

OVERALL FISHING INTENSITY OF THE JAPANESE ATLANTIC
LOONGLINE FISHERY FOR BIGEYE TUNA, 1956-1973

by

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SUMMARY

This is the fourth issue in a series to study fishing intensity of bigeye tuna exploited by Japanese and other longline fleets in the Atlantic Ocean. The fishing intensity of the whole longline fleet was estimated on the basis of the Japanese catch and effort data by area up to 1973.

During the three-year period 1971-1973, catch and fishing intensity of the longline fishery remained at a high level. The hook rate of Japanese data has remained at almost the same level since 1971, or two thirds of the average of the 1961-1963 period. It is possible that the fishery is approaching a level at which a further increase in effort would not result in a substantial increase in catch.

RESUME

Ce rapport est le quatrième d'une série d'études sur l'intensité de pêche portant sur le thon obèse exploité par la flottille japonaise et les autres flottilles palangrières dans l'Atlantique. L'intensité de pêche de la flottille palangrière dans son ensemble a été estimée à partir des données japonaises de capture et d'effort par zone jusqu'à 1973.

Pendant trois ans, de 1971 à 1973, la prise et l'intensité de pêche de la flottille palangrière sont restées à un niveau élevé. Le taux par hameçon des données japonaises est demeuré presque au même niveau depuis 1971, c'est-à-dire aux deux tiers de la moyenne de la période 1961-1963. Il se peut que la pêcherie soit près d'atteindre le niveau où un accroissement additionnel de l'effort n'entraînerait pas d'augmentation sensible de la prise.

RESUMEN

Este es el cuarto documento de una serie que estudia la intensidad de pesca del patudo, explotada por los japoneses y otras flotas palangreras en el Atlántico. La intensidad de pesca de toda la flota palangrera se evaluó en base de los datos japoneses de esfuerzo y captura por zona hasta 1973.

Durante los tres años, 1971 a 1973, la captura y la intensidad de pesca de palangre, mantuvo un alto nivel. Los datos japoneses de tasa por anzuelo han mantenido practicamente el mismo nivel desde 1971, es decir, dos tercios del promedio del periodo 1961-1973. Es posible que la pesquería esté llegando a un nivel desde el cual, un aumento adicional del esfuerzo no rendiría un aumento sustancial en las capturas.

Appendix Table reproduced in Data Record Vol. 7.

Appendice Tableau reproduit dans le Vol. 7 du Recueil de Données.

Apendice Cuadro reproducido en la Vol. 7 de la Colección de Datos Estadísticos.

1. Catch and effort in Japanese fleet

Procedure of the calculations was already described by Honma (1973). The newly added data for 1973 and some revised data for the years up to 1972 are those provided by ICCAT (1975) on catch in weight and by Fisheries Agency (1975) on Japanese catch in number and effort statistics by area. The average year in the present calculation extends from 1966 to 1973.

Catch and amount of effective fishing effort in 1973 remained on a high level after the sharp rise in 1971. The hook rate, yearly catch in number divided by yearly sum of effective effort, in 1973 was almost on the same level as that of 1972.

An estimate of "concentration index" on bigeye tuna fishing ground, yearly sum of effective effort divided by number of hooks actually used in the year, has been on the increase since 1962, and indicated the highest rise in 1973 (Fig. 1). This trend was reflected by the species preference of the recent Japanese longline fleet which had been paying continuing greater concerns on bigeye tuna.

2. Effort of whole fleet

Detailed catch and effort statistics, Task 2 in SCRS, have not been made available on the non-Japanese longliners. Therefore, the fishing intensity of the whole longline fleet has been surmised based on the assumption that all longliners operate as exhibited by the Japanese longline statistics. This will cause some bias in the estimation of the statistics for the whole longline fleet. Another bias relating to yield statistics is that the Japanese annual yield in years up to 1970 was not of nominal catch but of landing which included the catch in later months of the preceding year instead of that in the comparable months of the year. Yield statistics of major non-Japanese longline fleet have been also historically of landings. The above two kinds of shortcomings of data are difficult to evaluate, generating some weakness in the further analysis of the data.

Longline catch of bigeye tuna has increased during recent three years, 1971-1973, with a higher level of fishing effort. As shown by the top panel of Fig. 2, lower hook rates were experienced in the last three years, indicating about two thirds of the average hook rates of earlier years of 1961-1963. There observed the discrepancy between relationships of the two kinds of catch against effort, as shown in the lower two panels of Fig. 2. This discrepancy is not explained only by the annual change of average size of the catch, and most probably is due to the shortcoming of the weight data described above. The relation of catch in number to fishing intensity seems to be more precise, because this data are originally based on nominal catch in a year. It is noted that the decline of the hook rate and the catch and effort relationships are indicative that the fishery would be approaching to or near the level of maximum sustainable yield.

