FINAL

ISC/22/ANNEX/06

ANNEX 06

22nd Meeting of the
International Scientific Committee for Tuna
and Tuna-Like Species in the North Pacific Ocean
Kona, Hawai'i, U.S.A.
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REPORT OF THE PACIFIC BLUEFIN TUNA WORKING GROUP INTERSESSIONAL WORKSHOP

July 2022

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ANNEX 06

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)

December 14-21, 2021
Webinar

1. OPENING AND INTRODUCTION

1.1. Welcome and Introduction

The meeting was held online due to the COVID-19 pandemic. 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 2.1: M. Dreyfus, Item 2.2: M. Maunder, Item 2.3: H. Fukuda, Items 3 & 4: K. Piner, Item 5: Y. Tsukahara, and Item 6: SK. Chang.

2. REVIEW OF THE ASSESSMENT DATA

2.1. Catch Information for FY 2019 and 2020

K. Nishikawa presented catch tables for the 2022 PBF stock assessment. Quarterly data was updated up to the 2020-fishing year (up to June 2021). The catch tables shown in the presentation included provisional values for the most recent year of data. It was noted that these provisional values should be updated by the deadline (the end of December 2021).

Discussion

In general, there is no major catch increase seen among fisheries except for Japanese and Chinese Taipei longline fisheries which target adult PBF. It was noted that Japanese longline fisheries started to be managed through an individual quota system in 2021 (FY 2020), while Chinese Taipei longline fishery still did not reach its catch limit in 2021. Chinese Taipei authority would restrict catch when catch weight collected through catch documentation scheme (CDS) approaches its catch limit, should that happen in future. It was noted that the PBF catch amount for assessment includes catches below 20 degrees N that are not included in the public domain catch in the ISC web page.

Update of Korean fisheries information for Pacific bluefin tuna, Thunnus orientalis (ISC21/PBFWG-02/06)

JH. Lim presented ISC21/PBFWG-02/06. Total catch of Pacific Bluefin tuna (*Thunnus orientalis*, PBF) in the first half of 2021 (from Jan. to Jun.) was 425 tons caught by offshore large purse seine, set net and trawl fisheries in the Korean waters, and catch proportion of set net has been increasing in recent years. The catch proportion of large PBF in 2021 was 14% of the total catch and most PBF were caught by purse seine fishery from March to April in the eastern part of Jeju island. The catches by set nets, which are located along the coast of the East Sea, were getting higher. As for the PBF size frequency, the number of large size of PBF has increased since 2016 and is mainly caught in the 1st and 2nd quarters. Compared to the previous years, more fish larger than 100 cm were caught in 2020 and fish larger than 150 cm were caught in 2021.

Discussion

Regarding the increase of the size of PBF caught in recent years, it was questioned whether there were any changes in the gear used. It was explained that there were no changes in the gear and the reason for the changes in fish size should be investigated.

Mexico

According to the observations in the previous 2 years for the Mexican purse seine fisheries, the fishing period in 2021 started very early in the calendar year and is of very short duration mainly due to the race for the fish among operators.

2.2. Review of Updated CPUEs for Assessment

CPUE and Catch at Size for Pacific Bluefin tuna (Thunnus Orientalis) Caught by Japanese Coastal and Offshore Longline (ISC21/PBFWG-02/01)

Y. Tsukahara presented ISC21/PBFWG-02/01. Since the 2020 fishing year, the individual quota (IQ) system has been used for the management of Japanese coastal longline fishery. Unfortunately, the compilation of logbook data merging with IQ information is behind schedule due to the COVID-19. While it seems to be insufficient to calculate the standardized CPUE, the preliminary data in the 2020 fishing year indicated a continuous drastic increase of nominal CPUE since the 2019 fishing year. This was mainly because of the changes in the size structure of fish caught by the Japanese longline fishery. These catches dominated by small-sized fish had rarely been caught before the 2018 fishing year. To prioritize the consistency of index selectivity, PBFWG at the 2020 assessment meeting decided not to use the size composition data after the 2017 FY to estimate its selectivity. Based on these observations and treatment of size data, the author proposed an additional data filtering method to be used in developing the abundance index for the 2022 assessment. This will filter out catch records when the average weight of the fish in one operation is less than 60 kg in the logbook, in addition to the data of operation during the period when an individual vessel is considered to have almost exhausted quota based on the IQ control information. On the other hand, the author mentioned that excluding catch-at-size after 2017 may lead to misspecification for the removal of this fleet because of the substantial increase of small-sized fish in caught PBF.

Discussion

Several logistic issues were raised. First, it was noted that the provision of data was behind schedule and an extra meeting is needed in January to review this CPUE analysis. Second, it is unclear if the modifications to deal with small fish were appropriate in an update assessment or whether they should be addressed in the 2024 benchmark assessment. The general conclusion was to make necessary changes to address the small fish issue in the 2020 update assessment or at least include it as a sensitivity analysis. The changes might be particularly impactful for the projections.

A question was raised whether the increase of small fish was due to a change in targeting or a change in the spatial distribution of the small fish. There is no evidence of a change in the operating strategy in the west of 145°E. The increase of small fish in the catch is probably due to an increased abundance of small fish in the west of 145°E, which is due to spatial expansion due to the influx of small-sized fish. If the fleet has not changed to targeting small fish, the index will not be biased by dropping off the records for the small fish and only some information will be lost. This is considered to be a reasonable short-term solution. **The WG agreed to request Japan to conduct further analysis and present the result of standardization before the assessment meeting for review by the WG.**

It was suggested that a separate index should be created starting in the 2000s that includes the whole area and would provide information on the small fish. Another suggestion was to include size in the VAST CPUE standardization. These were suggestions for future assessments.

It was also suggested that to ensure that the catch is removed at the right size of fish, the selectivity for the index and fishery should be separated in recent years when the small fish are left out of the index. For example, the fishery could have its own selectivity and composition data for 2017-2020, but share the index selectivity for earlier years. It was noted that even with the size cutoff, there will still be some small fish in the composition data. Another suggestion was that the size cutoff for the index should be conducted for all years. (see also Item 3.2.)

It was commented that the introduction of the quota system might have incentivized discarding, and this would influence the CPUE. This issue is currently being investigated but **the WG agreed to take the same approach on the unaccounted mortality in the upcoming assessment, i.e., the inclusion of 5% discard fleets for most WPO fisheries. Furthermore, the WG once again encourages its members to continue researches for the collection of data regarding unaccounted mortality.**

Update of Relative CPUE (up to 2021) of Taiwanese PBF Fisheries Using Delta-Generalized Linear Mixed Models (GLMM) and Vector-Auto-Regressive Spatiotemporal Model (VAST) (ISC21/PBFWG-02/02)

SK Chang presented ISC21/PBFWG-02/02. PBF CPUE of Taiwanese longline fishery up to 2021 (2020 fishing year) was standardized using traditional delta-generalized linear mix model (delta-GLMM) (without consideration of spatial effect) and vector-auto-regressive spatiotemporal model (VAST) (considered spatial effect in the model). Relative CPUEs were obtained for three regions: southern fishing ground, northern fishing ground, and two fishing grounds combined; However, the index from the southern fishing ground was considered more representative. The resulting index from the southern region using the GLMM exhibited a strong increase in 2020 and 2021. The 2021 CPUE has recovered almost to the level of 2004. On the other hand, while the relative CPUE from VAST showed a similar, but more drastic, increasing trend compared to the GLMM result after 2012, the increase slowed down in 2021.

