FINAL

ISC/23/ANNEX/16

ANNEX 16

23rd Meeting of the
International Scientific Committee for Tuna
and Tuna-Like Species in the North Pacific Ocean
Kanazawa, Japan
July 12-17, 2023

Report of the Pacific Bluefin Tuna Working Group Intersessional Workshop, November 1-8, 2022

July 2023

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REPORT OF THE PACIFIC BLUEFIN TUNA WORKING GROUP INTERSESSIONAL WORKSHOP

International Scientific Committee for Tuna and Tuna-Like Species In the North Pacific Ocean (ISC)

November 1-8, 2022 Webinar

1 Opening and Introduction

1.1 Welcome and introduction

The meeting was held online. S. Nakatsuka (Japan), Chair of the ISC Pacific bluefin tuna Working Group (PBFWG or WG), welcomed the participants from Japan, Korea, Mexico, Chinese Taipei, the United States of America, and the Inter-American Tropical Tuna Commission (IATTC) and opened the meeting.

1.2 Adoption of agenda

The adopted agenda is attached as Appendix 1, and the list of participants is provided in Appendix 2. The list of documents reviewed during the meeting is provided in Appendix 3.

1.3 Appointment of rapporteurs

Rapporteurs were assigned by the Chair as follows: Item 2: K. Nishikawa and K. Piner, Item 3: Y. Tsukahara and HH. Lee, Item 4: M. Maunder, and Item 5: M. Dreyfus.

2 Data for the PBF MSE and Stock assessment

2.1 Catch

2.1.1 Retained catch

The WG confirmed that no change is necessary for the retained catch data. The Chair clarified that historical New Zealand (NZ) data has already been available in the ISC stock assessment data and included in the assessment as part of Chinese Taipei LL catch data.

The WG reviewed the recent information on fisheries by the member.

Japan:

IQ system was applied to the longline fishery. Purse seine fishery in the Sea of Japan caught larger fish than usual years. Generally speaking, Japanese fisheries had a good fishing year of PBF.

Korea:

In 2022, purse seine fisheries were originally allocated over 90% of the quota. However, the government modified domestic allocation due to the huge catch amount by set-net. The ratio of larger PBFs caught by purse seine in 2022 was high, over 60%.

United States:

One-year allocation for purse seine was increased to around 500t. The WG asked the size composition and operation information due to the increasing catch amount of US commercial fisheries.

Chinese-Taipei:

The longline catch in 2022 reached around 1,500t but still had 480t remaining compared to the catch limit. The government uses CDS and effort control by the number of licenses to monitor catch and effort . When the catch amount reaches around 90% of the allocation, the government will issue warnings.

Mexico:

Mexican purse seine finished their operation in 2022 by reaching the allocation early in the year.

2.1.2 Unseen Catch

In the current assessment, unseen mortality was assumed based on best available information. However, the WG noted that the estimation in WPO was not based on actual data and was thus uncertain. Although its impact on the current stock status is minimal, as the release started only after strict catch controls were introduced, it is considered an important sources of uncertainty for future projection in the MSE. The WG will further consider how to address this uncertainty through the development of MSE.

2.2 Abundance index

The Chair noted that both the Japanese longline (LL) and Japanese troll (age-0) indices were impacted by recent management affecting their use in the most recent stock assessment. The Japanese LL CPUE estimate was not used in the fishing year 2020, and the Troll CPUE was not used for 2017-2020. A new Real-Time Monitoring Index (RTMI) has been proposed to replace the old Troll CPUE, but it was too short a time-series to be validated in the assessment. It was further noted that the indices need to be continuously improved to be finalized for the 2024 assessment, with the assumption that the same indices will be used for MSE.

Paper/Presentation: Candidate Indices in MSE and Assessment

Summary

Y. Tsukahara made a presentation ('Candidate indices in MSE and assessment') regarding the current situation for the Japanese longline (JLL) index, candidate indices for the MSE and assessment, and the error structure for the data generation in MSE. The JLL index in 2021 was not used for the last assessment because there is not sufficient information to curate the data for standardization. Japanese scientists are now trying to revise this index thoroughly and also to develop two alternative fishery independent indices (survey-based larval index for SSB and close-kin mark recapture index). The presentation also summarizes the indices which were used for the previous assessment in terms of the period and the future availability of each index. The presenter indicated that the indices for the MSE should have not only the reliability as for the assessment, but also continuity for the future and instancy for the MP update. Additionally, the error structure in generated data by operating model in the feedback loop was introduced. The presenter showed the error structure in the example of Atlantic bluefin tuna MSE in the ICCAT, which uses the standard deviation and auto-correlation in the residuals by OMs for generating the indices data. In addition to that, the residuals of indices in PBF assessment showed systematic error, which is a somewhat linear relationship between the observation values and residuals. The issues on the error structure in the MSE will need to be discussed in this WG.

