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Updated the size data for North Pacific albacore tuna from Japanese fisheries for the 2026 stock assessment

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Abstract

This paper details the update and review of Japanese albacore (Thunnus alalunga) size data for the upcoming 2026 stock assessment. Understanding the size structure of catches is crucial as it reflects fishery selectivity, which varies across Japanese fleets (longline, pole-and-line, etc.). The updated dataset incorporates newly collected port sampling and research/training vessel data up to 2024 and corrects a significant filtering error that had erroneously excluded observer data in the previous 2023 assessment. This correction resulted in a substantial increase in the total number of size samples. Despite the sample size increase, comparisons of length frequency distributions for major fisheries (LL and PL) showed a high degree of consistency with the 2023 stock assessment data. The analysis confirmed key biological and operational characteristics, such as the longline fleet sampling larger, adult fish in lower-latitude spawning areas and the pole-and-line fleet targeting smaller, juvenile fish in northern feeding grounds. This data consistency and improved coverage, particularly for adult-indicator areas (Area 2), support the robust estimation of selectivity for the upcoming 2026 stock assessment.

Introduction

Size composition data, specifically length frequency distributions (LFDs), are critical for stock assessment models as they provide essential information on the age and size structure of the exploited population and are used to estimate selectivity parameters for each fishing fleet. Japanese vessels utilize various gear types, including longline (LL), pole-and-line (PL), and drift nets (until the 1993 moratorium). The size of albacore caught is closely related to the areas and seasons of operation, reflecting the species' seasonal migration patterns and changes in swimming depth off the coast of Japan (Kiyofuji et al., 2013).

Japanese albacore size data is routinely updated for each stock assessment, not only to incorporate the most recent observations but also to review and integrate newly discovered data sources (Ohashi et al., 2019; Uosaki et al., 2011). For this update, we included several new data points collected since the last assessment and performed a thorough re-review and refinement of the filtering process.

This paper describes the updated size datasets for the Japanese fisheries intended for the upcoming 2026 stock assessment. We detail the composition of the updated data and assess its consistency by comparing it with the data used in the 2023 assessment (Aoki et al., 2022). Finally, we summarize the characteristics of the Japanese size data, categorized by the gear and fleet definitions for the upcoming 2026 assessment.

Data and Methods

Data sources

Detailed descriptions of the data sets are provided in Aoki et al. (2022). The primary data sources used for this update include the following:

- Pole-and-line fishery (PL)
  - Training/Research vessels (R/V): 1995-2005
  - Port sampling by FRA staff (Fisheries Research Agency):
    - Tohoku National Fisheries Research Institute: 1953-1978
    - National Research Institute of Far Seas Fisheries:
      Kesennuma port: 2002-2024; Yaizu port: 2011-2023; Chiba-Katsuura port: 2006-2013
  - Port sampling by Prefectures:
    Miyagi pref.: 2001-2015, Ibaraki pref.: 1973-2001, Chiba pref.: 2003-2020, Mie pref.: 2005, Wakayama pref.: 2002-2015
- Longline fishery (LL)
  - Port sampling by FRA staff:
    - Tohoku National Fisheries Research Institute: 1974
    - National Research Institute of Far Seas Fisheries :
      Kesennuma port: 2001-2024, Yaizu port: 2001-2023, Kii-Katsuura port: 2001-2024, Chiba-Katsuura port: 2001-2012
  - Port sampling by Prefectures:
    Miyazaki Pref.: 2001-2023
  - Observer data:2002-2024
- Other fisheries (Drift net, Purse seine, etc.)
  - Port sampling by FRA staff:
    - Tohoku National Fisheries Research Institute: 1970-1977
      Kesennuma port: 2008
  - Port sampling by Prefectures:
    Miyagi Pref.: 2001-2020, Fukushima Pref.: 2013, 2016, Chiba Pref.: 2012
    Mie Pref.: 2022, Wakayama Pref.: 2002-2024
  - Observer data: 2017-2019

Data processing sand correction

The data processing steps used to prepare the size data for the 2026 stock assessment followed the methodology established for the previous 2023 assessment (Aoki

et al., 2022). Essential information for stock assessment input, such as fleet definition (Table 1) and stock assessment area information (Figure 1 and 2), was appended to the raw data. Subsequently, the following filtering criteria were applied to ensure the suitability of the data for the North Pacific albacore stock assessment:

- Species: only albacore
- Gear: longline (LL), pole-and-line (PL), longline Research and Training vessels (RV)
- Area: north Pacific Ocean (i.e., latitude >=0) and inside the stock assessment areas
- Area level: data resolution of 1x1, 5x5 grid degrees
- Year: 1998-2024
- Error: remove length >=160

Results and Discussion

Comparison of the size data between for 2023 assessment and for 2026 assessment

The locations of the ports where size measurements were recorded in each database were shown in Figure 3. Size data for longline, pole-and-line, drift net fishery were basically measured at three ports (Kesennuma, Nachi-Katsuura, and Yaizu).

