

OVERALL FISHING INTENSITY, CATCH, CATCH BY SIZE AND SPAWNING INDICES
OF YELLOWFIN TUNA IN THE ATLANTIC TUNA LONGLINE FISHERY, 1956-1974

by

M. Honma, Z. Suzuki

SUMMARY

A series of catch-and-effort, length and fecundity data were compiled for Atlantic yellowfin caught by the Japanese and other tuna longline fleets. In 1974, overall fishing intensity of all longline fleets on the Atlantic yellowfin was considerably less than that of the previous year. However, the total yield remained almost at the same level as in the preceding years. Fishing effort and the yield relationship of the Atlantic yellowfin exploited by the longline fishery indicates that increments in yield in response to increased fishing effort would not be expected at the present level of effort. The length compositions in 1974 were similar to those in 1973 but large fish seemed more predominate in 1974 than in 1973. Low spawning indices of the species in the recent years recovered slightly in 1974.

RESUME

Une série de données de capture, effort, longueur, et fécondité ont été compilées sur l'albacore atlantique pris par les flottilles palangrières, japonaise et autres. En 1974, l'intensité de pêche de l'ensemble de ces flottilles en ce qui concerne l'albacore était considérablement moindre que celle de l'année précédente, la production totale demeurant cependant presque au même niveau. La relation entre l'effort de pêche et la production indique qu'un accroissement de cette dernière par suite d'une intensification de l'effort de pêche n'est pas escompté au niveau actuel de l'effort. La composition de longueur était en 1974 similaire à celle de 1973, mais les poissons de grande taille semblaient être plus prédominants. Les indices de ponte de cette espèce, médiocres au cours des dernières années, ont subi une légère hausse en 1974.

RESUMEN

Se compilan una serie de datos de captura y esfuerzo, talla y fecundidad, referentes al rabil del Atlántico capturado por las flotas de palangre japonesas y de otras nacionalidades. En 1974, el conjunto de la intensidad de pesca de rabil de todas las flotas palangreras en el Atlántico, fue muy inferior al registrado en 1973. Sin embargo, la producción total permaneció casi al mismo nivel alcanzado en años anteriores. La relación entre esfuerzo de pesca y producción, indica que en el actual nivel de esfuerzo, no es de esperar un incremento de la producción en respuesta a la aplicación de un esfuerzo mayor. Las composiciones por talla en 1974 fueron similares a las de 1973, si bien en 1974, los ejemplares grandes fueron más abundantes que en 1973. Los índices de desove de la especie, bajos durante los últimos años, han experimentado un ligero aumento en 1974.

Appendix Table reproduced in Data Record Vol. 9

Appendice Tableau reproduit dans le Vol. 9 du Recueil de Données

Appendice Cuadro reproducido en la Colección de Datos Estadísticas Vol. 9

This report, up-to-date data series in the fifth of this kind (Honma, 1973-1976) basing on the data till 1974, 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.

1. Material and method.

Data for newly added 1974 consist of yield statistics (ICCAT, 1975), catch statistics by area (Fisheries Agency of Japan; 1975 and Institute of Oceanography, National Taiwan University; 1973, 1974 and 1975a) 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 (Honma and Suzuki, ms).

A new period, 1965-1974, was chosen as "average year" for the present calculation of the fishing intensity described in detail in the first series (Honma, 1973). This change of the period is done partly to meet with shift of species preference, that is geographical distribution of effort in the Japanese tuna longline fishery from yellowfin tuna to bigeye and bluefin tuna.

The Taiwanese fishing intensity on yellowfin tuna was estimated applying 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 boats have equal fishing efficiency 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.

Yield of yellowfin tuna in the Atlantic was the highest 53 thousand tons in 1960 and since that decreased to the lowest 21 thousand tons in 1967. After 1967, it began to increase to the annual amount of some 30-33 thousand tons during the period 1969-1974 (31 thousand tons in mean with the standard deviation 11 thousand tons) and seems quite stabilized in the recent years (Fig. 1). The yield in 1974 was 31 thousand tons, about 2 thousand tons less than that of the previous year.