Discussion:

It was clarified that the ISC prioritizes assessment over MSE. the RFMOs agreed that the next benchmark assessment is in 2024, while MSE is to be completed in 2025. The WG noted that after 2019 the JPN LL data is difficult to standardize due to management actions. It was not clear whether a new index for the Japanese LL fleet will be developed for the 2024 stock assessment. Several candidate adult indices were proposed (Korean PS, JPN revised LL, JPN CK, and JPN larval) but are relatively eshort. These time series may not be informative in the 2024 assessment. A new Real-Time Monitoring Index (RTMI) has already been developed to replace the old Troll index but was too recent to be evaluated for its consistency with existing data in the 2022 assessment. The WG also discussed what indices to be used in the MSE and noted that the OM and indices should be based on the 2024 assessment. The WG also indicated that additional error structure for the indices might be needed in the MSE to account for non-random residual patterns.

Paper/Presentation: Annual variability in the larval distribution and density of PBF based on the larval survey using a two-meter ring net from 2007 to 2019.

Summary

Y. Tsukahara made a presentation regarding the data and method to make an index from the larval survey conducted by Japan. The contents of this presentation had been already reported for the PBFWG in the April 2021 by A. Tawa. The index values showed rough linear relationship with the estimated SSB in the last assessment. This index will be revised and updated for the proposal as a candidate index for the assessment and MSE by the next meeting.

Discussion:

The WG chair noted that this index (and other new data) needs to be documented in a working paper before it could be considered for the stock assessment. The WG discussed if the larval abundance index was related to recruitment or spawners, deciding that it better represents spawners because of high larval mortality. The WG also discussed if it better expressed in biomass or numbers and if larval abundance would have the same proportionality to spawners across all stock sizes. It was also noted that many factors could affect the proportionality between spawners and larval abundance (e.g., fraction mature, skip spawning, etc.).

Paper/Presentation: Update of estimated recruitment index of Pacific bluefin tuna based on real-time troll monitoring survey data, added IQ-independent scientific survey data for 2021 (ISC/22/PBFWG-2/01)

Summary:

K. Fujioka presented ISC/22/PBFWG-2/01. This paper provides an update of the real-time troll monitoring data operated in the East China Sea during the winter season (November to the following February) for the 2017-2021 fishing year. In the latest year, 2021, the IQ-independent scientific survey began chartering monthly real-time troll monitoring vessels to reduce the impact of fishing regulations. The chartered 13 vessels collected a total of 77 latitude/longitude grids and

124 days of operational data, while the conventional real-time troll monitoring was conducted on 71 grids for a total of 366 days. The ratio of the number of spatial grids in the charter survey to the number of spatial grids in the conventional survey was sufficiently high (92.8% of the monthly total). Therefore, the two types of real-time troll monitoring data sets (with/without chartered operation data) for 2021 were found to be useful that complement each other's spatio-temporal information. Based on this updated data, the standardized CPUE was calculated by Vector Autoregressive Spatio-Temporal (VAST) model which is a delta-generalized linear mixed model that separately calculates the encounter probability and the positive catch rate, as in Fujioka et al. (2021). The indices using two data sets estimated in this study were similar to previous ones for the period 2017-2020 (Fujioka et al., 2021), suggesting high value in the most recent year, 2021.

Discussion:

The Real-Time Monitoring (RTM) Index (2017-2020) for recruitment was not included in the 2022 assessment. The authors clarified that the newly reported charter information started in 2021, where vessels were charted on some days to fish in areas with missing or limited data. It was also noted that RTM data goes back to 2011 and that early data could be used to expand the temporal scope of the index. Expansion of the time period for the index may be needed to judge its consistency with existing data, although the issue of impact by management action since 2017 may still apply. The WG noted that the assessment model uses highly flexible selectivity in fitting ages 0-5, so recruitment after 2017 are unlikely to affect fit to data as those recruitments do not have time to reach the longline fleets.