Figure 4 compares the total annual number of size samples between the dataset used in the 2023 stock assessment (SA2023) and the updated dataset prepared for the upcoming 2026 stock assessment (SA2026). Notably, a significant portion of this increase since 2000 is due to the correction of a filtering error in the SA2023 data preparation process, which had erroneously excluded observer-collected data. The inclusion of these previously missing observer data in the SA2026 dataset is a primary driver of the observed sample size increase.

Figures 5 and 6 compare the length frequency distributions for the longline and pole-and-line fisheries, stratified by stock assessment area. A substantial increase in sample size is observed across all areas in the SA2026 dataset. However, the overall shape of the length distributions remains generally similar between the two datasets. This consistency is expected to facilitate the estimation of selectivity that is consistent with the 2023 stock assessment. Specifically, the expanded data coverage in Area 2, which serves as an indicator for adult fish, is particularly important for understanding trends in the spawning stock biomass. The pole-and-line fishery primarily operates in the coastal and offshore waters of Japan, consistently targeting smaller, younger albacore. The length compositions for this fishery show no significant difference between the two datasets, suggesting that the size range targeted by this fishery has been stable over time. Although the increase in sample size for the pole-and-line fishery is modest, the consistency between the datasets supports the validity of model assumptions regarding this fishery.

Characteristics of Japanese size data

Figure 7 shows the quarterly geographical distribution of size sampling for the major fleets (LL, PL, and RV). Longline (LL) sampling covers a wide expanse of the North Pacific, while pole-and-line (PL) sampling is concentrated in the waters east of Japan. Longline research/training vessel data (RV) constitute a valuable subset of the total longline data, providing important coverage in low-latitude areas considered crucial spawning g

The geographical distribution of the median fork length (FL) by fishery is presented in Figure 8. For the longline fishery, a clear seasonal north-south movement pattern is evident, with larger individuals (FL > 90 cm) predominantly caught at lower latitudes and smaller ones at higher latitudes. In contrast, the pole-and-line fishery consistently catches relatively smaller individuals (FL 60-80 cm) throughout all seasons in the northern areas (Area 6). These spatial size distribution patterns reflect age-dependent migratory behavior: large adults tend to remain in low-latitude areas for spawning, while juveniles and sub-adult fish migrate to high-latitude areas for summer feeding. These observed spatial patterns in length distribution are fundamental inputs for estimating growth, movement, and spatially structured selectivity within the stock assessment model.

The fleet definitions for the Japanese fisheries used in the stock assessment are referenced from the 2023 assessment and displayed in Table 1. Figure 9 provides a comprehensive overview of the catch-weighted length compositions for all Japanese fleets defined in Table 1. For instance, longline fleets target vastly different sizes depending on their operational area, whereas pole-and-line fleets consistently focus on juvenile fish. Crucially, the fleet definitions and the resulting size compositions for each fleet remain consistent with those used in the 2023 stock assessment.

Reference

Aoki Y., Senda, T., Ijimma, H., Matsubara, N., Matsubayashi, J. and Tsuda., Y. Summary of size data update for North pacific albacore (*Thunnus alaunga*) in Japan. ISC/22/ALBWG-02/02.

Kiyofuji, H., Okamoto, S., and Ijima, H. 2013. Vertical and horizontal changes of North Pacific albacore derived from archival tag data. Working paper submitted to the ISC Albacore Working Group Intercessional Workshop, 5-12, November 2013, National Research Institute of Far Seas Fisheries, Shimizu, Shizuoka, Japan.

Ohashi, S., Ijima, H., and Kiyofuji, H. 2019. Summary of historical size data of North Pacific albacore (Thunnus alalunga) caught by Japanese fisheries. ISC/19/ALBWG-02/06. Working Paper submitted to the ISC Albacore Working Group Intercessional Workshop, 12-18 November 2019, National Research Institute of Far Seas Fisheries, Shizuoka, Japan.

