OVERALL FISHING INTENSITY, CATCH, CATCH BY SIZE AND SPAWNING INDICES OF YELLOWFIN TUNA IN THE ATLANTIC TUNA LONGLINE FISHERY, 1956 - 1975

by

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SUMMARY

The catch and effort relationship, hook rates, length composition and spawning indices on Atlantic yellowfin tuna caught by the tuna longline fishery were computed based on the data obtained mainly through the Japanese longline fleets for the years 1956-1975.

The annual catch in weight and fishing intensity on the Atlantic yellowfin tuna taken by the whole longline fishery remained fairly stabilized for the recent years since 1971, at around 30 thousand tons and 1.2 - 1.5 million hooks per 5º square, respectively.

However, the hook rates by the Japanese longline fishery for 1977 were the lowest record, 0.40, in the history of the fishery. It does not seem likely that a further increase in the longline fishing effort would result in an increased catch of this species.

Length composition of yellowfin tuna obtained through cooperative on-board measurement by the Japanese longline fishermen showed no marked changes for 1977 as compared to that of the previous year.

Spawning indices have increased slightly since 1974 although the indices still remained low compared to the late 1960's.

RESUME

La relation prise/effort, le taux par hameçon, la composition de taille et l'indice de ponte de l'albacore atlantique pris à la palangre ont été calculés à partir de données obtenues en majeure partie de la flottille palangrière japonaise pour les années 1956-75. La prise annuelle en poids et l'intensité de pêche portant sur l'albacore atlantique pris par l'ensemble de la pêcherie palangrière sont demeurés assez stables pour les années après 1971 (environ 30.000 TM et 1,2-1,5 millions d'hameçons par carré de 5º x 5º, respectivement).

Cependant, le taux par hameçon de la pêcherie palangrière japonaise pour 1977 (0,40) a été le plus faible jamais enregistré depuis le début de la pêcherie. Il semble peu probable qu'un accroissement ultérieur de l'effort palangrier puisse entraîner une hausse des prises de cette espèce. La composition de taille de l'albacore, obtenue par des relevés de mensurations à bord effectués en collaboration par les pêcheurs japonais de palangre, ne montrait aucun changement significatif pour 1977 par rapport à l'année précédente. L'indice de ponte a légèrement augmenté depuis 1974, bien qu'il soit demeuré médiocre par rapport à la fin des années soixante.

RESUMEN

En base a los datos obtenidos principalmente de las flotas palangreras japonesas para los años 1956-1975, se calculan: la relación captura/esfuerzo, tasas por anzuelo, composición por tallas y los índices de desove del rabil capturado por la pesquería de palangre en el Atlántico.

La captura anual en peso y la intensidad de pesca aplicada al rabil por el conjunto de la pequería de palangre, han permanecido relativamente estables desde el año 1971: unas 30.000 toneladas y 1.2 a 1.5 millones de anzuelos por cuadrícula de 5º, respectivamente.

Sin embargo, la tasa por anzuelo de la pesquería de palangre japonesa en 1977 ha sido la más baja registrada en la historia de la pesquería: 0,40. No parece probable que un nuevo aumento en el esfuerzo de pesca del palangre incremente la captura de la especie.

Los datos de composición por tallas del rabil, obtenidos por mediciones a bordo efectuadas por los pescadores de palangre japoneses, no mostraban en 1977 cambios significativos con relación al año anterior.

Los índices de desove han aumentado ligeramente desde 1974, si bien continúan siendo bajos en relación con los de los últimos años en la década de los 60.

Appendix tables reproduced in Data Record Vol. 11.
Appendice tableaux reproduits dans le Vol. 11 du Recueil de Données.
Apendice cuadros reproducidos en Vol. 11 de la Colección de Datos Estadísticos.

