FINAL

ISC/24/ANNEX/08

ANNEX 08

24th Meeting of the
International Scientific Committee for Tuna
and Tuna-Like Species in the North Pacific Ocean
Victoria, Canada
June 19-24, 2024

REPORT OF THE ALBACORE WORKING GROUP WORKSHOP

June 2024

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ANNEX 8

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

11 – 18 March 2024
Fisheries and Oceans Canada Institute of Ocean Sciences
Victoria, CANADA

1. OPENING AND INTRODUCTION

An intersessional workshop of the Albacore Working Group (ALBWG or WG) of the International Science Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC) was convened at the Fisheries and Oceans Canada Institute of Ocean Sciences, Victoria, Canada, 11-18 March 2024.

John Holmes, Fisheries and Oceans Canada Division Manager of Stock Assessment and Research in the Pacific region, and current Chair of the ISC, welcomed participants from Japan, the United States of America (USA), Chinese Taipei, the Inter-American Tropical Tuna Commission (IATTC), and Canada to the workshop, both in-person and virtually. He mentioned that this was the first time the ALBWG has held a meeting at the Institute of Ocean Sciences in Victoria. He reminded the ALBWG of the importance of the scientific work that they conduct and noted the healthy status of the North Pacific albacore tuna (NPALB) stock and wished the group a productive meeting.

The ALBWG Chair briefly described the objectives of the meeting and the expected outcomes. The objectives of this workshop were to: 1) make progress on improvements to biological modelling, data collection and reporting, and abundance index improvements; 2) address tasks for the ALBWG from ISC plenary and RFMOs (updated abundance index, update exceptional circumstances, options to translate fishing intensity); and 3) discuss code archiving and MSE modelling training.

2. MEETING LOGISTICS

2.1 Meeting protocol

The ALBWG Chair noted that the efforts of the WG at this meeting would be collegial and follow the scientific method with an emphasis on empirical testing, open debate, documentation and reproducibility, reporting uncertainty, peer review, and constructive feedback to authors and presenters.

2.2 Review and adoption of agenda

The draft agenda was circulated prior to the meeting, reviewed, and adopted at the workshop (**Attachment 2**). A list of working papers and presentations can be found in **Attachment 3**.

2.3 Assignment of rapporteurs

Rapporteuring duties were assigned to Haikun Xu and Steven Teo. Sarah Hawkshaw had the overall responsibility for assembling the report.

2.4 Distribution of Documents and Working Paper Availability

Seven (7) working papers (WP) were submitted and assigned numbers for the workshop (**Attachment 3**). Working papers will be publicly available through the ISC website (http://isc.fra.go.jp/) and author contact details will be provided for the other related materials.

3. REVIEW WORK ASSIGNMENTS

The WG chair briefly presented the research priorities identified during the 2023 stock assessment and the table of work assignments developed at previous WG meetings (Table 1).

4. Review Working Papers

4.1 Updated abundance index for ISC24

Additional Japanese longline logbook data analysis on CPUE of adult North Pacific albacore tuna. ***Makoto Nishimoto, Hirotaka Ijima, Naoto Matsubara and Yuichi Tsuda (ISC/24/ALBWG-01/04)***

This working paper reports on the Japanese longline CPUE standardization results conducted during the North Pacific albacore tuna stock assessment. At the request of the ISC Albacore Working Group (ALBWG), we addressed two analyses using the R software package R-INLA, which includes, 1) using data for all quarters in area 2 with the addition of data from the most recent year and then extracting the second quarter results, and 2) estimating the abundance trend with explicit uncertainty. The model including data from all quarters converged well, and the resampling program for the posterior distribution of the standardized CPUE was modified to work in realistic time by reducing the number of iterations. On the other hand, since the number of iterations is currently kept to the minimum necessary, we plan to address this by modifying the program in the future to improve the accuracy of the uncertainty assessment.

Discussion

The WG thanked the authors for conducting this updated analysis of the CPUE standardization for the JPLL fishery in Q2 and A2, which included two additional years of data and improved uncertainty estimates.

The WG noted that the JPLL data used was from 1996 to 2023 and were reminded that the data start in 1996 rather than 1994 because there is evidence in the logbook data that there was a change in gear transitioning before 1996. **The WG recommended that the JPLL data be reevaluated for a start year in 1994, rather than 1996, in the next stock assessment cycle.** The WG also noted that aggregated set data was used rather than operational, and enquired about the reasons. The authors responded that the main reason was the high computational cost of using operational data, which is substantially reduced with aggregated data. However, a member of the WG noted that using operational data improves model diagnostics compared to aggregated data, when using a log normal distribution, for example. The authors noted that the operational data are difficult to fit given they have some extreme tail cases of for example, small effort and high catch in real data. The WG noted that it should be considered how important it is to model the extreme values in the tails.

The WG suggested several potential improvements for the authors to consider for this standardization model, including reevaluating the random field with a biological lens. However, the authors noted that this index was an updated index for examining recent CPUE trends since the 2023 assessment, which had a 2021 terminal year. The authors also noted that an alternative candidate adult index for the 2026 assessment is detailed in **ISC/24/ALBWG-01/06**, which is meant as an improvement over the current index. In addition, a potential method to improve the fleet structure for the 2026 assessment will be discussed in **ISC/24/ALBWG-01/01.**

The WG examined this updated index in order to respond to the ISC Plenary request to provide updated stock status and conservation information at ISC24. The abundance index in the 2023 stock assessment went from a historical low in 2020 to an above average estimate in 2021, which was the terminal year in the index for the latest assessment. The WG noted that with the addition of the 2022 and 2023 data, the 2021 index estimate is still slightly above the average index value in the timeseries and the 2022 and 2023 index estimates were in a similar range to 2021. **The WG agreed that the terminal 3 years of the index (2021 – 2023) had values that were all slightly above average. However, as in the 2023 assessment, the 2020 index estimate was still at a historical low. The WG recommended that this information be presented at the ISC24 Plenary meeting with the stock status and conservation information from the 2023 stock assessment.**

The WG also recommended that this method of CPUE standardization continue to be considered and improved (i.e., updated fleet structure in ISC/24/ALBWG-01/01) as alternative methods are developed (i.e., ISC/24/ALBWG-01/06).

Updated standardized CPUE for North Pacific albacore caught by the Japanese pole and line from 1972 to 2022. ***Makoto Nishimoto, Naoto Matsubara and Hirotaka Ijima (ISC/24/ALBWG-01/03)***

This document describes the location of operations and spatial changes in standardized CPUE for the Japanese pole and line (JPPL) albacore fishery CPUE was updated to include the most recent data, including the year 2022, to update the results. The CPUE was standardized using the same methodology as last year's albacore tuna stock assessment, but a program code error regarding data aggregation was discovered and corrected. The results of the analysis showed that the estimated standardized CPUE showed almost the same trend as the nominal CPUE. Recent standardized CPUE (2015-2022) was highly variable, with 2022 being the lowest historically.

At the last ISC Albacore Working Group Assessment Improvement Meeting on December 6-12, 2022, we gave the presentation on the overview of JPPL fishery and the CPUE calculated by GLM using delta-log normal method (Matsubara et al. 2022). This document describes an update of the analysis using the same method for the JPPL data for Q2 and Q3 as before, with the addition of data for the latest year (2022). In the course of the update, a code error was discovered in which the data aggregation process for the 5-degree grid was not applied properly, and we corrected so that the number of captures and effort were aggregated as annual totals. In this report, we present the updated results as well as our outlook for future modeling.

Discussion

The WG noted that this current stock assessment does not fit to this index given that the WG does not think that the juvenile indices currently show the recruitment trends. This is potentially due to time-varying migration patterns of juveniles to the EPO, not being accounted for and target switching between skipjack and albacore in the fishery operations. The authors suggested that one potential way to deal with target switching for this fishery is to use a two species model. Understanding growth patterns, however, is very complicated with migration. The WG discussed future steps for improving this index and noted that the juvenile indices should continue to be improved and investigated.

The WG noted that for past assessments, the WG preferred the use of a juvenile longline index rather than the pole-and-line index and the EPO surface fleet index. In addition, it was important for the juvenile index standardization methods to be consistent with the adult index methods. **The WG agreed to continue to develop the juvenile indices and to compare the four candidate juvenile indices (JPPL, EPOSF, juvenile JPLL and TWNLL) at the model improvement meeting in early 2025.**

4.2 Investigate potential COVID-I9 safety protocols impacts

The impact of Covid-19 on Japanese longline fishery. ***Naoto Matsubara, Makoto Nishimoto, Yoshinori Aoki, Hirotaka Ijima and Yuichi Tsuda (ISC/24/ALBWG-01/02)***

This working paper summarized the potential impacts of Covid-19 safety protocols on Japanese longline (JPLL) fisheries. The JPLL catch per unit effort (CPUE) submitted in the previous 2023 stock assessment showed a sharp decline in 2020, followed by a sharp increase in 2021, and at the 2023 stock assessment meeting in La Jolla, the Albacore Working Group (WG) suggested that the safety protocols taken as a result of Covid-19 may have impacted catch and effort. To verify whether these sudden changes were due to Covid-19 safety protocol responses, interviews with fishing masters were conducted in order to confirm any of the changes in effort from logbook data from 2019-2022. The results of the interviews showed that seven out of ten fishing masters responded that their fishing effort was not changed by Covid-19 safety protocols. Two of the remaining three fishing masters responded that fish prices had increased, and one fishing master responded that its fishing grounds were off Japan in 2020. The results from the number of data set of logbook showed that the number of data in 2020 was almost similar as in 2019, while the number of data in 2021 tended to be slightly less than in 2020. Effort data showed a slight decreasing trend as a whole, but no significant changes were observed. The efforts also showed a tendency to be concentrated and distributed around the nearshore area of Japan in 2020, and over certain level for effort were confirmed to be distributed around Area 2 in 2021. There was also the trend for albacore catch and CPUE to decrease significantly 2 in 2020, and increase sharply in 2021 around Area 2.

