCULATE WORKSHOP REPORT

The WG Chair prepared a draft of the workshop report and reviewed it with the WG members. The provisional report was editorially revised by the WG Chair and distributed via email for WG members to finalize.

10. ADOPTION

The WG adjourned the data preparatory meeting of Pacific blue marlin stock assessment at 13:33 on 13 November 2020 (JTS). The WG Chair expressed appreciation to the participating scientists for their collaboration in the stock assessment work.

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Table 1. Fleet definitions for the Pacific blue marlin stock assessment.

Fleet No	Fleet name	Fishing countries	Gear types	Catch units	Size data	CPUE	Source
F1	JPNEarlyLL	Japan	Offshore and distant water longline	B	Y	S1_JPN_DW&O SLL	Ijima 2020a, Ijima 2020b
F2	JPNLateLL	Japan	Offshore and distant water longline	B	Y	S2_JPN_DW&O SLL	Ijima 2020b, Kanaiwa and Kimoto 2013
F3	JPNCLL	Japan	Coastal longline	B	N (Mirror to F2)	N	Ijima 2020b
F4	JPNDRIFT	Japan	High-sea large-mesh driftnet and coastal driftnet	B	Y	N	Ijima 2020b
F5	JPNBait	Japan	Bait fishing	B	N (Mirror to F4)	N	Ijima 2020b
F6	JPNOth	Japan	Other gears	B	N (Mirror to F2)	N	Ijima 2020b
F7	HWLL	USA (Hawaii)	Longline	B	Y	S3_HW_LL	Sculley and Brodziak 2020, Ito and Sculley 2020
F8	ASLL	USA (American Samoa)	Longline	B	N (Mirror to F7)	N	Ito and Sculley 2020
F9	HWOth	USA (Hawaii)	Troll and handline	B	N (Mirror to F7)	N	Ito and Sculley 2020
F10	TWNLL	Taiwan	Distant-water longline	B	Y	S4_TW_DWLL, S4_TW_DWLL, and S4_TW_DWLL	Liu et al., 2020, Hsu and Chang 2020

Table 1. Continued

Fleet No	Fleet name	Fishing countries	Gear types	Catch units	Size data	CPUE	Source
F11	TWNOth	Taiwan	Offshore longline, coastal longline, gillnet, harpoon, and others	B	N (Mirror to F10)	N	Liu et al., 2020
F12	OthLL	Various flags	Longline	B	Y	N	Ijima 2020c
F13	PYFLL	French Polynesia	Longline	B	Y	N	Ijima 2020c
F14	EPOPS	Various flags	Purse seine	B	Y	N	Ijima 2020c
F15	WCPFCPS	Various flags	Purse seine	B	N (Mirror to F14)	N	Ijima 2020c
F16	WCPFCOth	Various flags	Troll, handline, and harpoon and others	B	N (Mirror to F14)	N	Ijima 2020c

Table 2. Biological parameters for the Pacific blue marlin stock assessment models. Values will be added to shaded cells before commencement of the stock assessment meeting.

Parameter	2016 base	Alternative	Reference
Growth_Age_for_L1	1		Chang et al. (2013), Chang et al (2020)
Growth_Age_for_L2	26	20	Chang et al. (2013), Chang et al (2020) Andrews (2018)
NatM_p_1_Fem_GP_1	0.42		Lee and Chang (2013)
NatM_p_2_Fem_GP_1	0.37		Lee and Chang (2013)
NatM_p_3_Fem_GP_1	0.22		Lee and Chang (2013)
L_at_Amin_Fem_GP_1	144		Chang et al. (2013) , Chang et al (2020)
L_at_Amax_Fem_GP_1	304.178		Chang et al. (2013), Chang et al (2020)
VonBert_K_Fem_GP_1	0.107		Chang et al. (2013), Chang et al (2020)
CV_young_Fem_GP_1	0.14		Chang et al. (2013), Chang et al (2020)
CV_old_Fem_GP_1	0.15		Chang et al. (2013), Chang et al (2020)
NatM_p_1_Mal_GP_1	0.42		Lee and Chang (2013)
NatM_p_2_Mal_GP_1	0.37		Lee and Chang (2013)
NatM_p_3_Mal_GP_1	0.37		Lee and Chang (2013)
L_at_Amin_Mal_GP_1	144		Chang et al. (2013), Chang et al (2020)
L_at_Amax_Mal_GP_1	226		Chang et al. (2013), Chang et al (2020)
VonBert_K_Mal_GP_1	0.211		Chang et al. (2013), Chang et al (2020)
CV_young_Mal_GP_1	0.14		Chang et al. (2013), Chang et al (2020)
CV_old_Mal_GP_1	0.1		Chang et al. (2013), Chang et al (2020)
Wtlen_1_Fem	1.84E-05	1.84E-05	Brodziak 2013
Wtlen_2_Fem	2.956	2.956	Brodziak 2013
Mat50%_Fem	179.76	179.76	Sun et al. (2009), Shimose et al. (2009)
Mat_slope_Fem	-0.2039	-0.2039	Sun et al. (2009), Shimose et al. (2009)
Fecunditiy	Proportional to spawning biomass	Proportional to spawning biomass	Sun et al. (2009)
Wtlen_1_Mal	1.37E-05	1.37E-05	Brodziak 2013
Wtlen_2_Mal	2.975	2.975	Brodziak 2013
Spawning season	2	2	Sun et al. (2009)
R0	-	-	Estimate
Steepness	0.87	0.87	Brodziak and Mangel (2011), Brodziak et al. (2015)

Table 3. List of proposed sensitivity runs.