<u>**Discussion**</u>

Several issues were encountered in the VAST analyses, but it was noted that the GLMM of the southern area was used in the previous assessment and would also be used this year. Therefore, the issues with the VAST analyses would not impact the assessment. It was noted that the southern fish are getting smaller on average and there are no very large fish in recent years. It was queried whether this is due to changes in spatial distribution or targeting of small fish. It does not appear to be spatial differences in operation. Since the quota has not restricted the fleet, the quota is not influencing targeting. It was also noted that the length of the fish in the north are larger suggesting small fish only enter the southern area. **The WG agreed to use the updated CPUE of Chinese Taipei longline using GLMM used for the next assessment (Fig. 1).**

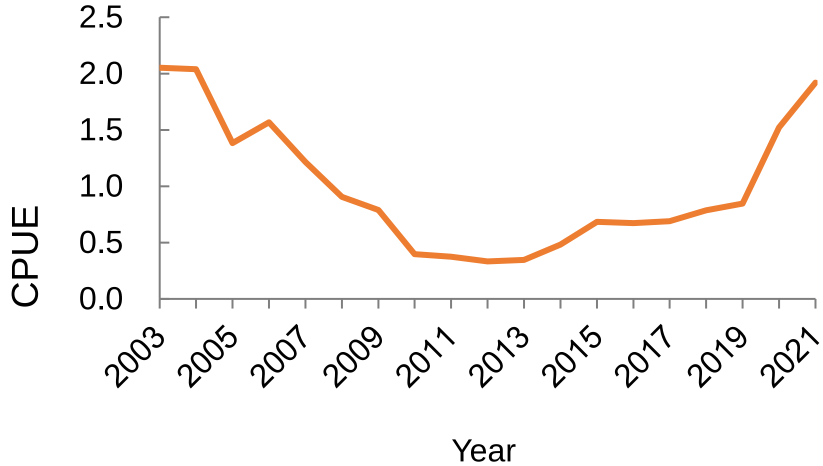

Figure 1. Updated standardized CPUE from Chinese Taipei longline index from south fishing ground. Year here refers to calendar year.

A participant pointed out that in recent years the average size is reducing and it was queried whether this was due to reducing age or due to density-dependent growth. The age data should be evaluated. It was also noted that the selectivity in the south is assumed to be asymptotic, but dome shape in the north. However, in recent years the northern fishery has larger fish. It was noted that an analysis was conducted with asymptotic selectivity for the southern fishery in the 2020 assessment. (JC. Shiao presented an aging analysis of Chinese Taipei PBF landings.)

Estimation of Recruitment Index of Pacific Bluefin Tuna Based on Real-Time Troll Monitoring Survey Data Using Vector Autoregressive Spatio-Temporal (VAST) Model Analysis (ISC21/PBFWG-02/03)

K. Fujioka presented ISC21/PBFWG-02/03. In this document, they attempted to develop recruitment abundance indices (i.e. standardized CPUE) of age-0 Pacific bluefin tuna using data of real-time troll monitoring operated in the East China Sea during the winter season for two periods of time during 2011-2020 and 2017-2020 fishing year. The standardized CPUE was calculated by Vector Autoregressive Spatio-Temporal (VAST) model which is a delta-generalized linear mixed model that separately formulates the encounter rate and the catch rate of positive catches. Those estimated indices in this study were generally similar to the index based on the traditional sales slip data, which was used for the 2020 assessment. Furthermore, the candidate models complement the data-poor 2017 fishing year, when operations were restricted due to a strict fishing regulation, thus the indices would be reasonable for input into the stock assessment model for the next assessment.

Discussion

It was clarified that a single VAST model was used for two apparent fishing areas and this may be inappropriate if the correlation structure differs among areas. It was clarified that the two areas were modelled together to facilitate the creation of a single area-weighted index. A participant asked if the two areas had similar length compositions. This was confirmed and they are 30-50cm.

It was noted that the GLM model was a bit different for the 2019 data point compared to the last assessment. It was suggested that this is probably due to updated data.

It was explained that the data aggregation is different between the sales slip data and the real-time data. It was suggested that the GLM analysis of the sales slip data be used up to 2016 and that the

GLM or VAST model of the real-time data be used for 2017 onwards for the assessment. However, the real-time index from 2017 onwards cannot be validated by the model as little information is contained in the assessment model for those ages of fish. It was suggested that the recruitment index might be biased in recent years due to the introduction of quotas and may better be dropped from the analysis. The projections take uncertainty into consideration and therefore dropping the index is a better way to represent uncertainty than to include the possible bias due to including the index. It was further noted that the decision was a bias-variance tradeoff. Other indices of composition data that provide information on younger fish could be used to evaluate the recruitment index. However, it was noted that movement to the EPO occurs at ages 2-5, and without sufficient understanding of the movement, data for these ages would be difficult to use to evaluate the recruitment index.

After discussion, **the WG agreed that the index based on sales slips should be used up to FY 2016. For the index after 2017, it was recommended that the VAST standardization of the real-time data should be re-analyzed only using the data from 2017. This analysis was conducted, and the results were very similar (Fig. 2). It was concluded that the assessment should be run with and without the index from 2017 onwards to evaluate its influence. Unless either approach clearly outperforms the other, the WG anticipates both models be treated as the base case models in the next assessment. (see also Item 3.1)**

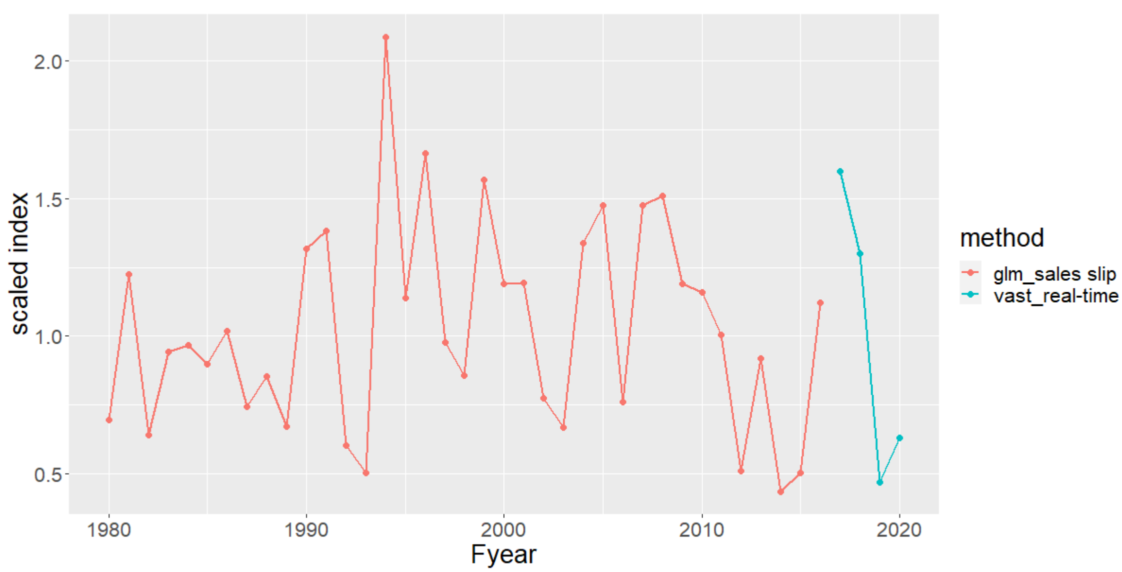

Figure 2. Updated standardized CPUE from Japanese troll indices. Index up to 2016 (red) is based on sales slip data and standardized by GLM. Index after 2017 (blue) is based on real-time monitoring data and standardized by VAST.

