Update on Korean fishery information and size distribution of Pacific Bluefin tuna

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Summary

Total catch of Pacific Bluefin tuna (PBF) in 2023 was 668 ton caught by offshore large purse seine, set net and trawl fisheries in the Korean waters. The catch proportion of set net has been increasing in recent years and it recorded at highest in 2022. In 2023 catch of set net fishery was similar with catch in 2022. The catch proportion of large PBF in 2023 was 67% of the total catch. Although most PBF were caught by purse seine fishery during February to March in the eastern part of Jeju island, and that of set net was caught largely from June to September along the coast of the East Sea. The catch by set net, which are located along the coast of the East Sea, were getting higher. As for the PBF size frequency, large size of PBF has increased since 2016 and mainly caught in 1st and 2nd quarters.

Introduction

Pacific bluefin tuna (*Thunnus orientalis*, PBF) mostly has been caught by Korean offshore large purse seine fishery (hereafter 'purse seine fishery', Fleet 11 for stock assessment) which targets pelagic species such as mackerels round the Jeju island (Yoon et al., 2012). And it is also caught by set net and trawl fisheries in the Korean waters. For monitoring and managing of fisheries associated with PBF, the Ministerial Directive on conservation and management for PBF stock put established on 26 May 2011, since then it has been amended several times, and the latest directive was put into force in 2023. Under the Ministerial Directive, the annual catch limit of PBF has been set by fishery and province, and the catch reporting system has improved as well according to the Western and Central Pacific Fisheries Commission (WCPFC) Conservation and Management Measure (CMM) related to PBF and recommendations by ISC Pacific bluefin tuna Working Group (PBFWG).

This document describes the updated Korean fisheries information and size distribution related to PBF up to 2023 (Calendar year).

Catch and effort

Total catch of PBF was highest with about 2,600 tons in 2003, thereafter it has been decreased with annual fluctuations. The PBF catches in 2022 and 2023 were 881 ton and 668 ton, respectively. The number of vessels belonging to the purse seine fishery has been continuously declined, and it recorded 19 in 2023 (Fig. 1)

As for the purse seine fishery, the PBF catches in 2016 and 2017 were exceeded the allocated annual catch limit due to an unexpected huge amount of catch caught by most purse seine vessels at once only within one or two days. Accordingly, the over catches have been paid back through a 5-year schedule from 2017 to 2021. The catch by purse fishery in 2023 was 448 ton, which added underage of catch limit in 2023.

While the catch by purse seine fishery has historically accounted for most of the total PBF catch, set net fishery are getting much more catch proportion for recent years. The PBF catches by set net was around 79 ton in 2021, it sharply increased to 222 ton and 215 ton in 2022 and 2023. This is because many unexpected PBF caught in set net fishery, which has passive fishing method, so that more quotas were allocated to set net fishery within PBF associated fisheries. The catch by trawl and other fisheries was around 5 ton in 2023, which similar with catch in 2021 (Fig. 2).

Historically, most PBF caught by fisheries in the Korean waters were small fish less than 30 kg in weight. However, the catches of large PBF began to increase since the late 2000s, and the catch proportion of large PBF highly recorded at 68%, 59%, and 50% in 2020, 2022 and 2023, respectively. In 2023, most large fishes caught by purse seine fishery in the first quarter (Fig. 3).

Fishing distribution

The catch distribution and fishing season of PBF differ by fishery. As for purse seine fishery, the PBF mainly caught in the waters of Jeju island around the first quarter. For set net fishery, PBF mainly caught along the coast of north of 36°N in the East Sea during all the seasons. In 2023, the main fishing ground was mainly formed in the southern part of Jeju island, and significantly reduced the area where caught PBF. In addition, it more distributed along the coast of the East Sea by set net.

