Japanese catch statistics of North Pacific albacore tuna (*Thunnus alalunga*) for Stock synthesis 3¹

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Abstract

The Japanese catch statistics of North Pacific albacore tuna for ISC stock assessment correspond to ISC table 1 that was summarized by fishery and annually. However, in the ISC stock assessment, this data sets need to divide year, area and quarterly and that calculation procedure is complicated. In this document, we summarized Japanese catch of North Pacific albacore tuna and suggested new compile method. This revision is a minor update. However, some part of the new procedure will be clearly and will keep consistency with each fishery.

Introduction

Using stock synthesis 3 (SS3), The ISC Albacore Working Group (ALBWG) conducted a stock assessment of North Pacific albacore tuna [1]. SS3 is an integrated stock assessment model that needs several kinds of data sets such as catch amount, length frequency data, CPUE, and biological parameters [2]. The data source of Japanese catch of North Pacific albacore is yearbook and logbook (Table.1). The yearbook is an official statistics of Japan and that value almost corresponds to the ISC table 1 that was submitted ISC Plenary meeting [3]. The resolution of Japanese yearbook is quite low (by year and fishery). On the contrary, the logbook data was compiled by Fisheries Research Agency of Japan, and that resolution is high (e.g., latitude, longitude, year, month). However, logbook coverage is not perfect. The catch statistics of ISC albacore stock assessment is ISC table 1. However, some parts of this data sets need to estimate area-quarterly allocation because ALBWG assumed area-quarterly fishery definition to explore the SS3. This calculation procedure is very complicated and different by the fishery. Here, we summarized calculation method of Japanese albacore catch statistics and suggested a revision process keeping consistency with each fishery.

Material and methods

In the 2014 stock assessment, ALBWG categorized Japanese albacore catch as the longline fishery, pole and line fishery and miscellaneous fishery (Fig.1). These fisheries catch data sets were divided by year, area and quarter considering catch size of albacore tuna [1].

Longline fishery

The data source for stock assessment is ISC table 1 and logbook data. In the previous stock assessment, ISC table 1 was divided by year, quarter and area using logbook data and several kinds of compile methods [4]. The catch data of longline fishery could define four type category (Fig.4). The detail of these methods are as follows:

- a: Offshore and Distant water longline. The coverage of logbook is 100%. This data set was aggregated by year, quarter and area. The logbook data of Offshore and Distant water longline was summarized catch number and weight. ALBWG used catch number data because SS3 based on the age-structured stock assessment model.
- b: Coastal long line after 1994. The logbook data is available (1994-2015). These data sets were aggregated by year, quarter and area. This data set was summarized catch number and weight. ALBWG used catch amount data.
- c: Coastal longline before 1993. There is no logbook. Thus 1) Average area-quarterly allocation rate was calculated by catch weight logbook data (data set b) that period is between 1994 and 1997. 2) The catch allocation rate multiplied ISC table 1 (data sets c).

d: Small-scale coastal longline. Small-scale coastal longliners did not submit logbook. These fleets have operated inside of Japanese EEZ (Simply, we assumed 25-45N and 120-145E). To obtain year, area and quarterly data sets, 1) Annual area-quarterly CPUE allocation rate was calculated by logbook data (data set a). 2) This CPUE allocation rate multiplied data set d that was calculated by ISC table 1 minus reported logbook data.

To keep consistency with all data compiling, we suggest 1) to use catch number data for the data set a, and 2) to use the catch allocation rate to compile coastal longline that have not reported logbook data (1994-2015).

Pole and line fishery

Japanese pole and line statistics was categorized distant water, offshore and coastal. In the 2014 stock assessment, the year quarterly catch amount of pole and line fishery was calculated by ISC table 1 and logbook data [5]. The coverage of logbook data is not 100% because coastal pole and line did not submit logbook. The estimated quarterly catch ratio is different by the year (Fig.6). The quality of logbook data is different by historical period as follows:

- a: Pole and line after 1972. Weight based logbook data is available (Distant water and offshore pole and line). Some coastal pole and line fishery did not submit logbook. Hence year-quarterly catch ratio was calculated by logbook data, and that catch ratio multiplied annual catch data of ISC table 1.
- b: Pole and line before 1971. The catch number based logbook data is available (Distant water and offshore pole and line). The coverage of logbook data was not perfect. Thus, year-quarterly catch ratio was calculated by the complicated method and multiplied annual catch data of ISC table 1 [5].

To keep the consistency of calculation method between the different historical period, we suggest new procedure to use average quarter catch ratio for before 1971 pole and line catch. This catch rate was calculated by logbook data between 1972 and 1974.

