RECENT STATUS OF THE SOUTHERN BLUEFIN TUNA STOCK*

by

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Japanese longline fishery for southern bluefin tuna dates back to 1952. In the early years of exploitation, the longliners fished spawning group (about 6 years old, 130 cm in length, 40 kg in weight, and older) at tropical waters of the eastern Indian Ocean, and then shifted their fishing ground to southern waters where feeding adults and young fish (4-6 years old, 95-130 cm, 15-40 kg) are widely distributed throughout the year. Since 1967 the longline fishery have been concentrated in the West Wind Drift area south of 40° S latitude. Up to early 1970's most of the distributional area of this species were covered by longline operations. The only one spawning ground is located off northwestern Australia (Fig. 1).

Catch and fishing effort

The bulk of southern bluefin catch is made by two countries, Japan and Australia (Fig. 2). Japanese catch was highest, about 1,200,000 fish and 65,000 metric ton, during 1960 and 1961 and then decreased to 450,000-650,000 fish and 22,000-30,000 ton in recent three years. Australian catch (2-5 age fish) by live-bait fishery has shown upward trend and recently reached to 800,000-1,200,000 fish and 8,000-14,000 short ton. Relation between historical catch (in number) and effort (number of hooks) for longline fishery is shown in Fig. 3. Fishing effort increased largely from 1967. After 1970 fishing effort was around 100 million of hooks and catch was nearly the same level as that of mid 1960's in which fishing effort was about a half of recent ones. The lowest hook-rate was observed during 1975 (Fig. 3). This was due to the decrease of recruitment of medium size fish to the longline fishery (Fig. 4). During 1976, however, the fish from 80 cm to 110 cm appeared again in the longline catch and the fish from 130 cm to 160 cm as well. As a result of this the hook-rate in 1976 was slightly higher than that

in 1975, although fishing effort increased by 20 % of 1975 to 110 million of hooks (Fig. 3).

Annual change in length frequency distribution

Figure 4 shows annual length frequency distribution of total catch by Australia and Japan. In the catch of adult fish (130 cm and over) a stable mode is found around 150 cm every year. The fish from 70 cm to 130 cm are shared between two countries. Two or three strong modal groups occur in the yearly Australian catch, suggesting that the same year classes which once entered the fishing grounds support this fishery, at least, during three years or so. After 1974 small fish from 45 cm to 65 cm has been caught by surface fishery. This may result from some changes of fishing area, season or recruitment.

Status of the stock

Recent catch-per-unit-effort (catch/100 hooks) for the whole longline stock decreased to 20-25 % of the early 1960's and that of spawning stock is assumed to have decreased to about 10-20 % of the initial level. With decrease of large fish, longline operation has expanded to the fishing ground where the catch consist of younger fish (Fif. 1). The average age of first capture by longline fishery was lowered to 5.6 years in 1973 and then risen to nearly 6 years in recent three years (Fig. 5). Southern bluefin tuna are rather long-lived fish and biomass is considered to be maximized at about age 7. This means that lowering of age of first capture with increasing fishing effort rapidly reduce the level of adult stock as well as fecundity. History of Japanese longline fishery from 1958 to 1970 is shown in relation with the isometric curves of yield per recruit and relative stock fecundity (Fig. 6). Two series of fishing mortality after 1966 were estimated and illustrated. Relative stock fecundity seems to have decreased to about 10-20 % of the initial level. Although there is no signs of reduction of recruitment judging from the catch of Australian surface fishery up to 1976, further decrease of stock fecundity should be avoided. Since 1971, Japanese longline fishermen have been executing

voluntary regulation for the operation in the fishing grounds, where younger fish are dominant, in order to improve the decreasing age at first capture. Although the effect of regulation has not yet been observed so much, it is likely to have kept out the further lowering of age at first capture (Fig. 5). Since the spawning stock is low level careful watch needs to be kept for the status of the recruitment. In addition, the more detailed assessment of the whole southern bluefin stock is also needed.

Further works needed

Further works for assessment of the whole southern bluefin stock are now carring out between Japanese and Australian scientists.

The following items are recommended as the further works needed. (FAO Fish. Reports, No. 174, 1975)

1) Detailed analysis of tagging records
2) Analysis of pattern of occurrence of young for a better understanding of population structure
3) Analysis of catchability, q
4) Recompute the parameter of the growth equation
5) Examine stock-recruitment relationship as soon as more acceptable estimates of both are available

etc.

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FAO : Report of the special southern bluefin tuna working party. In Appendix F, FAO Fisheries Reports, No. 174, 29-43, (1975).