Size distribution

Data and Methods

PBF size data are mainly collected at Busan Cooperative Fish Market, where most PBF catch of purse seine fishery are loaded, by researchers and observers. In addition, detailed biological information including length and weight are collected at the laboratory of the National Institute of Fisheries Science (NIFS). The measurements are recorded in fork length and weight in 1 cm and 1 kg interval, respectively, in a basic manner.

PBF size data have been collected since 1996, but data before 2003 were not used in this study because they were not enough for analyzing.

Sample size data were raised to represent population size. For that we categorized the size group into “large” of 30 kg or more and “small” of under 30 kg, and weighted size distribution based on the category as follows;

$$\mathrm{TN} = \sum_{i=n}^{m} SN_{i,qut} w_{s,qut} + \sum_{j=n}^{m} LN_{j,qut} w_{L,qut}$$

where, *TN* is the estimate of the total number of catch for the quarter, $SN_{i,qut}$ is the number of sample of length class *i* for small size, quarterly, $LN_{j,qut}$ is the number of sample of length class

j for large size, quarterly, $w_{s,qut}$ and $w_{L,qut}$ are weightings that are divided sampled catch by nominal catch for small and large size, quarterly, and n and m are the minimum and the maximum size sampled for each size group.

Fig. 4 and 5 represent the distributions of fork length of PBF caught by purse seine fishery, which are not raised (Fig. 4) and raised (Fig. 5) based on the catch of small and large size, respectively. Those figures show similar distributions between them, but in 2004 the frequency of large size decreased from the raised distribution. Compared to the previous years, fish larger than 100 cm were much caught from 2020. Fig. 6 represents the frequency of PBF length by quarter, which showed that the large size was commonly caught in quarter 1 and 2.

Fig. 7 represents the distribution of raw fork length of PBF caught by set net fishery, 2019-2023. The distribution are not raised because there are not enough sample size.

References

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Yoon SC, Kim ZG, Lee SI, Lee MK and Lee DW. 2012. Catch characteristics and resources management of Pacific Bluefin tuna caught by offshore large purse seine in Korean waters. ISC/12-3/PBFWG-09.

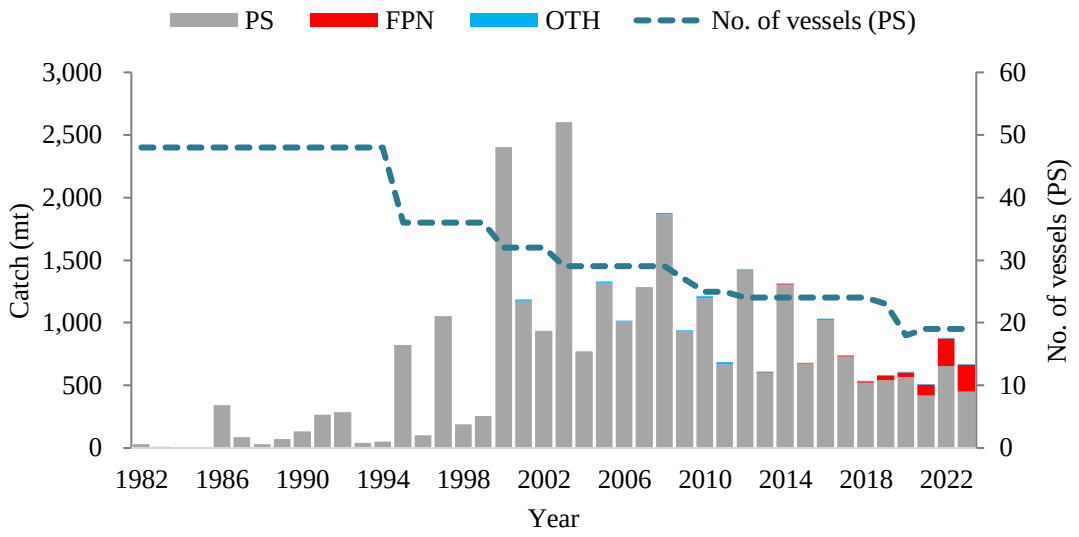


Fig. 1. Total catch of Pacific bluefin tuna and number of vessels belonging to the Korean offshore large purse seine fishery, 1982-2023 (PS: purse seine, FPN: set net, TX & OTH: trawl and other fisheries).