At this point, no clear evidence was found from the fishing master interviews or effort trends to suggest that Covid-19 safety protocols had an impact on the JPLL fishing operations from 2019 - 2021.

Discussion

The WG thanked the authors for the informative presentation. The WG noted that from this analysis there appears to be no important impacts of Covid-19 safety protocols on the CPUE index for albacore. There was still a large drop in the index in 2020 and an increase in 2021 however this was more likely to have be caused by environmental factors and changes in migration patterns.

The WG agreed with the conclusion that COVID-19 safety protocols did not have substantial impacts on fishery operations of the Japanese longline fishery.

4.3. Abundance index improvements

Updated analysis for Japanese longline logbook data by finite mixture model.
Naoto Matsubara, Makoto Nishimoto, Yuichi Tsuda and Hirotaka Ijima (ISC/24/ALBWG-01/01)

This document summarized for the information of new fleet definition by clustering of finite mixture model to input the future stock assessments. We reanalyzed Japanese longline logbook data using the finite mixture model to improve the fisheries definition in the North Pacific albacore stock assessment. In a previous document, we reported the results of our analysis focusing only on Area 1 and Area 3 (Ijima and Tsuda., 2022), but at previous stock assessment meeting, there were the trends of large fluctuations for Japanese longline CPUE and it was mentioned that it may be potentially reflected the mix of adult and immature albacore information in Area 2 due to the problems with the area division of the fleet definition. This document summarized about reanalysis of all areas by the several finite mixture model with updated logbook data from the previous document, in addition, statistically validate the model selection and number of clusters in the model.

Discussion

The WG thanked the authors for the updated analysis and noted that this methodology is important accommodate the fundamental biological assumption used in the NPALB stock assessment that the fish are segregated by size over space and time. The WG agreed that this approach is useful for the JPLL data however size data quality in other fisheries may be limited and it may be difficult to use this cluster analysis method in these cases.

The WG agreed that all members would attempt to use this or similar methods to classify their fisheries for the 2026 assessment. The authors agreed to provide the analytical code to the WG to help with the analysis. The WG also agreed that it was important to think through the consequences of using this approach and how it impacts the assessment model. Therefore, the **WG decided that at the model improvement meeting in early 2025, the WG will decided on whether to apply this approach and if so, for which fisheries, and how to apply it for the 2026 assessment.**

Preliminary analysis for size-based abundance indices considering multiple latent spatial fields. ***Hirotaka Ijima and Yuichi Tsuda (ISC/24/ALBWG-02/06)***

The ISC Albacore Working Group adopts an Area-as-Fleet approach, considering that Japanese longline vessels catch albacore of different sizes and genders in different areas. However, multiple cohorts are caught in the same area, and the main distribution of albacore may extend beyond the designated areas by year. Japanese researchers have developed a new fisheries definition methodology using a finite mixture model. This approach allows the classification of multiple cohorts in the same area without the need for boundary setting, thus improving the accuracy of stock assessment. In this study, we attempted to standardize CPUE using logbook data sorted by fish size. As a result, the preliminary model converged, and standardized CPUE for four size groups was obtained. We plan the additional analysis, including discrete distribution models with offset terms, adding an average spatial field, developing an alternative model for three-size groups, and excluding fixed effects by year. We will summarize these results and prepare a manuscript for submission.

Discussion

The WG thanked the authors for providing this preliminary analysis of this new methodology for the NPALB abundance index. The authors noted that this work is still preliminary and additional improvement will be made before the next working group meeting. They also noted that the analysis used fleet definitions from the updated analysis presented in **ISC/24/ALBWG-01/01.** The WG agreed that the methodology and theory presented in this working paper is an improvement from the previous abundance index standardization methods, however the modelling will require several improvements. **The WG made several suggestions for the authors to consider as they continue to develop this methodology and recommended that**

the authors present an updated analysis to be considered at the next working group meeting. The WG also suggested that authors should consider alternative size specific spatial temporal models to compare different adult and juvenile indices methods (ie, Maunder et. al., 2020, ISC/24/ALBWG-01/Presentation 02).

Catch, length and standardized CPUE of North Pacific albacore caught by the Taiwanese distant-water longline fisheries in North Pacific Ocean from 1995 – 2022 (improvement). ***Hsu, J., Yeh, Z., and Chang, Y. (Presentation 02)***

The authors presented a summary of the updates to the standardized catch rate data and length composition of albacore exploited by Taiwanese distant-water longliners (TWN LL) in the North Pacific Ocean (NPO) from 1995 - 2022. Catch data of the albacore caught by Taiwanese longliners in the NPO was also summarized by quarter. Albacore-targeting fleets were identified by using a cluster analysis. The catch rates of albacore within albacore-targeting fleets were mainly distributed in Areas 3 and 5 in Q1 and Q4. Therefore, the authors utilized the albacore-targeting dataset to conduct standardized CPUE analysis to provide juvenile information for Areas 3 and 5 in Q1 and Q4. The catch rate data were standardized using a Vector-Autoregressive Spatio-Temporal model with year, spatial, spatio-temporal, and vessel effects as explanatory variables. Overall, the trend of standardized CPUE in recent years was stable. Results suggest that TWN LL data could provide additional albacore information from Q4 in Area 5 compared to the current abundance index (JPN LL juvenile index) used in the assessment model.

Discussion

The WG discussed the use of the TWN LL data as a juvenile index and compared to the JPN LL juvenile index analysis. The WG noted that the JPN LL effort in the EPO is decreasing but the TWN LL effort in the EPO is increase, so it may provide a good option for the juvenile index.

The WG recommended that the authors continue to develop this model and that all juvenile indices be compared at the next working group meeting.

The WG also recommended that the authors start developing a size-specific spatiotemporal model to provide standardized size compositions for the index fishery, which will be used to estimate the selectivity of the index fishery.

4.4. Biological modeling and data collection (Catch, Effort, Aging Data, Sex Composition, etc.)

Biological sampling and data collection for North Pacific albacore by Fisheries Research Institute, Japan. Tsuda, Y., Aoki, Y., and Matsubara, N. (Presentation 01)

A summary of the updates to the biological sampling and data collection for NPALB by Japan was presented to the WG. Japan has been collecting length and weight data for NPALB since 1967. A total of 372,745 fish have been measured for length, and 50,773 for weight, at major landing ports (Nachi-Katsuura, Yaizu, and Kesennuma) and from research and training vessels. In recent years, Japan has expanded its biological sampling program to collect otoliths for age estimation, gonads for sex identification and maturity stage determination, and muscle tissue for DNA analysis to potentially determine sex and for isotope analysis to gain ecological information about NPALB. From 2020 to 2023, Japan conducted a tagging program, releasing 165 NPALB with archival tags in the waters near Japan. To date, movement data have been obtained from two individuals. These data could be used to improve growth models and investigate spatiotemporal variation in length-at-age in future stock assessments of NPALB.

Discussion

The WG thanked Japan for this updated information. The WG asked the author to share the results of the analysis of biological samples collected from the EPO area, as there is limited information on the sex ratio and growth curve in this area. **The WG recognized the lack of updates to the biological parameters stock assessment since 2017 and emphasized the need for a comprehensive re-evaluation of biological parameters (growth, reproduction and sex composition) for the next stock assessment. The WG recommended discussing methods to updated these biological parameters at the next WG meeting.**

The WG discussed options for improvements to the biological modeling within the stock assessment. Growth, reproduction and sex composition were the main biological parameters discussed.

For the growth model, three options were discussed: 1. Fit the growth inside the assessment model; 2. Develop a new growth curve with old and new data; and 3. Compare the old growth curve with thenew growth curve.

For reproduction it was suggested that the WG reexamine the maturity and spawning seasonality of the stock. The WG noted that the Chen et al. (2016) maturity paper needs updating and Japan may be able to provide and compare the new maturity data with the Chen et al. 2016 study. The WG further recommended the reevaluation of the reproductive spawning seasonality analysis for NPALB.

For the sex composition data the WG will need to further consider the updated genetics data from both US and Japan.

4.5 High seas driftnet and squid gillnet fisheries

S. Teo updated the WG on the progress of the project to estimate NPALB catch and bycatch from the historical high seas drift gillnet fisheries (large-mesh and flying squid). S. Teo reported that the observer data of these fisheries have been obtained and examined, and is ready for use. However, none of the ISC member countries with historical high seas gillnet fisheries have currently provided logbook data. Korea has reported that they will provide the logbook data shortly but also reported that the logbook coverage is less than 100% and only a few years of data are available. Japan and Taiwan have identified the sources of logbook data and are in the process of obtaining permission to provide the data to the WG. S. Teo will be meeting the STATWG Chair and the ISC Data Manager at the end of March to discuss the storage of the data in the ISC database.