Run name	Description
Alternative input data (based on the base case model)	
Alternative life history parameters: naturel mortality (based on the base case model)	
base_case_lowM	Alternative natural mortality rates, lower M , juvenile M rescaled
base_case_highM	Alternative natural mortality rates, higher M
Alternative life history parameters: stock recruitment steepness	
base_case_h065	Alternative stock-recruitment steepness, lower h, h = 0.65
base_case_h075	Alternative stock-recruitment steepness, lower h, h = 0.75
base_case_h095	Alternative stock-recruitment steepness, higher h, h = 0.95
Alternative life history parameters: growth curve (depend on the base case model)	
Alternative life history parameters: maturity ogives	
base_case_high_L50	Alternative maturity ogives, L50 = 197.7 cm
base_case_low_L50	Alternative maturity ogives, L50 = 161.8 cm

ATTACHMENT 1. LIST OF PARTICIPANTS

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ATTACHMENT 2. MEETING AGENDA

INTERNATIONAL SCIENTIFIC COMMITTEE FOR TUNA AND TUNA-LIKE SPECIES IN THE NORTH PACIFIC

BILLFISH WORKING GROUP (BILLWG)

Data-preparatory Meeting of Pacific Blue Marlin Stock Assessment Announcement and Draft Agenda

Meeting Style:	Webinar meeting using Webex
Meeting Dates:	9:00-13:00, 6-7th, 10, 13th November (Japan Time) 8:00-12:00, 6-7th, 10, 13th November (Taiwan Time) 11:00-15:00, 6-7th, 10, 13th November (New Caledonia Time) 14:00-18:00, 5-6th, 9, 12th November (US Hawaii Time) 16:00-20:00, 5-6th, 9,12th November (US San Diego Time)
Meeting Goals:	This meeting aims to agree on the data and the model setting of Stock Synthesis 3.
Meeting Attendance:	Please respond to Hirotaka Ijima (Email: ijima@affrc.go.jp) if you plan on attending this meeting
Working Papers:	Submit working papers to Hirotaka Ijima by October 27th.
BILLWG Contact:	Hirotaka Ijima (Ph.D, ISC BILLWG Chair) Highly Migratory Resources Division, Fisheries Stock Assessment Center, Fisheries Resources Institute (FRI), Japan Fisheries Research and Education Agency. 2-12-4 Fukuura, Kanazawa-ku, Yokohama, Kanagawa, 236-8648, JAPAN E-mail: ijima@affrc.go.jp TEL: +81-543-36-6044

AGENDA

November 6th (Friday), 9:00-13:00 (Japan time)

1. Opening of Billfish Working Group (BILLWG) data preparatory meeting of Pacific blue marlin stock assessment
    a. Welcoming Remarks
    b. Introductions
    c. Standard Meeting Protocols
2. Adoption of Agenda and Assignment of Rapporteurs
3. Numbering Working Papers and Distribution Potential
4. Abundance Indices
    a. Japanese CPUE (ISC/20/BILLWG-03/01,02)
    b. Taiwanese CPUE (ISC/20/BILLWG-03/03)
    c. US CPUE (ISC/20/BILLWG-03/04)

November 7th (Saturday), 9:00-13:00 (Japan time)

5. Catch and length frequency data
    a. Japanese data (ISC/20/BILLWG-03/05)
    b. withdraw (ISC/20/BILLWG-03/06)
    c. US data (ISC/20/BILLWG-03/07)
    d. IATTC and WCPFC data (ISC/20/BILLWG-03/08)

November 10th (Tuesday), 9:00-13:00 (Japan time)

6. Model configurations
    a. Fleet definition and data sets
    b. Biological parameters
    c. Future projection
    d. Sensitivity analysis
7. Date of the stock assessment meetings
8. Other items

November 13th (Friday), 9:00-13:00 (Japan time)

9. Circulate workshop report
10. Adoption

ATTACHMENT 3. THE LIST OF WORKING PAPERS.

ISC/20/BILLWG-03/01	Update Japanese longline abundance index of Pacific blue marlin (*Makaira nigricans*) estimated by the habitat model Hirotaka Ijima ijima@affrc.go.jp
ISC/20/BILLWG-03/02	Preliminary analysis for the CPUE standardization of the Pacific blue marlin using Japanese longline logbook and the R software package R-INLA Hirotaka Ijima1 and Haruko Koike ijima@affrc.go.jp
ISC/20/BILLWG-03/03	CPUE standardization of blue marlin (Makaira nigricans) for the Taiwanese distant-water tuna longline fishery in the Pacific Ocean during 1971 – 2019 Jhen Hsu and Yi-Jay Chang jhenhsu@ntu.edu.tw
ISC/20/BILLWG-03/04	Standardization of Pacific Blue Marlin Catch Per Unit Effort in the Hawaii Longline Fishery from 1995-2019 Michelle Sculley and Jon Brodziak michelle.sculley@noaa.gov
ISC/20/BILLWG-03/05	Update Japanese catch and length-frequency data of Pacific blue marlin (*Makaira nigricans*) during 1971-2018 Hirotaka Ijima ijima@affrc.go.jp
ISC/20/BILLWG-03/06	Withdraw
ISC/20/BILLWG-03/07	U.S Commercial fisheries for marlins in the North Pacific ocean Russell Y. Ito and Michelle Sculley russell.ito@noaa.gov
ISC/20/BILLWG-03/08	Update of Pacific blue marlin (*Makaira nigricans*) catch and size statistics from the WCPFC and the IATTC Hirotaka Ijima ijima@affrc.go.jp