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 after 1967 rapidly faded away to 43 thousand tons in 1974 which account for only 14% in the whole Atlantic catch of yellowfin tuna by the longline fishery. Recent Taiwanese yield* of the species declined to 2.8 thousand tons in 1974, 9.2% to the total Atlantic longline yield of this species.

Despite of the case in those two countries, yellowfin tuna yield by the longline fleets of Korea, Panama and Cuba is remarkable. Above all, the Korean yield dominated sharing 50.4% in the total Atlantic longline yield of yellowfin in 1974 (Fig. 1). Japanese catch of yellowfin tuna in 1974 is estimated about 95 thousands and hook rates ((total catch/total effective effort) x 100) of its fleets for 1974 is 0.63%, a little higher than the previous year (Table 1).

*There is discrepancy with the Taiwanese yields between Statistical Bulletin Vol. 5 (ICCAT, 1975) and the Institute of Oceanography of National Taiwan University (1973, 1974, 1974 and 1975b). Yellowfin yield on the former statistics reads 4370 tons in 1971, 4705 tons in 1972, 2655 tons in 1973 and 2325 tons in 1974 which compare consistently higher 8177, 5258, 3431 and 2833 tons for the respective year on the latter statistics. The estimates from the latter statistics were used in this report because mean weights of this species calculated from the former ones seemed too small.

3. Fishing intensity.

Fishing intensity of the Japanese longline fishery on this species in 1974 was 124 thousand hooks (effective hooks per 5² sq.), 62 thousand hooks less than the previous year reflecting recent declining trend of its interests to yellowfin tuna (Table 1). This phenomenon is well endorsed 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 1974 (Fig. 2). No Japanese tuna longline boats, therefore, operate aiming mainly at yellowfin tuna in the recent years. Similarly, the Taiwanese fleets show their decreasing fishing effort to the species with the decreased 174 thousand hooks in 1974 (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). The intensity in 1974 was considerable less than that for 1973 while the hook rate, catch and yield remained almost the same with the recent year level. 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 were estimated shares no more than 25% 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 1975 remain roughly in the same level with that in 1973-1974.

4. Length composition of yellowfin in 1974.

Total of 4426 yellowfin tuna were measured in 1974. Of them, 4278 and 589 specimens^{were} obtained from Carib and Guinea areas, respectively. Total catch of yellowfin tuna taken in the two areas in 1974 were about 91 thousands, which account for 96.6% in the total Atlantic Japanese yellowfin catch by the longline boats. Figure 4 shows length compositions of catch for the two areas estimated basing on the sample length composition. Detailed numbers by quarter and 2-cm length class are tabulated in Appendix table 2.

The length composition of the Caribbean yellowfin in 1974

is similar to that in 1973 (Honma, 1976, Fig. 4) except for disappearance of 104-108 cm modal class observed in 1973. Like the previous year, large-sized-fish over 120 cm appears predominantly in the length composition of the Guinea area with minor change in which 124-128 cm modal class in 1973 is replaced by still larger 144-148 cm modal groups in 1974 (Fig. 4)***

5. Spawning indices, 1965-1974.

Spawning indices, (Honma, 1974) for both areas seems to have recovered slightly in 1974 probably due either to increase of population density or domination of larger fish.

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

***Due to lacking or very poor measurements of the sample specimens in the first, second and fourth quarters (Jan.-Mar., Apr.-July and Oct.-Nov.) of the Guinea area, they are substituted (Table 2). Therefore, it should be born in mind that the gaps in the length compositions of catch between 1973 and 1974 would apparently be caused by this substitutions of the sample length compositions.