This report, up-to-date data series in the sixth of this kind (Honma; 1973-1976, Honma and Suzuki; 1977) basing on the data till 1975, covers fishing intensity, catch in weight (referred to "yield" hereafter), catch in number (referred to "catch", hereafter) by size and spawning indices of yellowfin tuna caught by Japanese and other tuna longline fleets in the Atlantic Ocean.

1. Material and method.

The data utilized in this report consist of yield statistics (ICCAT; 1975, 1976), catch statistics by area (Fisheries Agency of Japan; 1965-1977, Shiohama et al.; 1965, Institute of Oceanography, National Taiwan University; 1973, 1974, 1975a, 1975b and 1977 (ICCAT personal comm.)) and length composition data compiled by the Far Seas Fisheries Research Laboratory. Sample catch statistics by area by the National Taiwan University were converted to the total estimated statistics by month of the year and lat. 5° x long. 5° rectangle and species multiplying reciprocals of coverage rates.

A preiod of 1965-1975 was chosen as "average year" for the present calculation of the fishing intensity described in detail in the first series (Honma, 1973) (Appendix Table 1).

The Taiwanese fishing intensity on yellowfin tuna was estimated basing on the average year distribution pattern of hook rates for the species derived from the data by the Japanese longline fleets under the assumption that the Japanese and Taiwanese longline fleets have equal fishing efficiecy to this species.

Fishing intensity thus computed from the fleets of the two countries is multiplied by the ratio of yield from the two countries to the total longline yield in the Atlantic to estimate the total fishing intensity in the Atlantic on this species. Likewise, was estimated total catch of yellowfin tuna in the Atlantic by the whole longline fishery.

2. Yield.

In and after 1966, the yield of yellowfin tuna caught by the longliners of the whole Atlantic Ocean fluctuates between 21 and 33 thousand tons (28 thousand tons in mean with 3 thousand tons of standard deviation) and almost levels off during the recent years. The yield in 1975 was 27 thousand tons, about 3 thousand tons less than that of the previous year (Fig. 1).

Though Japanese longline catch of yellowfin tuna in the Atlantic formed more than 80 % in the total yield of the whole Atlantic longline fishery till 1966, its dominancy in and after 1967 rapidly faded away to 6 thoudand tons in 1975 which account for only 22 % in the whole Atlantic catch of yellowfin tuna by the longline fishery. Recent Taiwanese yield of the species declined to 2.4 thousand tons in 1975; 8.7 % to the total Atlantic longline yield of this species.

Despite of the case in the two countries, yellowfin tuna yield by the longlie fleets of Korea and Cuba is remarkable. Above all, the Korean yield dominated sharing 56.6 % in the total Atlantic longline yield of yellowfin in 1975 (Fig. 1). Japanese catch of yellowfin tuna in 1975 is estimated about 116 thousands and hook rates ((total catch/total effective effort) x 100) of its fleets for 1975 is 0.40, the lowest record since the commencement of the Atlantic longline fishery (Table 1).

3. Fishing intensity.

Fishing intensity of the Japanese longline fishery on this species in 1975 was about 240 thousand hooks (effective hooks per 5° sq.). (Table 1). This phenomenon is well endosed by the trend of indices of effectiveness of effort (effective hooks/nominal hooks) which dropped below 1.0 after 1972 and further to the lowest 0.5 in 1975 (Fig. 2). No Japanese tuna longline boat, therefore, seems to operate aiming mainly at yellowfin tuna in the recent years. Similarly, the Taiwanses fleets show their decreasing fishing effort to the species with the decreased 130 thousand hooks in 1975 (Table 1).

The hook rate, catch and yield are plotted against the total fishing intensity on the species by the whole Atlantic longline fishery (Fig. 3). Although in and after 1972 the fishing intensity remained in high level over 1.2 million hooks, the hook rate, catch and yield remained almost the same with the recent year level. However, while the catch in 1975 decreased appreciably despite the fishing intensity in that year remained almost the same with that in 1974, the yield in 1975 was similar to those in the recent years. This is inferred to be brought about by the fact that in 1975 size of yellowfin tuna was large as mentioned later.