Hayasi, S. : Stock assessment of southern bluefin tuna based on information up to September 1973 - its conclusions and problems. Bull. Far Seas Fish. Res. Lab., No. 11. 51-65, (1974).

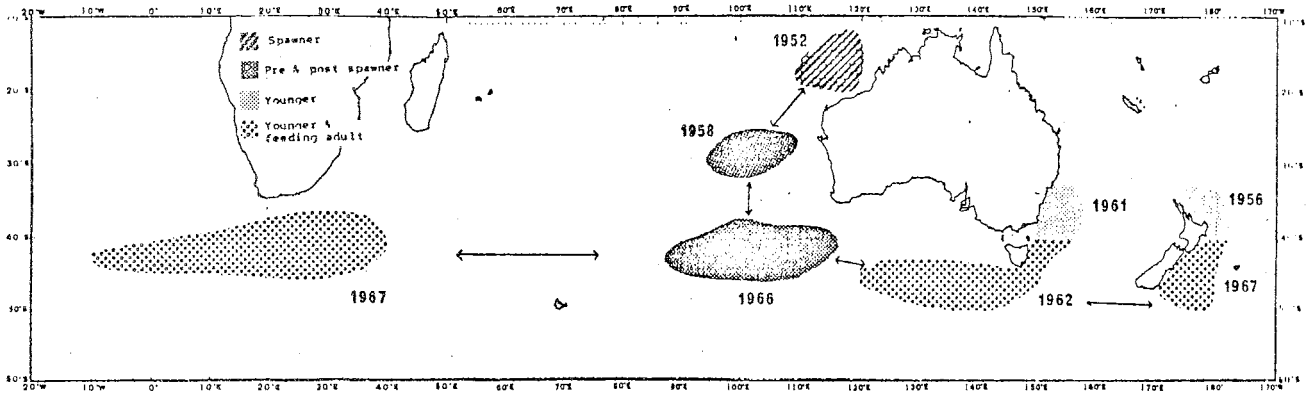

Fig. 1. Distribution of longline fishing grounds. Number in the figure denote the first year of exploitation.

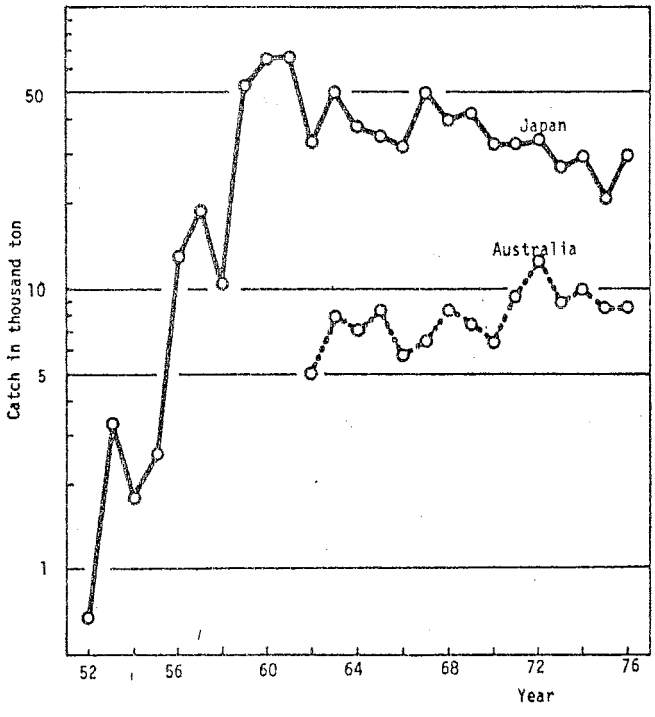

Fig. 2. Annual catch of southern bluefin tuna by Japanese and Australian fisheries.