2.3 Size Data

Paper/Presentation: A review of fishery and size data for purse seines in the sea of Japan

Summary

K. Nishikawa made a presentation. The presentation provides the operational information, size composition, and management history in Fleet 4 (Japanese purse seine in the Sea of Japan). Catch at size for fleet 4 varied annually. In the north-eastern area, smaller PBF and single cohorts were mainly caught. In the south-western area, larger PBF and multiple cohorts were caught. Due to demand, IQ, fuel cost and biomass, the fishermen apparently changed their behavior. Due to changes in the operation positions, selectivity varied annually. The change of selectivity may still occur in the future.

Discussion:

The WG noted that changes in the distribution of this fleet resulted in changes in the sizes caught. This supports that selectivity in this fleet is time-varying. The WG also noted that the catch from specific areas are of a single cohort. The WG recognized that flexible and time-varying age-based selectivity should capture these spatial effects. The WG discussed that in the MSE, some fleets' selection patterns might need to vary to capture this spatial effect.

3 PBF MSE framework

3.1 Review of the request and report from the IATTC-NC JWG07

Paper/Presentation: Draft proposal of "Statement of Work for the Management Strategy

Evaluation of Pacific Bluefin tuna" (ISC/22/PBFWG-2/01)

Summary:

H. Fukuda presented ISC/22/PBFWG-2/01. In this document, the Terms of Reference (TOR) for the PBF MSE, adopted candidate HCRs, and Reference points by the JWG-04 were reviewed. Also, candidate management objectives, which were under discussion towards the JWG-08 held in 2023, were introduced to discuss about the possible technical issues to calculate the performance indicators based on those candidate objectives. This document also covered the proposal of the timeline and technical matters for the development of the PBF MSE package, such as the uncertainty grid of the operating model, the relationship between the management procedure and its estimation model, performance indicators, management cycles, and so on. The authors recommended managing the process of developing the MSE package through the discussion of this kind of review document.

Discussion:

The WG chair explained that the JWG meeting will be held just before the ISC plenary in 2023. The PBFWG, therefore, has to prepare the materials to introduce the concepts and progress of MSE in the JWG.

The data submission deadline for the MP calculation in 2024 was discussed, because the WG might be short in time to calculate the MP after data submission. It was clarified that the deadline for MP calculation is different from that for the OM conditioning. The data for the MP calculation have the latest data to reflect the most recent fishery situation. **The WG generally agreed that data up to 2022 FY will be used for the OM conditioning, while the data up to 2023 FY (and possibly some data from 2024FY) will be used for the TAC calculation by MP.**

The WG agreed to use the short-term assessment model starting from 1983 FY as the operating model in the PBFMSE. It was also noted that the model specification for the OM should be consistent with the 2024 assessment and be developed in the data preparatory meeting in 2023. The consistency of data (i.e., catch, size frequency, and indices) will be evaluated by the assessment. The model specification for OM and MP will be finalized in the meeting in November or December 2024.

The WG also discussed the uncertainty grid and the weighting in the operating models. It was mentioned that the growth curve was estimated by a large number of the actual data, and therefore the estimated growth curve is more robust than the natural mortality assumption and steepness. The WG also discussed future recruitment, which is assumed to be randomly distributed from the mean of the estimated average recruitment in the current assessment. A WG member pointed out that the uncertainty related to the steepness can cover by the uncertainty of future recruitment.

The WG recognized that the number of uncertainty grids in OMs would influence the calculation time. The total calculation time is further magnified by the number of MP (i.e., HCRs). It was clarified that the current OM takes a day to calculate a single combination of an OM and an MP. Too many uncertainty grids in OM and too many MPs can be ineffective. **Therefore, the WG**

concluded that less than 10 MPs is desirable for scientists to calculate and evaluate them appropriately. Although the WG discussed a possible approach to weight various OMs, there was no consensus. The OM weighting issues will need to be discussed after determining the uncertainty grid.

The WG discussed the way to incorporate selectivity in the projection period. The fishery selectivity is changing after introducing strict fishery management, especially for the fishermen who have a quota of small PBF. It was observed that the mean size of fish caught by Japanese purse seine in the Sea of Japan is larger than before, as presented in Agenda 2.3. A WG member suggested that selectivity uncertainty can be dealt with as the robustness test. The WG will discuss future selectivity issues in future meetings.