Regarding the influence of possible artificially reduced catch of very small fish due to management, it was also suggested that using constant selectivity for some fisheries, which catch both age-0 and older fish, might cause a bias if the model is fit to the length composition data and excluding the index might not remove all the bias and the associated composition data should also be removed.

2.3. Review of updated size composition data for assessment

PBF Size Composition 2020-2021 from the Mexican Purse Seine Fishery from Data Collected at Pen Rearing Operations (ISC21/PBFWG-2/04)

M. Dreyfus presented ISC21/PBFWG2-04. An analysis of the PBF size-composition data for 2020 and 2021 fishing seasons is presented based on length measurements taken from stereoscopic underwater camera videos during pen transfer operations of live PBF. PBF average size in 2020 was 121 cm furcal length and in 2021, 140 cm. The highest modes in 2020 and 2021 are located in 108 cm and 156 cm, respectively.

Discussion

A question was raised regarding a possible reason for the difference in the predominant cohort in the 2020 and 2021 calendar years. It was responded that the recent fishing season and operations for the Mexican purse seine for PBF has become shorter and fewer due to the competition of allocation among the farming companies, and this might cause an opportunistic size distribution among the year. It was also questioned that if the limited number of sets cause a bias of size samples by catching PBF in a limited area and season for recent years. The author responded that although the total number of the set (20~30) has decreased in recent years, the size measurements were performed for almost every set, so the size data from this fishery can be considered as representative of fishery removals. It was noted that since the time-varying selectivity was assumed for this fishery in the assessment model, the possible change in the size selectivity could be accounted for in the assessment. **The WG generally agreed to use those updated data in the next assessment.**

What is Next? Lessons Learned from Sensitivity Model Runs Using Length Compositions Collected by the Sportfishing Association of California (ISC21/PBFWG-2/08)

HH. Lee presented ISC21/PBFWG-2/08. U.S. recreational fisheries have been the key component of the total catch for Pacific bluefin tuna (PBF) for about a decade. The catch and its catch-at-size data are used in the stock assessment. However, the port sampling program (PSP) by the Southwest Fisheries Science Center, National Oceanic and Atmospheric Administration that measured the length of fish discontinued in 2020 due to COVID-19. The common practices to fill the data gap are 1) to borrow the information from other similar fleet or 2) borrow the information from the most recent data in the same fleet. Recent work showed that a parallel on-board sampling program (OSP) by the Sportfishing Association of California measured the length of fish in a smaller percentage of the catch than the PSP. As another option, sensitivity runs using the alternative length compositions were conducted and the results were compared to those based on common practices. Overall, the time series of spawning biomass and recruitment were almost identical among the models examined. The difference in catch-at-age(/size) between the model fitting the OSP data and model fitting the PSP data was smaller compared to the differences 1) between the model fitting either OSP or PSP data and the model borrowing information from EPO commercial fleet and 2) in between-year catch-at-age(/size). This suggests that despite the variability in the PSP and OSP data, either PSP or OSP data provides more appropriate information on the catch-at-age (/size) than borrowed information from the EPO commercial fleet and borrowed the information from the most recent data in the same fleet.

Discussion

A question was raised if the OSP data in the early years, which had a small number of samples, affected the estimated size compositions. It was responded that the OSP data in the early years were not recommended to include in the next assessment, but the data in 2019 FY and thereafter were recommended because it is unclear whether the PSP may re-start in the near future given the COVID situation. The WG sees the benefit of using the size composition data collected by OSP over the data gaps. The coverage of OSP compared to the port-sampling program is relatively low. The WG suggests OSP increase the sampling across vessels and trips. **The WG agreed to use the OSP data in 2019 and 2020 FY to inform the size of removals by the U.S. recreational fishery in the 2022 assessment.**

***PBF Size Composition 2020-2021 from the Japanese Fishery* (Oral Presentation)**

K. Nishikawa presented the catch and size composition data from Japanese fisheries in FY2019 and 2020. The total catch amount by Japan was slightly increased, and the increment was mainly composed of Longline catch. In the size composition of the longline fishery, a peak at smaller than 150 cm FL was continuously observed since 2017. In the size composition of purse seine fishery operated in the Sea of Japan, there were some observations of the larger fish in FY 2020 than the those of recent years.

<u>Discussion</u>

The WG generally agreed to use those presented data in the next assessment. An additional comment was made from the authors that although there was no critical inconsistency in the updated size composition data presented here, there still be some data from coastal fisheries, which were not included in this presentation. Because of the COVID-19 pandemic and/or other possible reasons such as an opportunistic fishery unloading due to the management, the data sampling for those coastal fisheries might have been sparser than before. The authors suggested the WG not to use those data in the upcoming assessment meeting, if it is considered biased due to the sparser samplings.

***The Input Data Format for Pacific Bluefin Tuna Stock Assessment Conducted by Stock Synthesis*. (ISC21/PBFWG-2/07)**

K. Nishikawa presented a new input data submission format for PBF stock assessment using Stock Synthesis. The PBF stock assessment required catch, size composition, and abundance indices. Since the PBFWG does not have a uniform data submission format for the latest PBF assessment, the authors proposed a new data format to submit input data easily. This format constructs the catch at size data corresponding to the definition of the assessment data bins from a fine resolution (1 cm bin width) catch at size data. So the analyst can access the fine scale data and assessment data from a data submission.

<u>Discussion</u>

A clarification was made on whether all members can submit the size composition data in finer size resolutions for the whole assessment period. A member responded that there might be a difficulty for the historic fleets which have not been updated in the recent assessments. **The WG welcomed the new format which enables analysts to access either of the finer resolution data and currently used data and agreed to submit data in the new format at least for the added period (FY 2019 and 2020) and, if possible, there before.**

3. POSSIBLE AREAS OF CHANGE IN THE ASSESSMENT MODEL

The 2022 assessment is an update of the 2020 benchmark assessment model. The WG notes that there isn't an agreed upon ISC definition of what is acceptable in an "update". The WG intends to make changes where recent fishery regulations have impacted data or where analytical problems were detected in the previous assessment. The following sections provide an overview of what changes the WG is planning to make in the updated assessment model.

3.1. Input data

Evaluation of Recruitment Indices

HH. Lee made an oral presentation on the evaluation of recruitment indices using ASPM-R. The conventional troll index (1980-2018) is used to inform the age-0 recruitment for the Pacific bluefin tuna stock assessment. The age-structured production model (ASPM) diagnostic with the recruitment deviates matched to the conventional troll index (ASPM-R) showed consistent information on the adult abundance indices (Japan longline and Chinese Taipei longline). The more restrictive management since 2017 made the fishery suspended early in the fishing seasons and hampered the data quality based on the sale slips. Therefore, it was suggested not to use the conventional troll index after 2017. An alternative age-0 recruitment index (2011-2018) was developed based on the equipped data logger and transmitter (real-time monitoring troll index). Three choices to use the recruitment index have been proposed in the April 2021 working group meeting. The first one is to use the conventional troll index for 1980-2016. The second choice is to use the combination of the conventional troll index and real-time monitoring troll index. The last one is not to use any recruitment index. The purpose of this presentation is to prompt the discussion based on the ASPM-R analyses. The first choice is comparable to the previous assessments, where the conventional troll index (1980-2016) showed consistent information on the adult indices. The ASPM-R analyses on the selection the year to be used in either index showed that 1) inclusion of the 2014 conventional troll index decreased the goodness of fit for the 2018 Japan longline index, 2) the conventional troll index took 4 years to reflect in the adult index, and 3) real-time monitoring troll index before 2014 seems to connect to the longline and the connection afterward is unclear since it is not shown up at the longline index yet. Based on the analyses, the author does not recommend the third choice.