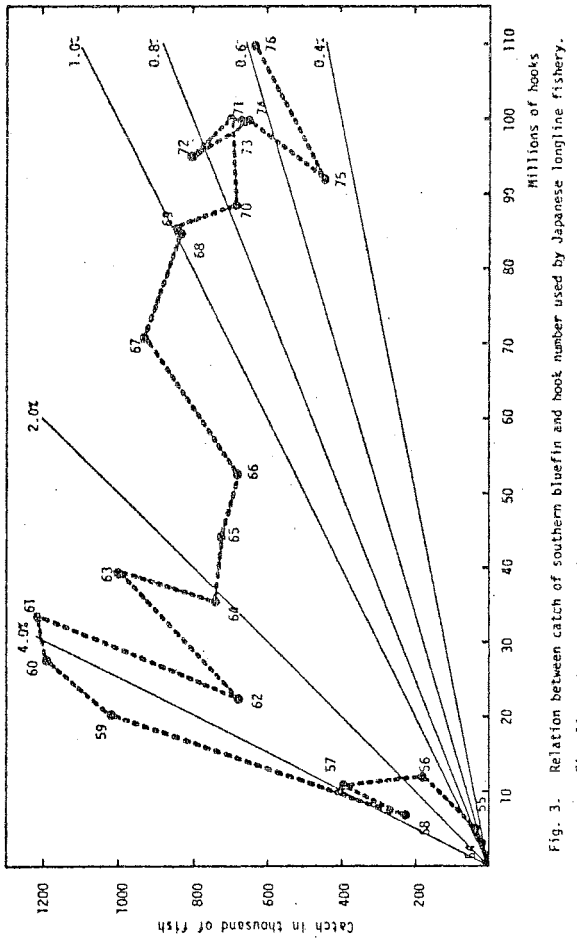

Fig. 3. Relation between catch of southern bluefin and hook number used by Japanese longline fishery. Fine lines show catch-per-100 hooks in percentage.