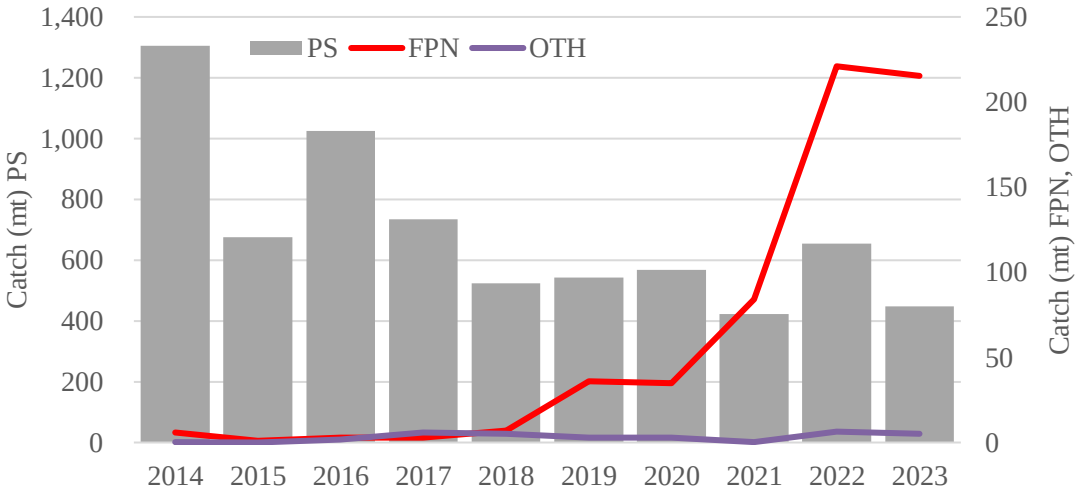
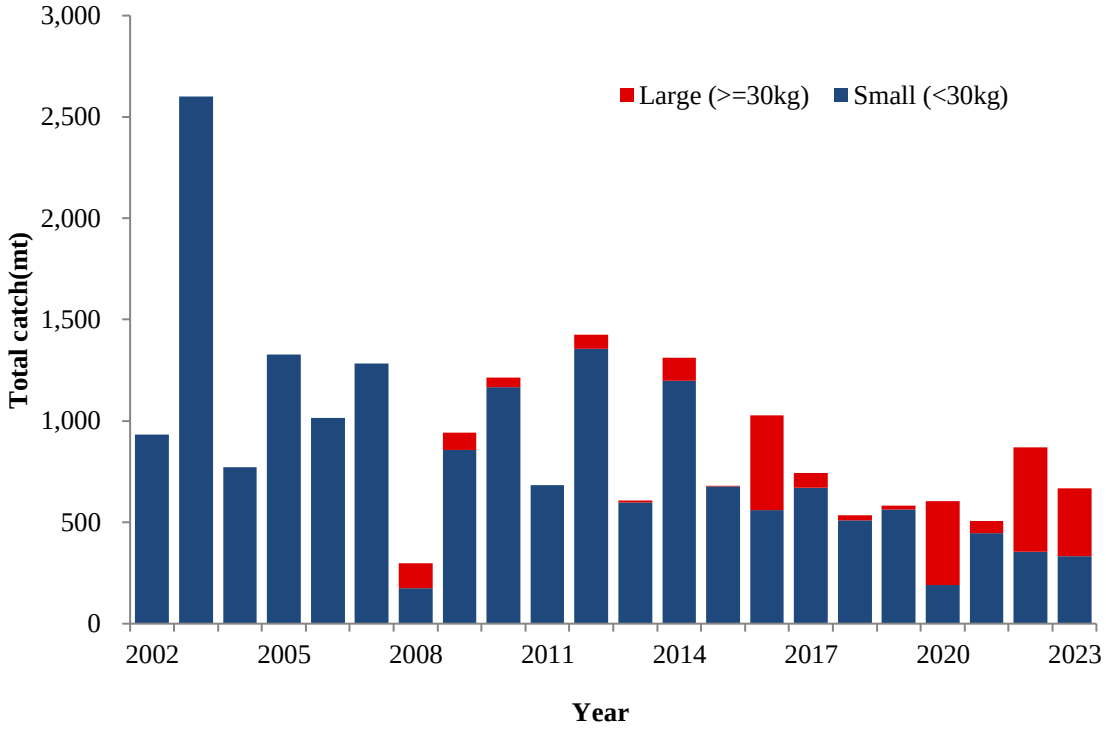