<u>**Discussion**</u>

Considerable discussion occurred regarding the influence of recent regulations on the fishery behavior in the Japanese troll fleet and its potential influence on the age 0 index derived from that fleet. The WG agrees that these regulatory impacts have likely biased the historical troll CPUE series based on landing slip data after 2016. A new real-time monitoring program has been established which may address some of the impacts of these regulations, but may still be impacted in ways not fully understood. The real-time monitoring data could be used to create a new age 0 index from 2017 onward. However, the WG acknowledged that it will not be able to validate the reliability of this index for the update assessment. The choice before the WG is to include this new information in the updated assessment and potentially bias the most recent recruitment estimates or leave the information out of the update and increase the uncertainty of the most recent recruitments. No consensus on this issue could be reached and both options may be explored in the update assessment. The WG also notes that this issue will be of greater importance for the projections than for the assessment itself (see also Item 2.2).

How Good is it? Using a 10-years Hindcast to Conclude the PBF Assessment and Projections Provide a Very Good Basis for Management Advice (ISC21/PBFWG-02/10)

HH. Lee presented ISC21/PBFWG-02/10. A good stock assessment should be determined based on: 1) how accurate is the assessment model at recreating the past population dynamics, and 2) how good is the assessment model at predicting the future? This paper will focus on the second question that is the goal of fishery management. To assess the prediction quality of stock assessment for Pacific bluefin tuna, we used a hindcast to make a 10-years past prediction on the age-structured production model. As if we conducted the assessment 10 years ago using data only up to that year and forecast forward with the catches by fleets as actually did occur in the next 10 years, could we have predicted what happened to the stock? The result showed that the PBF assessment is a very reliable assessment for prediction because our production function accurately describes on average the effects of removing catches at age. Although we cannot prove that the model is accurate in recreating the past dynamics, it is very unlikely that a model with this predictive ability is not capturing a reasonable approximation of the dynamics. We strongly recommend that the following assessments provide the prediction tests, as they are the best gauge of an assessment's reliability for management.

Discussion

The PBF assessment was shown to have good predictability, which lends confidence in the assessment and projection results. The WG noted that the analysis was based on an ASPM model and believes the predictability of the actual assessment is even better as the full dynamics are estimated. **The WG noted that predictability is a good way of evaluating assessment's reliability and recommends this kind of diagnostic be produced in future assessments.**

3.2. Model Assumption and Structure

Model structure and setting are given in the table below (Table 1). Changes from the 2020 assessment are given in red.

The WG noted that the change in the constant added to weight composition data (from 0.01 to 0.0001) is only used in the bootstrapping procedure. This change is to reduce a bias in the bootstrapping procedure for weight composition data (Lee et al. 2021). **The WG also agreed that Japanese longline catches and composition data excluded from fleet 1 from 2017 onward will be added to fleet 28 (Japanese longline season 1-3)**, which is an attempt to deal with the large number of small fish showing up in the catch (see also Item 2.1). Further investigation of this issue and whether the small fish represent an increasing abundance of smaller fish or change in fishery behavior is needed to continue. The WG also discussed having a grid approach to address uncertainty as is requested from outside parties. It was noted that the options for the recruitment index may provide an axis of uncertainty for the grid or potentially alternative life-history parameters could be used.

After further discussion in Item 5.1, **the WG agreed with the intention to construct one or two base case model(s) depending on the results of models with or without the recent recruitment index. Additionally, the WG will also evaluate the robustness of the base case model(s) by looking at the results from the more flexible models based on the shorter time period and applying different biological assumptions including lower steepness.** (for detail see more in Item 5.1)

4. FUTURE PROJECTION

The WG chair presented background information from attachment F of the Northern Committee report that details requests from the WCPFC NC for the upcoming projections. The request included fishery impacts by region, reviewing the appropriate recruitments to resample for projections, and quota transfer (see NC17 report, attachment F for the full suite of requests).

4.1. Scenarios of projection for the next assessment

A Review of Model Setting and Updated Scenarios for the 2022 Future Projection of Pacific Bluefin Tuna (ISC21/PBFWG-02/11)

K. Nishikawa presented ISC21/PBFWG-02/11. For the PBF future projection, 'ssfuture' has been used since the 2012 stock assessment. Since then, the future projection software was updated several times to add options to depict the implemented management measures in the projection model. This document provides the explanation of the projection settings and harvesting scenarios corresponding to the new CCMs adopted by WCPFC and IATTC commissions in 2021 and future harvesting scenarios requested by the WCPFC Northern Committee. Since the request from the NC included some scenarios which require an exploration of the harvests to meet given conditions, the authors provided the procedure of that exploration. Also, the authors recommended moving the projection starting year from the assessment terminal year to the next year of the assessment terminal year since the number-at-age at the beginning of that year is available in the output file of SS ver. 3.3.

Discussion

The WG discussed the new bootstrapping method proposed by Lee et al. (2021), focusing on its ability to solve the bootstrapping bias. It was noted that the procedure did not completely eliminate bias but diminished it to an acceptable level in the last assessment. The WG agreed to use the method proposed by Lee et al. (2021) and to continue to evaluate its performance in the next assessment. The WG also asked for clarification on the potential change to the projection method that proposed using the numbers at age from terminal year+1 (forecast). It was noted that the number at age in terminal year +1 occurs before fishing, but the future age 0 recruitment will need to be replaced by the resampled value from the past recruitment time series of bootstrap replicates. The WG agreed to use this change in the timing of the start of the projections. The WG also discussed the level of recruitment to be used in the projections, noting that because the stock likely rebuilt to the first interim target that the default level is average. The WG discussed requests from the Northern Committee to evaluate the best recruitment level to resample. The WG agreed to examine the estimated recruitments in the next assessment to determine the most appropriate resampling procedure. The WG then discussed a request by the Northern Committee to evaluate the fishing impact by region (WPO vs EPO). It was noted that this request is complicated and requires a searching algorithm. It was determined that the WG chair should consult with the ISC chair on how to ensure the WG is addressing the question posed by the Northern Committee.

4.2. General Discussion for the Response to the Requests from RFMO

No discussion.

5. MANAGEMENT STRATEGY EVALUATION

The WG chair recalled that ISC is requested to complete MSE on PBF by 2024 and the WG in the April meeting agreed to explore the ensemble approach.

5.1. General model structure of the operating model

How to Improve a Flexibility of the Stock Synthesis Model for Pacific Bluefin Stock to the Alternative Assumptions with Keeping its Performance (ISC21/PBFWG-02/12)

H. Fukuda presented ISC21/PBFWG-02/12. One of the features of the PBF SS model is that the observed recruitment index, catch, and adult indices show consistency under the fixed productivity assumptions of growth, natural mortality, and stock-recruit relationship. This consistency among the data and model assumptions brought robust assessment results for the recent three data-update or benchmark assessments since 2016. On the other hand, the WG also acknowledged that the current PBF model showed inflexibility in terms of the model convergence to the changes of recruitment assumption (e.g. lower steepness). Since the reason for this convergence issue might be that the population is observed at a very low relative stock size, and the model is fine-tuned to explain data under the current assumption, the author re-constructed the PBF SS model without very high consecutive catches observed in 1981-1982 by starting the model from 1983 (short time series model). The model performance was evaluated by the residual analysis and model convergence to the sensitivity runs for several alternative assumptions about the steepness and natural mortality. The biomass time series such as the SSB and recruitment estimated for 1983-2018 were basically identical between the 2020 assessment base case and the short time series model. The short time series model brought some advantages such as higher flexibility to the alternative assumptions about the steepness, shorter run time, and keeping its high model performance in terms of the model fits to the data. The author recommends incorporating this kind of idea for the development and conditioning of the operating model, which requires depicting the population dynamics under a wide range of assumptions. Also, the author does not recommend useing this model for the next assessment directory since the shorter time series model can not estimate the fishery impact for historic fleets and the empirical reference point which is used in the current management framework as the initial rebuilding target (SSBmed 1952-2014).