References

- Fisheries Agency of Japan 1975. "Annual report of effort and catch statistics by area on Japanese tuna longline fishery, 1973". 265p.
- Honma, M. 1973. "Overall fishing intensity and catch by length class of yellowfin tuna in Japanese Atlantic longline fishery, 1956-1971". Col. Vol. Sci. Pap. Vol. 1, 59-77.
- International Commission for the Conservation of Atlantic Tunas 1975. ICCAT Circular 1975/09.

Table 1. Extent of fishing ground in 5° square unit based on "average years from 1966 through 1973", amount of effective effort in thousand hooks (X) and overall fishing intensity in thousand hooks per 5° square (f) of Japanese longline fishery for bigeye tuna in the Atlantic Ocean, 1956-1973.

Month	Area	1956		1957		1958		1959		1960		1961	
		X	f	X	f	X	f	X	f	X	f	X	f
Total	1,754.14	87	0.6	3,097	18.9	7,184	48.1	13,041	88.2	17,398	118.8	35,673	245.0
1	151.61	-	-	-	-	539	3.6	828	5.5	630	4.2	1,402	9.3
2	153.59	-	-	11	0.1	163	1.1	394	2.6	702	4.6	1,603	10.4
3	123.39	-	-	7	0.1	167	1.4	222	1.8	471	3.8	925	7.5
4	141.77	-	-	60	0.4	169	1.2	535	3.8	987	7.0	1,274	9.0
5	148.55	-	-	205	1.4	332	2.6	837	5.6	1,071	7.2	2,339	15.7
6	154.94	9	0.1	211	1.4	910	5.9	1,236	8.0	2,145	13.8	3,202	20.7
7	136.47	3	0.0	375	2.7	612	4.5	1,630	11.9	2,191	16.1	6,307	46.2
8	136.35	17	0.1	227	1.7	206	1.5	1,228	9.0	1,732	12.7	6,271	46.0
9	143.38	21	0.1	449	3.1	894	6.2	1,285	9.0	2,196	15.3	1,310	9.1
10	160.79	29	0.2	532	3.3	1,214	7.6	2,201	13.7	1,550	9.6	4,412	27.4
11	151.83	3	0.0	338	2.2	759	5.0	1,883	12.4	2,184	14.4	4,852	32.0
12	151.47	7	0.0	683	4.5	1,160	7.7	762	5.0	1,541	10.2	1,777	11.7

Month	1962		1963		1964		1965		1966		1967	
	X	f	X	f	X	f	X	f	X	f	X	f
Total	59,734	409.4	52,212	359.2	68,120	467.0	127,002	880.0	47,640	329.0	35,666	240.6
1	1,301	8.6	1,465	9.7	1,473	9.7	7,545	49.8	4,124	27.2	2,144	14.1
2	4,315	28.1	4,604	30.0	3,914	25.5	7,764	50.6	8,835	57.5	5,282	34.4
3	2,744	22.2	2,996	24.3	3,965	32.1	9,725	78.8	5,779	46.8	1,686	13.7
4	3,435	24.2	5,782	40.8	4,565	32.2	11,324	79.9	4,210	29.7	2,243	15.8
5	7,453	50.2	7,520	50.6	3,778	25.4	8,324	56.0	3,607	24.3	1,813	12.2
6	3,877	25.0	1,171	7.6	1,674	10.8	8,528	55.0	2,815	18.2	1,427	9.2
7	6,021	44.1	2,255	16.5	3,575	26.2	16,950	124.2	3,011	22.1	2,286	16.7
8	7,701	56.5	7,284	53.4	9,770	71.7	14,943	109.6	3,525	25.9	1,705	12.5
9	7,189	50.1	7,287	50.8	10,472	73.0	13,031	90.9	4,000	27.9	3,439	24.0
10	8,396	52.2	6,742	41.9	10,977	68.3	13,677	85.1	4,128	25.7	5,452	33.9
11	5,121	33.7	3,930	25.9	7,538	49.6	9,752	64.2	2,106	13.9	5,005	33.0
12	2,180	14.4	1,176	7.8	6,419	42.4	5,439	35.9	1,500	9.9	3,184	21.0