Uosaki, K., Kiyofuji, H., and Matsumoto, T. 2011. Review of Japanese albacore fisheries as of 2011. ISC/11/ALBWG/13. Working Paper submitted to the ISC Albacore Working Group Stock Assessment Workshop, 4-11 June 2011, National Research Institute of Far Sea Seas Fisheries, Shimizu, Japan.

Table 1 Fleet definition for Japanese fisheries for North Pacific albacore stock assessment (referred from previous assessment). RTV indicates the Research and Training vessels.

Fleet (mirror)	Gear	Area	Quarter
F1 (F6)_juvenile	LL	1,3	1
F2 (F7)_adult	LL	1,3	1
F3 (F8)	LL	1,3	2
F4 (F9)	LL	1,3	3
F5 (F10)	LL	1,3	4
F11 (F15)	LL	2	1
F12 (F16)	LL	2	2
F13 (F17)	LL	2	3
F14 (F18)	LL	2	4
F19	LL	4	1,2,3,4
F20	LL	5	1,2,3,4
F21	PL	3,5 (>=30N)	1
F22	PL	3,5 (>=30N)	2
F23	PL	3,5 (>=30N)	3
F24	PL	3,5 (>=30N)	4
F25	PL	2,4 (<30N)	1,2,3,4
F36	LL_RTV	2	1,2,3,4
F37	LL_RTV	4	1,2,3,4

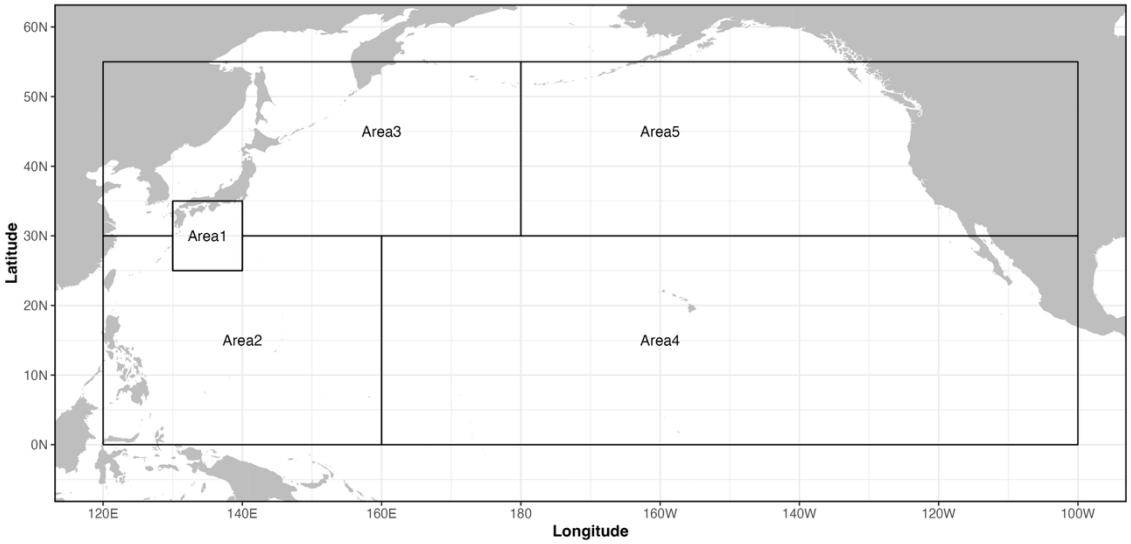


Fig. 1. Area definition for the longline (LL) fishery.