Discussion

The WG noted that some countries still need time to examine these historical data and obtain approval to release the logbook data to the ISC.

The WG discussed the possibility of conducting a simulation analysis to investigate the potential impacts of scenarios from these data to show the risks of omitting these data in the stock assessments if the assessment models start earlier than 1994.

The WG recommended that a working paper with analysis of the historical drift net fisheries be prepared for the 2025 modelling improvements meeting. The WG chair will provide an update at ISC24.

4.7. Options for HCR fishing intensity implementation

Relationships between fleet-specific spawning potential ratios and measures of catch and effort for North Pacific albacore tuna. ***Teo, S., Lee, H., Tommasi, D., Hawkshaw, S., Yi-Jay Chang, Tsuda, Y., and Kwon, Y. (ISC/24/ALBWG-01/07)***

The WCPFC and IATTC adopted harvest strategies for NPALB in 2023. These harvest strategies include harvest control rules that mandated reductions in fishing intensity if the female spawning stock biomass fell below reference points. Fishing intensity in the NPALB stock assessment and harvest strategy was defined as $F_{\%SPR}$, which is the fishing intensity associated with a specific spawning potential ratio (SPR). The WCPFC NC and IATTC requested that further work be performed to relate reductions in fishing intensity to more traditional measures of catch and/or effort. The aim of this working paper is to: 1) estimate the fleet-specific fishing intensities from the 2023 stock assessment results; and 2) relate changes in the estimated fleet-specific fishing intensities to multiple fleet-specific measures of effort and catch. The base case model for the 2023 stock assessment was used to estimate the fleet-specific $F_{\%SPR}$. In order to simplify this analysis, fleets from the same country, gear, and areas were combined into fleet groups for this analysis. Quarterly effort data for each fleet group were collated from national databases or RFMOs. Estimated catches in metric tons and numbers for each fleet were extracted from the 2023 stock assessment model and combined into the fleet groups. A cross-correlation was first performed on the catch and effort data for each fleet group, together with the estimated fleet-specific SPR. Depending on the fleet group and the results from the cross-correlation, one or more effort and/or catch variables were used as explanatory variables in a series of generalized linear models to explain the changes in SPR. All fleet groups exhibited strong relationships between catch and SPRs. However, these relationships are expected to change if recruitment and/or fleet selectivity change substantially in the future. This analysis is based on historical (1994 – 2021) conditions in the 2023 assessment and if the stock conditions are very different, the analysis may not be useful. It is therefore recommended that the fleet-specific catch and effort reduction per unit of SPR presented in this analysis be thought of as approximate and illustrative, and will likely need to be reevaluated if SSB falls below the threshold or limit reference points, as this may be an indication of exceptional circumstances. The relationships between effort and SPRs are fleet-specific and more variable than between catch and SPR. Some of the fleet groups (e.g., JPPL and EPOSF) exhibited moderately strong relationships between effort and SPRs, and may be able to be managed using effort. However, the increased variability in the relationships between effort and SPRs should be taken into account. It is recommended that the ALBWG consider the information from this paper to develop advice on how fishing intensity should be interpreted into actual management under this harvest strategy.

Discussion

The WG discussed a preliminary version of the working paper and made suggests for revisions. The updated version of the working paper was then discussed at an online meeting in April 2024.

Preliminary discussion:

The WG discussed the interpretation of the request from the WCPFC and IATTC:

"The USA and Canada stressed their desire to control their troll and pole-and-line fisheries by effort. The NC requested ISC in 2024 to advise how the fishing intensity should be interpreted to actual management measures under this harvest strategy"

"The IATTC scientific staff in 2024 shall collaborate with the ISC to advise how fishing intensity should be interpreted to actual management under this harvest strategy"

In a situation when the stock status falls below the threshold reference point (30%SSBF=0) the fishing intensity will need to be reduced by the percent calculated from the HCR. **The WG agreed that it is not science's role to determine the allocation of any potential reductions in fishing intensity (or catch and effort).** Given that the RFMOs are not used to interpreting fishing intensity relative to traditional management controls, such as catch and effort, the WG agreed that the first step is to provide technical science advice on translating fishing intensity (SPR) reductions into reductions in catch and effort. However, the exact numbers will likely change as conditions of the stock and fishery selectivity will change. Currently, NPALB is in a relatively stable state in terms of recruitment however as selectivity and productivity changes and the stock drops lower than the threshold reference point than it is clear that something has changed for the stock and the analysis will need to be reevaluated to provide updated values.

The WG noted that the assessment currently calculates the fishing intensity for the stock across all fleets and that there is increased uncertainty as we break this down into fleet specific fishing intensities. The WG discussed the important point that implementation error will likely be larger if the fishery is managed by effort instead of catch, or if larger number of fleets with different selectivities are managed as a group.

The WG recommended that a simpler grouping of fleets (1. JPLL, 2. US LL, 3. TWN LL, 4. KR LL, 5. CN LL, 6. VU and OTH LL, 7. Misc fleets, 8. JP PL, 9. EPO Surface) will be easier for communicating to the RFMOs.

The WG noted that the JPPL exhibited a stronger relationship with the effort of this fishery and catch of skipjack as compared to catch of albacore. This is likely due to skipjack being the primary target species in this fishery. Japan confirmed that the JPPL fishery has an adopted harvest strategy for skipjack (WCPFC CCM 2020-01) using effort controls. **The WG agreed it will be important for managers to be consistent with management control in this fishery given target switching.**

Follow-up discussion and advice:

The WG thanked the authors for the additional analysis and additions. The WG discussed the updated information and made note that Table 5 of the WP specifically may be difficult to understand. This table represents the annual fleet-specific fishing intensity ($F_{\%SPR}$) estimates, however the SPRs were calculated in this case when only the specified fleet was fishing, therefore they are multiplicative and are non-additive to the total annual fishing intensity. The WG agreed that trying to calculate the additive values would be difficult given that the solutions in this case tend to have to use various transformations and end up losing the easily understandable connections to SPR. The WG agreed that the historical fishing intensities presented in this way could be used to answer questions about potential historical fleet impacts.

The WG recommended that the information presented in this WP should be used to inform the scientific advice requested by the RFMOs to understand interpreting fishing intensity in terms of catch and effort controls (See Attachment 6). The WG also cautioned that it should be clear in the advice that the fleet-specific catch and effort reductions per unit of SPR for each fleet presented in this analysis should be thought of as approximate and illustrative and will likely need to be reevaluated if SSB falls below the threshold or limit reference points.

5. Review Stock Status and Conservation Advice

5.1. Review biological reference points and Kobe plots

The WG reviewed the biological reference points adopted for NPALB and the La Jolla plots developed during the most recent stock assessment. The WG discussed the adopted threshold reference point (30%SSBcurrent, F=0) compared to what is adopted for south pacific albacore.

5.2. Updated exceptional circumstances criteria

The WG reviewed the exceptional circumstances criteria developed in 2023 and made updated based on the HCR in the IATTC and WCPFC adopted harvest strategies (Attachment 5). The WG discussed the importance of stressing that these are preliminary criteria and are subject to change as more information becomes available.

5.3. Stock status and conservation advice

The WG reviewed the text describing current stock status and conservation information from the ISC23 report:

<u>Stock Status</u>

Based on these findings, the following information on the status of the NPO ALB stock is provided by the ISC23 Plenary:

1. The stock is likely not overfished relative to the threshold (30%SSBcurrent, F=0) and limit (14%SSBcurrent, F=0) reference points adopted by the WCPFC and IATTC;

2. The stock is likely not experiencing overfishing relative to the adopted target reference point (F45%SPR); and

3. Current fishing intensity (F2018-2020) is lower than the average fishing intensity from the 2002-2004 period (the reference level for IATTC Resolution C-05-02 and WCPFC CMM-2019-03).

<u>Conservation Information</u>

Based on these findings, the following conservation information is provided by the ISC23 Plenary for the NPO ALB stock:

1. If fishing intensity over the next ten years is maintained at the current fishing intensity (F2018-2020), then female SSB is expected to remain around 54%SSBcurrent,F=0 (90,098 t), with a 97.7% probability that female SSB will remain above the 14%SSBcurrent, F=0 LRP for all ten years and the management objectives of the IATTC and WCPFC will likely be met.

2. If fishing intensity over the next ten years is similar to the 2005 – 2019 period, then female SSB is expected to decrease to 52%SSBcurrent, F=0 (87,669 t), with a 98.1 % probability that female SSB will remain above the 14%SSBcurrent, F=0 LRP for all ten years and the management objectives of the IATTC and WCPFC will likely be met.

The ISC Plenary requested that the ALBWG investigate the main abundance index again and present an updated index at ISC24.

The WG has solved the technical issues with the main abundance index that were identified during the 2023 stock assessment and updated the analysis with two additional years of data. The updated analysis showed that the terminal 3 years of the index (2021 – 2023) had values that were all slightly above average. However, as in the 2023 assessment, the 2020 index estimate was still at a historical low. **The WG recommended that this information be presented at the ISC24 Plenary meeting informing them that the stock status and conservation information from the previous stock assessment was still valid.**

6. Administrative Matters

6.1. Work Plan and Assignments for 2025 Modelling Improvements Workshop

The WG developed a general work plan for the upcoming 2 years until the next assessment in 2026 (Attachment 4). The WG also developed a detailed plan for the next modelling improvements workshop, highlighting topics that were priorities for the next stock assessment cycle (**Table 2**).