The WG chair asked if the current framework for the PBFMSE can incorporate the empirical-based MP. It was clarified that an empirical-based MP could be evaluated in the current framework, but it requires additional technical work. The WG noted that the stakeholders might wish to apply empirical-based MP, so the WG should prepare for the possibility.

Regarding the HCR, the WG chair noted that, in general, the tuning process in the MP development makes the dialogue and decision-making complex. It was noted that the performance of HCRs in the model-based approach could be presented without tuning, by using the performance measures as a cut-off level for the communication between the stakeholder and scientists. Also, the WG preferred the hockey stick shape HCR rather than the sigmoid shape HCR.

The WG discussed the catch allocation in the future projection to adjust the fishery impact between the EPO and WPO, which is one of the management objectives. It was clarified that if the traditional fishery impact illustrated in the assessment report will be used as the trigger to allocate the future catch, further development outside of the current feedback loop is required. The WG recognized that some derivatives, e.g., fleet-specific equilibrium SPR, can be an alternative indicator to allocate the catch, requiring much less efforts to introduce into current feedback loop. A WG member noted that the allocation within the EPO and WPO will not be changed in the MSE process unless stakeholders instruct. On the other hand, the fishery impact can be presented as one of the performance indicators.

In terms of the projection period and cycle of the TAC update, **the WG generally agreed to make the projection period 20 years (approximately corresponding to the 2 generation cycles).** The WG considered that the assessment and MP update should not occur in the same year since the future assessment models may be modified as new scientific knowledge becomes available, while the MP update will be calculated based on the agreed estimation model. **A 3-year interval for TAC update was supported by the WG to allow some time between assessment and MP update for scientific advancement.**

The WG prepared a document "PBF MSE stocktaking" to record the development of PBF MSE (Appendix 4). This document will be regularly updated in accordance with the decision of the managers and the WG.

3.2 Technical development for MSE framework

Paper/Presentation: Overview of the preliminary Pacific bluefin tuna management strategy evaluation framework (ISC/22/PBFWG-2/05)

Summary:

D. Tommasi presented ISC/22/PBFWG-2/05. A preliminary management strategy evaluation (MSE) framework was developed for Pacific bluefin tuna (PBF) to assess the performance of alternative candidate management strategies once the stock has rebuilt to the second rebuilding target. Here, we focus on describing the overall workflow of the MSE and provide an overview of the following MSE components: 1) base-case operating model, 2) data generation, 3) estimation model, 4) harvest control module, and 5) implementation error and feedback control of each HCR back into the OM. To exemplify capabilities of the framework, we compare performance of a management strategy with a constant catch limit to one with a rectilinear harvest control rule with management control points set by threshold and limit reference points and a maximum fishing intensity set by a target reference point.

Discussion:

A question was raised regarding the setting in the time blocks of the selectivity for the conditioning period. It was responded that they were left as in the 2022 assessment model, while time-varying setting with deviation was removed. A member concerned if there is the difference in the absolute scale of biomass. It was confirmed that the scale did not change by removing the time varying selectivity.

The WG discussed the setting for the future selectivity pattern. Currently, the selectivity for the future is assumed to continue as of 2017-2019. It was noted that an additional time block since 2017 would be beneficial to reflect the current fishery situation. A WG member asked how the catch in number, which is used for 3 fleets in the assessment model, is converted to the catch in weight. It was responded that the estimated catch in the SS report file was used to replace those values. It was clarified that 2 fleets have an actual catch in weight data, while the other doesn't. For the sake of consistency in the data treatment, the WG generally agreed that a catch in weight estimated by the SS will be used for the fleet with a catch in number in the assessment model.

The WG also discussed future data generation in the OM. A concern was raised regarding the larger fluctuation in the future trajectory of TAC and SSB than expected. It was confirmed that the generated future indices also varied much, resulting in a large fluctuation of TAC. This suggests that the trend of SSB itself fluctuates a lot, which was considered to be influenced by the future recruitment deviation based on the current sigma R setting, 0.6. It was pointed out that in reality, there is a clear targeting of the larger cohort in PBF fisheries, so assuming a fixed selectivity regardless of cohort size may retain the cohort-size influence in future larger than actual. The WG encouraged further investigations regarding the high variation in the generated future index. **The WG generally agreed to use the method to generate the size frequency data given the input sample size by Lee et al. (2021) which is used for the bootstrap procedure in the assessment.**

It is unclear if the terminal year of catch data will be available by the timing of the actual TAC calculation by MP. It was clarified that if the latest catch data is not available, the catch limit is the best assumption for the catch in the latest year. The WG generally agreed to the setting of the size class in caught fish (large/ mixed/ small) for each fleet which is related to the future allocation of either large (>=30kg) or small fish (<30kg) in the MSE process.