Fig. 2. The catch (upper) and its proportion (lower) by fishery, 2015-2023.



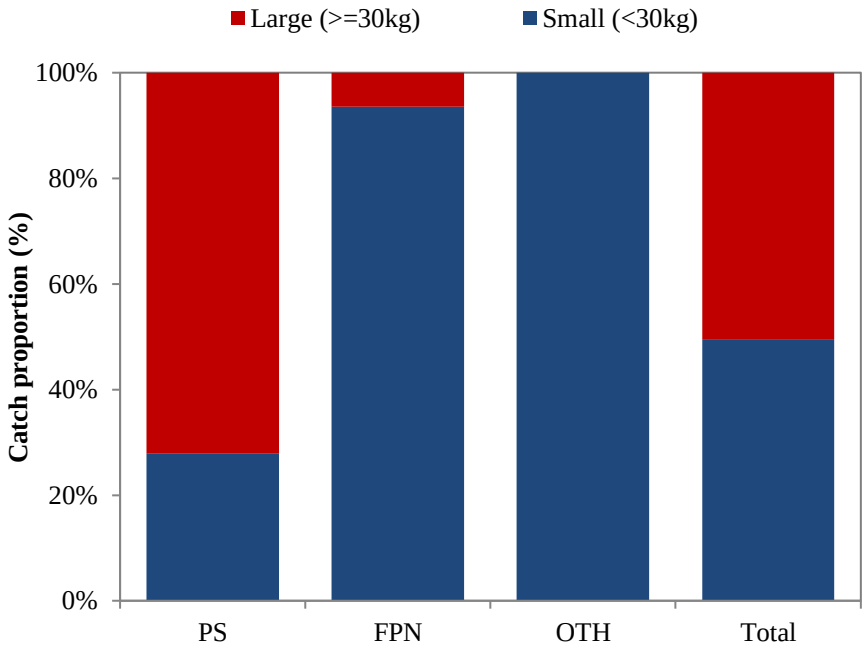


Fig. 3. The catch (2002-2023) (upper) and its proportion by fishery (lower) in 2023 by size (large/small).