6.2 Time and place of next ALBWG meeting

In April 2024 the WG plans to reconvene for a short web meeting to review updates to working paper **ISC/24/ALBWG-01/07** and develop an advice document (Attachment 6) based on this working paper to present to ISC24 Plenary.

The WG discussed the tentative time and place of the next modelling improvements workshop. Chinese-Taipei tentatively offered to host the WG workshop (March 2025) in Taipei. This in-person meeting will be confirmed later in 2024.

6.3 ALBWG elections

The WG Chair reminded the WG members that elections for a new WG vice-Chair and Chair was scheduled for during this meeting given that current vice-Chair, Steven Teo, was coming to the end of his first one year extension and current Chair, Sarah Hawkshaw, was at the end of her first three year term (2021-2024).

The results of these elections were that the Yuichi Tsuda, Japan was elected as the new ALBWG vice-Chair for his first three year term (2024 – 2027) and the current WG chair Sarah Hawkshaw, Canada, was re-elected for her second three-year term (2024 – 2027).

The WG thanked Steven Teo, USA, for his many years supporting the group in this leadership role as the vice-Chair and his continued contributions to the WG.

7. Other Matters

7.1 NPALB MSE Technical Training

Desiree Tommasi provided the WG with an introduction to the north Pacific albacore management strategy evaluation code structure and made note of areas of potential improvements.

Discussion

The WG thanked Desiree Tommasi for attending the workshop and providing the group with this important training. The WG discussed several updates that will have to be considered for updated MSE analyses in the future and recommended that members become familiar with the code. The WG also discuss how to collaborate on editing this code in github.

7.2 Code Archiving (MSE and NPALB Projections Software)

Brief instruction and developing plan of the SSfuture C++. Ijima, H. and Tsuda, Y. (ISC/24/ALBWG-01/05)

The ISC Albacore Working Group utilizes its proprietary software, SSfuture C++, for future projecting of the albacore tuna stock. This software consists of R functions capable of seamlessly integrating the results of Stock Synthesis 3 (SS3) and a future projection program implemented using Rcpp, ensuring consistency with SS3's future projection results. However, SS future C++ has yet to be publicly released. This document explains the usage, release process, and development plans for SSfuture C++ to maintain transparency in stock assessment.

Discussion

The WG thanked the author for the updates on the projection software. The WG noted that uncertainty in the estimated fleet-specific selectivities is currently not included in the projections. However, the WG also noted that it is relatively easy for the current projection software to include selectivity uncertainty but the SS output files has to be modified for SS to report the fleet-specific selectivity uncertainty. **The WG recommended that future assessments include output for selectivity uncertainty.**

The WG noted that the authors are planning several upcoming features for the software: 1) constant catch scenarios; and 2) simple harvest control rules. The WG also recommended several features: 1) resampled recruitment; 2) resampled recruitment deviates; and 3) fleet-specific selectivity uncertainties.

The WG recommended that the WG Chair discuss with the ISC Plenary, the appropriate platform to collaborate on editing this code in the future. The SSfuture C++ code is currently stored on Github in a private repository while the MSE code is in a public Github repository.

13. Clearing of Meeting Report

The WG Chair prepared a draft of the meeting report, which was reviewed by the WG prior to adjournment of the workshop. The WG reconvened for a short meeting in April 2024 to discuss requested updates to ***ISC/24/ALBWG-01/07*** and the science advice on interpreting fishing intensity (Attachment 6), after which the WG Chair distributed a second draft and the WG provided final suggested revisions via email. The WG Chair incorporated final edits. The final report will be forwarded to the Office of the ISC Chair for review and approval by the ISC24 Plenary.

14. Adjournment

The ALBWG meeting was adjourned at 1830 on April 24, 2024 (PST). The WG Chair thanked the WG members for their commitment to this research, their hard work, for presenting their research and contributing to this successful modeling improvements workshop.

15. Literature Cited

Chen, K.-S., C.-C. Hsu, C.-Y. Chen, F.-C. Cheng, and H. Ijima. 2016. Estimation of sexual maturity-at-length of the North Pacific albacore. Working document submitted to the ISC Albacore Working Group Meeting, 8 - 14 November, 2016, Pacific Biological Station, Nanaimo, BC, Canada.

Lee, H.-H., and I. Taylor. 2023. Calculating spawning potential ratio in fishery groups from a seasonal stock assessment model. ISC/23/PBFWG-2/13. Working paper submitted to the ISC Pacific Bluefin Tuna Working Group Workshop, 27 November -1 December, 2023. Webinar.

Maunder, M. N., Thorson, J. T., Xu, H., Oliveros-Ramos, R., Hoyle, S. D., Tremblay-Boyer, L., Lee, H. H., Kai, M., Chang, S.-K., Kitakado, T., Albertsen, C. M., Minte-Vera, C. V., Lennert-Cody, C. E., Aires-da Silva, A. M., & Piner, K. R. (2020). The need for spatio-temporal modeling to determine catch-per-unit effort based indices of abundance and associated composition data for inclusion in stock assessment models. Fisheries Research, 229, 105594. https://doi.org/10.1016/j.fishres.2020.105594.

Table 1. Work assignments identified at the March 2023 ALBWG meeting and the ISC23 Plenary.

Assignment	Lead(s)	Mar 2023 Stock Assessment	Mar 2024 Model Improvements
Improve the fleet definition of Japanese longline fishery	Ijima, H., Matsubayashi, J., and Tsuda, Y.	The WG agreed to use the new fleet structure (ISC/22/ALBWG-02/03) in the 2023 assessment. The data was not available for the old fleet structure for sensitivity runs so the WG recommended comparing the fleet structures again in the next assessment cycle.	Reevaluate in 2026 assessment cycle 3. Re-examine the fleet structure for the NPALB stock assessment
Development of a new strategy for CPUE standardization for JPNLL and JPNPL fleets using spatial-temporal models using INLA	Matsubayashi, J., Ijima, H., Matsubara, N., Aoki, Y. and Tsuda, Y.	The WG agreed to use CPUE standardization method presented at the Dec meeting (ISC/22/ALBWG-02/04) for the primary adult index in 2023 stock assessment. However due to evidence of juveniles in A2Q1 and changes in operations of the JPNLL fishery in recent years the WG decided to use A2Q2 data (**ISC/23/ALBWG-02/05)** which required slight modifications to the method. A WP will be prepared to document these standardization methods and the WG decided on several sensitivity runs.	***WP*** to document updated CPUE standardization method and produce an updated abundance index (update to be presented at ISC24) 2. Further investigation of appropriate adult abundance index for the NPALB stock
Updated standardized CPUE from Taiwanese distant-water longline fisheries	Jhen Hsu, Cheng-Hao Yi, Chun-Wei Chang, Yi-Jay Chang	WP in preparation for next stock assessment cycle.	Updates to **ISC/22/ALBWG-02/08**? Considered in the abundance index improvements discussion
Evaluate potential juvenile indices from the Japanese longline fisheries in northern areas (Areas 1, 3 and 5).	Ijima, H., Matsubayashi, J., and Tsuda, Y.	WP was presented at 2023 stock assessment workshop. The WG recommended that this was not a useful index as it was inconsistent and had adults and juveniles in the data.	4. Evaluate potential juvenile indices -- next stock assessment cycle

Assignment	Lead(s)	Mar 2023 Stock Assessment	Mar 2024 Model Improvements
Summary of size data update for North Pacific albacore in Japanese fisheries	Aoki, Y., Senda T., Ijima, H., Matsubara, N., Matsubayashi, J., and Tsuda, Y.	WP describing the split of size composition data from JPNLL in Areas 1 and 3 using new fleet structure (ISC/22/ALBWG-02/03) compared to previous fleet structure presented at 2023 stock assessment workshop. WG recommended not using Q1 data for a juvenile index and to continue to explore Q2 in the next stock assessment cycle.	Continue to explore Q2 in the next stock assessment cycle
Candidate relative abundance indices of juvenile albacore tuna for the US surface fishery in the north Pacific Ocean	Teo, S.	WG recommended not to fit to these indices, described in **ISC/22/ALBWG-02/11** in the 2023 assessment base case model and use the old GLM index for the EPO index in sensitivity model runs.	4. Evaluate potential juvenile indices -- next stock assessment cycle sensitivity runs
Evaluate and document historical high seas drift gillnet catch by member countries.	Teo, S.	WG recommended a collaboration with the SHARKWG to publish the analyses of these data a scientific journal and explore appropriate data storage protocols for the observer data within the ISC. Progress to be presented at 2024 WG meeting.	***Presentation*** describing progress on metadata documentation and potential catch reconstruction methodologies for historical high seas and squid gillnet fisheries 10. Estimate and document historical high seas drift gillnet removals by member countries;
Options for exceptional circumstances triggering additional MSE simulations	Hawkshaw, S.	WG recommended sending the criteria for exceptional circumstances to the ISC chair for plenary review.	***Presentation*** of options for updates to the exceptional circumstances criteria that include HCR considerations, implementation etc. according to the updated harvest strategy for NPALB
Investigate impacts of recently passed IATTC and WCPFC harvest strategies	Hawkshaw, S.	Newly identified reference points were estimated in the 2023 assessment and were used to inform the stock status and conservation advice.	***Presentation*** to review 2023 updates to harvest strategy