A question was raised regarding how to allocate small/large fish catch to the fleets which catch the mixed-size class. It was responded that those fleets caught only 6% of the overall catch. Half of catch amount allocated for those fleets was assumed to be for the small fish, while the rest half was for the large fish. Also, it was clarified that this allocation method is applied only for 2021 and 2022 and, in the projection period, the TAC for each fleet will be determined by the ratio to the target F at the age of apical F.

A question was raised regarding how to determine the F minimum in the HCR. It was responded that the value (5%) came from the document in the JWG. It was asked whether the biomass reference point is dynamic or equilibrium. It was clarified that it is equilibrium.

The WG discussed the implementation errors for the future TAC, i.e., overage or underage TAC. It was explained that, in the case of ALB MSE in the ISC, there is a "ghost fleet" to evaluate the impact of unseen catch in the MSE process. It was clarified that there is no difference between the ghost fleet in the ALB MSE and the discard fleet in the PBF assessment model. **The WG generally agreed to have the discard fleet in the MSE process to evaluate the impact of unseen catches**. For the implementation error for specific fleets, a WG member mentioned that the catch tends to be lower than TAC under the current strict fishery management. The WG considers not including the upward implementation error for each fleet in the uncertainty grid in the PBF MSE process.

In terms of stability in the TAC update, it was clarified that there is no limit for the TAC change and the current variation of TAC was about 20% on average. It was noted that in the current wording from JWG, 15% for TAC change is not the target but the threshold to cut off the MP. It was noted that a function to limit the variation range might become necessary after further consultation with stakeholders.

A WG member suggested that using ASPM-R as EM would help reduce the calculation time due to the fixation of selectivity parameters. The result using ASPM-R will be calculated by the Japanese scientist. The WG will decide which model uses as EM in the next meeting.

Paper/Presentation: Changing Pacific bluefin tuna exploitation patterns and implications for management strategy evaluation (ISC/22/PBFWG-2/06)

Summary

D. Tomassi presented ISC/22/PBFWG-2/06. Changes in Pacific bluefin tuna (PBF) catches and catch ratios per fleet type are examined. Taking into consideration the observed temporal variability in relative catch per fleet type, the impact of using different exploitation patterns on catch and biomass metrics was assessed using the recently developed PBF management strategy evaluation framework. We demonstrate that the choice of the range of years over which to average the selectivity and relative F between fleets and seasons for the target fishing intensity calculations in the PBF MSE management module can lead to different performance in terms of both biomass and catch metrics.

Discussion

The WG again discussed the selectivity patterns in the future. It was noted that the F for the small fish seems to be continuously decreasing. The use of 2017-2019 selectivity for future selectivity is considered reasonable because it was expected that the fishery pattern would be maintained unless the rules of fishery management are drastically changed.

A participant asked why the absolute values of projected SSB are different among selectivity reference years under the same HCR. It was responded that a possible reason is a difference in exploitation patterns due to a difference in the fishery selectivity, although it is unclear at this stage. The WG encouraged further investigation on this point.

Paper/Presentation: Evaluating productivity parameter uncertainty using ASPM (ISC/22/PBFWG-2/03)

Summary:

HH Lee presented ISC/22/PBFWG-2/03. Management strategy evaluation (MSE) evaluates how robust a feedback-control management strategy is to uncertainties using forward simulation. These uncertainties include process uncertainty, parameter uncertainty, model uncertainty, data and observation systems error, and implementation uncertainty. Among these uncertainties, the productivity parameters, length at age 3, natural mortality for age 2 and older, and steepness of the stock-recruitment relationship, are shown to greatly impact the historical trajectory of Pacific bluefin tuna spawning stock biomass in the 2022 assessment. Potential combinations for the values of these parameters are enormous and some options may not be plausible for the stock, given the fishing history and life-history traits. We used the age-structured production model diagnostic to select plausible productivity parameters to consider in the MSE uncertainty grid based on the improvement of the fits of the adult indices from the short time series model.