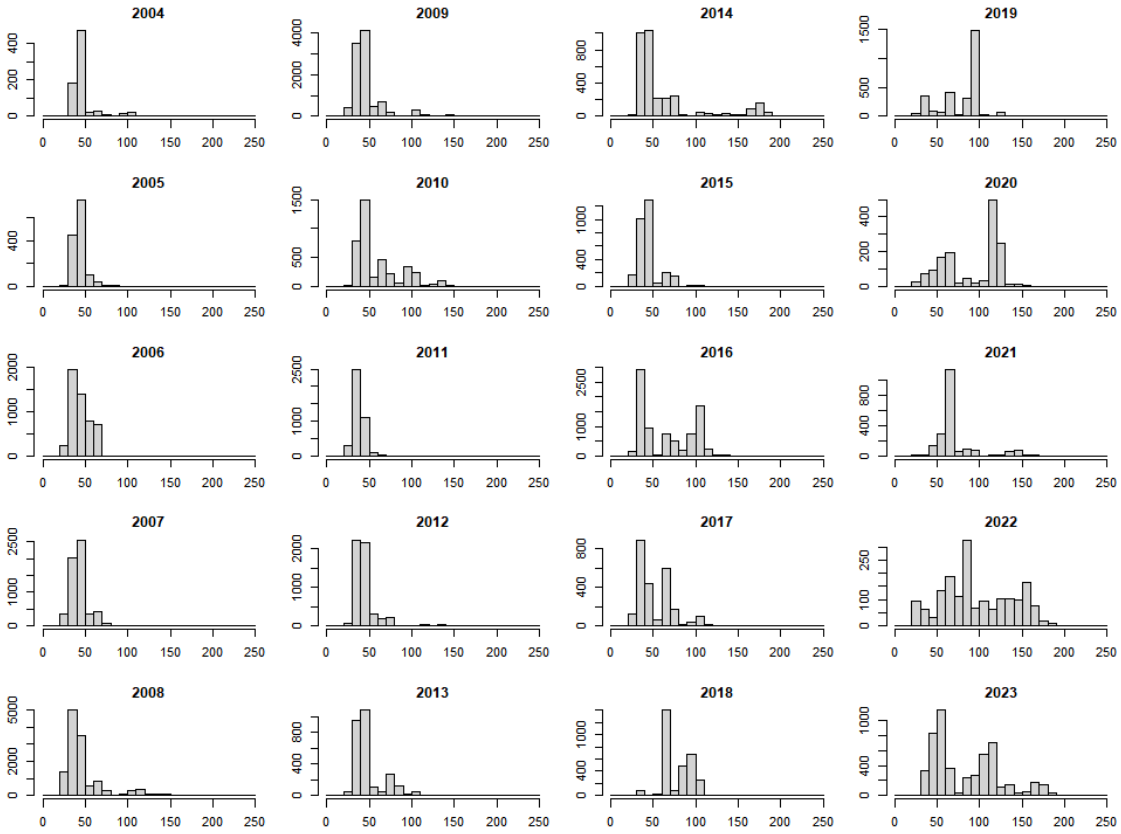


Fig. 4. The distributions of raw fork length of Pacific bluefin tuna caught by the Korean offshore large purse seine fishery, 2004-2023.