From the recent relationship between the two variables, increments of yield in response to increased fishing effort would not be expected in the present level of effort. However, since the yield of the Japanese and Taiwanese fleets by which the total fishing intensity of yellowfin tuna were estimated shares only 30 % in the total yield, it is quite possible that biases might be derived from such a difference as in actual operations between the Japanese and Taiwanese longline boats combined and the rest of the longline fleets. In this respect, improvement of basic data (Task II) is highly desirable on the latter fleets. Provisional estimates of cpue for this species in 1976 remain roughly in the same level with that in 1973-1975.

4. Length composition of yellowfin in 1975.

Total of 11,047 yellowfin tuna was measured in 1975. Of them, 9,705 and 4,643 speciemens were obtained from Carib and Guinea areas, respectively*. Total catch of yellowfin tuna taken in the two areas in 1975 was 111 thousands, which account for 95.8 % in the total Atlantic yellowfin caught by the Japanese longline boats. The increased number of the sampled yellowfin tuna in the recent years is owing to the on-board measurements by the Japanese longline fishermen in the Atlantic Ocean.

Figure 4 shows length composition of catch for the two areas estimated basing on the sample length composition. Due to very poor measurements of the sample specimens in the first quarter of the Carib area, substitution was made for that stratum (Table 2). Detailed number by quarter and 2-cm length class are tabulated in Appendix Table 2).

Modal length of the Caribbean yellowfin in 1975 was 135-140 cm class, about 20 cm larger than that in 1974 (Honma and Suzuki, 1977) and the ratio of the large sized individuals above 120 cm formed about 80 % in the catch.

Like the previous year, large sized fish over 120 cm appears predominantly in the length composition of the Guinea area with the modal length class of 144-148 cm. Generally, the size of yellowfin in the Guinea area is larger than in the Carib area (Fig. 4).

5. Spawning indices, 1965-1975.

Spawning indices (Honma. 1974) for both areas showed decreasing tendency till 1971. Since then, a slight increase has been observed probably due to the increase of average size of yellowfin in the catch. (Fig. 5).

* Sum of the number of sample specimens from the two area does not agree with the total because the samples from the rectangles 20° W-40° W which spread over the two areas were used for both areas.

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Table 1. Hook rate, catch in number, yield in weight and overall fishing intensity of yellowfin tuna in Japanese and Taiwanese longline fishery, and catch, yield and overall fishing intensity in the whole longline fishery in the Atlantic Ocean, 1956 - 1975.

Year	Japanese longline fishery				Taiwanese longline fishery				Whole longline fishery		
	Hook rate (%)	Catch in number of fish	Yield in tons	Intensity in 1000 hooks per 5° square	Hook rate (%)	Catch in number of fish	Yield in tons	Intensity in 1000 hooks per 5° square	Catch in 1000 fishes	Yield in tons	Intensity in 1000 hooks per 5° square
1956	4.91	12,028		1.0							2.0
1957	4.28	258,544	13,198	48.1					272	13,894	50.9
1958	4.50	746,490	27,159	132.8					775	28,203	137.9
1959	4.10	1,097,535	44,071	216.4					1,144	45,927	225.5
1960	3.38	1,158,534	50,822	279.1					1,211	53,142	291.8
1961	2.65	980,339	42,609	303.2					1,034	44,929	319.7
1962	1.49	990,472	41,973	543.7			285		1,096	46,434	601.5
1963	1.29	885,796	37,717	566.3			409		1,022	43,522	653.4
1964	0.96	879,188	35,106	749.9			350		968	38,660	825.9
1965	0.83	927,267	36,918	913.7			162		1,006	40,068	991.6
1966	0.72	394,538	22,354	450.8			1,100		469	26,600	536.4
1967	0.94	366,046	12,824	316.1			2,675		598	20,935	516.4
1968	0.84	274,181	13,913	264.1	0.83	276,962	7,862	270.2	694	27,437	673.2
1969	0.76	241,832	9,966	260.9	0.66	233,743	10,798	286.9	694	30,302	799.5
1970	0.65	189,569	6,809	237.4	0.47	109,890	7,071	190.4	657	30,451	938.5
1971	0.56	292,062	11,026	425.5	0.40	188,972	4,370	394.4	905	28,953	1,541.9
1972	0.51	159,010	7,527	253.8	0.58	185,008	4,705	261.5	833	29,607	1,247.1
1973	0.48	108,585	5,349	184.1	0.44	120,199	2,655	219.0	948	33,153	1,669.6
1974	0.63	94,700	4,296	121.9	0.43	95,629	2,127	175.3	870	30,282	1,359.0
1975	0.40	116,319	5,958	239.8	0.27	46,060	2,362	136.0	529	27,108	1,224.6

