Estimation of the PBF length-composition for the Japanese purse seine operating in the Pacific side

Hiromu FUKUDA[1]

[1]National Research Institute of Far Seas Fisheries
5-7-1, Orido, Shimizu, Shizuoka 424-8633, JAPAN

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Introduction

Japanese tuna purse seine operated in the Pacific Ocean side (JTPS-PO; so-called fleet 5 in the assessment) is the historical biggest fleet but its catch declined in early 2000's. During late-2000's to the recent year, the amount of catch by this fleet had remained low (> 1,000 tons). However, their catch increased after 2015 and it went up beyond 1,000 tons again (Figure 1). According to the corresponding industry, PBF came back to their fishing ground and now there has been PBF in a high availability. Given the relatively small global quota (ca. 14,000 tons) for PBF under the current strict management, 1,000 tons of catch is not negligible portion for both the management and assessment.

In domestically, the purse seine fleets were allocated the PBF TAC for both of small and large fish categories and the purse seine industries re-allocate that quota for each area. The most of all quota for small PBF category (< 30 kg) were consumed by the Japanese small pelagic fish purse seine fleet (fleet 2 and 17 in the assessment), and the quota for large PBF were consumed by the Japanese tuna purse seines (JTPS-SOJ and JTPS-PO; Fleet 4 and 5 in the assessment). Historically, JTPS-PO had been caught both of small and large PBF, but they have been caught only large PBF due to the new allocation since 2011, with some exceptions. The information described above illustrates the strong time-varying nature of the JTPS-PO purse seine fishery due to the management change since 2011.

In the stock assessment of PBF, JTPS-PO is assigned as "fleet 5". In the assessment, catch in weight and length composition data were used to depict the removal process of this fleet. The length composition used in the current assessment for JTPS-PO fleet was based on the length measurement data during 1995-2006 collected by the port sampling (ISC, 2012). After 2006, there has been a difficulty to have an enough length sample due to the opportunistic unloading of PBF. In the last stock assessment, the selectivity of this fleet was assumed to be constant after 2006 to be similar with those past years and the size composition of this fleet after 2006 were not used. The National Research Institute of Far Seas Fisheries of Japan (NRIFSF) recognized the possible change in the size selection of this fleet and they re-organized the port sampling program, and then currently we could collect the size samples from port sampling program.

In this document, newly available size composition data from 2015 to 2018 are presented and reviewed.

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The length composition is calculated by the length measurements of each unloading raised to the number of fish in the respective unloading. The probability that the fish at the length bin of i occurred in the quarterly catch at length distribution can be described as follows:

$$P_i = \sum_{l=1}^{L} r_l p_{il}$$

where, r_l is catch in number in each unloading (l) in a quartet and p_{il} is proportion at the length bin of i in each unloading (l) in a quarter.

The length measurement data were collected by the port sampling program "RJB port sampling program". PBF catch in number for each unloading was obtained from the port sampling survey. In case the catch in number is not available from the port sampling survey, it was estimated based on the catch in weight obtained from the TAC report of Japan and the average weight of individual fish measured by the port sampling.

Results and Discussion

The size samplings were conducted for about or more than half of the total unloadings of respective years and more than 10% of fish were measured in average except 2015 (Table 1). The estimated size compositions of JTPS-PO after 2014 were different from those of before 2007; most of the observation occurred at size bins of above 110 cm (Figure 2). On the other hand, there had been some PBF observations in the size bins of below 110 cm during 2000's (Figure 3). This clear difference in the composition data would be the indicative of the selectivity change of this fleet due to the domestic reallocations of the quotas for the small and large PBF categories implemented since 2011.

In addition to those, there were also some differences among the size compositions of the most recent 4 years. From 2015 to 2018, this fleet might catch mainly same some (or even single) cohort(s) and the growth of that (those) cohort(s) might be reflected in the composition data. In the 3rd quarter (Calendar year; July to September) of 2018, there might be some new cohorts occurring at the peaks of 90 cm and 170 cm. Those small differences in the composition data would reflect the change in the age structure of the whole population as well as the change in the local availability.

Within the year, they generally showed similar size distributions. However, the compositions here were drawn by Calendar years. Since PBF assessment applies fishing year starting from July 1st, catch in the 2nd and 3rd quarters in a calendar year corresponded to the 4th quarter of one-previous fishing year and 1st quarter of a fishing year. There might be necessity to apply the "super-year" option for the observation model, or combining all of the catches and size compositions in a quarter (maybe 4th quarter of a fishing year).

This document illustrated the newly available size sampling data for JTPS-PO fleet which collected by the reorganized port sampling program. This sampling program covered reasonably high proportion of the total number of unloading. Newly available size composition data for this fleet was the indicative of the big shift of the length selectivity from both small/large PBF during 1990-2000' to the only large PBF selection during 2010's due to the management change. It was

also indicated that there might be some temporal variations in the length (age) selectivity of this fleet for the recent years.