Assignment	Lead(s)	Mar 2023 Stock Assessment	Mar 2024 Model Improvements
Update catch, size composition, and CPUE (if available) data for 2023 assessment	All ALBWG Members	All updated data was considered for use in the 2023 stock assessment.	1. Further investigation how COVID-19 safety protocols affected these data All ALBWG members present any analyses or trends for their country data, especially CPUE, from 2020 and 2021
NC request: Advice on how to convert fishing intensity controls in NPALB HCR to effort and/or catch controls	Teo, S.		***WP (or presentation?)*** outlining options – ALBWG will review and discuss (recommendations will need to be presented at ISC24 to pass on to NC20 and SAC)

List of research recommendations developed during the 2023 stock assessment:

1. Further investigation of the data, especially CPUE, from 2020 and 2021 to better understand if and how COVID-19 safety protocols affected these data;
2. Further investigation of appropriate adult abundance index for the NPALB stock especially with respect to expanding the spatial domain of the CPUE standardization model to reduce the effect of time-varying availability on the standardized abundance index, which in the model is assumed to be proportionally influenced solely by population abundance;
3. Re-examine the fleet structure for the NPALB stock assessment;
4. Evaluate potential juvenile indices from the Japanese longline fisheries in northern areas (Areas 1, 3 and 5), the Japanese pole-and-line and/or EPO surface fisheries;
5. Investigate the sensitivity of model estimates to the variability in Linf;
6. Investigate how to better model variability in availability in size and/or age to the juvenile fisheries (JPPL and EPO fisheries selectivities);
7. Investigate the conflict in size composition data between fleets;
8. Collect sex-specific age-length samples using a coordinated biological sampling plan to improve current growth curves, and examine regional and temporal differences in length-at-age;
9. Collect sex ratio data by fleet;
10. Estimate and document historical high seas drift gillnet removals by member countries;
11. Explore ocean productivity as drivers of albacore trends and dynamics.

Table 2. Work plan and assignments for 2025 modelling improvements meeting and data preparation meeting.

Assignment	Lead(s)	Mar 2024 Modelling Improvements	Mar 2025 Modelling Improvements	Nov 2025 Data Preparation
Abundance Indices				
Improve the fleet definition of Japanese longline fishery – **Fleet structure for index**	Matsubara, N., Nishimoto, M., Tsuda, Y., and Ijima, H.	-The WG reviewed the updated analysis (ISC/24/ALBWG-01/01). -The authors agreed to provide the analytical code to the WG to help apply methods to other areas. -The WG agreed that all members should think about how to use this or similar methods to classify their fleets for the 2026 assessment.	-Discuss WP documenting improvements -The WG will decided on whether to apply this approach for the 2026 assessment. -The WG will consider using this method for the index compared to other approaches.	Reevaluate in 2026 assessment cycle
Further development of CPUE standardization for the 2023 **JPLL adult index**	Nishimoto, M., Ijima, H., Matsubara, N., and Tsuda, Y.	-WP ISC/24/ALBWG-01/04 presented improvements and updates to the adult index used in the 2023 assessment. Addition of 2022/23 data and uncertainty estimates. -WG agreed to continue to update and improve this index while working on developing new methods.	- Discuss whether this method will be used in the next stock assessment cycle.	-Potentially WP for 2026 stock assessment cycle.
Further development of CPUE standardization for **JPPL Juvenile index**	Nishimoto, M., Ijima, H., and Matsubara, N.	-WP ISC/24/ALBWG-01/03 presented updates to this juvenile index. -WG agreed to continue to update and improve this index while working on developing new methods.	- Discuss comparisons to other juvenile indices.	Potential WP for 2026 stock assessment cycle.

Assignment	Lead(s)	Mar 2024 Modelling Improvements	Mar 2025 Modelling Improvements	Nov 2025 Data Preparation
Updated standardized CPUE from Taiwanese distant-water longline fisheries – **TWN LL Juvenile index**	Jhen Hsu, Zi-Wei Yeh, and Yi-Jay Chang	- Authors provided an update ISC/24/ALBWG-01/Presentation 01on the TWN LL juvenile index -WG provided suggestions for updates and improvements for the next stock assessment cycle.	- Discuss WP documenting improvements - Discuss comparisons to other juvenile indices.	WP for 2026 stock assessment cycle.
Candidate relative abundance indices of juvenile albacore tuna for the US surface fishery in the north Pacific Ocean **EPO Surface Juvenile index**	Teo, S.	- No updates presented at this workshop. - WP presented at 2022 data preparation meeting	- Discuss WP documenting improvements - Discuss comparisons to other juvenile indices.	-WP for 2026 stock assessment cycle. -Juvenile index sensitivity run
Size-based abundance indices for JP LL – **Adult and Juvenile indices**	Ijima, H., and Tsuda, Y.	- WP ISC/24/ALBWG-01/06 presented preliminary results from this new approach. - The WG agreed this was a important method to continue to develop and made several suggestions for the authors to consider.	- Discuss WPs documenting improvements - Discuss comparisons to other juvenile indices.	- WP for 2026 stock assessment cycle.
Fleet definitions in the stock assessment	All WG members	-The WG discussed updating and comparing the fleet definitions with the potential new fleet definitions from the finite mixture model.	- Discuss WPs with updated analyses.	

Assignment	Lead(s)	Mar 2024 Modelling Improvements	Mar 2025 Modelling Improvements	Nov 2025 Data Preparation
Biological modelling				
Growth	US and Japan	- The WG discussed using updated age, sex, and maturity data to improve growth models and investigate spatiotemporal variation in length-at-age.	- Discuss WPs presented by US and Japan	- Combined WP for 2026 stock assessment cycle.
Maturity	Japan	- The WG discussed recent data collection by Japan biological sampling program.	- Discuss WP documenting data updates	- Discuss inclusion in 2026 stock assessment cycle.
Sex composition	US and Japan	- Both Japan and US are working on collecting updated sex composition data. - The WG discussed the potential to update this information in the next stock assessment.	- Discuss WP documenting updates	- Discuss inclusion in 2026 stock assessment cycle.
Spawning seasonality	Ijima, H.	To support the development and interpretation of the juvenile indices the WG further recommended the reevaluation of the reproductive spawning analysis for NPALB as well as development of a larval distribution working paper.	-WP in preparation for next stock assessment cycle.	- Discuss inclusions in 2026 stock assessment

Assignment	Lead(s)	Mar 2024 Modelling Improvements	Mar 2025 Modelling Improvements	Nov 2025 Data Preparation
RFMO Requests, Code Development and Data				
Updates to the exceptional circumstances criteria	Hawkshaw, S.	WG recommended sending the updated criteria for exceptional circumstances to the ISC chair for plenary review before the IATTC SAC meeting.	-Incorporate any updates from ISC24 plenary review	- Discuss how to present evaluation of exceptional circumstances in 2026 stock assessment cycle.
Fishing intensity conversion to catch and effort controls	Hawkshaw, S.	-Meeting April 24/25, 2024 to discussion final WP and generate advice to provide to managers -Present advice to Plenary before ISC24.	Chair will provide updates to the WG on discussions with the ISC24 plenary and RFMOs.	
Evaluate and document historical high seas drift gillnet catch by member countries.	Teo, S.	WG was updated about the status of these data. Updates will be provided to the ISC STATWG and to ISC24	Discuss WP describing progress on metadata documentation and potential catch reconstruction methodologies for historical high seas and squid gillnet fisheries	- WP for 2026 stock assessment cycle.
Projection and MSE code archiving	Hawkshaw, S.	-Currently stored on github – WG discussed how to collaboratively edit these pieces of code and it was suggested to bring this up with the ISC Plenary and potentially the STATWG first.	-WG Chair will provide updates on discussions with the ISC plenary.	
MSE updates	All WG members	- The WG received training to use the MSE code and discussed potential updates that would need to be made if additional MSE was required.	- Discuss	

Assignment	Lead(s)	Mar 2024 Modelling Improvements	Mar 2025 Modelling Improvements	Nov 2025 Data Preparation
Ensemble models? Grid? Sensitivity runs?	All WG members	-The WG briefly discussed the best approach to represent uncertainty for NPALB stock assessment.	- Discussions of the most important uncertainties for the stock assessment	- Discussions of the most important uncertainties for the stock assessment

Attachment 1

List of Participants

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The Albacore Working Group 2024 (left to right) – Sarah Hawkshaw, Desiree Tommasi, Steve Teo, Makoto Nishimoto, Yuichi Tsuda, Hirotaka Ijima, Naoto Matsubara, and Haikun Xu. Yi-Jay Chang, Jhen Hsu (respectively pictured above) and Huihua Lee and Juan Valero also participated virtually in this meeting.