Month	1968		1969		1970		1971		1972		1973	
	X	f	X	f	X	f	X	f	X	f	X	f
Total	35,493	243.4	43,642	302.8	37,539	257.0	97,180	662.5	84,805	577.3	89,780	604.7
1	2,297	15.1	1,044	6.9	2,161	14.3	4,484	29.6	9,435	62.2	6,965	45.9
2	1,938	12.6	2,030	13.2	3,354	21.8	6,119	39.8	14,285	93.0	6,948	45.2
3	1,819	14.7	2,018	16.4	2,619	21.2	6,080	49.3	7,492	60.7	4,433	35.9
4	1,490	10.5	4,730	33.4	3,093	21.8	11,179	78.9	7,445	52.5	4,481	31.6
5	2,468	16.6	5,573	37.5	2,223	15.0	9,602	64.6	4,759	32.0	3,511	23.6
6	3,364	21.7	3,767	24.3	2,276	14.7	6,966	45.0	2,930	18.9	3,920	25.3
7	4,199	30.8	5,492	40.2	3,524	25.8	8,434	61.8	2,892	21.2	5,037	36.9
8	4,204	30.8	6,253	45.9	2,500	18.3	5,095	37.4	4,889	35.9	6,217	45.6
9	5,677	39.6	5,799	40.4	4,392	30.6	8,605	60.0	5,887	41.1	10,170	70.9
10	5,775	35.9	2,998	18.6	4,671	29.0	15,220	94.7	9,694	60.3	20,355	126.6
11	1,662	10.9	2,176	14.3	4,145	27.3	9,854	64.9	9,152	60.3	9,637	63.5
12	600	4.0	1,761	11.6	2,580	17.0	5,540	36.6	5,944	39.2	8,106	53.5

Table 2. Historical catch and effort statistics of Japanese longline fishery and those estimated for the Whole longline fishery in the Atlantic Ocean, 1956-1973.

Year	JAPANESE FLEET				WHOLE FLEET		
	Hook rate Catch in number per 100 hooks	Catch in number of fish in 1,000	Yield in 1,000 tons	Intensity per 5° square (1,000 hooks)	Catch in number of fish in 1,000	Yield in 1,000 tons	Intensity per 5° square (1,000 hooks)
1956	0.219	0.2	..	0.6	0.2	..	0.6
1957	0.279	8.7	0.5	20.9	8.7	0.5	20.9
1958	0.206	14.8	0.5	48.1	14.8	0.5	48.1
1959	0.344	44.8	1.5	88.2	44.8	1.5	88.2
1960	0.406	70.6	2.9	118.8	73.0	3.0	122.9
1961	0.683	243.3	11.0	245.0	247.7	11.2	249.5
1962	0.616	370.7	15.7	409.4	375.4	15.9	414.6
1963	0.546	285.3	14.5	359.2	289.2	14.7	364.2
1964	0.505	343.7	17.3	467.0	347.7	17.5	472.4
1965	0.512	649.8	28.5	880.0	661.2	29.0	895.4
1966	0.487	232.1	17.6	329.0	250.6	19.0	355.2
1967	0.507	180.9	8.5	240.6	242.6	11.4	322.7
1968	0.576	204.6	10.3	243.4	339.7	17.1	404.1
1969	0.604	263.6	10.3	302.8	534.9	20.9	614.4
1970	0.504	189.2	9.0	257.0	536.1	25.5	728.2
1971	0.406	395.0	20.8	662.5	721.6	38.0	1210.3
1972	0.409	346.5	18.5	577.3	603.1	32.2	1004.8
1973	0.436	391.5	20.2	604.7	670.6	34.6	1035.8

Table 3. Estimated amount of catch of bigeye tuna in the Atlantic Ocean, 1963-1974, in 1,000 tons.

Country	Gear	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974*
Grand total		17.6	20.5	29.1	19.0	11.9	18.1	24.2	28.2	46.2	36.1	41.8	42.1
Total by gear	Longline	14.7	17.5	29.0	19.0	11.4	17.1	20.9	25.5	38.0	32.2	34.6	35.0
	Surface	2.9	3.0	0.1	0.0	0.5	1.0	3.3	2.7	8.2	3.9	7.2	7.1
Argentina	L	0.2	0.2	0.4	0.2	0.1	0.3	0.2	0.1	0.0	0.0	0.0	..
Brazil	L	-	-	-	-	-	-	-	-	-	-	0.1	0.2
China(Taiwan)	L	0.0	0.0	-	0.6	2.2	5.3	7.5	7.6	5.5	5.0	3.8	3.1
Cuba	L	..	..	0.1	0.3	0.3	0.9	1.0	4.1	3.2	2.0	2.6	..
France**	S	2.7	2.8	-	..	..	..	1.6	1.2	0.5	0.3	2.5	1.3
	S	-	-	-	-	-	-	-	-	-	-	-	0.0
Japan	L	14.5	17.3	28.5	17.6	8.5	10.3	10.3	9.0	20.8	18.5	20.2	22.5
	S	0.0	0.0	0.1	0.0	0.5	1.0	0.5	0.1	0.2	0.3	0.2	0.7
Korea	L	..	..	..	0.3	0.3	0.3	1.9	4.7	8.5	6.6	5.2	7.4
Panama	L	-	-	-	-	-	-	-	-	-	0.1	2.7	1.8
	S	-	-	-	-	-	-	-	-	-	-	-	1.0
South Africa	S	0.2	0.2	..	..	..	..	..	..	..	..	..	-
Spain	S	..	..	..	..	..	..	1.1	1.2	7.0	3.1	4.4	3.2
U.S.	S	..	..	..	..	..	0.0	0.1	0.2	0.5	0.2	0.1	0.9
Venezuela	L	..	..	..	..	..	0.0	0.0	0.0	0.0	-	..	-

Notes: 1) Source of data: ICCAT Statistical Bulletin, Vol. 4 (1974) and ICCAT Circular 1972/09.