__Discussion__

A question was raised regarding the convergence issues for a couple of steepness values. It was responded that further exploration of initial values and phases in parameter estimation would solve the convergence issues. It was pointed out that the size data for the US commercial fishery in the early period have no size data after 1983 while there was one data point in the result. That was mistakenly in the model and hence will be removed from the input data. A participant asked about the setting for the initial condition of this model. The author answered that the initial F only for Fleet 8 (Japanese Set-net) was estimated, but not to fit the equilibrium catch on this fleet, resulting in a little higher biomass in 1983 than that in the full assessment model. The author commented that there is still room for consideration of setting for the initial condition.

A participant questioned how the range of uncertainty used in this analysis was determined. It was responded that the aim of this trial was to seek the lowest value of steepness in terms of the convergence and there was no other perspective to determine the range. Then, the WG discussed the range and items to be included in the uncertainty grid.

The inclusion of growth and natural mortality in the uncertainty grid was suggested to evaluate the degree of productivity for this stock. A participant responded that the current assessment has a credible growth function based on a large number of observations, although the uncertainty on the growth, which is often considered as uncertainty for other species, could be an option based on the standpoint outside of ISC. It was noted that the unrealistically wide-ranged scenarios should be avoided to keep the distribution of results within the plausible range. **The WG agreed to use this short-term model as the base for OMs and to see the results with 3 uncertainty grids (steepness, natural mortality, and growth) as the first step of OM development.** In terms of the weighting, it was suggested that the performance of hindcasting might be an indicator for the weighting but needs further discussion.

The WG also considered the applicability of this model for the stock assessment. The sensitivity run with a lower steepness value was an outstanding issue on the PBF assessment. Some participants mentioned the benefit of not including data from early periods with lower reliability. Furthermore, the biological assumption may change over time, e.g. regime shift or the change of ecosystem. Therefore, the WG considered that this model starting from 1983 could be considered as an assessment model for future assessment.

The WG also discussed an application of this model to future projection. The author mentioned the results of future projection by this model will be incomparable to those by the current assessment due to the difference of resampled period of recruitment and difference of both empirical (SSB_{med}) and biological (SSB_0) reference points. It was noted that the next assessment in 2022 is an update assessment and hence these changes on the structure for future projection are inappropriate. Nonetheless, the WG considered it still can provide useful information regarding the alternative assumptions which cannot be tested through sensitivity analysis. Therefore, **the WG agreed that the future projection with this short-term model with different biological assumptions including lower steepness will be evaluated as a robustness test in the next assessment.**

It was noted that the WG is requested to complete the development of MSE in 2024, when the next benchmark assessment is also scheduled. A participant suggested the 3-year cycle for the stock assessment instead of the current schedule (2-year cycle). **It was agreed that the PBFWG proposes to conduct the stock assessment every 3 years after the 2022 assessment at the ISC Plenary and that the WG focuses on MSE research after the next assessment.**

Lesson Learned from the North Pacific Albacore MSE and Potential Application to Pacific Bluefin Tuna (Oral Presentation)

D. Tommasi presented *Lesson Learned from the North Pacific Albacore MSE and Potential Application to Pacific Bluefin Tuna*. Some lessons learned from the recently concluded ISC North Pacific Albacore (NPALB) management strategy evaluation (MSE) were presented. There are many steps in developing an MSE, some of which require management and stakeholder involvement, such as the selection of management objectives and strategies. While the MSE process is characterized by iterative feedback between managers and stakeholders, some tasks, such as the selection of uncertainties to be considered, can be done by scientists without the involvement of managers and stakeholders. The uncertainties that were selected and prioritized for the NPALB MSE were presented. These included model uncertainty, process uncertainty, observation error, assessment error, and implementation error. It was stressed that running a full assessment model within the simulation is very computationally intensive and thus, for the NPALB MSE, the number of runs and potential OMs in the final set of results had to be limited. Some of the lessons learned were 1) to develop a list of uncertainties that need to be considered, and the associated operating models, early in the process, 2) the type of estimation error used is a key decision as there is a trade-off with the number of potential runs, 3) be clear with the managers as to what the assumptions and simplifications of the simulated management process are, 4) have frequent interactions with managers, and 5) it is useful to present results of preliminary runs to managers and stakeholders, even if the finalized management strategies or performance metrics have not yet been identified.

Discussion

A question was raised regarding the rationale behinds the selection of the final OMs set to evaluate the management procedure (MP). It was responded that some uncertainty grids, e.g., natural mortality and growth, have a similar impact on productivity, resulting in similar results among OMs. It was also explained that the reduction of the number of runs was important due to the computationally intensive nature of NPALB MSE framework. A participant asked about the process to determine the overall design of this MSE. The author responded that the ALBWG decided to use the integrated models both for the operating models and estimation (assessment) model in MSE because the aim of this MSE was to evaluate an MP with HCRs based on reference points derived from stock assessment. The ALBWG discussed other approaches, e.g., using ASPM and empirical HCR, but ALBWG considered that the reliability of the abundance index was not sufficient to go with those approaches.

6. OTHER MATTERS

6.1. New Scientific Information Relevant to PBF

No discussion.

6.2. Close-Kin Mark-Recapture (CKMR) Analysis

Update on Close Kin Genetic Activities by Members

M. Craig and MK. Lee presented the progress of CKMR research for USA and Korea, respectively, and no new information was updated from Taiwan and Mexico.

MK Lee made the oral presentation on the information of research activities for PBF CKMR conducted by Korea up to date. Korea has been collecting PBF tissue samples since 2016 and conducting studies on the development of genetic markers for PBF since 2018. During the period, Korea developed 33 MS markers and has been developing candidate SNP markers using whole genome sequencing (WGS) and GBS analysis. Over 7 million SNP markers per sample were developed based on the reference published in 2019 of the NCBI database.

M. Craig presented a brief update on collection activities related to the close-kin mark-recapture genetic study of Pacific Bluefin Tuna (PBF) at the NOAA National Marine Fisheries Service (NMFS) Southwest Fisheries Science Center (SWFSC). The SWFSC has conducted dock-side sampling of PBF length data from the recreational hook and line fishery since ~2014. In 2016, this sampling program was adapted to include sampling tissue (fin clip stored in ethanol) to accommodate the interest in close kin mark-recapture as a tool to estimate the abundance of PBF in the Pacific. In addition, collaborators ad the California Department of Fish and Wildlife, as well as industry partners in the commercial fleet, have contributed samples for this project. Sampling was steady from 2016 until 2019 when the COVID-19 pandemic resulted in an inability to further conduct samples in the field. The SWFSC plans to continue its collaboration with international colleagues to begin collecting genetic data in early 2022 baring delays due to COVID-19 restrictions on access to the laboratory.