Attachment 2

ALBACORE WORKING GROUP (ALBWG)

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

MODELLING IMPROVEMENTS WORKSHOP

11-18 March 2024

Fisheries and Ocean Canada Institute of Ocean Sciences
Victoria, BC, CANADA

DRAFT AGENDA

1. Opening of workshop
   1.1. Welcoming Remarks
   1.2. Introductions
2. Meeting Logistics
   2.1. Meeting Protocol
   2.2. Review and Adoption of Agenda
   2.3. Assignment of Rapporteurs
   2.4. Group Photo
3. Review Work Assignments
4. Review Working Papers
   4.1. Updated abundance index for ISC24
   4.2. Investigate potential COVID-19 safety protocols impacts
   4.3. Abundance index improvements
   4.4. Biological modeling (Growth)
   4.5. Data collection (Catch, Effort, Aging Data, Sex Composition, etc.)
   4.6. High seas driftnet and squid gillnet fisheries
   4.7. Options for HCR fishing intensity implementation
5. Review Stock Status and Conservation Advice
   5.1. Review biological reference points and Kobe plots
   5.2. Update exceptional circumstances criteria
   5.3. Stock status and conservation advice
6. Administrative Matters
   6.1. Workplan for Next Workshop
   6.2. Time and place of next ALBWG meeting
   6.3. Upcoming ALBWG elections
7. Other matters
   7.1. MSE Technical Training
   7.2. Code Archiving (MSE, projections software, assessment)
8. Clearing of Meeting Report
9. Adjournment

Attachment 3

List of Working Papers and Presentations

Number	Title and Authors	Availability
ISC/24/ALBWG-02/01	Updated analysis for Japanese longline logbook data by finite mixture model. Naoto Matsubara, Makoto Nishimoto, Yuichi Tsuda and Hirotaka Ijima	ISC Website
ISC/24/ALBWG-02/02	The impact of Covid-19 on Japanese longline fishery. Naoto Matsubara, Makoto Nishimoto, Yoshinori Aoki, Hirotaka Ijima and Yuichi Tsuda	ISC Website
ISC/24/ALBWG-02/03	Update standardized CPUE for North Pacific albacore caught by the Japanese pole and line from 1972 to 2022. Makoto Nishimoto, Naoto Matsubara and Hirotaka Ijima	ISC Website
ISC/24/ALBWG-02/04	Additional Japanese longline logbook data analysis on CPUE of adult North Pacific albacore tuna. Makoto Nishimoto, Hirotaka Ijima, Naoto Matsubara and Yuichi Tsuda	ISC Website
ISC/24/ALBWG-02/05	Brief instruction and developing plan of the SSfuture C++. Hirotaka Ijima and Yuichi Tsuda	ISC Website
ISC/24/ALBWG-02/06	Preliminary analysis for size-based abundance indices considering multiple latent spatial fields. Hirotaka Ijima and Yuichi Tsuda	ISC Website
ISC/24/ALBWG-02/07	Relationships between fleet-specific spawning potential ratios and measures of catch and effort for North Pacific albacore tuna. Steven Teo, Hui-Hua Lee Desiree Tommasi, Sarah Hawkshaw, Yi-Jay Chang, Yuichi Tsuda and Youjung Kwon	ISC Website
Presentation 01	Biological sampling and data collection for North Pacific albacore by Fisheries Research Institute, Japan. Yuichi Tsuda, Yoshinori Aoki, Naoto Matsubara	Contact the author
Presentation 02	Updated analysis of Taiwanese distant-water longline catch and effort data. Jhen Hsu, Zi-Wei Yeh, and Yi-Jay Chang	Contact the author
Presentation 03	Introduction to the North Pacific Albacore Management Strategy Evaluation. Desiree Tommasi	Contact the author

Attachment 4

Meetings and Workplan

Date	Location	Task/Event
April 2024	Online	Follow up WG meeting
June, 2024	La Jolla, USA	IATTC SAC
June, 2024	Canada	ISC Plenary
July, 2024	Japan	NC20
Early 2025	*Tentatively* Chinese-Taipei	Model improvement workshop
Late 2025	TBD	ALBWG workshop: Data Preparation
Next benchmark assessment 2026	TBD	ALBWG workshop: Stock Assessment 2026

Attachment 5

Subject to Change as more Information Becomes Available to the International Science Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC)

Criteria for identifying exceptional circumstances for north Pacific albacore tuna V02. March 2024

The Albacore Working Group (ALBWG) of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC) was tasked by the Western and Central Pacific Fisheries Commission (WCPFC; WCPFC-NC18-WP-03) and the Inter-American Tropical Tuna Commission (IATTC; IATTC-100) with developing criteria for the identification of exceptional circumstances that would result in suspending or modifying the application of the adopted harvest strategy, and potentially may require updated Management Strategy Evaluation (MSE) simulation work. Exceptional circumstances define situations outside the range of scenarios over which robustness of the harvest strategies was evaluated in the MSE analysis, and for which a different management action than specified by the adopted harvest strategy may have to be taken. This guidance document provides an outline of the process for identifying exceptional circumstances for north Pacific albacore tuna (NPALB). The criteria presented in this document were developed based on criteria developed by other Regional Fisheries Management Organizations (RFMOs), such as the International Commission for the Conservation of Atlantic Tunas (ICCAT), for other tuna stocks. The document, however, does not provide all necessary actions to apply should an exceptional circumstance be identified for this stock, nor does it cover all possible exceptional circumstances.

To identify exceptional circumstances for NPALB, the ALBWG will continue to conduct benchmark stock assessments for the stock every 3 years with updated data sources and research as well as, examine new evidence about the current stock status and environmental conditions.

The following general elements will be considered when examining signals of possible exceptional circumstances for NPALB:

Stock and Fleet Dynamics: Evidence from stock assessment estimates that the stock is in a state not previously simulated in the MSE (e.g., current or projected SSB estimates produced in a new stock assessment are outside the range of uncertainty tested in the most recent MSE, or new evidence about the biology of the stock is presented). As well as evidence that the fleet structure or fishing operations have changed substantially.

Application: Data collection required to produce the stock assessment is no longer available and/or appropriate to apply the adopted harvest strategy.

Implementation: The implementation of the management action is substantially different from what is prescribed by the HCRs. For example, the total removals or effort by the fishery differ substantially (i.e. more than what was specified by the implementation error used in the MSE) from what is prescribed by the HCRs.

Based on the general elements above, several indicators for NPALB were identified by the ALBWG and are summarized in the following table:

Element	Indicator	Range	Evaluation Schedule
Stock and Fleet Dynamics	Depletion stock biomass ($SSB/SSB_{current,\ F=0}$)	In any year estimates fall outside the range of uncertainty simulated by the operating models (OMs) used in the most recent MSE (accepted by the ALBWG in 2021)	Benchmark stock assessment every 3 years
	Fishing intensity ($F_{\%SPR}$) where SPR is the spawning potential ratio		
	Changes in fleet dynamics	Any substantial differences from the structure and parameterization used in the OMs of the most recent MSE (accepted by the ALBWG in 2021)	As new evidence and research is presented and accepted by the ALBWG
	Biological parameters		
Application	Stock assessment	Stock assessment is not producible or estimates are unreliable	Benchmark stock assessment every 3 years
Implementation	Fishing intensity ($F_{\%SPR}$)	The fishing intensity is different from what is prescribed by the HCR, given the uncertainty range that was simulated by the most recent MSE (accepted by the ALBWG in 2021)	Benchmark stock assessment every 3 years
	Realized catch or effort	If a TAC/TAE is implemented and the realized catch or effort exceeds the TAC/TAE by greater than 20%	Benchmark stock assessment every 3 years

Should evaluation of the above criteria identify any exceptional circumstances, the ALBWG will assess the severity and potential impacts on the performance of harvest strategies, including the HCRs, and provide advice on the action required, including the need for a change in harvest strategy (e.g., reference points, HCRs), additional research, and/or updates to the MSE framework for NPALB.

Attachment 6

Scientific advice on interpreting the fishing intensity metric from the north Pacific albacore tuna harvest strategies in terms of catch and effort management measures

Background

The Western and Central Pacific Fisheries Commission (WCPFC) Northern Committee (NC) and the Inter-American Tropical Tuna Commission (IATTC) adopted a harvest strategy for north Pacific albacore (NPALB) in 2023 (WCPFC NC Harvest Strategy 2023-01; IATTC Resolution C-23-02). This harvest strategy includes harvest control rules that mandate reductions in fishing intensity if the female spawning stock biomass (SSB) falls below the adopted reference points. The WCPFC NC and IATTC have requested scientific advice from the Albacore Working Group (ALBWG) of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC) on interpreting required changes in fishing intensity for NPALB, as described in the harvest strategy.

> *"The NC requested ISC in 2024 to advise how the fishing intensity should be interpreted to actual management measures under this harvest strategy"*
>
> *"The IATTC scientific staff in 2024 shall collaborate with the ISC to advise how fishing intensity should be interpreted to actual management under this harvest strategy"*

Fishing intensity is an important metric used to measure overall the extent to which a stock is being exploited and is often used in assessments with complex spatial and temporal structure in the population and the fisheries. A single annual estimate of fishing intensity is calculated across all fleets in the NPALB stock assessment and described in the adopted harvest strategy. For NPALB, fishing intensity is currently defined as $F_{\%SPR}$, which is the fishing intensity associated with a specific spawning potential ratio (SPR). It is a measure of fishing mortality expressed as the decline in the proportion of the spawning stock biomass (SSB) produced by each recruit relative to the unfished state. For example, a fishing mortality at age leading to $F_{20\%}$ is expected to result in an SSB of approximately 20% of SSB_0 over the long run. Fishing intensity and SPRs are particularly useful in stocks like NPALB, where: 1) there are multiple fisheries exploiting different age classes of the same stock due to different gear selectivities and/or availability; and 2) important reference points for NPALB are based on dynamic SSB_0 ($SSB_{current,F=0}$). Using fishing intensity and SPRs allows fishing mortality at different age classes to be related to impacts on SSB equivalence and compared using the same units. It also takes into account changes in selectivity that have occurred as NPALB distribution, fishing gear and/or techniques have changed over time.