Discussion:

It was noted that this analysis help determine the number of and the parameter value in the uncertainty grid. A WG member asked why the ASPM model was used. It was responded that the parameters in this analysis are related to the stock productivity, and the indices used in the assessment have appropriate information on the productivity. The fit to the indices, therefore, is the main focus of this analysis. A member mentioned that the actual fishery seems to target strong cohorts to catch PBF. Hence, the averaged recruitment values estimated in the ASPM would be high to compensate the catch of strong cohort. That is probably the reason why the models have lower log-likelihood with high productivity parameter values.

A WG member asked if the log-likelihood values can be used as the indicator for OM weighting. It was responded that the aim of this analysis is to seek a range of plausible parameters in the uncertainty grid, not for the weighting. It was recommended that the parameters related to the productivity are estimated by the fit only to the indices using either log-likelihood or RMSE.

It was questioned if the setting L2 to 124 cm is plausible in the uncertainty. A WG member responded that there are a lot of actual aging observations using otolith, and therefore the uncertainty range should base on the observation data. It enables the determination of the alternative parameter values without the influence of other biological assumptions and data components. The WG encouraged the further investigation of alternative biological parameters with the biology research team.

3.3 Management Procedure

The PBFWG discussed the F-based HCRs (HCR-1a, HCR-1b, and HCR-2) selected by the JWG-04 in 2019. The candidate HCR-1 or HCR-2 have a constant F once the stock reaches $SSB_{threshold}$ or SSB_{limit}, respectively, and a declined F once the $SSB_{threshold}$ or SSB_{limit} is breached. The PBFWG discussed how the HCR-1 and HCR-2 would perform and may refine the options if they perform similarly. Similar discussions on how the HCR-1a (a linear transition between $SSB_{threshold}$ and SSB_{limit}) and HCR-1b (a sigmoidal transition) would perform. The PBFWG suggested further work to facilitate the decision in the next JWG meeting. The combination of the potential reference points in one HCR can be overwhelming for scientists and stakeholders, such as 50 options in HCR-1. The PBFWG suggested limiting the options.

4 Possible Areas of Change in the assessment model

Paper/Presentation: Possible areas of Change in the assessment model for 2024 assessment

Summary:

H. Fukuda made an oral presentation about the schedule and plan for the next stock assessment for PBF scheduled in 2024. Since the 2024 assessment will be the benchmark assessment, all of assumptions and input data could be a subject of reconsideration. During the history of the PBF assessment since 2012, the number of parameters to be estimated within the stock synthesis has inflated and the model has lost its flexibility to the alternative assumptions. In addition, the most recent assessment showed a small but obvious retrospective pattern in the model diagnostics. On the other hand, the PBF assessment model still showed its internal consistency regarding the population scale estimates, strong production relationship consistently evident in data, and highly stable model results through 4 assessments in recent 6 years. The presenter recommended to reconsider some points of the model such as the spawner indices and their selectivity, data regarding the removals, simplification of the model, and possibility to incorporate new indices. Those should be undertaken to improve the model in terms of the model diagnostics, while maintaining its advantages already achieved.

Discussion:

It was noted that the current long-term model is rigid in terms of the productivity parameters (i.e., only a small range of steepness values is possible), and this can be solved using the short-term model. There were no objections to using the short-term model in the next assessment. However, a decision on using the short-term model will be made at the time of completing the assessment.

If the short-term model is used, it needs to be able to provide information related to the management requirements. The virgin biomass can be estimated using the short-term model, but the definition of median biomass may need to be changed. The short-term model will facilitate the creation of the uncertainty grid, but consideration needs to be given to whether and how to do the ensemble model and model weighting. This is similar to the considerations required for the MSE operating model. It was also noted that even if the short-term assessment model was used, the long-term assessment model would still have to be conducted to ensure that the two models were consistent. Korea noted that they will evaluate the proposed change in the selectivity of their fishery and report back.

It was suggested that a VAST model similar to that used for the Chinese Taipei longline data be used to calculate the index of abundance for the Japanese longline data. This index should be used if it improves the diagnostics. It was clarified that the VAST approach used for the Chinese Taipei longline data using the length composition data is an ongoing project. The WG encouraged such improvements on in the standardization.

It was noted that the index length composition data should be raised by the index, and the fishery length composition data should be raised by the catch. It was noted that nearly all the catch is measured in Chinese Taipei longline, so the length composition is already related to the catch. It was also noted that spatial information is not available for the Japanese length composition data.