Y. Tsukahara provided an oral presentation on the recent progress of close-kin research in Japan.

After the ISC CKMR Workshop held in Jeju 2019, the analyst team in Japan has been using not the same but a similar technique for DNA sequencing, GRAS-Di, which is an outsourcing service. Additionally, a function to identify the kinship will be published on the web. These works could enable to conduct collaborative work internationally.

Discussion

The major difficulty for cooperation among ISC members on CKMR research noted in the 2019 Jeju meeting was the restriction of sharing CKMR techniques among members, but according to the presentation by Japan, the restriction will be relieved to some extent. Hence, members having PBF tissue samples to use the same techniques for DNA analyses for collaboration is now technically feasible. The author responded to an enquiry regarding analyzing about $45 per sample for GRAS-Di sequencing plus the fee for DNA extraction from tissue samples (around $15-20) in Japan. Sample quality of over 5-10 ng/μl of DNA will be a minimum acceptable level for successful DNA analyses. The author also responded that the formula to estimate the finding probability of POP (parent offspring pair) and HSP (half sibling pair) in the southern bluefin tuna model was mimicked and has been tested in the prototype estimation model for PBF. IBD (identification by descent) method for kin recognition used by Japan was discussed. The method will be published shortly but might still have potential concerns for further studies, and Korea expressed their interest to cooperate in this kinship detection method study.

Many benefits of CKMR study were discussed to understand the potential uncertainties and provide an independent estimation of absolute abundance. However, for PBF that was considered to have a good quality of stock assessment compared to other tuna species, and given the imminent workload of update of stock assessment and development of MSE that requested by the NC, the WG considered that the priority of CKMR was low at this moment although encouraging continuous investment in the study. Therefore, in response to the query from the ISC Plenary regarding the necessity of CKMR to improve the assessment, PBFWG provides the following observation; **While normally the strength of CKMR is to provide information on the absolute biomass of fishery resources which is usually difficult to estimate, based on various model diagnostic results the WG is confident that the current PBF assessment provides a reasonable and appropriate level of absolute biomass estimate and thus considers that the need for CKMR is currently low for the stock. However, CKMR can potentially provide useful information on absolute biomass or biology of the stock and may become more valuable in the future assessments or MSE of PBF. Therefore, while currently there is no plan to include CKMR into the stock assessment, the WG encourages its members to continue CKMR researches and exchange information at future WG meetings for further collaboration.**

6.3. Others

The stock assessment workshop of PBFWG was proposed to be held on March 8-18, 2022, in a virtual format. An additional one-day meeting before the workshop for reviewing the PBF index of Japanese longline fishery was scheduled on January 28.

7. ADOPTION OF THE REPORT

The draft report was reviewed, amended as needed, and adopted.

8. ADJOURNMENT

The meeting was adjourned on December 21, 2021.

Table 1	**Full stock assess. in 2020**	**2022 Stock assessment**	Corresponding paper
SS version	SS-V.3.308	SS-V.3.308	
Year definition	July to June (Fishing year)	July to June (Fishing year)	
Time step	Quarter	Quarter	
Stock(spawning population)	Single spawning population	Single spawning population	
Area	Single for assessment	Single for assessment	
Number of age class	21(0-20) -default; 21- lumped	21(0-20) -default; 21- lumped	
Ngender	sex-combined	sex-combined	
SRR	B-H (h=0.999) w/ sensitivity runs	B-H (h=0.999) w/ sensitivity runs	
R0	estimated	estimated	
sigmaR	0.6 (need a diagnostics)	0.6 (need a diagnostics)	
R0 offset	estimated as a regime shift parameter	estimated as a regime shift parameter	
recruitment deviation	Beverton-Holt SRR	Beverton-Holt SRR	
Natural mortality	Age specifc M M0=1.6 M1=0.386 M2+=0.25 w/ Appropriate sensitivity runs	Age specifc M M0=1.6 M1=0.386 M2+=0.25 w/ Appropriate sensitivity runs	
Maturity	Age specific Maturity Age3.75=0.2 Age4.75=0.5 Age 5.75+=1.0	Age specific Maturity Age3.75=0.2 Age4.75=0.5 Age 5.75+=1.0	
Growth curve	Fukuda et al. (2015) vBertalanffy form	Fukuda et al. (2015) vBertalanffy form	
Functional form of CV growth	CV=f(Length at Age)	CV=f(Length at Age)	
Amin	0	0	
Amx	3	3	
L-W	Kai et al., 2007	Kai et al., 2007	
Data Length bin definition	Maintain the same bin width definition	Maintain the same bin width definition	
Weight bin definition	Maintain the same bin width definition	Maintain the same bin width definition	
Population length bin	2 cm for all	2 cm for all	

Small constant to composition data	0.0001 for length comp data; 0.01 for weight comp data	0.0001 for length comp data; 0.01 for weight comp data (Try 0.0001 for weight comp and check the results)	Lee et al., 2021
Catch unit	weight for most of fisheries except US sports early, terminal, discard (numbers) troll for pen fishery, discard (numbers) Jpn PS for pen (number)	weight for most of fisheries except US sports early, terminal, discard (numbers) troll for pen fishery, discard (numbers) Jpn PS for pen (number)	
Catch error	0.1 for fishing fleets, 0.3 for discard fleet	0.1 for fishing fleets, 0.3 for discard fleet	
F-method	3 (solve catch eq) - catch exact	3 (solve catch eq) - catch exact	
upperF	10	10	
Fishery definition	22 Fleets for fisheries, 3 Discatd fleets for unaccounted catch, 5 Surveys for abundance indices	22 Fleets for fisheries, 3 Discatd fleets for unaccounted catch, 5 Surveys for abundance indices	
Selectivity for fishery	Type 1 Time-invariant size based Double normal/Asymptotic; Type 2 Combination of Time-invariant size based Asymptotic and Time-invariant age specific non-parametric; Type 3 Time variant size based Double normal (Time-block); Type 4 Combination of Time invariant size based Asymptotic and Time variant age specific non-parametric; Type 5 Combination of Time invariant size based Double normal and Time variant age specific non-parametric; Type 6 borrow from other fleet (not fitted to comp data); Type 7 Given Age specific non-parametric (not fitted to comp data); Type 8 Combination of Time-invariant size based Asymptotic and Sharable Time variant age-based (fitted to comp data);	Type 1 Time-invariant size based Double normal/Asymptotic; Type 2 Combination of Time-invariant size based Asymptotic and Time-invariant age specific non-parametric; Type 3 Time variant size based Double normal (Time-block); Type 4 Combination of Time invariant size based Asymptotic and Time variant age specific non-parametric; Type 5 Combination of Time invariant size based Double normal and Time variant age specific non-parametric; Type 6 borrow from other fleet (not fitted to comp data); Type 7 Given Age specific non-parametric (not fitted to comp data); Type 8 Combination of Time-invariant size based Asymptotic and Sharable Time variant age-based (fitted to comp data); Type 9 Combination of Time-invariant size based Double normal and Sharable Time variant age-based (fitted to comp data).	