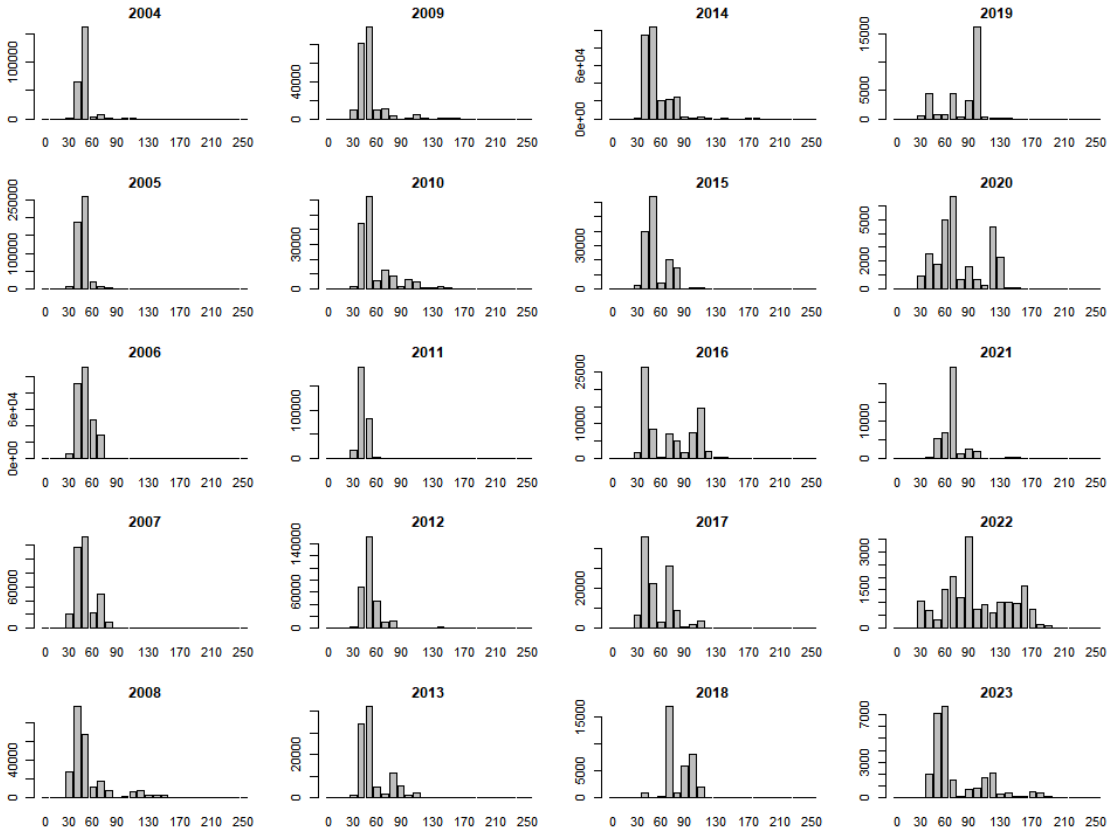


Fig. 5. The distributions of fork length of Pacific bluefin tuna caught by the Korean offshore large purse seine fishery, which were weighted by the catch of small and large size, 2004-2023.