Table 2. Sample size in number of individual fish and substitution of data for calculating catch by length class, 1975.

Area	Quarter I	II	III	IV
CARIB	(30)	2,690	6,203	782
GUINEA	272	759	3,273	339

The sample in parenthesis was substituted by the sample of II Quarter.

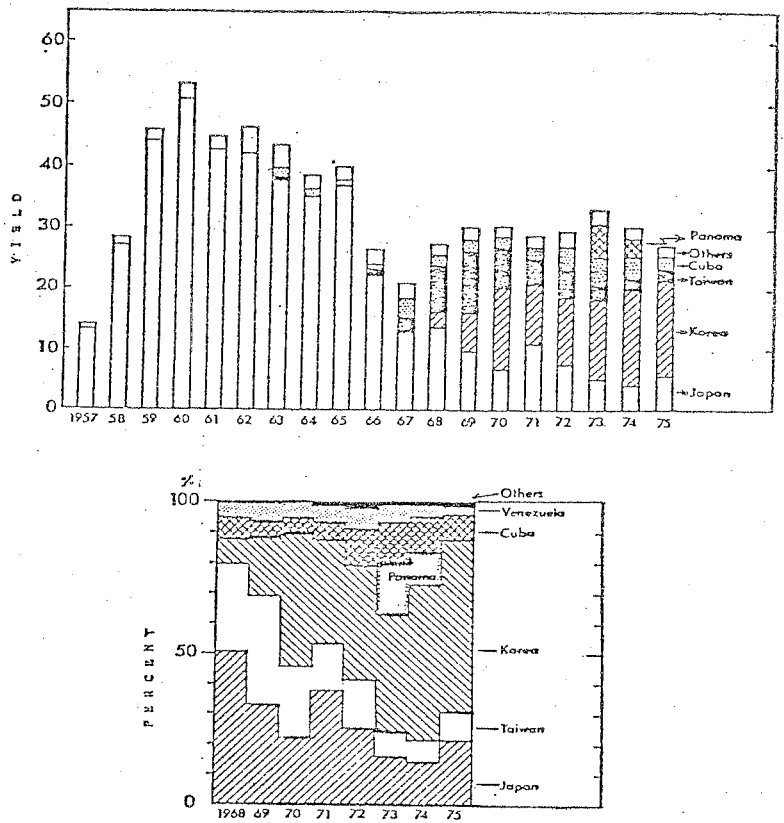

Fig. 1. Yield in ten thousand tons (upper panel, 1957-1975), and yield in percent (lower panel, 1968-1975) of yellowfin tuna by country in the Atlantic longline fishery.

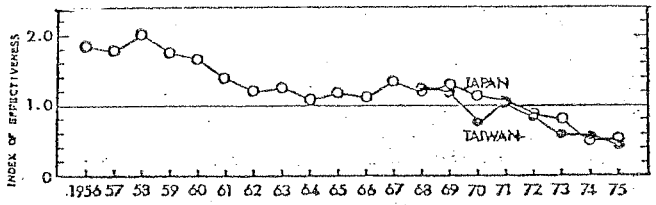

Fig. 2. Yearly average indices of effectiveness of Japanese and Taiwanese longline fishery on yellowfin tuna in the Atlantic Ocean, 1957-1975.