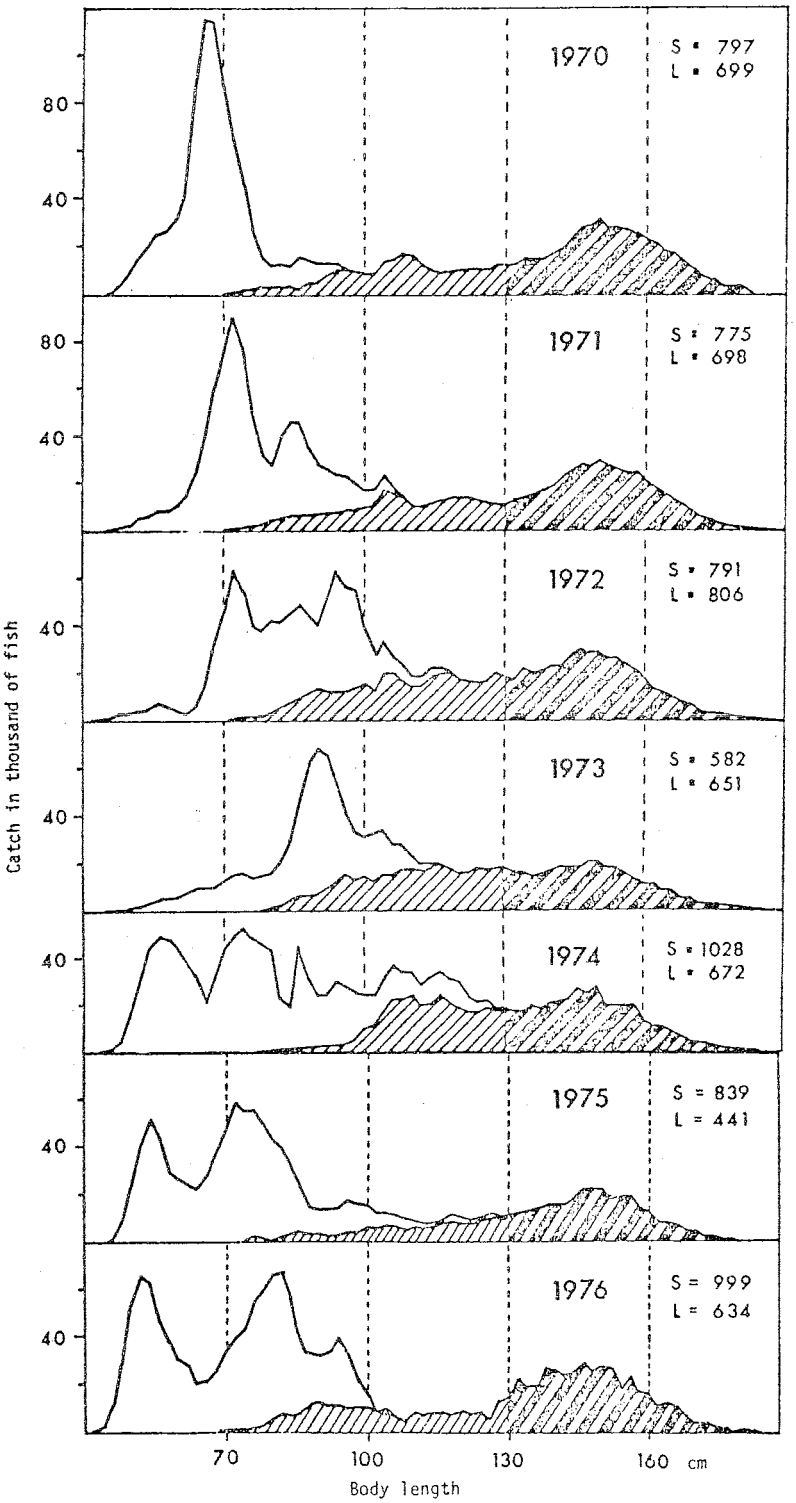

Fig. 4. Length frequency distribution of southern bluefin catch by Japanese (shaded part) and Australian*(white part) fisheries. S and L denote catch in thousand of fish by Australia and Japan, respectively.

*/ Data from Division of Fisheries and Oceanography, CSIRO.

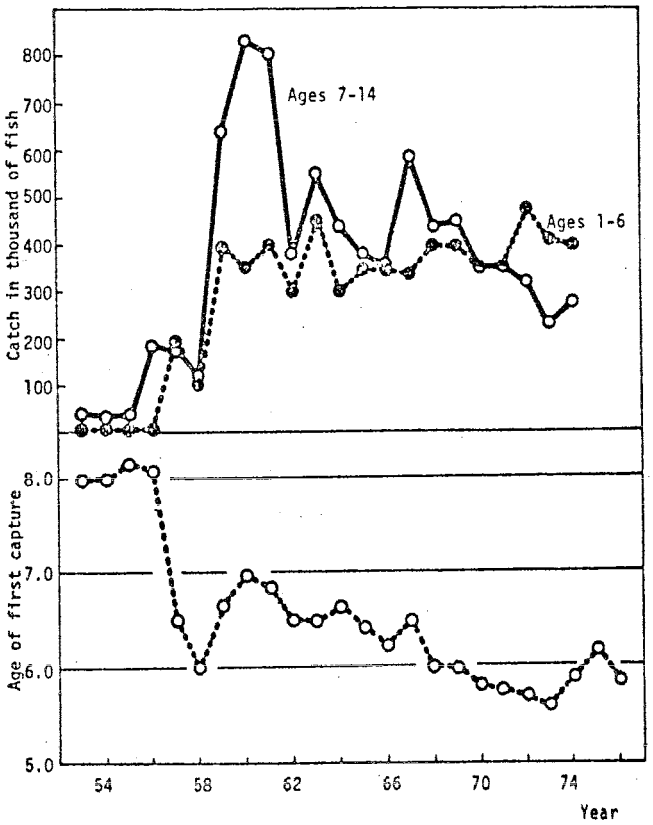

Fig. 5. Longline catch of small (ages 1-6) and large (ages 7-14) southern bluefin (upper panel) and average age of first capture (lower panel).

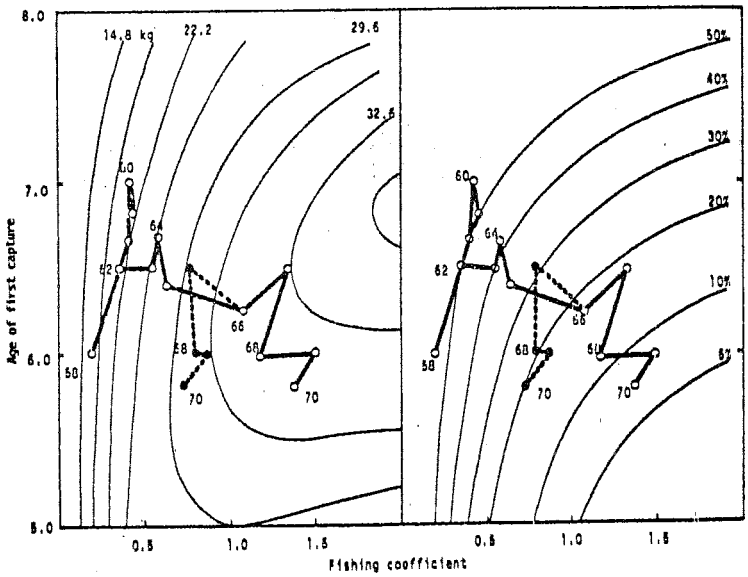

Fig. 6. Isomatric curves of yield per recruit in kg (left panel) and relative stock fecundity (right panel) against fishing coefficient and average age of first capture and history of Japanese longliners from 1958 to 1970. Fishing coefficient of black circles are estimated from cohort analysis.