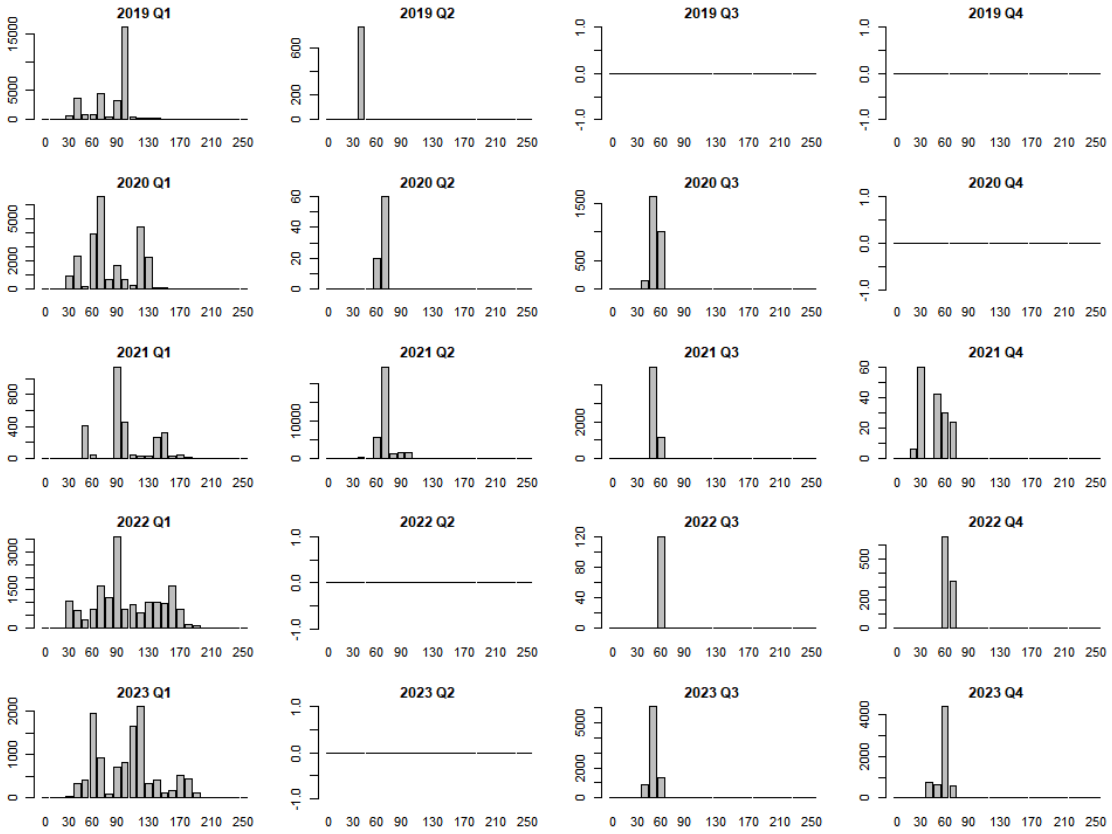


Fig. 6. The distributions of fork length of Pacific bluefin tuna caught by the Korean offshore large purse seine fishery, by year-quarter, 2019-2023.

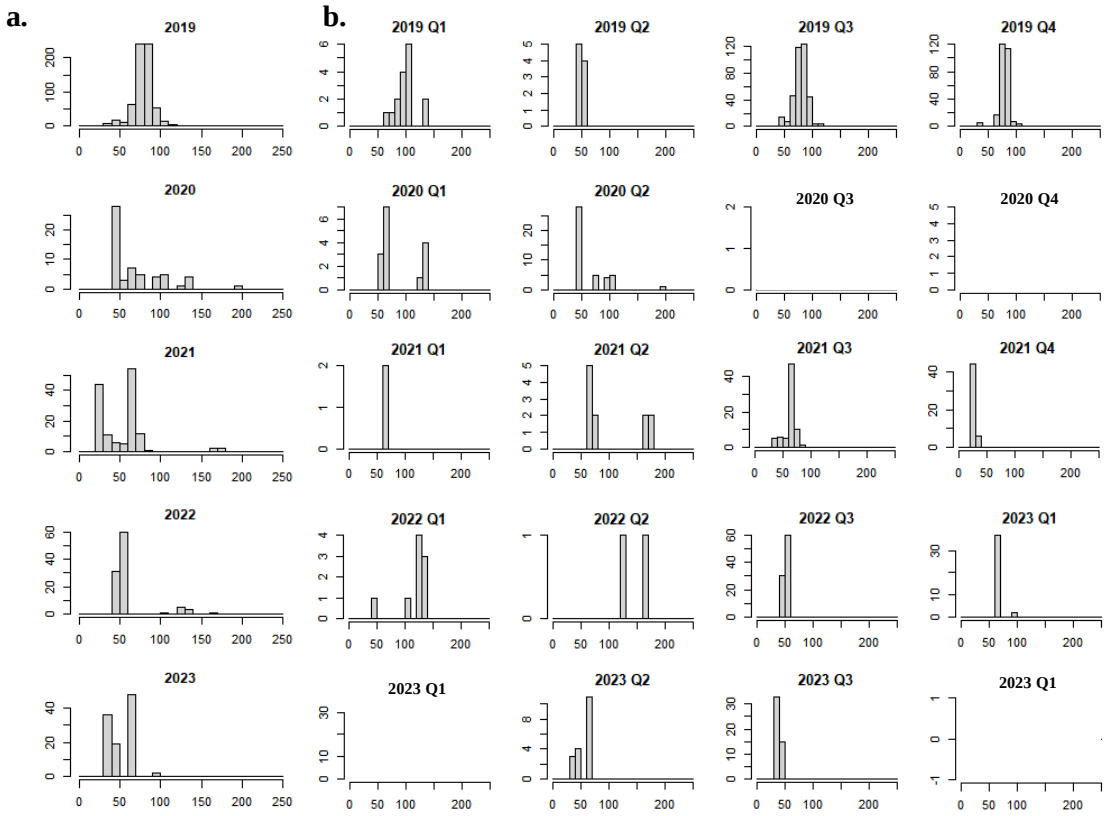


Fig. 7. The distributions of raw fork length of Pacific bluefin tuna caught by the Korean set net fishery, by (a) year and (b) quarter, 2019-2023.