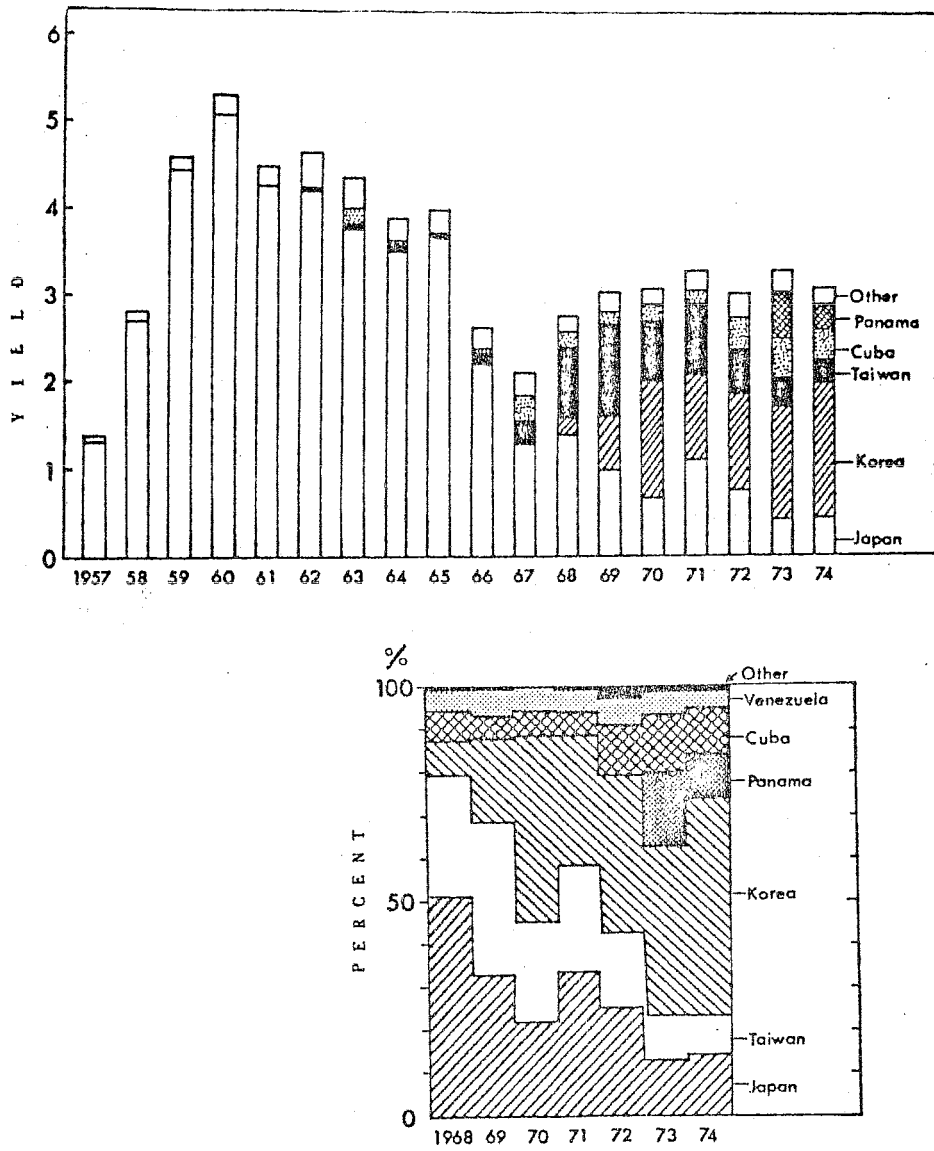


Fig. 1. Yield in ten thousand tons(upper panel),and yield in percent (lower panel) of yellowfin tuna by country in the Atlantic long-line fishery, 1957 - 1974.

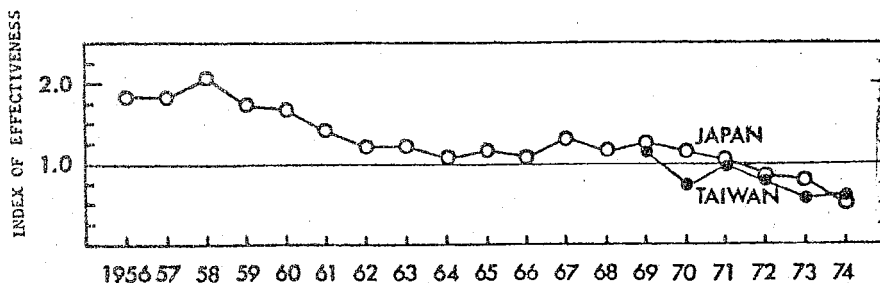


Fig. 2. Yearly average indices of effectiveness of Japanese and Taiwan's longline fishery on yellowfin tuna in the Atlantic Ocean, 1956-1974.

