

CREATION OF BIGEYE TUNA CATCH-AT-SIZE CAUGHT BY THE JAPANESE LONGLINE FISHERY IN THE ATLANTIC

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1. Introduction

At the Ad hoc Working Group Meeting on Bigeye held in Madrid this year (Apr. 9-11), the re-creation of whole catch-at-size was decided (ICCAT 1997). The reason for this is that size data were all pooled by fishing gears, regardless of nationality, by quarter-year period, and it was thought this is not a proper way to do it. The purpose of this paper is to describe how the catch-at-size was created for fish caught by the Japanese longline fishery.

2. Material and method

Catch and size measurement data used to create catch-at-size were all compiled at the National Research Institute of Far Seas Fisheries (NRIFSF). These are the essentially the same data which were submitted to ICCAT by the NRIFSF. These data were aggregated into 10 degree of latitude and 20 degree of longitude rectangles and quarter-of-the-year. Then, the available number of catch and size frequency data were carefully looked into in order to identify the better way of data substitution (Fig. 1). After this process, several basic ideas for the data substitution were noticed as follows:

1. Fish are larger in the tropical/subtropical area (20N-20S).
2. Fish are more similar in the longitudinal direction than in the latitudinal one.
3. Fish are more similar between second and third quarters or fourth and first quarters than between first and second quarters or third and fourth quarters.
4. Fish are caught during winter season in the higher latitudes while in the low latitudes fish are caught all year round.

Considering these points, substitution scheme, which consists of 7 different levels, was formulated. When sample size (measured fish) is larger than 200 fish or sample size is larger than 5 %, no substitution was made. Substitution scheme adopted at this time is ;

Level 1 substitution : Substitution with neighbouring rectangle in the same quarter, priority was given in the order of east, west, lower latitude, higher latitude, lower east, lower west, higher east, higher west.

Level 2 substitution : Same substitution as Level 1 but neighbouring quarter, only between second and third quarters and between fourth and first quarters in the following year except first quarter in the first year and fourth quarter in the last year, in which substitution was made between first and second quarters and between third and fourth quarters, respectively.

Level 3 substitution : All available catch-at-size, including Level 1 and 2 substitutions, was summed for four large areas (north of 20 N, between equator and 20 N, between equator and 20 S and south of 20 S) in the Atlantic. Substitution was made with one of them to which that stratum belongs to.

Level 4 substitution : Same as Level 3 but neighbouring quarter (2↔3 and 4↔1).

Level 5 substitution : Areas were extended to north and south Atlantic in the same quarter.

Level 6 substitution : Same as Level 5 but neighbouring quarter (2↔3 and 4↔1).

Level 7 substitution : Area was further extended to total Atlantic in the same quarter.

3. Results and discussion

Data availability

The number of fish caught and measured are annually shown in Fig. 2. Measured fish were very few during the 1960s, and suddenly increased in 1975. This is when Japan set up on-board measurement system through industry. Actual number of fish fluctuated between 30 and 80 thousand until recently. However, it decreased to less than 30 thousand fish since three years ago. Coverage has been gone down from about 10 % during the late 1980s to less than 5 % in recent few years.

Degree of substitution

Degree of substitution is shown graphically in Fig. 3 by two different terms, number of records (strata) and number of catch. In terms of records, there were about 40-50 % records which do not require substitution during 1975 and the early 1990s. This accounted the largest part except for the most recent 6 years. Level 1 substitution followed next amounting to 30-40 %. Other levels of substitution were very minor. If we looked this situation in terms of catch number, it seemed much better. Catch number without any substitution occupied 80 to 90 %, and level 1 substitution accounted for most of the rest (10 to 20 %) of total catch. This is because catch has concentrated in relatively smaller areas during the past 20 years.

Newly created catch-at-size

Annually summed catch-at-size were shown in Fig. 4. Until the beginning of the 1970s, the majority of catch was fish larger than 120 cm. Certain amount of smaller fish (100-120 cm) was found thereafter. It should be noted that the most recent two years indicated fewer fish of that size range. The decline of small fish in recent years seems to be at least the result of withdraw of fishing area from such as northwest Atlantic where small fish were major size of fish caught. Other reasons such as the change of longline material as well as the low availability of small fish due to the increased fishing pressure by the surface fishery might have caused as well.

Since the method used this time was a kind of automatic way, which does not look into detail process (does not specify substitution stratum by stratum), it should be reviewed and improved in near future.

References

ICCAT 1997. Report of Ad Hoc Working Group on Bigeye Tuna. Madrid, Apr. 9-11, 1997.