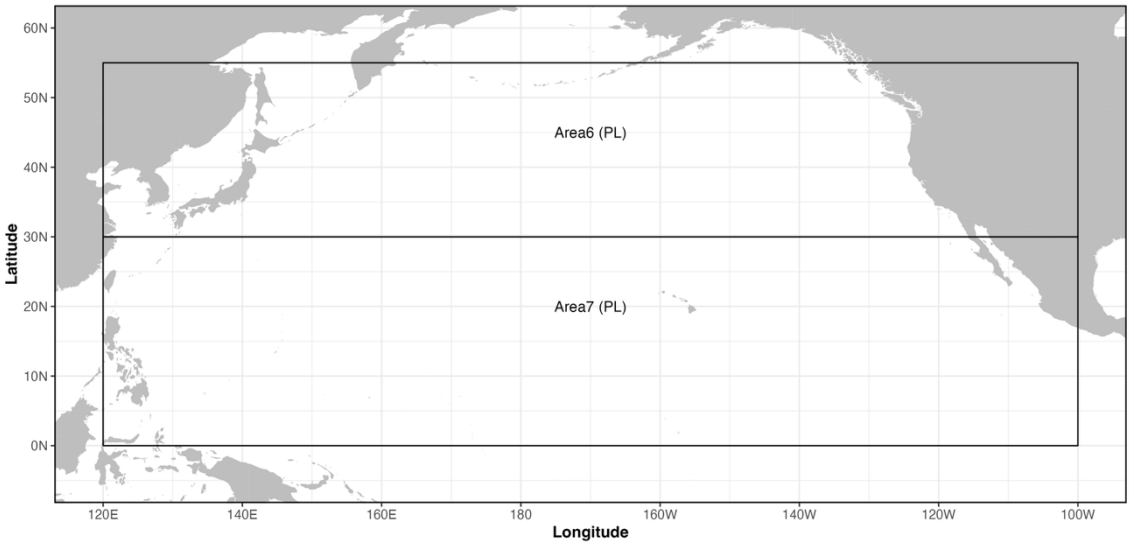


Fig. 2. Area definition for the pole-and-line (PL) fishery.

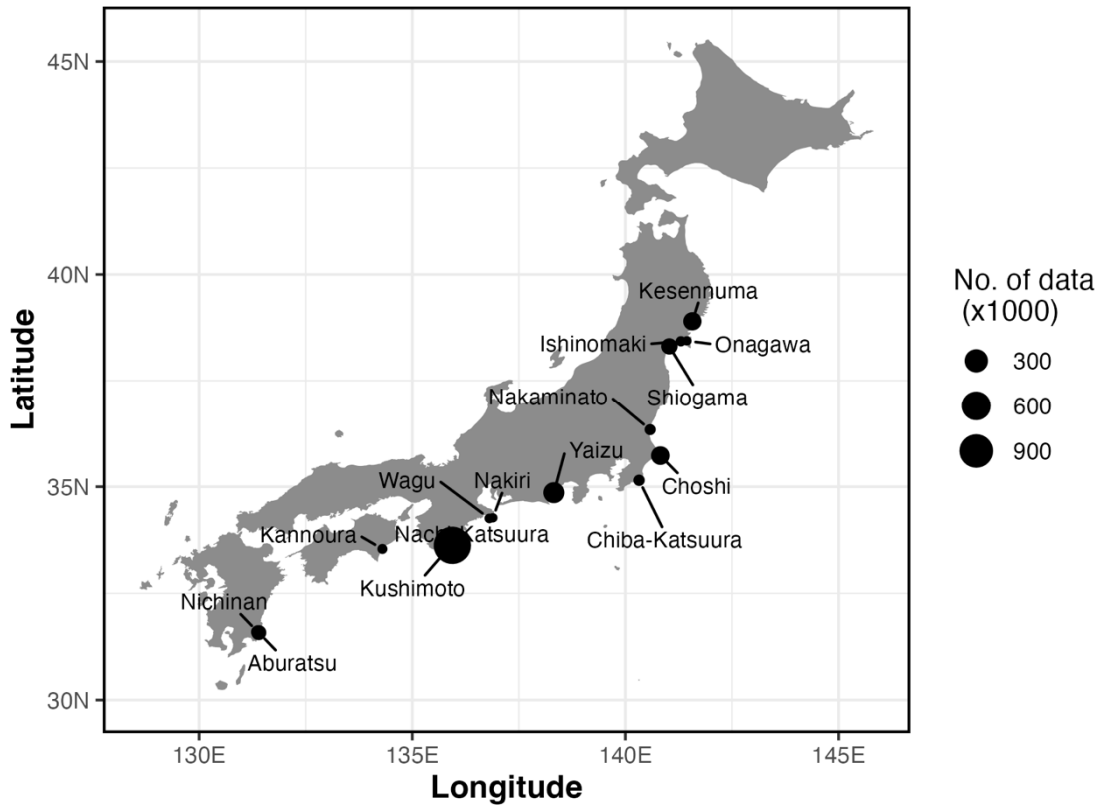


Fig. 3. Sampling locations of size data of Japan.