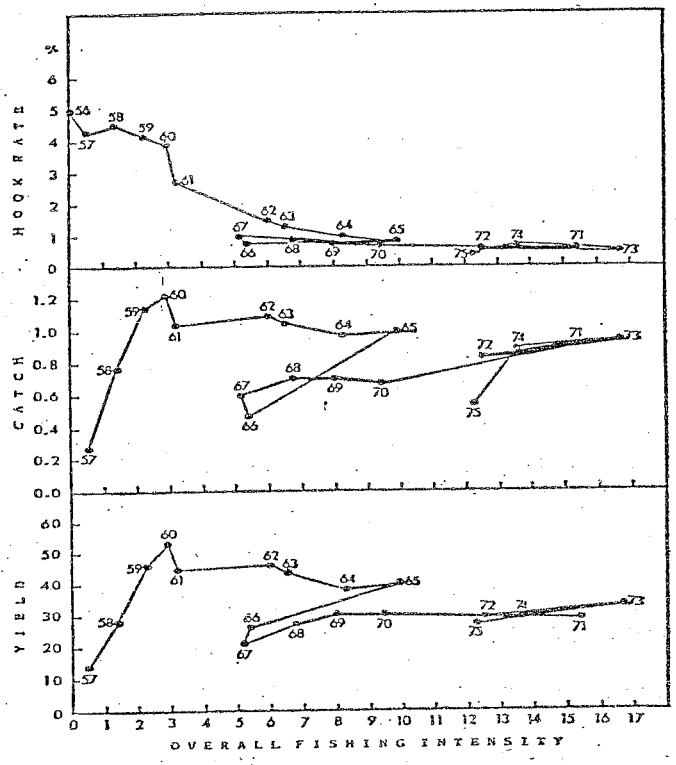

Fig. 3. Hook rate in percent (upper panel), catch in million fish (central panel), and yield in thousand tons (lower panel) of yellowfin tuna against overall fishing intensity in hundred thousand hooks per 5 square in the Atlantic longline fishery, 1956-1975

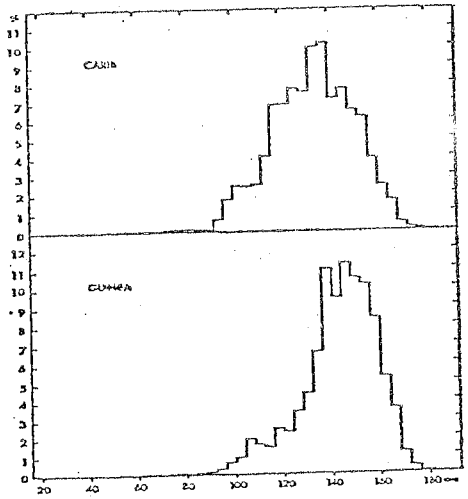

Fig. 4. Percentage length composition of yellowfin caught by Japanese longline fishery in the Atlantic Ocean (CARIB and GUINEA areas), 1975.

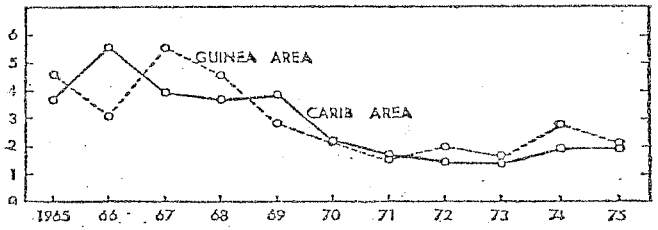

Fig. 5. Spawning index of yellowfin tuna in the Atlantic longline fishery, 1965-1975.