Fishing mortality on different age-classes have differing impacts on SSB and SPR. It is assumed that female albacore have age-specific differences in natural mortality, maturity, and average weights, which causes fishing on different age classes to have different impacts on the resulting SSB. Fisheries with different age selectivities and/or availabilities will therefore have different levels of catch-per-recruit and $F_{\%SPR}$, even with the same level of maximum F-at-age. A fleet with higher selectivities for juvenile albacore is expected to have a larger impact on female SSB (i.e., a larger decline in SPR) than a fleet with higher selectivity for older fish (See Fig.1 in ALBWG 2024). Under only one fleet with a constant selectivity and availability, an increase in fishing mortality will be associated with a lower SPR, but for a stock with multiple fleets, SPR is also dependent on the relative fishing mortality across fleets and their selectivities and availabilities.

The WCPFC and IATTC members have traditionally used catch and/or effort controls to manage their fisheries. Although the $F_{\%SPR}$ is an effective way to communicate stock status, it is complex to interpret in terms of these operational management controls for each fishery given the variety of age classes intercepted by different gear types in different locations throughout the north Pacific Ocean. Furthermore, the fishing intensity referred to in the current stock assessment and the harvest strategy is reported as the overall $F_{\%SPR}$ and fleet-specific $F_{\%SPR}$ have not been reported on yet.

Summary of Analyses

The ALBWG performed analyses to evaluate the relationships between fishing intensity and catch and/or effort (ALBWG 2024). Given that fishing intensity reported in the 2023 stock assessment and the harvest strategy is the overall annual $F_{\%SPR}$, the ALBWG started by producing estimates of fleet-specific fishing intensities using the base case model from the 2023 stock assessment and the methods described in Lee & Taylor (2023). These estimates were then used to relate changes in the estimated fleet-specific fishing intensities to multiple fleet-specific measures of catch and effort. The 2023 assessment used a relatively complex fleet structure of 35 fleets accounting for various combinations of country, gear, catch unit, area, and season. For this analysis, the ALBWG recommends using a simplified approach with 9 fleet groupings dependent on gear and country to relate to traditional management controls (Table 1).

A cross-correlation analysis was initially used to investigate the potential relationships between catch and effort data for each fleet group and the estimated fleet-specific SPR. Depending on the fleet group and the results from the cross-correlation, one or more effort and/or catch variables were used as explanatory variables in a series of generalized linear models (GLMs) to explain the changes in SPR. The GLMs assumed that the intercept was at 0 (i.e., no intercept was estimated) because a catch or effort of 0 is expected to result in no change in SPR. Given the large number of correlations and GLMs performed, as well as the lack of observation error, the statistical significance of the results should be interpreted with caution.

The ALBWG also advises that the relationships between catch or effort, and SPR are expected to change if recruitment and/or fleet selectivity change substantially in the future. The analysis is based on the historical (1994 – 2021) conditions in the 2023 assessment. The results may not be useful if future stock conditions differ substantially from those described in the 2023 assessment. The ALBWG therefore recommends that the fleet-specific catch and effort reduction per unit of SPR estimated in the analysis be thought of as approximate and illustrative, and will likely need to be reevaluated if SSB falls below the threshold or limit reference points, as this may be an indication of exceptional circumstances.

The ALBWG found that all fleet groups exhibited strong relationships between catch and SPRs. For the longline fleet groups, catch was highly negatively correlated with fleet-specific SPR. For illustration, the relationships between fleet-specific SPRs and seasonal fleet-specific catch in weight (Fig. 1) show that catches would have to be reduced by 901 – 1,473 mt, depending on the fleet group, in order to increase fleet-specific SPR by 1%pt (%pt is the arithmetic difference between two percentages) and lower fishing impacts. Those fleet groups with higher catch (mt) per unit of change in SPR have a lower impact on the female SSB per unit of catch in weight. The fishing impact on SSB per unit of catch depends on the ages and sex ratios of fish (i.e., removing male fish do not impact SPR) caught by the fleet group. For example, the USLL, which catches both the largest fish and the highest proportions of male fish, shows the highest catch (mt) per unit of change in SPR among all fleet groups (Fig. 1).

Similar to the longline fleet groups, the surface fleet groups (JPPL and EPOSF) also showed that their fleet-specific catch is highly correlated with the fleet-specific SPR. However, the relationships between catch and SPRs for the surface fleet groups were slightly more variable and uncertain than for the longline fleet groups. This variability occurs because the surface fleet groups catch predominantly juvenile fish (Ages 2 – 4) and are more sensitive to changes in recruitment and availability. Interestingly, our results also show that catches of both fleet groups would have to be reduced by similar amounts in order to increase SPR by 1%pt (Fig. 1). In addition, it was noted that the JPPL fleet group exhibited a stronger relationship between effort and skipjack catch, as compared to albacore catch.

The relationships between effort and SPRs were found to be fleet-specific and more variable than those between catch and SPR. Some of the longline fleet groups (JPLL, and CNLL) had moderate correlations between effort (number of hooks) and SPRs but other longline fleet groups (USLL, TWLL, KRLL, and VUOTHLL) had much weaker relationships. Even among the longline fleet groups with stronger relationships, the correlations between effort (number of hooks) and SPRs were more variable than between catch and SPRs.

Both surface fleet groups (JPPL and EPOSF) also showed moderately strong correlations between the number of vessel days and SPRs. These relationships between effort and SPRs were weaker than for the corresponding relationships between catch and SPRs. In contrast to the similar impact on SSB per unit of catch in weight, the GLMs for effort (number of vessel days) show an order of magnitude difference between the two fleet groups (Fig. 2). This difference is likely due to the order of magnitude difference between the recorded effort for these fleets.

Scientific Advice and Recommendations

It should be noted that both RFMOs currently maintain fishing effort for NPALB at or below the average of 2002 – 2004 levels (e.g., IATTC Resolution C-05-02) and that they have maintained the fishing impact on NPALB around or below the target reference point of 45% $F_{\%SPR}$.

The ALBWG cautions that the fleet-specific catch and effort reduction per unit of SPR presented in this document (Figs. 1 & 2) will likely change if stock conditions (i.e. recruitment and/or selectivity or availability patterns) change in the future and it is recommended that the relationships presented in the advice be reevaluated if reference points are breached for the stock (i.e. if the SSB falls below the threshold or limit reference points for NPALB (30%$SSB_{current,F=0}$ and 14%$SSB_{current,F=0}$),) or if exceptional circumstances are identified.

All fleet groups exhibited strong relationships between catch and SPRs. The relationships for the surface fleet groups (JPPL and EPOSF) were slightly more variable and uncertain than for the longline fleet groups, due to these fleets predominantly catching juvenile fish (Ages 2 – 4). However, there was still high correlation between catch and SPRs for these fleets. Based on these results the ALBWG recommends that changes in fishing intensity required by the NPALB harvest strategy can potentially be translated into catch reductions for all fleet groups.

The relationships between effort and SPRs were found to be fleet-specific and tended to be more variable and often less correlated than for catch and SPR. However, the fleet groups using surface gears (i.e., JPPL and EPPOSF) exhibited moderately strong relationships between effort and SPRs. In addition, it should be noted that the WCPFC has adopted a harvest strategy for skipjack tuna in the WCPO (WCPFC CCM 2020-01) and the JPPL fishery, which targets primarily skipjack tuna, is managed using effort controls under that harvest strategy. It should also be noted that the JPPL fleet group exhibited a stronger relationship between effort and skipjack catch, as compared to albacore catch. The ALBWG therefore recommends that changes in fishing intensity required by the NPALB harvest strategy can potentially be translated into changes in effort for the management of surface fleet groups, JPPL and EPOSF.

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Table 1. Fleet groups used in this study with reference to the fleets in the 2023 stock assessment.

Fleet Group	Fleet Group Name	Fleet ID in 2023 assessment	Units of Effort	Fleet Group Description
1	JPLL	F1 to F20	Hooks, Vessels, Days	Japan longline; all areas; all seasons
2	JPPL	F21 to F24	Vessels, Days, Poledays, Avg poles, SKJ catch	Japan pole-and-line; all areas; all seasons
3	USLL	F26 & F27	Hooks, Vessels, Sets	US longline; all areas; all seasons
4	TWLL	F28 & F29	Hooks, Vessels, Days	Taiwan longline; all areas; all seasons
5	KRLL	F30	Hooks	Korea longline; all areas; all seasons
6	CNLL	F31 & F32	Hooks	China longline; all areas; all seasons
7	VUOTHLL	F33	Hooks	Vanuatu & Others longline; all areas & seasons
8	EPOSF	F34	Vessels, Days	EPO Surface fleet (primarily US and Canada); all seasons
9	MISC	F35	NA	Miscellaneous fleets from Japan, Taiwan, & Korea