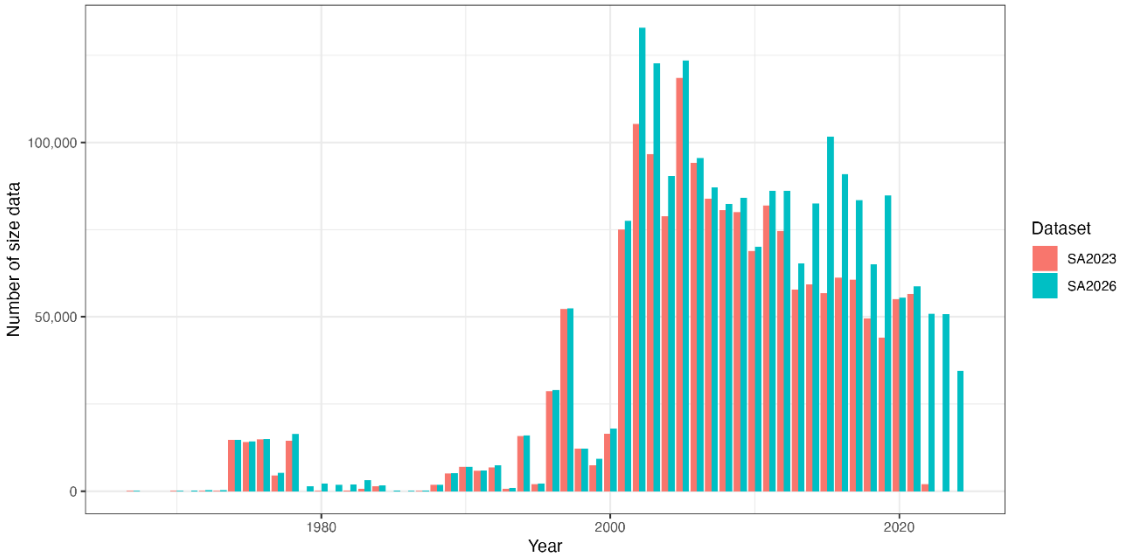


Fig. 4. Comparison of the total annual number of North Pacific albacore size samples used in the 2023 stock assessment (SA2023) and prepared for the 2026 stock assessment (SA2026).

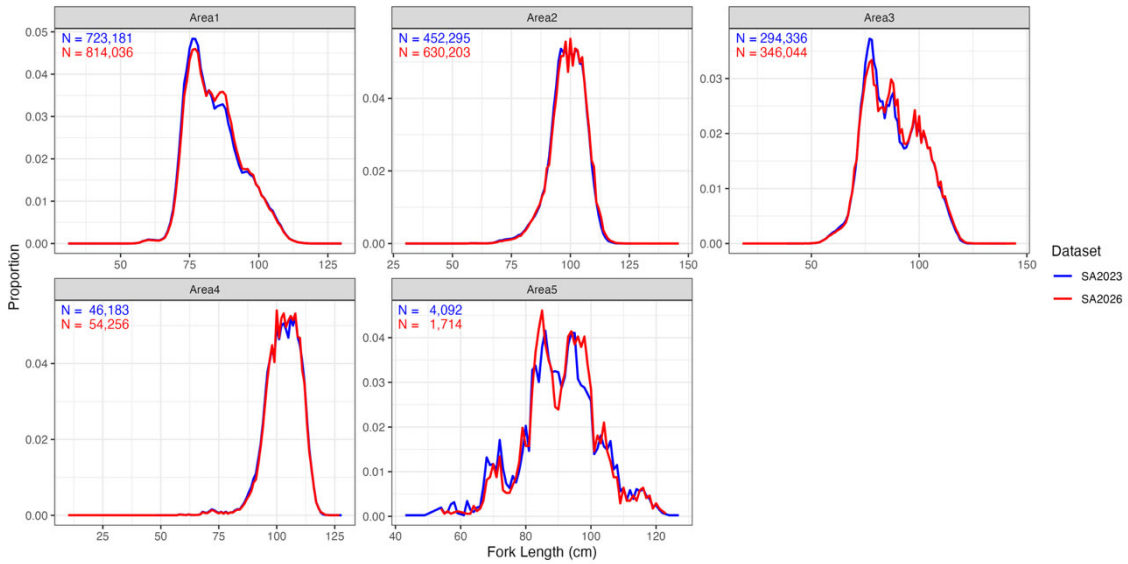


Fig. 5. Comparison of length frequency distributions for the longline fishery by stock assessment area. The figure compares data used in the 2023 assessment (SA2023) with data prepared for the 2026 assessment (SA2026).