A participant suggested that the bootstrap bias be re-considered by changing the weight frequency bin structure to address the steep selectivity curve.

5 Other matters

5.1 New scientific information relevant to PBF

Paper/Presentation: Revisiting the spawning fraction of Pacific bluefin tuna caught in the Sea of Japan

Summary:

H. Ashida presented revisiting the spawning fraction of Pacific bluefin tuna caught in the Sea of Japan. Spawning fraction is presented as the fraction of daily spawner to mature fish and need to be estimated considering the duration of spawning marker. This presentation revealed that the postovulatory follicles retain up to 38.5h after ovulation in the ovary based on the results of diurnal changes of postovulatory follicles stages. It was also found that the estimated spawning fraction of PBF in the Sea of Japan considering duration of postovulatory follicles in the ovary was smaller than the values in previous study in the Sea of Japan and equal or slightly higher than other two spawning grounds such as Nansei Island and Kuroshi-Oyashio transition area.

Discussion:

It was questioned if there is a difference in spawning aspects between fish caught in the east and west. It was clarified that the spawning season is slightly different between east and west fishing grounds, from early June to August in the east while from late June to late July in the west.

5.2 Close-Kin mark recapture analysis

Paper/Presentation: Progress report for CKMR in Japan

Summary:

Y. Tsukahara presented the recent progress of Close-kin Mark Recapture (CKMR) research in Japan, which was initiated in 2015. The samplings for the CKMR were conducted for the putative parents and offspring by spawning grounds, and the genetic data for those samples were obtained. At current, more than 300 pairs have been found, including parent offspring pair, full sibling pair, and half sibling pair. Additionally, the alternative kinship detection method, COLONY, was tested instead of the originally developed Identity by Descent-based method. It is expected that the empirical-based index and model-based CKMR using the samples around Japan will be ready by the next assessment.

Discussion:

A WG member asked if the methods in this presentation are the same as those for Southern Bluefin tuna in CCSBT. It was responded that the methods for the genotyping and kin detection are different, while the methods to calculate the empirical index and absolute biomass will be the same. The question was raised with regard to the age in the empirical index calculation. It was responded that the age of parents was not considered for the empirical index.

A WG member asked about the reason for developing the empirical index instead of estimating absolute biomass. It was responded that using an empirical index in the assessment model will not require much change from the current assessment model, resulting in being easy to introduce it into the assessment model, while full statistical model to estimate the absolute biomass need the change of overall assessment model structure. It was clarified that the empirical index and model based CKMR will be prepared for the next assessment. A question was raised regarding the estimate method for the ages of the parent samples. It was responded that the cohort slicing method will be applied for the model-based approach.

5.3 Others

The WG agreed to hold the next W Gmeeting on March 21-24 in Japan, mainly to discuss MSE development further. Though it will be held was a physical meeting, an option to participate as an online meeting may be considered if necessary. Logistical details are to be provided later.

6 Adoption of the report

The WG reviewed and adopted the report of the meeting.

7 Adjournment

The meeting was adjourned on November 8, 2022.

Appendix 1

INTERNATIONAL SCIENTIFIC COMMITTEE FOR TUNA AND TUNA-LIKE SPECIES IN THE NORTH PACIFIC OCEAN (ISC)

PACIFIC BLUEFIN TUNA WORKING GROUP
INTERSESSIONAL WORKSHOP
November 2022
Online
Draft agenda

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6 Adoption of the report

7 Adjournment

Appendix 2

Chinese Taipei

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Appendix 3: Working papers

Index	Title	Author	Contact	Website availability
ISC/22/PBFWG-2/01	Update of estimated recruitment index of Pacific bluefin tuna based on real-time troll monitoring survey data, added IQ-independent scientific survey data for 2021	Ko Fujioka, Yohei Tsukahara, Saki Asai, Hiromu Fukuda and Shuya Nakatsuka	fujioka_ko34@fra.go.jp	Yes
ISC/22/PBFWG-2/02	Draft proposal of "Statement of Work for the Management Strategy Evaluation of Pacific Bluefin tuna"	Hiromu Fukuda and Norio Takahashi	fukuda_hiromu57@fra.go.jp	Yes
ISC/22/PBFWG-2/03	Evaluating productivity parameter uncertainty using ASPM	Huihua Lee, Desiree Tommasi Kevin Piner	huihua.lee@noaa.gov	Yes
ISC/22/PBFWG-2/04	Revisiting the spawning fraction of Pacific bluefin tuna caught in the Sea of Japan	Hiroshi Ashida, Yukio Ishihara, Shuuyo Watanabe, Seiji Ohshimo, Hiroshige Tanaka, Atsushi Tawa, Taiki Ishihara, Yosuke Tanaka	ashida_hiroshi35@fra.go.jp	No
ISC/22/PBFWG-2/05	Overview of the preliminary Pacific bluefin tuna management strategy evaluation framework	Desiree Tommasi, Huihua Lee	desiree.tommasi@noaa.gov	No
ISC/22/PBFWG-2/06	Changing Pacific bluefin tuna exploitation patterns and implications for management strategy evaluation	Desiree Tommasi, Huihua Lee	desiree.tommasi@noaa.gov	No