Miscellaneous fishery

Japanese miscellaneous fishery consisted of drift net, purse seine, troll, set net and others (Fig.8). Almost catch of miscellaneous fishery was drift net or purse seine fishery (Fig.8). In the 2014 stock assessment, catch amount of Japanese miscellaneous fishery was added to the catch amount of Japanese pole and line fishery in quarters 1 and 2. In this document, we summarized quarter-spatial change of drift net and purse seine fishery using logbook data and length frequency data.

Result and discussion

Total catch amount of Japanese albacore catch in the North Pacific is 55,958, 51,841 and 43,237 (mt) that are 2013, 2014 and 2015 respectively (Fig.1). The current year (2015) catch is still preliminary because Japanese yearbook is provisional version. If ALBWG needs 2016 catch in the next stock assessment, we should estimate 2016 catch amount using logbook data.

Annual catch of total Long line fishery was divided by area-quarter catch using the log book data (Fig.2). The Eastern fishing ground has shrunken and main fishing ground is North West Pacific area (Fig.2). Using the log book data, pole and line fishery catch data also was divided by area-quarter (Fig.3). Pole and line fishery has caught albacore at quarter 2 and 3 in Northern area (Fig.2).

We suggested new data preparation method of catch data for the small-scale coastal longline fishery. As a result, quarterly catch allocation ratio changed gradually (Fig.5). We prefer new methodology because catch ratio is more understandable than CPUE ratio to estimate catch allocation ratio by year, quarter and area. We also addressed new data compiled method for Pole and line fishery between 1966 and 1971. There are not much difference between New and Old method (Fig.7). Hence ALBWG can use newly compiled data sets of pole and line fishery in 1966-1971. We checked logbook data of drift net that period is between 1977 and 1993 and that length frequency data between 1965 and 2015. Drift net fishery caught albacore in the northern area in quarter 2 (Fig.9). And that size is small(Fig.10). Hence, it is reasonable to combine drift net catch data to pole and line catch data in quarter 2. We plotted area-quarter albacore catch of purse seine fishery (Fig.11). Japanese purse seiner has caught albacore in the northern part that area is similar to pole and line fishery. Thus purse seine catch can add to pole and line catch.

References

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Data source	Fishery category	Period	Unit	Resolution
Yearbook	All fishery	1966-2015	Kg	Annually
Logbook	Longline (Distant	1966-2015	Number	Year, Month, Day and 5X5
	water and offshore)			
Logbook	Longline (Distant	1970-2015	\mathbf{mt}	Year, Month, Day and 5X5
	water and offshore)			
Logbook	Longline (Coastal)	1994 - 2015	mt / Number	Year, Month, Day and 5X5
Logbook	Pole and line (Dis-	1966 - 1971	Number	Year, Month, Day and 5X5
	tant water and off-			
	shore)			
Logbook	Pole and line (Dis-	1972-2015	Kg	Year, Month, Day and 5X5
U	tant water and off-		C	, , , ,
	shore)			
Logbook	Drift net	1977 - 1993	Number	Year, Month, Day and 5X5
Logbook	Purse seine	1995-2015	100kg	Year, Month, Day and 5X5

Table 1: Data source of Japanese albacore catch for the stock assessment



Figure 1: Historical albacore catch of Japanese fisheries in the North Pacific ocean (ISC table.1).



Figure 2: Time spatial change of long line catch amount (metric ton). Log scale 10 years catch (metric ton) was summarized by area quarterly.



Figure 3: Time spatial change of pole and line catch amount (metric ton).



Figure 4: North Pacific albacore catch of Japanese longline fishery. a) Offshore and Distant water longline. b) Coastal longline after 1994. c) Coastal longline fishery before 1993. d) Small-scale coastal longline.



Figure 5: Catch of the small-scale longline fishery that quarterly allocation was estimated by logbook data. New: catch amount allocation ratio were used. Old: CPUE allocation ratio were used.



Figure 6: North Pacific albacore catch of Japanese pole and line fishery. a) Weight base logbook data is available. b) Number base logbook data is available.



Figure 7: Estimated quarterly albacore catch of Japanese pole and line fishery.



Figure 8: The detail of albacore catch by Japanese miscellaneous fishery.



Figure 9: Seasonal-spatial catch number of albacore by Japanese drift net fishery (1977-1993).



Figure 10: Seasonal-spatial catch length of North Pacific albacore by Japanese drift net fishery (1965-2015).



Figure 11: Seasonal-spatial catch amount (mt) of North Pacific albacore by Japanese purse seine fishery (1995-2015).