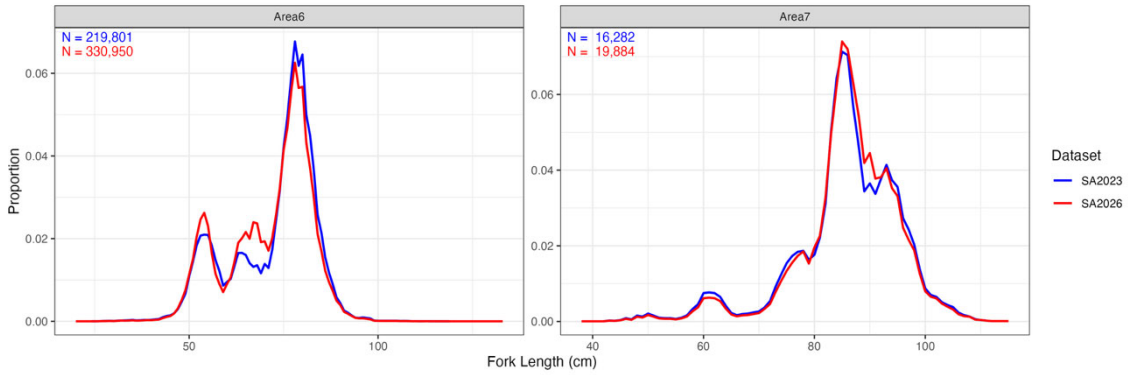
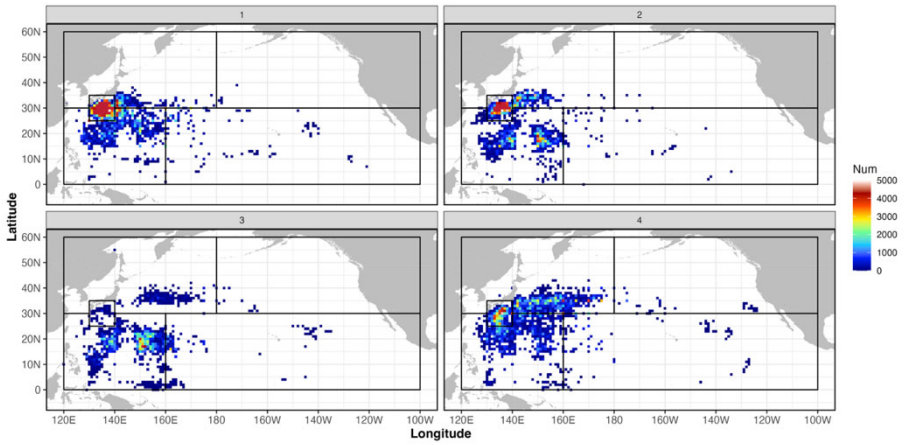
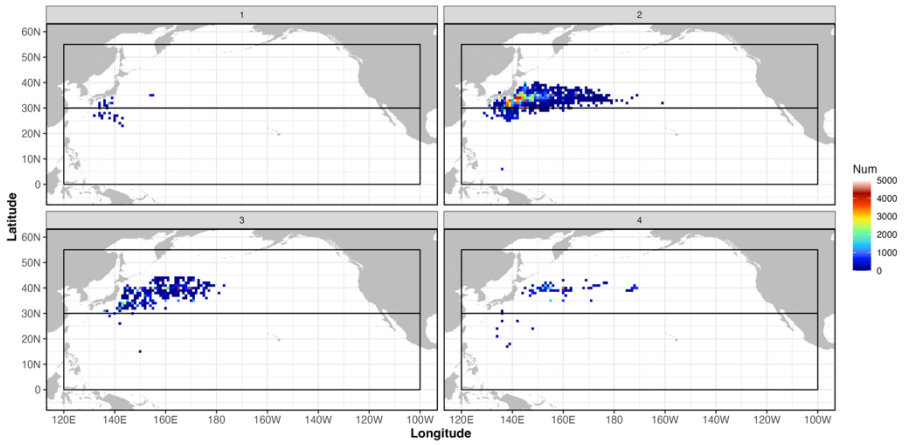


Fig. 6. Comparison of length frequency distributions for the pole-and-line fishery by stock assessment area. The figure compares data used in the 2023 assessment (SA2023) with data prepared for the 2026 assessment (SA2026).