	Type 9 Combination of Time-invariant size based Double normal and Sharable Time variant age-based (fitted to comp data).		
Fleet 1	Japanese Longline; Catch in weight; Length comp data available; Selex Type3 (-1992, 1993-);	Japanese Longline; Catch in weight; Length comp data available; Selex Type3 (-1992, 1993-);Move recent (2017-2020) catch and size data to Fleet 28 (Jpn LL season1-3) as fishery removals (subject to check). Remove size observations small than 152cm during 1994-2016.	
Fleet 2	Japanese Small Plagic Fish Purse Seine for market (Season 1, 3, 4); Catch in weight; available Length Comp 1 (Dome) and 7	Japanese Small Plagic Fish Purse Seine for market (Season 1, 3, 4); Catch in weight; available Length Comp 1 (Dome) and 7	
Fleet 3	Korean Offshore Large Purse seine Catch in weight; Length comp. available; Selex Type 4	Korean Offshore Large Purse seine Catch in weight; Length comp. available; Selex Type 4	
Fleet 4	Japanese Tuna Purse Seine operating in the Sea of Japan; Catch in weight; Length comp available; Selex type 4	Japanese Tuna Purse Seine operating in the Sea of Japan; Catch in weight; Length comp available; Selex type 4	
Fleet 5	Japanese Tuna Purse Seine operating in the Pacific coast; Catch in weight; Length comp available; Selex type 4 (Time block)	Japanese Tuna Purse Seine operating in the Pacific coast; Catch in weight; Length comp available; Selex type 4 (Time block)	
Fleet 6	Japanese troll (Season 2-4); Catch in weight; Length Comp. available; Selex Type 1 (Double Normal) and 7	Japanese troll (Season 2-4); Catch in weight; Length Comp. available; Selex Type 1 (Double Normal) and 7	
Fleet 7	Japanese Pole and Line; Catch in Weight; Length Comp. available; Selex Type 6	Japanese Pole and Line; Catch in Weight; Length Comp. available; Selex Type 6	

Fleet 8	Japanese Setnet Season 1-3; Catch in weight; Length Comp. available; Selex Type 2	Japanese Setnet Season 1-3; Catch in weight; Length Comp. available; Selex Type 2	
Fleet 9	Japanese Setnet Season 4; Catch in weight; Length Comp. available; Selex Type 2	Japanese Setnet Season 4; Catch in weight; Length Comp. available; Selex Type 2	
Fleet 10	Japanese Setnet in Hokkaido and Aomori Catch in weight; Weight Comp (combined with Fleet 11 in the data file). available; Selex Type 8	Japanese Setnet in Hokkaido and Aomori Catch in weight; Weight Comp (combined with Fleet 11 in the data file). available; Selex Type 8	
Fleet 11	Japanese Other fishery (mainly in Hokkaido and Aomori) Catch in weight; Weight Comp. available (combined with Fleet 10 in the data file); Selex Type 8	Japanese Other fishery (mainly in Hokkaido and Aomori) Catch in weight; Weight Comp. available (combined with Fleet 10 in the data file); Selex Type 8	
Fleet 12	Taiwanese Longline South fishing ground Catch in weight; Length Comp. available; Selex type 1	Taiwanese Longline South fishing ground Catch in weight; Length Comp. available; Selex type 1	
Fleet 13	1952-2001; US com PS; Catch in weight; Length Comp. available; Selex type 3	1952-2001; US com PS; Catch in weight; Length Comp. available; Selex type 3	
Fleet 14	2002-; Mexican PS for pen (include US catch) Catch in weight; Length Comp. available; Selex type 3	2002-; Mexican PS for pen (include US catch) Catch in weight; Length Comp. available; Selex type 3	
Fleet 15	US recreational (recent); Catch in number of fish; Length comp. available; Selex Type3	US recreational (recent); Catch in number of fish; Length comp. available; Selex Type3 Use size data from Onboard sampling data from 2019~	James et al., 2021, Lee et al., 2021
Fleet 16	Japanese troll for pennning Catch in number of fish, No size comp. available; Selex type 7 (Fix only age-0 selectivity as full selection)	Japanese troll for pennning Catch in number of fish, No size comp. available; Selex type 7 (Fix only age-0 selectivity as full selection)	

Fleet 17	Taiwanese Longline North fishing ground; Catch in weight; Length Comp. available; Selex type 1	Taiwanese Longline North fishing ground; Catch in weight; Length Comp. available; Selex type 1	
Fleet 18	Japanese Small Plagic Fish Purse Seine (Season 2); Catch in weight; Length comp. available, Selex Type 5	Japanese Small Plagic Fish Purse Seine (Season 2); Catch in weight; Length comp. available, Selex Type 5	
Fleet 19	Japanese Troll (Season 1); Catch in weight; Length comp. available; Selex Type 1	Japanese Troll (Season 1); Catch in weight; Length comp. available; Selex Type 1	
Fleet 20	Japanese Small Plagic Fish Purse Seine (Penning); Catch in number of fish; Length comp. available; Selex Type 1 (Dome)	Japanese Small Plagic Fish Purse Seine (Penning); Catch in number of fish; Length comp. available; Selex Type 1 (Dome)	
Fleet 26	WPO Discard (unit: mt); Catch in weight; no size data available; selex Type 6	WPO Discard (unit: mt); Catch in weight; no size data available; selex Type 6	
Fleet 27	WPO Discard (unit: ind); Catch in number; no size data available; selex Type 6	WPO Discard (unit: ind); Catch in number; no size data available; selex Type 6	
Fleet 28	Japanese Longline (Season 1-3); Catch in weight; Length comp data available; Selex Type1;	Japanese Longline (Season 1-3) for 1993-2016 and all seasons from 2017; Catch in weight; Length comp data available; Selex Type1;	
Fleet 29	US recreational (early); Catch in number of fish; Length comp. available; Selex Type 6	US recreational (early); Catch in number of fish; Length comp. available; Selex Type 6	
Fleet 30	US recreational (discard); Catch in number of fish; Length comp. available; Selex Type 6	US recreational (discard); Catch in number of fish; Length comp. available; Selex Type 6	
CPUE S1	Standerdized Japanese longline CPUE (terminal) by the Geo-stat standerdization (1993-2018)	Standerdized Japanese longline CPUE (terminal) by the Geo-stat standerdization (1993-2020)	
CPUE S2	Standerdized Japanese longline CPUE by the log-normal model	Standerdized Japanese longline CPUE by the log-normal model	

CPUE S3	Standerdized Japanese longline CPUE by the log-normal model	Standerdized Japanese longline CPUE by the log-normal model	
CPUE S4	Standardized Japanese Troll CPUE by the log-normal model (1980-2016, 2018);	Standardized Japanese Troll CPUE by the log-normal model (1980-2016);	Nishikawa et al., 2021, Fukuda et al., 2021, Fujioka et al., 2021
CPUE S5	Standardized Taiwanese LL CPUE Delta-lognormal GLMM;	Standardized Taiwanese LL CPUE Delta-lognormal GLMM; 2002-2020	
CPUE S6		Standardized Japanese Troll monitoring survey CPUE by VAST (2017-2020)	Fujioka et al., 2021
CPUE (JLL) selectivity	Same as Fleet 1	Same as Fleet 1	
CPUE (Jp Troll) selectivity	Same as Fleet 6	Same as Fleet 6	
CPUE (TWLL) selectivity	Same as Fleet 12	Same as Fleet 12	
CPUE likelihood	lognormal	lognormal	
CPUE lambda	1	1	
CPUE CV	Lowest is 0.2, use observation error if it is above 0.2.	Lowest is 0.2, use observation error if it is above 0.2.	
Input sample size for LenComps	Number of haul well measured/ Number of fish measured/Number of landing well measured/Number of total month of well sampled port	Number of haul well measured/ Number of fish measured/Number of landing well measured/Number of total month of well sampled port	
1st year of main Rdev	1953	1953	
SR auto correlation	no	no	

