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Additional Japanese longline logbook data analysis for adult albacore tuna CPUE.[1]

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Abstract

We report 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 from the first quarter of Area 2 only and 2) data from all quarters of Area 2 and extracting only the results from the second quarter. Although the all-quarter-data model converged successfully, the resampling program for the posterior distribution of standardized CPUE did not work effectively, and we could not obtain the coefficient of variation. We plan to address this issue by modifying the program in the future.

Introduction

Matsubayashi et al. (2022) presented the standardized Japanese longline CPUE results to the ISC Albacore Tuna Working Group (ALBWG) in December 2022. The ALBWG discussed the results and agreed to use them in the following stock assessment.
However, the ALBWG noted inconsistent data in area 2 quarter 1 in the last 2 years.
The reasons were considered as follows:
1) due to changes in operations and data collection
2) due to the COVID-9 pandemic.
3) the changes seen in the Area 2 Quarter 1 data, including potential migration changes for the stock.
The CPUE data in Area 2 Quarter 2 for the last 2 years of data improved slightly (Figure 1). However, there was a significant decrease in the year 2020. The ALBWG proposed utilizing information from all locations through an AR-1 process across year-quarter and isolating the quarter 2 estimates to enhance the standardization technique. We followed this request and performed these analyses during the stock assessment meeting. This working paper reports the results of these additional analyses.

Material and methods

Japanese longline logbook data

We utilized logbook data from Japanese longline fishery operations. The logbook data was obtained from Area 2, where believed to have the highest density of mature fish. The data was aggregated by year, month, number of hooks between floats (HBF), vessel name, and latitude and longitude at a resolution of 1 degree.

Statistical model

In the analysis, we used a spatiotemporal model similar to Matsubayashi et al. (2022). The categorical year variable was treated as a fixed effect, and the vessel name and HBF as random effects. The number of albacore catches was assumed to follow a Zero-inflated negative binominal distribution, and 1,000 hooks were used as an offset term. The Statistical model are

$$alb \sim intercept + year + f(fleet, model = iid) + f(hbf, model = iid) + f(vessel\ ID, model = iid) + f(w, model = AR1) + offset(hooks/1000).$$

We used the Auto-regression 1 (AR1) process that time step as a year to analyze data from the first quarter of Area 2. For the analysis that incorporated all quarters of Area 2, the time step was adjusted to year-quarters which assumed a correlation between the preceding and following quarters.

Standardized CPUE

We calculated the least-square means for standardized CPUE using all combinations of year or year-quarter and location explanatory variables. The R-INLA predict function outputs a response variable for

each explanatory variable. However, resampling based on the posterior distribution must be performed again to calculate the variance of the least-square mean because it only outputs posterior distribution means and percentiles. In this analysis, 1,000 resampling were performed to calculate the mean and variance of the standardized CPUE by year.

Result and discussion

The result shows a sharp increase in 2021 after a record low in 2020, even when analyzing only the data from the second quarter (Figure 1). We calculated the standardized CPUE using data from all quarters and could obtain parameter estimates with the model convergence. However, the program stopped during the resampling of the standardized CPUE. We tried to split the predicting process into two periods (1996-2007 and 2008-2021) and could perform resampling, but standardized CPUE values differed. Further study is needed on the resampling method for larger data with much of the fixed effect coefficient. In addition, the 2020 CPUE still shows a steep drop (Figure 2). We also need to explore this issue.

References

Matsubayashi, J., Ijima, H., Matsubara, N., Aoki, Y., and Tsuda, Y. CPUE standardization for North Pacific albacore caught by Japanese longline fishery from 1996 to 2021 in Area 2 and Quarter 2. ISC/22/ALBWG-02/08

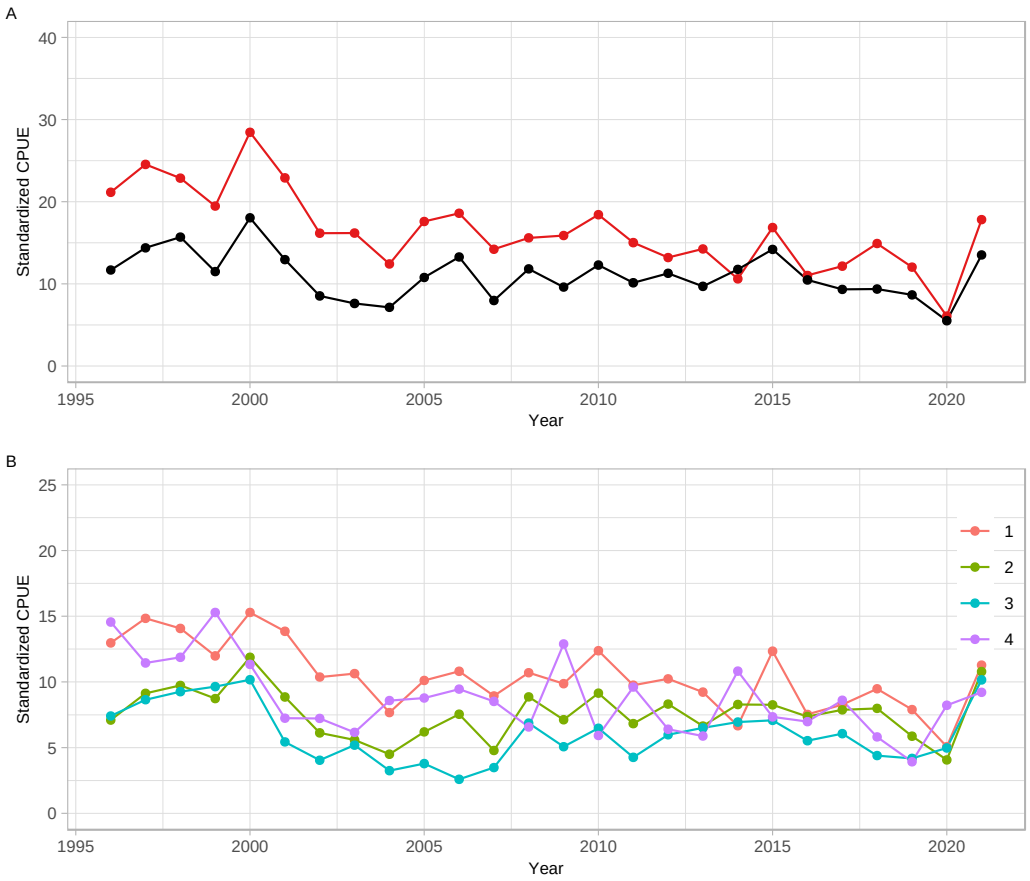

Figure 1 Adult albacore tuna CPUE standardized by the Japanese longline logbook data. A: Analysis results using only data from the first or second quarter (red: qtr1, black: qtr2). B: Analysis results using data from all quarters.