LL



PL



RV

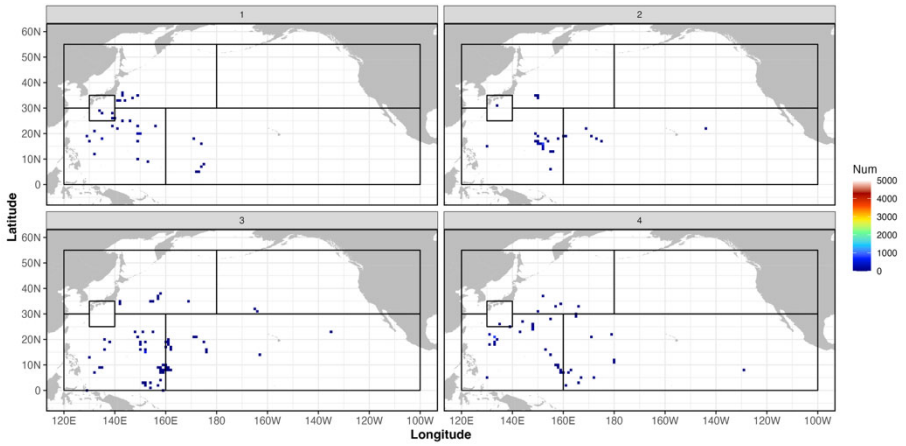
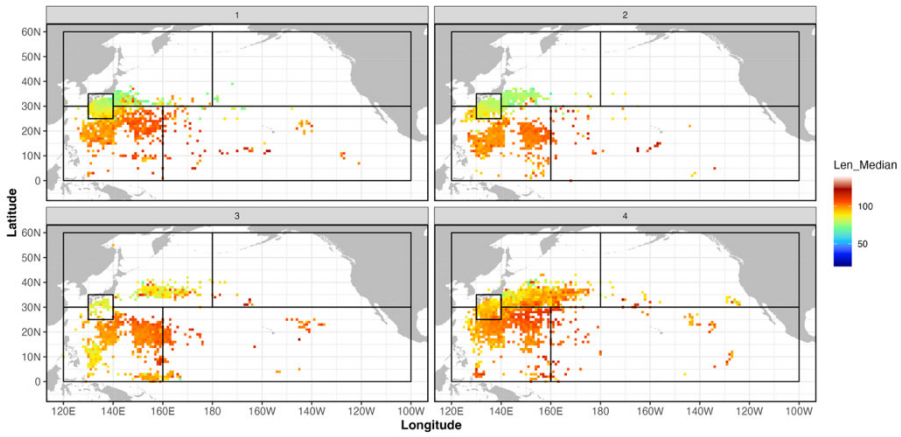
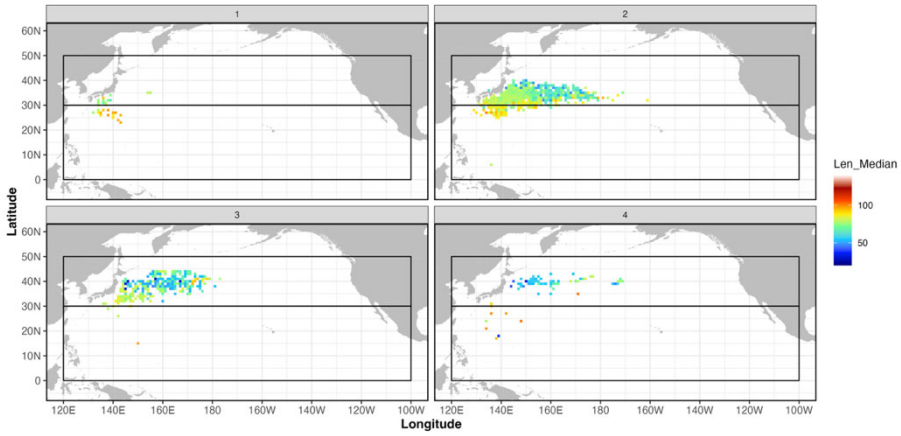


Fig. 7. Quarterly distribution of the number of North Pacific albacore size samples for the longline (LL), pole-and-line (PL), and longline with longline research/training vessels (RV).

LL



PL



RV

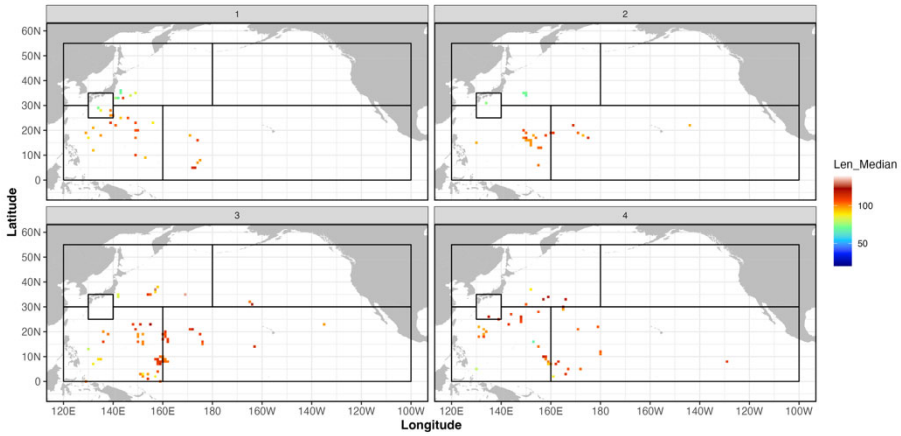


Fig. 8. Quarterly distribution of the median fork length (cm) of North Pacific albacore for the longline (LL) and pole-and-line (PL) fisheries, and longline research/training vessels.