Initial F	Estimate without fitting to EqC	Estimate without fitting to EqC	
	Fleet 1, Fleet 8	Fleet 1, Fleet 8	
uncertainty	Statistical uncertainty using bootstrapping procedure for 300 times	Statistical uncertainty using bootstrapping procedure for 300 times (apply procedure 4 of Lee et al., 2021)	Lee et al., 2021
Diagnostics of the model	ASPM model, Jitters, retrospective analysis, Likelihood profile relative to R0, model fits to the data, residual analysis	ASPM model, Jitters, retrospective analysis, hindcast, Likelihood profile relative to R0, residual analysis	Lee and Piner (2021)
GRID APPROARCH	not cunducted	The WG will not conduct grid approarch, but may have a robustness test of the current CMMs for lower steepness and lower natural mortality using short time series model.	Fukuda (2021)

APPENDIX 1

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

PACIFIC BLUEFIN TUNA WORKING GROUP INTERSESSIONAL WORKSHOP
December 2021
Online

INFORMATION AND DRAFT AGENDA

Meeting Objectives

The ISC Pacific Bluefin tuna working group (ISCPBFWG) is planning to conduct an update stock assessment of Pacific bluefin tuna in 2022. The WG is also requested several technical works such as the future projections and the development of MSE framework from the WCPFC and IATTC. The primary objective of the present meeting is to confirm the data and model structure of the next assessment. The WG will also discuss how to respond to the request from the WCPFC and IATTC.

Draft agenda

1 Opening and Introduction
  1.1 Welcome and introduction
  1.2 Adoption of agenda
  1.3 Appointment of rapporteurs

2 Review of the assessment data
  2.1 Catch information for FY 2019 and 2020
  - The formal submission of input data for assessment is scheduled on December 31. This is an opportunity for WG to informally go over the updated catch data (FY 2019 and 2020). Please, if possible, submit PBF catch in FY 2020 (July 2020 to June 2021) to Hiromu Fukuda (fukudahiromu@affrc.go.jp).

  2.2 Review of updated CPUEs for assessment
  - Please present updated CPUEs with up to FY2020.
  2.3 Review of updated size composition data for assessment
  -Please present updated size comps with up to FY2020 (if available).

3 Possible areas of change in the assessment model
-The next assessment is planned as a data update and, in principle, any of change in the model structure or data preparation method is out of the scope. However, in the previous intersessional meeting, the WG recognized that several changes are obviously beneficial for the assessment model. This is an opportunity for WG to confirm the assessment model structure including possible areas of subject to changes.
  3.1 Input data

3.2 Model assumption and structure

4 Future projection

-The WG is requested from the WCPFC NC to conduct several future projections for their consideration of the long-term management of this species. This is an opportunity for WG to confirm the harvesting scenarios, procedure of the requested projections, and deliverables to respond the WCPFC NC.

4.1 Scenarios of projection for the next assessment

4.2 General Discussion for the response to the requests from RFMO

5 Management Strategy Evaluation

5.1 General model structure of the operating model

5.2 Status of the MSE-related elements (e.g. Management objectives, RP, HCR)

6 Other matters

6.1 New scientific information relevant to PBF

6.2 Close-Kin mark recapture analysis

6.3 Others

7 Adoption of the report

8 Adjournment

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APPENDIX 3 LIST OF DOCUMENTS

Working papers

index	Related Agenda	Title	Author	Contact	Website availability (Yes/No)
ISC21/PBFWG-02/01	2.2	CPUE and Catch at Size for Pacific Bluefin tuna (*Thunnus Orientalis*) caught by Japanese coastal and offshore longline	Yohei Tsukahara, Saki Asai, Hiromu Fukuda, Shuya Nakatsuka	tsukahara_y@affrc.go.jp	Yes
ISC21/PBFWG-02/02	2.2	Update of relative CPUE (up to 2021) of Taiwanese PBF fisheries using delta-generalized linear mixed models (GLMM) and vector-auto-regressive spatiotemporal model (VAST)	Shui-Kai Chang, Bing-Jing Lu, Tzu-Lun Yuan	skchang@faculty.nsysu.edu.tw	Yes
ISC21/PBFWG-02/03	2.2	Estimation of recruitment index of Pacific bluefin tuna based on real-time troll monitoring survey data using Vector Autoregressive Spatio-Temporal (VAST) model analysis	Ko Fujioka, Yohei Tsukahara, Saki Asai, Kirara Nishikawa, Hiromu Fukuda and Shuya Nakatsuka	fuji88@affrc.go.jp	Yes
ISC21/PBFWG-02/04	2.3	PBF size composition 2020-2021 from the Mexican purse seine fishery from data collected at pen rearing operations	Michel J. Dreyfus-Leon	dreyfus@cicese.mx	Yes
		Withdrawn			
ISC21/PBFWG-02/06	2.3	Update of Korean fisheries information for Pacific bluefin tuna, *Thunnus orientalis*	Junghyun Lim, Mi Kyung Lee, Sung Il Lee, Youjung Kwon and Doo Nam Kim	jhlim1@korea.kr	Yes
ISC21/PBFWG-02/07	2.3	The input data format for Pacific Bluefin tuna stock assessment conducted by Stock Synthesis.	Kirara Nishikawa and Hiromu Fukuda	kiraranishi@affrc.go.jp	Yes
ISC21/PBFWG-02/08	2.3/3.1	What is next? Lessons learned from sensitivity model runs using length compositions collected by the Sportfishing Association of California	Huihua Lee	huihua.lee@noaa.gov	Yes
		Withdrawn			
ISC21/PBFWG-02/10	3.2	How good is it? Using a 10-years hindcast to conclude the PBF assessment and projections provide a very good basis for management advice	Huihua Lee, Kevin Piner	huihua.lee@noaa.gov	Yes
ISC21/PBFWG-02/11	4.1	A review of model setting and updated scenarios for the 2022 future projection of Pacific bluefin tuna.	Kirara Nishikawa, Hiromu Fukuda and Shuya Nakatsuka	kiraranishi@affrc.go.jp	Yes
ISC21/PBFWG-02/12	5.1	How to improve a flexibility of the Stock Synthesis model for Pacific bluefin stock to the alternative assumptions with keeping its performance	Hiromu Fukuda	fukudahiromu@affrc.go.jp	Yes
ISC21/PBFWG-02/13	2.2	Real-time recruitment monitoring for Pacific bluefin tuna using CPUE for troll vessels: Update up to 2020 fishing year	Ko Fujioka, Yohei Tsukahara, Saki Asai, Kirara Nishikawa, Hiromu Fukuda and Shuya Nakatsuka	fuji88@affrc.go.jp	Yes

Oral presentations

Related Agenda	Title	Author	Contact
2.1	PBF catch information submitted from 5 countries	Kirara Nishikawa	kiraranishi@affrc.go.jp
2.3	Japanese catch and size composition information	Kirara Nishikawa	kiraranishi@affrc.go.jp
3.1	Evaluate recruitment index	Huihua Lee, Kevin Piner	huihua.lee@noaa.gov
5.1	Lesson Learned from the North Pacific Albacore MSE and Potential Application to Pacific Bluefin Tuna	Desiree Tommasi	desiree.tommasi@noaa.gov
6.2	Recent progress of Close-kin research in Japan	Yohei Tsukahara	tsukahara_y@affrc.go.jp
6.2	Research activities for Pacific bluefin tuna Close-kin Mark Recapture	Mi Kyung Lee, Sung Il Lee, Junghyun Lim, Youjung Kwon and Doo Nam Kim	ccmklee@korea.kr
6.2	Update on close kin genetic activities at the SWFSC	Matthew Craig, John Hyde	matthew.craig@noaa.gov