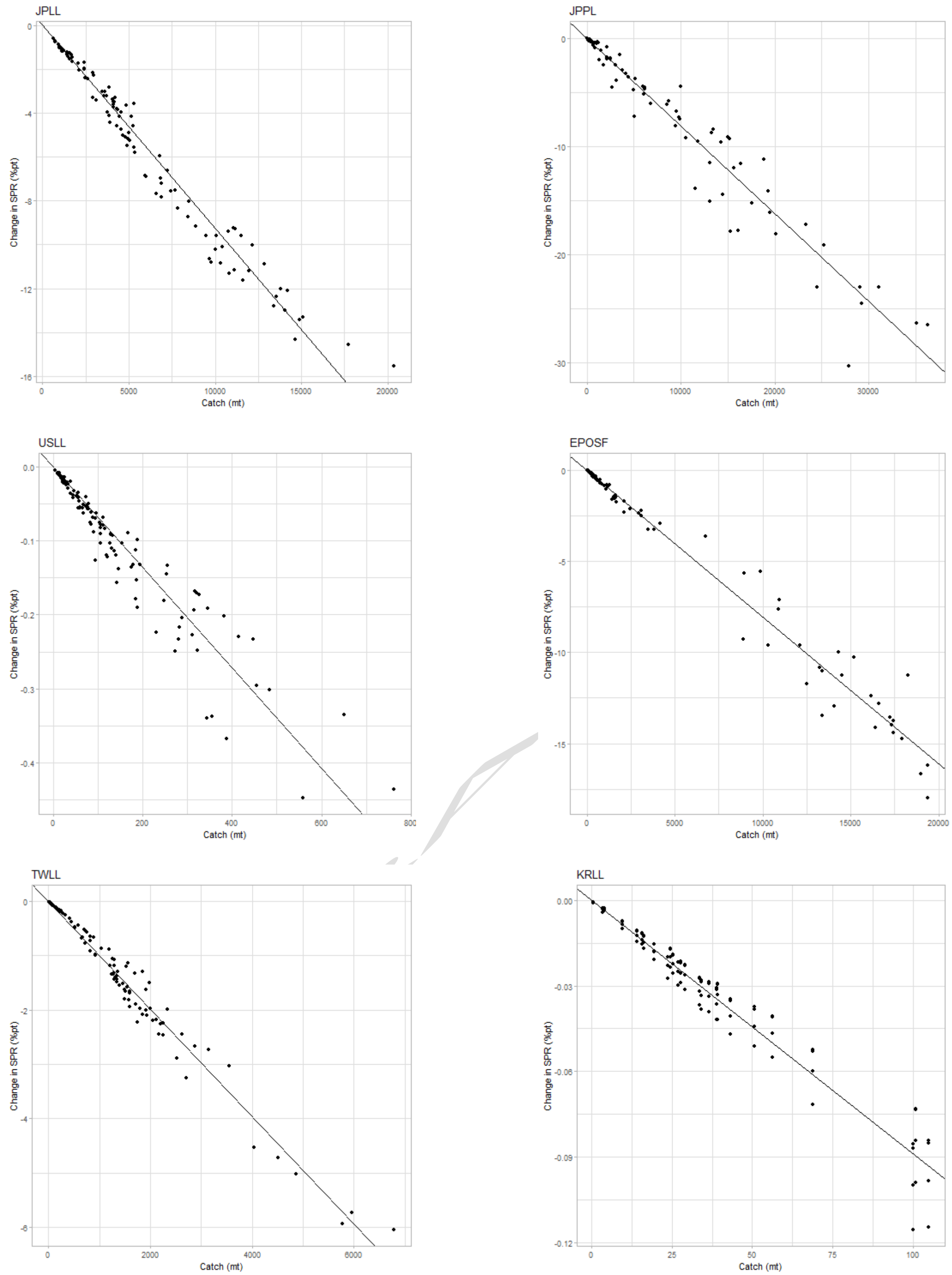

Figure 1. Estimated relationships (line) between seasonal catch in weight (t) and expected change in spawning potential ratio (SPR; %pts, the arithmetic difference between two percentages) for nine fleets using single variable generalized linear models (GLMs) with a fixed intercept at 0. See Table 1 for fleet abbreviations. Note that scales of the x- and y-axes are variable.

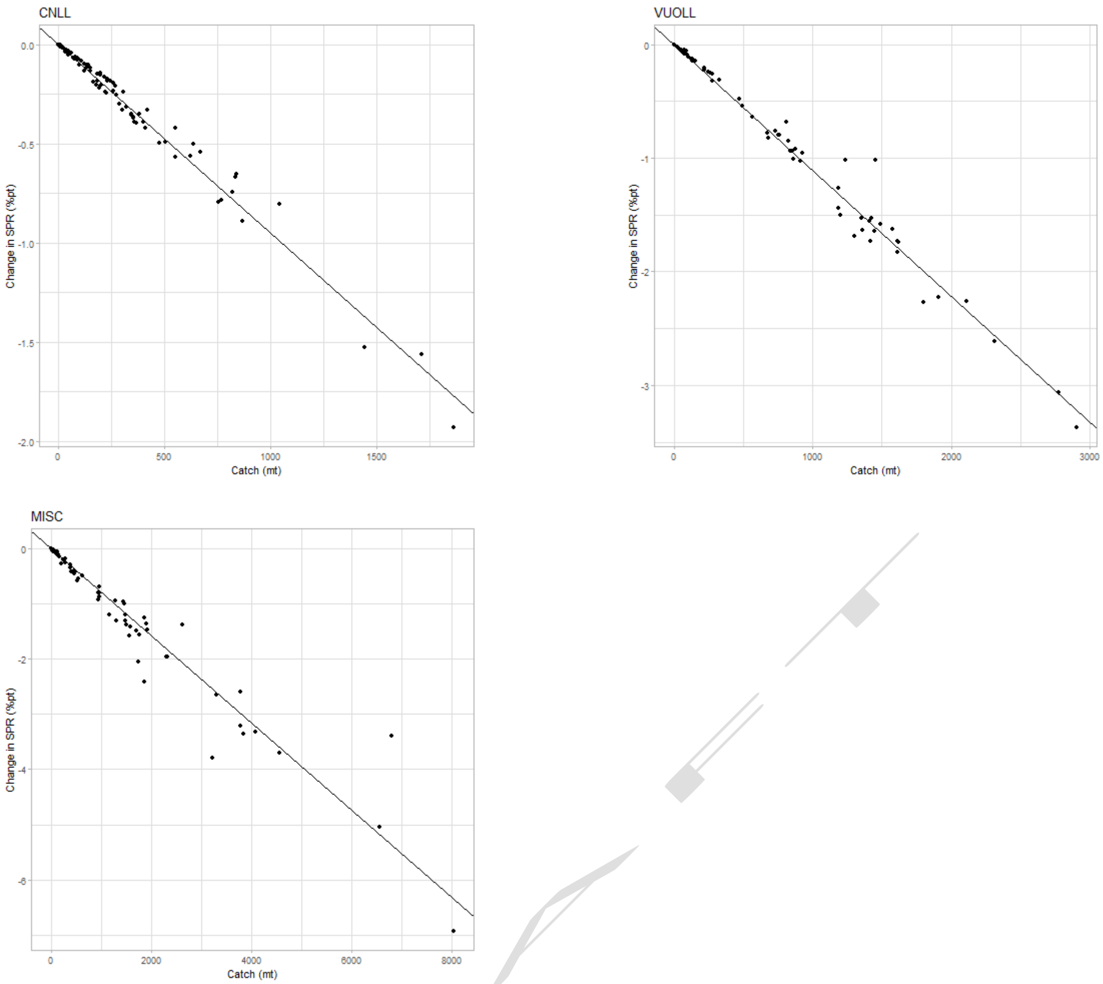

Figure 1. continued.

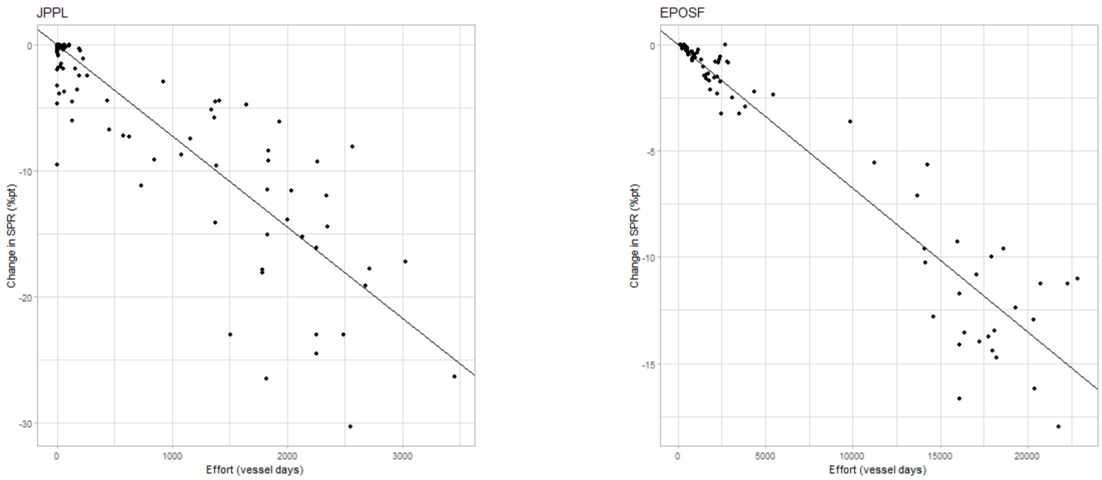

Figure 2. Estimated relationship (line) between seasonal fishing effort (vessel days) and expected change in spawning potential ratio (SPR; %pts, the arithmetic difference between two percentages) for the two surface gears (troll and pole-and-line) fleets using single variable generalized linear models (GLMs) with a fixed intercept at 0. See Table 1 for fleet abbreviations. Note that scales of the x- and y-axes are variable.