2) ..: no data available, -: none, 0.0: magnitude known to be more than zero but less than half the unit final digit used.

* Includes provisional figures.

** Catches of France, Ivory Coast and Senegal combined.

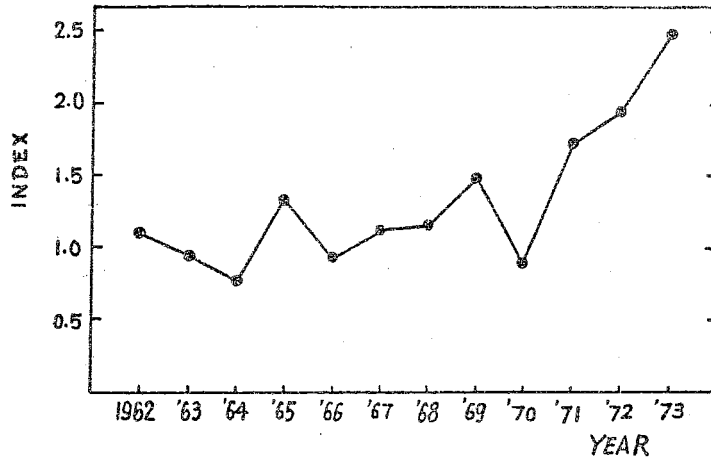


Fig. 1. Concentration index of Japanese longline fishery on bigeye tuna in the Atlantic Ocean, 1962-1973.

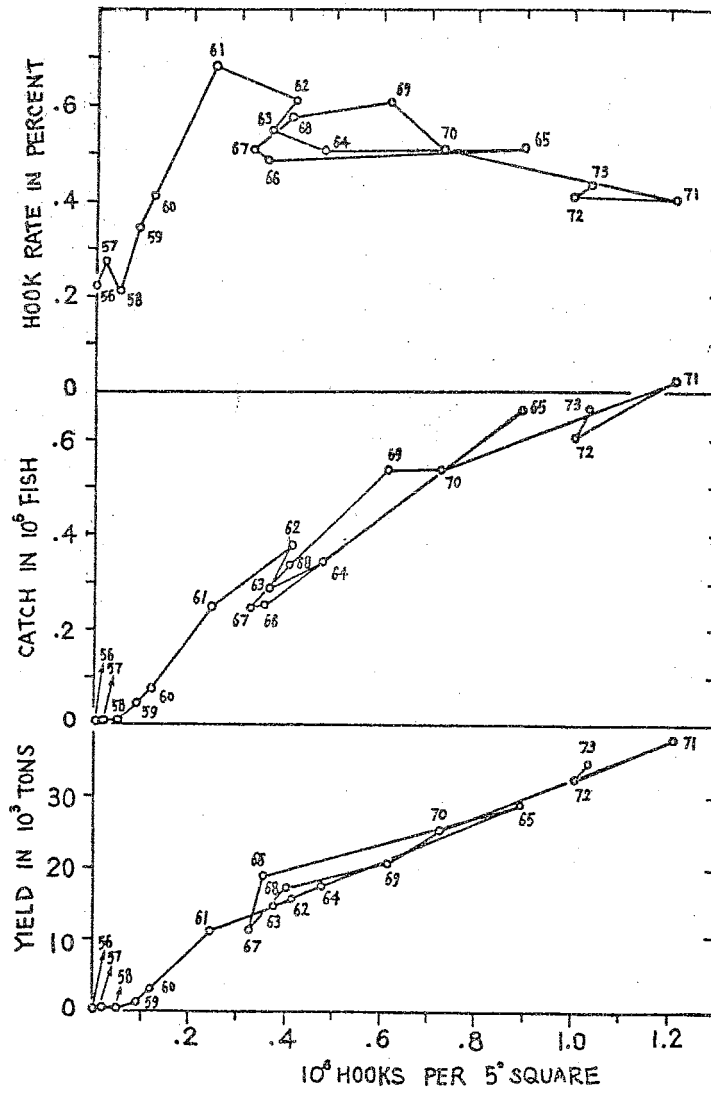


Fig. 2. Density in hook rate, catch in number, and yield in weight of bigeye tuna, against overall fishing intensity in the whole Atlantic longline fishery, 1956-1973.