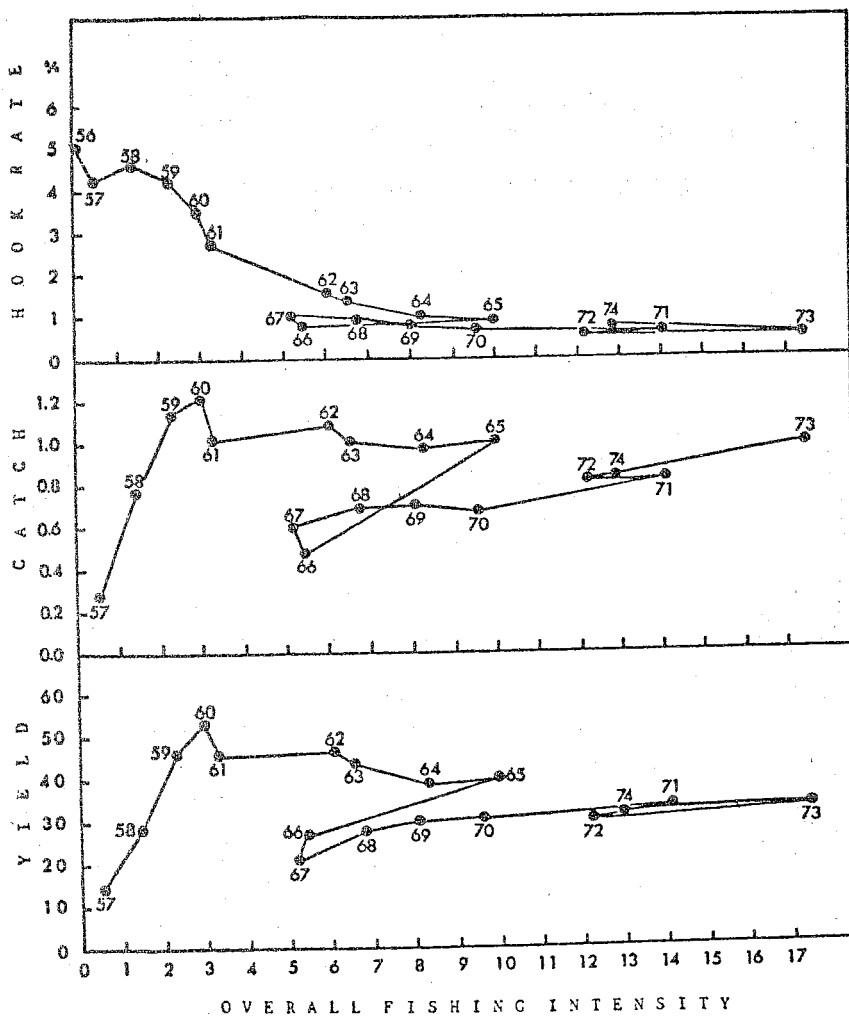


Fig. 3. Hook rate in percent (upper panel), catch in million fish (central panel), and yield in thousand tons (lower panel) of yellowfin tuna against overall fishing intensity in hundred thousand hooks per 5 square in the Atlantic longline fishery, 1956 - 1974.

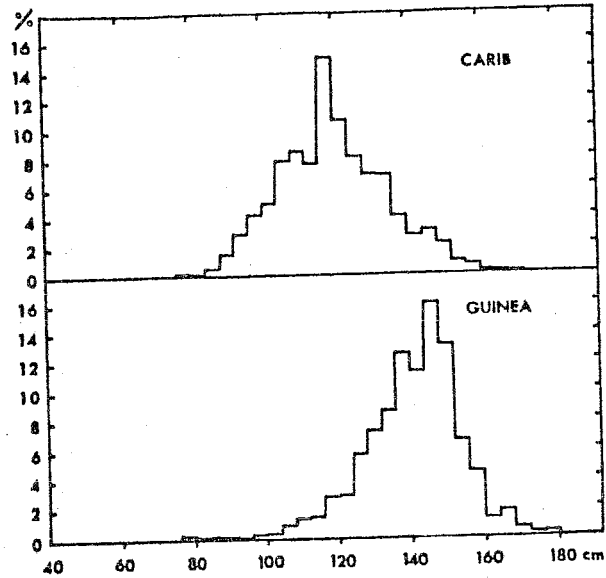


Fig. 4. Percentage length composition of yellowfin tuna caught by Japanese longline fishery in the Atlantic Ocean (CARIB and GUINEA area), 1974.