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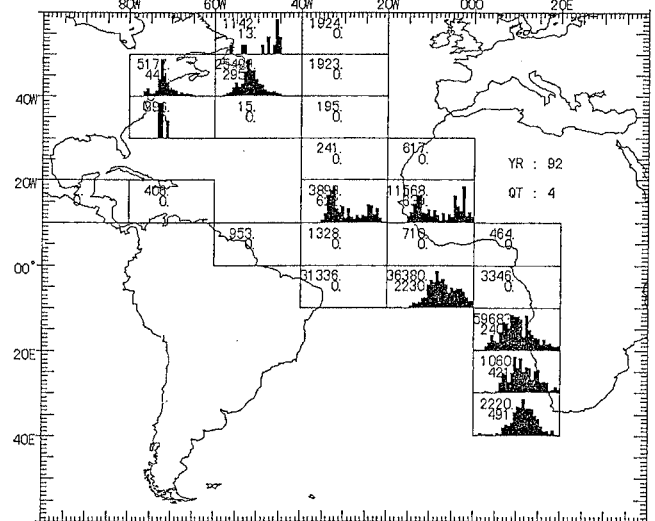
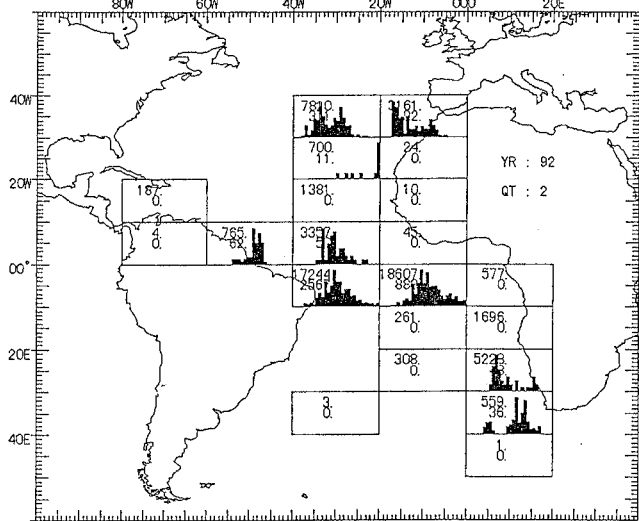
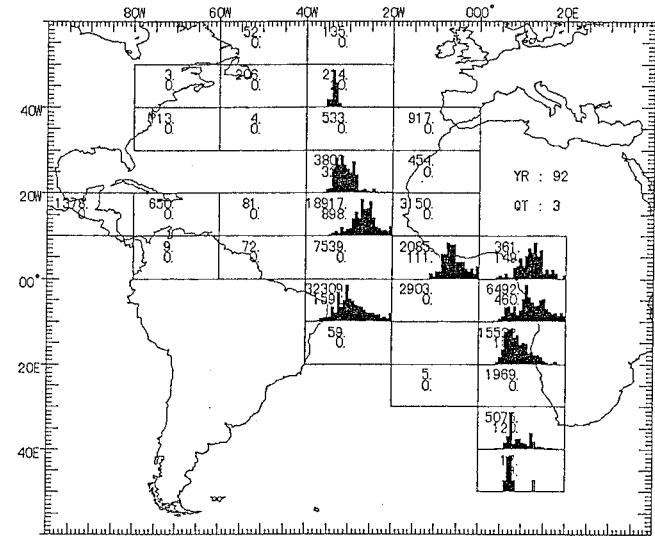
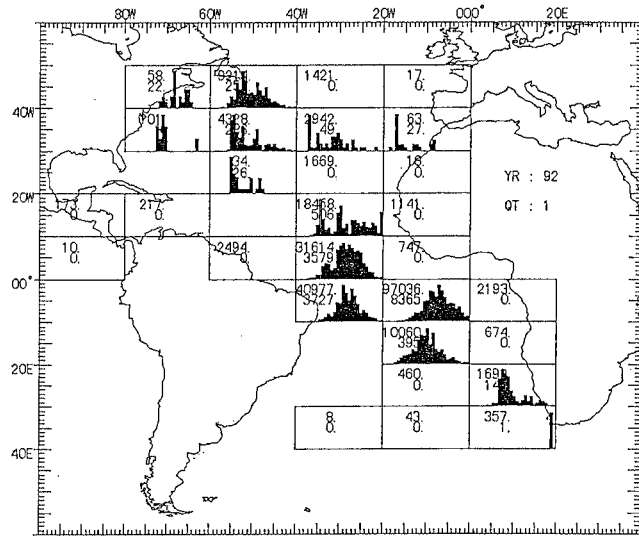


Fig. 1. Length frequency of bigeye tuna caught by the Japanese longline fishery by area (10 lat. x 20 long.) and by quarter-of-the-year, plotted with number of fish caught(upper left, first line) and measured(upper left, second line). 1992 first and second quarters.