Presentations

Title	Author	Contact
Candidate indices in MSE and assessment	Yohei Tsukahara, Saki Asai and Hiromu Fukuda	tsukahara_yohei35@fra.go.jp
A review of the fishery and size data for Purse seines in the Sea of Japan	Kirara Nishikawa and Hiromu Fukuda	nishikawa_kirara68@fra.go.jp
Possible areas of Change in the assessment model for 2024 assessment	Hiromu Fukuda	fukuda_hiromu57@fra.go.jp
Progress report for CKMR in Japan	Yohei Tsukahara	tsukahara_yohei35@fra.go.jp

Appendix 4

PBF MSE Stocktaking
November 2022

- **Bold** sentences were generally agreed

1) Timeline for development
- **March 2023: Drafting feedback from the PBFWG to JWG.**
- **November 2023: Decide general structure of OM and Grids.**
- **November 2024: Decide all the specifications (Model weighting, MP(s), performance indicators…)**
- **April 2025: Confirm the results of MSE**

2) Data for MSE (will be discussed and evaluated through the 2024 stock assessment)
- **Data for OM Conditioning: Data up to 2022FY (basically identical data set with 2024 stock assessment) will be used.**
- **Data for 2026 TAC calculation by MP: Data up to 2023 FY (for model-based approach) and 2024 FY (for index-based approach; if available) will be used.**
- Deadline of the data submission will be similar with an assessment schedule.

3) Specification of operating model including uncertainty grid
- **Using short-term model starting from 1983 fishing year**
- Elements for uncertainty grid: Biological assumption (Steepness and Natural mortality as priority), Observations (Index), Implementation (unseen mortality) (to be proposed by developers)
- Elements for robustness test (selectivity change, recruitment drop)
- OM plausibility weighting: will be discussed after agreement of uncertainty grid
- **Catch in number in data file will be replaced by the estimated catch in weight**
- Assume time in-variant selectivity for conditioning OM with time blocks
- Reference year for the fishing pattern in the future projection: use the recent period, e.g. 2017-2019 (to be updated for final presentation). Consider adding time varying selectivity?

4) Estimation model regarding the type of models and management procedure
- Type of estimation model: full integrated model or ASPM-R
- Type of management procedure: model-based or empirical based. Features of two types of MPs be presented to stakeholders for their input.

5) Exceptional circumstances.
- Further consideration is necessary together with OM grid.

6) HCR

- HCR procedure will be implemented as specified rather than using as tuning target to avoid complication.
- Less than 10 MPs is desirable for the scientists to prepare the materials for introduction in time.
- Inform stakeholders sigmoid HCR (HCR-1b) would likely not perform differently from HCR-1a. Also inform stakeholders HCR-1 and HCR-2 with a same target would not perform differently. Need actual calculation to show.

7) Allocation
- If fishery impact is a control parameter to allocate TAC in the feedback loop, further modules will be required outside of current feedback loop.
- Some derivatives from the estimation model, e.g., fleet specific SPR, could be an indicator of fishery impact, which can be calculated in the current framework.

8) Performance indicators
- Safety: Probability of $SSB < SSB_{LRP}$[5-20%]
- Status: Probability of $F <= F_{target}$[50%]
- Stability: Less than [15%] change of catch limit. Need further consideration and stakeholder input if there should be a built-in limit for change.
- Yield: Impact ratio [SPR/Traditional impact] and expected annual yield

Safety and Status indicator will work as a cutoff level.

9) Management cycle
- **Tentative default: Projection period: 20 years (roughly corresponding to 2 generation cycle for PBF)**
- **Interval of TAC change: 3 year**