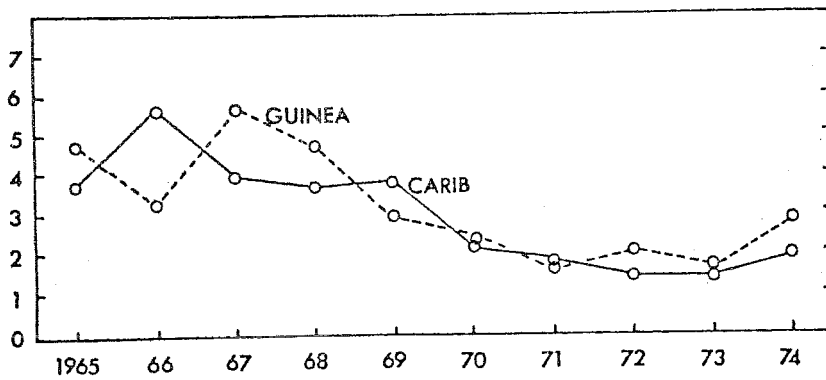


Fig. 5. Spawning index of yellowfin tuna in the Atlantic longline fishery, 1965 - 1974, preliminary.

Table 1. Hook rate, catch in number, yield in weight and overall fishing intensity of yellowfin tuna in Japanese and Taiwan's longline fishery, and catch, yield and overall fishing intensity in the longline fishery in the Atlantic Ocean, 1956-1974.

Year	Japanese longline fishery				Taiwan's longline fishery				Whole longline fishery		
	Hooking rate (%)	Catch in number of fish	Yield in tons	Intensity in 1000 hooks per 5 ² square	Hooking rate (%)	Catch in number of fish	Yield in tons	Intensity in 1000 hooks per 5 ² square	Catch in 1000 fish	Yield in tons	Intensity in 1000 hooks per 5 ² square
1956	5.01	12,028		2.0					..	..	2.0
1957	4.24	258,544	13,198	49.6					272	13,894	52.2
1958	4.57	746,490	27,159	133.8					775	28,203	139.0
1959	4.17	1,097,535	44,071	217.4					1,144	45,927	226.5
1960	3.42	1,158,534	50,822	282.3					1,211	53,142	295.2
1961	2.66	930,339	42,609	309.9					1,034	44,929	326.8
1962	1.52	990,472	41,973	547.6	..	..	285	..	1,096	46,434	605.8
1963	1.32	835,796	37,717	568.5	..	..	409	..	1,022	43,522	656.0
1964	0.98	879,188	35,106	751.1	..	..	350	..	968	38,660	827.2
1965	0.85	927,267	36,619	917.0	..	..	162	..	1,007	39,769	995.9
1966	0.74	394,538	22,123	452.3	..	..	1,100	..	472	26,459	540.9
1967	0.97	366,046	12,809	317.4	..	..	2,673	..	598	20,918	518.4
1968	0.87	274,181	13,857	265.5	0.86	276,962	7,857	268.8	664	27,376	673.5
1969	0.78	241,832	9,823	263.1	0.67	233,743	10,798	278.1	710	30,159	804.7
1970	0.66	189,569	6,674	241.0	0.48	109,890	7,071	190.8	776	30,516	958.6
1971	0.57	292,062	11,026	426.3	0.41	188,972	8,177	396.7	840	32,760	1403.9
1972	0.53	159,010	7,527	256.0	0.61	185,008	5,258	259.1	711	30,160	1215.2
1973	0.49	108,585	4,189	185.4	0.45	120,199	3,431	219.6	881	32,769	1741.5
1974	0.63	94,700	4,296	123.5	0.44	95,629	2,833	174.2	822	30,788	1285.7

le 2. Sample size and substitution of data for calculating catch by length class.

Area	Quarter			
	I	II	III	IV
CARIB	25(II)	506	3,267	480
GUINEA	1600(I)	23(III)	566	(III)

Arabic numerals without parentheses denote number of individuals determined by either length or body weight. Roman numerals in parentheses denote substituted data of the given quarter except one in the first quarter of Guinea area indicating the substitution for the data in the first quarter of 1973.

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