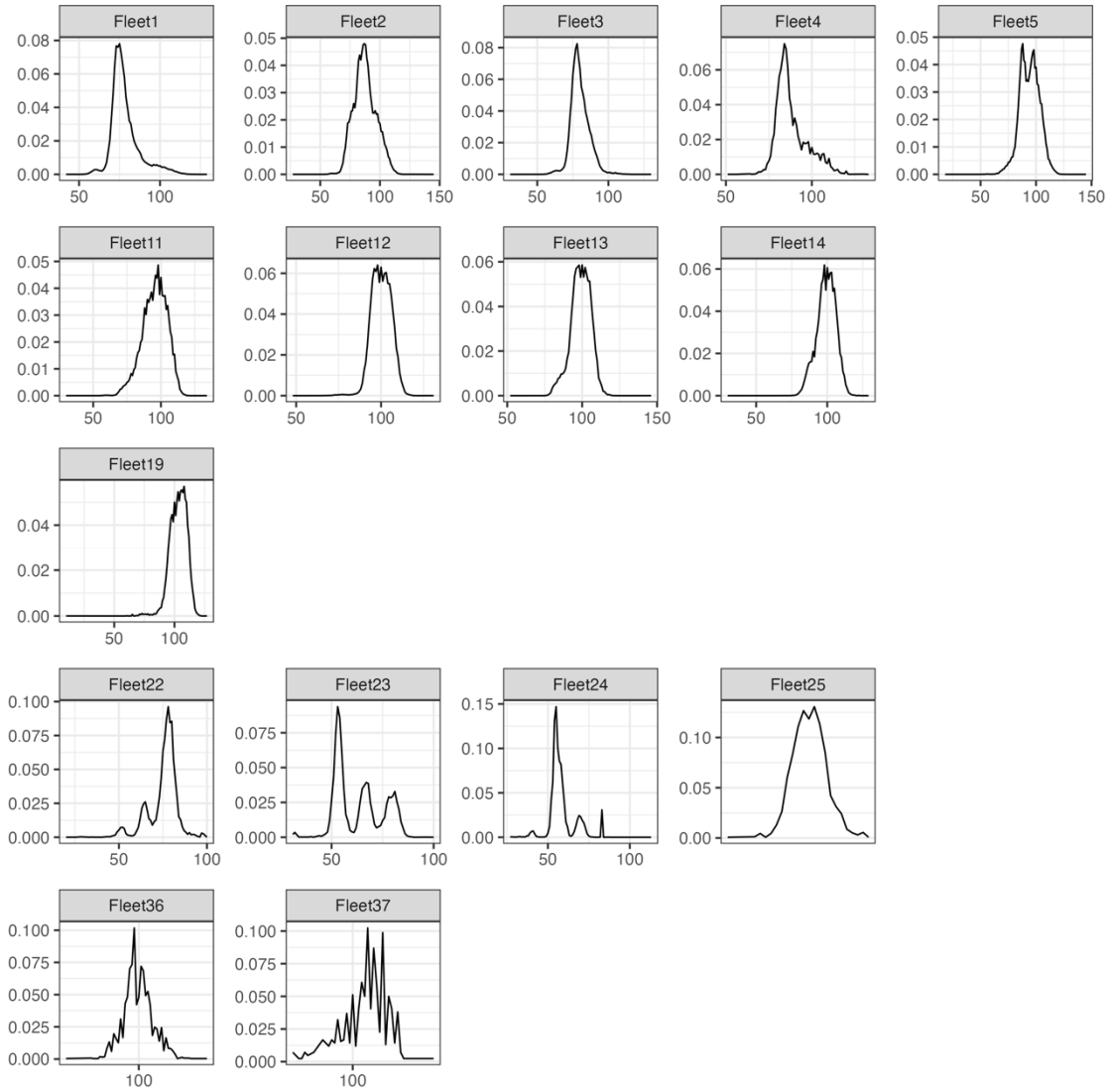


Figure 9. Size composition of North Pacific albacore for all Japanese fleets, aggregated over all years. No data were available for Fleet 20 and 21.