Fig. 1. Continued. 1992 third and fourth quarters.

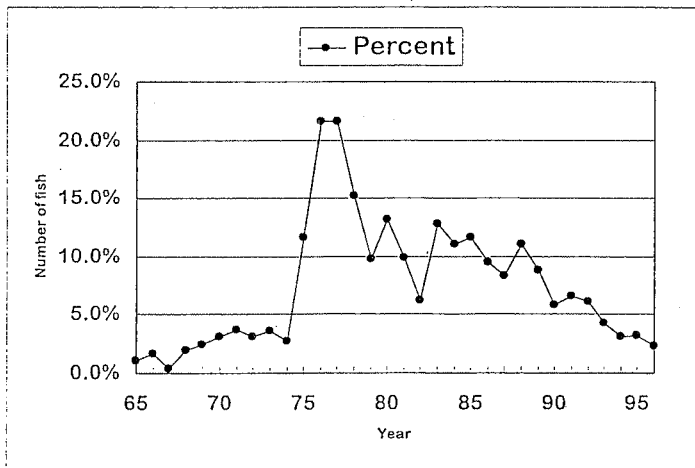
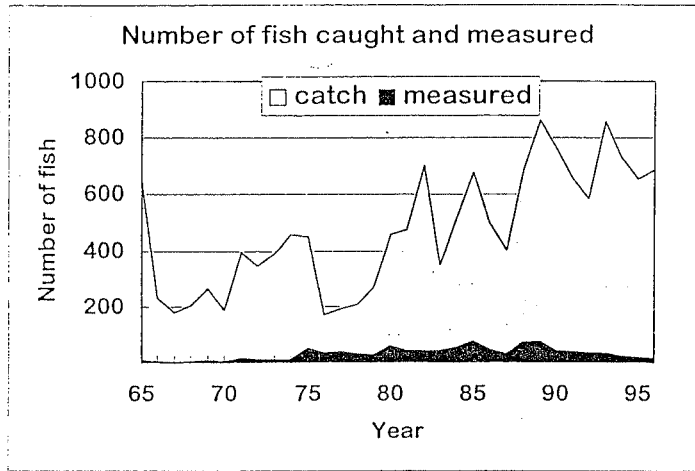


Fig. 2. Data availability, annually summed number of fish caught and measured.

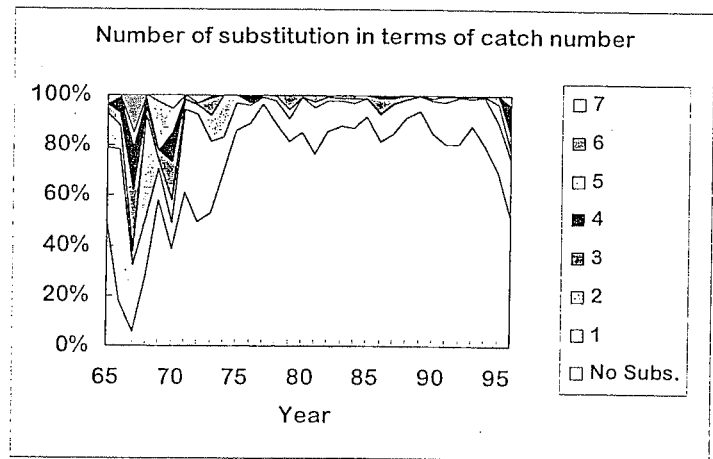
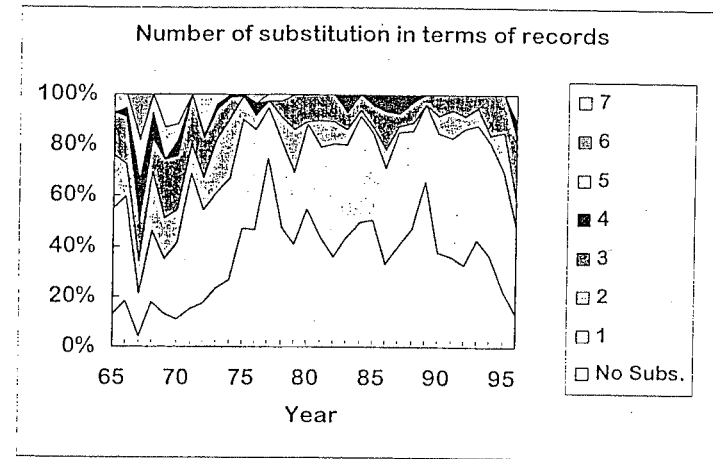


Fig. 3. Degree of substitution viewed at two different quantities (number of records and number of fish).