Considering those matters, the authors strongly recommended to include this newly available size composition data for JTPS-PO fleet in the next assessment. To reflect the big selectivity shift from the "small & large PBF" to the "only large PBF", it might be better to have a new fleet in the next assessment to depict the recent removal of this fleet (from 2011 to the terminal year). It also might be better to assume the time-varying age/length selectivity for the recent year's JTPS-PO fleets to depict the temporal variation in the composition data. Since those modeling process will require additional (maybe 20-30?) parameters to be estimated in the assessment model, the WG may want to discuss how to save that number of parameters to be estimated.

References cited

Abe, M. et al. 2012. Estimation of the catch at size for the Japanese tuna purse seine operated in the Pacific Ocean. ISC/12/PBF-1/04.

ISC. 2013. The ISC Pacific bluefin tuna working group meeting report.

ISC. 2018. The Stock assessment report for the Pacific Bluefin tuna conducted in 2018.

Table 1. Unloading, catch, and size sampling for JTPS-PO fleet during 2015-2018.

	Number of unloading			Total weight of PBF (tons)		
	Total	Measured	Coverage	Unloaded	Measured	Coverage
2015	22	11	50%	939	49	5%
2016	42	27	64%	1,286	189	15%
2017	40	26	65%	1,620	215	13%
2018	61	40	66%	1,571	263	17%
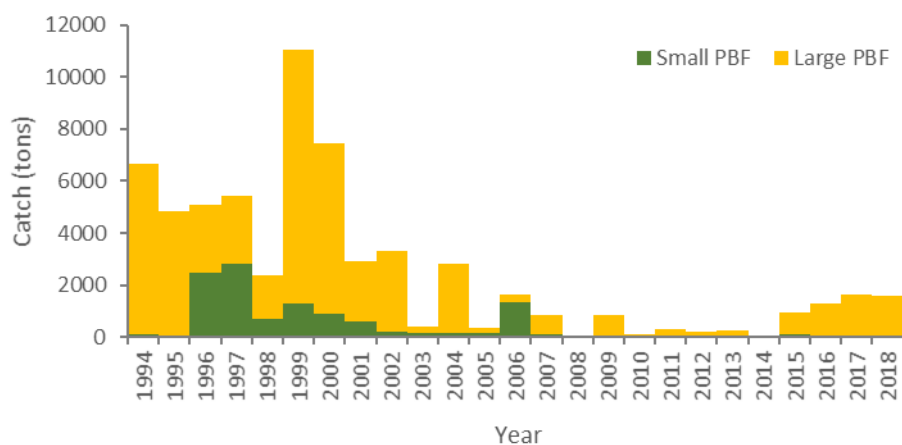
Figure 1 PBF catch by small (<30 kg) and large (≥30 kg) fish category by the Japanese tuna purse seine fleet operated in the Pacific Ocean.
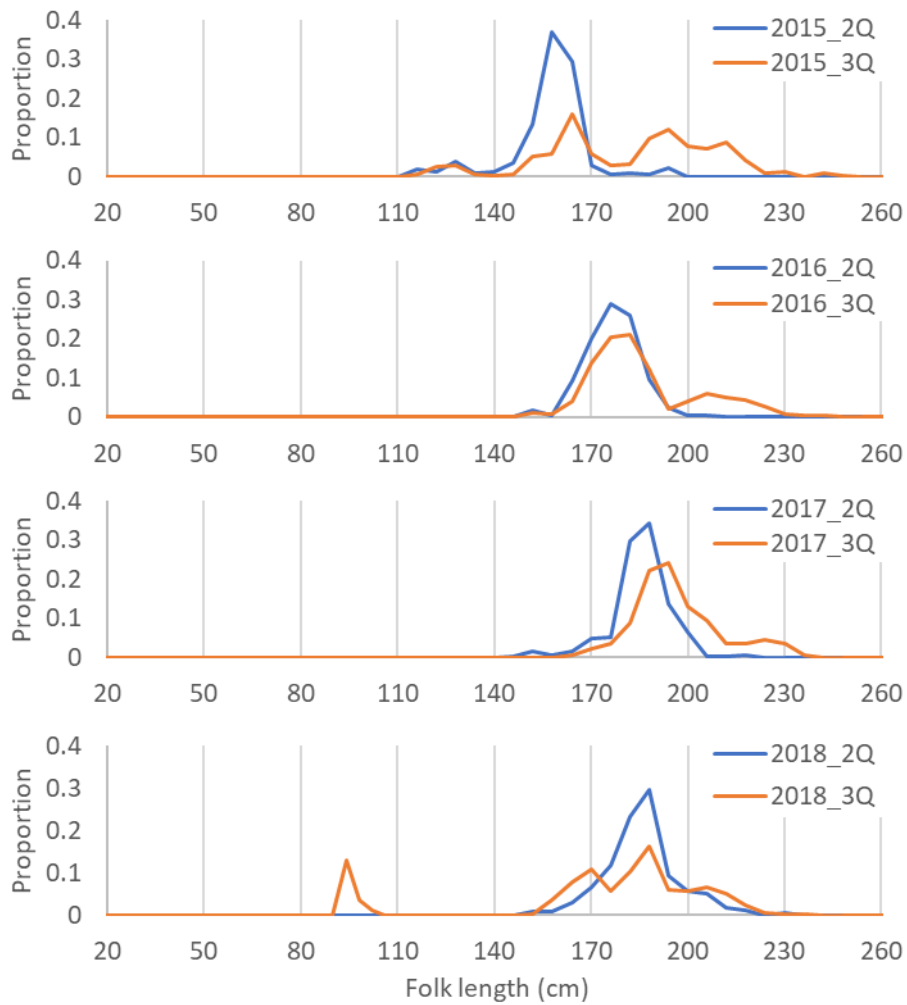
Figure 2 The estimated size composition data for JTPS-PO fleet based on the newly available size sampling data.
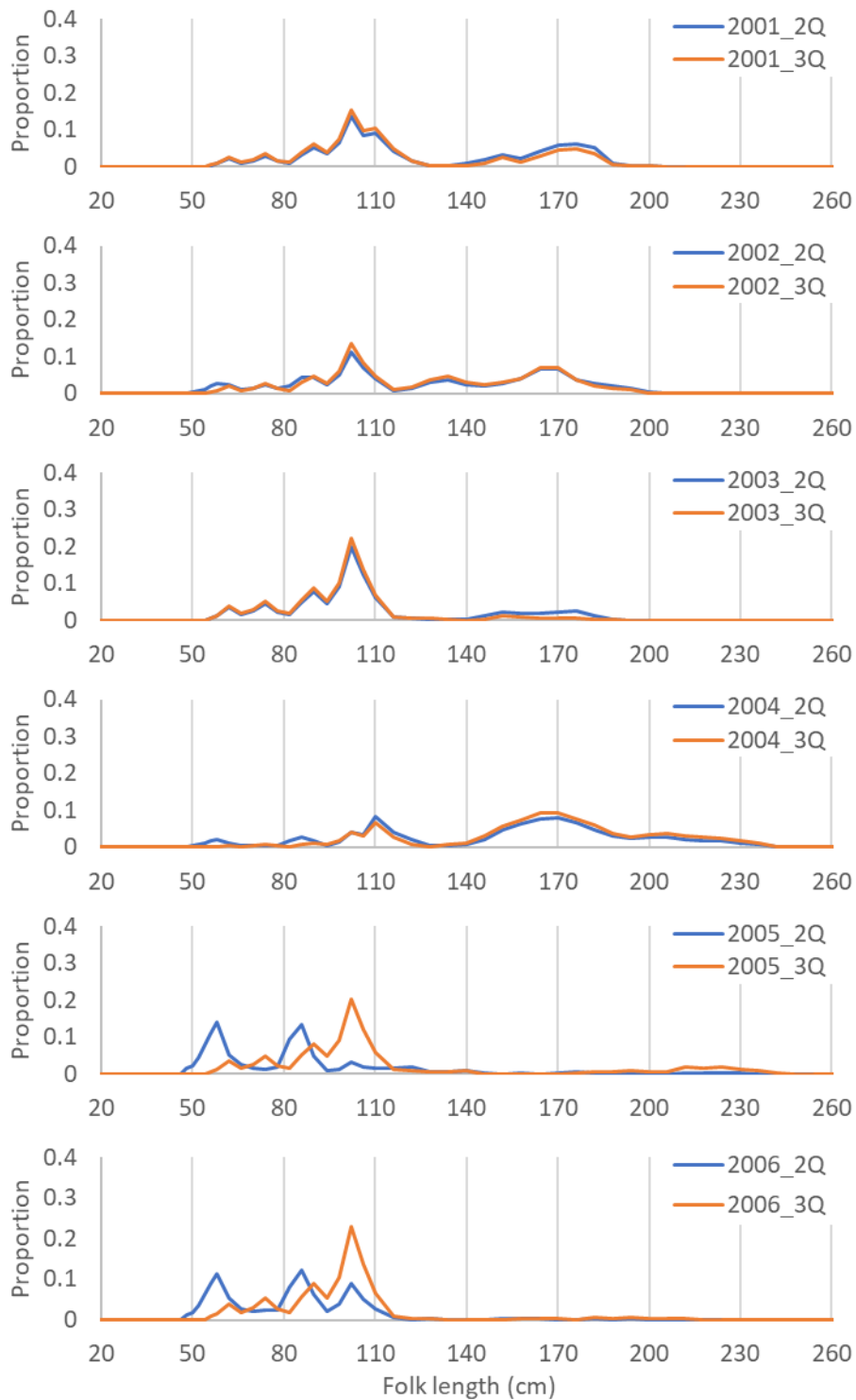
Figure 3. The size composition data for JTPS-PO fleet, which was used in the current stock assessment of PBF (ISC, 2018).