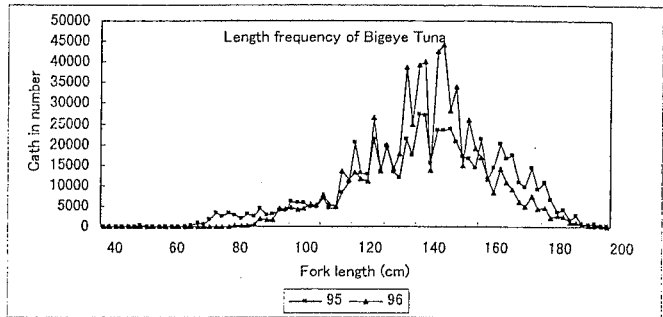
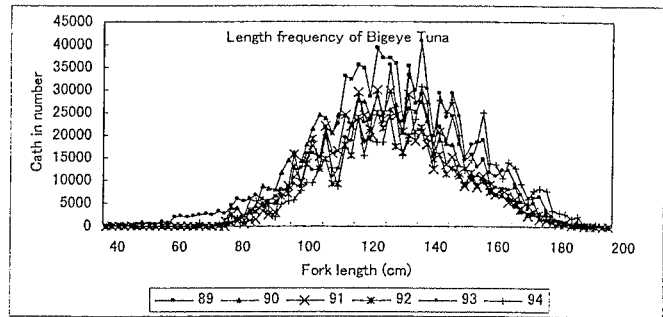
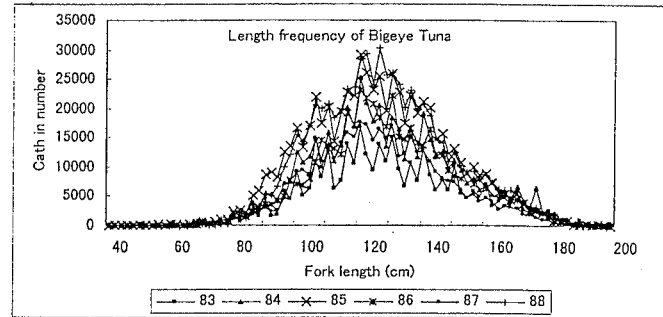
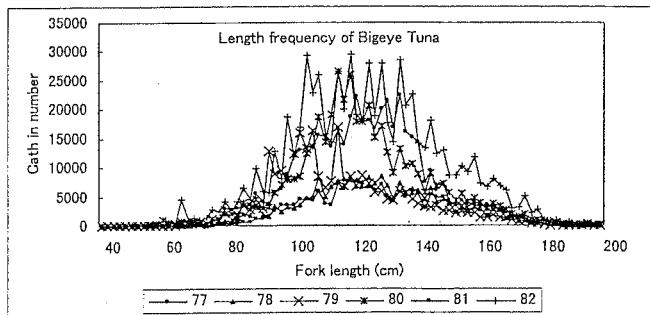
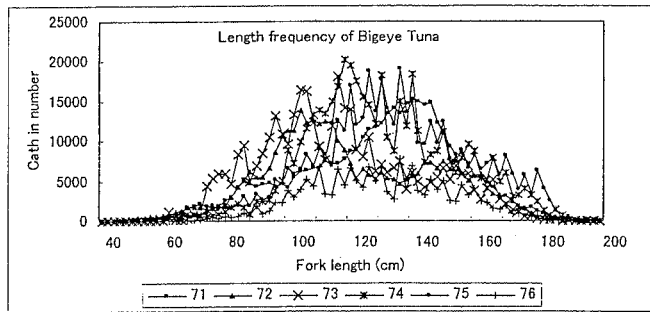
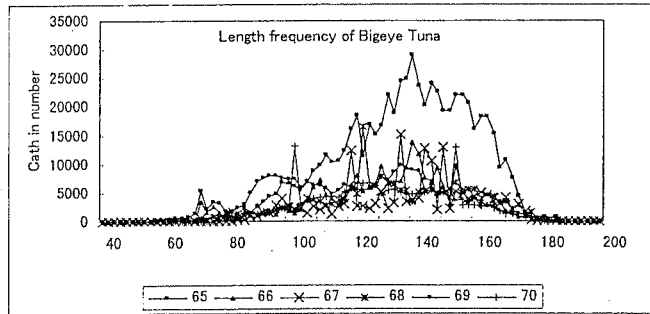


Fig. 4. Continued.

Fig. 4. Annually summed catch-at-size of bigeye tuna caught by the Japanese longline fishery.