OVERALL FISHING INTENSITY OF JAPANESE ATLANTIC LONGLINE FISHERY FOR BIGEYE TUNA, 1956-1971

by

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SUMMARY

In 1971, the fishing intensity of longline fishery increased on bigeye tuna in the Atlantic Ocean. The hook-rate showed the first appreciable decline since 1962. It is possible that the fishery is reaching the level of maximum sustainable yield.

RESUME

En 1971, l'intensité de pêche de la pêcherie palangrière de thon obèse dans l'Atlantique a augmenté. Le taux par hameçon montre pour la première fois depuis 1962 une baisse appréciable. Il est possible que la pêcherie soit près d'atteindre le niveau de rendement maximal soutenu.

RESUMEN

En 1971, la intensidad pesquera sobre patudo con palangre aumentó en el Oceano Atlántico. El índice de capturas por anzuelo acusó el primer descenso apreciable desde 1962. Posiblemente, la pesquería está alcanzando el nivel de máximo rendimiento continuado.

This paper presents fishing intensity of longline fishery on bigeye tuna stock in the Atlantic Ocean during the years from 1956 to 1971. Data and methods of calculation are almost the same with the previous report (Hisada 1973) except that:

(1) yield in weight is based on newly compiled statistics (ICCAT 1973),
(2) "average years" cover 1966 to 1971 due to inclusion of the final year's statistics (Fishery Agency of Japan 1973), and,
(3) "distribution range" extends between Lat. 45°N and 45°S.

Modification of definitions of "average years" and "distribution range" caused only slight changes of estimates of effective effort and fishing intensity of Japanese fleet up to 1971 (Table 1) from the previous calculation given in Hisada's (1973) comparable table.

Catch and effort in Japanese fleet

Amount of effective fishing effort in 1971 increased sharply from the previous five years, and reached the second record following 1965 (Table 1). Amount of catch also increased in 1971, but did not meet to the sharp increase offeffort. Average hook rate, yearly catch divided by sum of monthly effort, dropped in 1971 from the level long retained during 1962 through 1970 (Table 2).

Recently Japanese longline fleet tended to concentrate their effort on bigeye tuna (e.g. Hayasi 1973). An estimate of "concentration index" on bigeye tuna fishing ground, ratio of yearly sum of monthly effort on number of hooks used in the year, has been on incresing trend since 1962, and showed a highest rise in 1971 (Fig. 1).

Effort of the whole fleet

Non-Japanese longliners failed to provide series of detailed Task 2 statistics required to calculate the effective effort. Recent decrease of Japanese share in yield of bigeye tuna (Table 3), therefore, makes it necessary to surmise the fishing intensity of the whole fleet based on an assumption that all the longliners behaved as shown by the Japanese statistics. But it is possible that the non-Japanese boats did not always operate in major fishing grounds of Japanese fleet (Shiohama ms). Furthermore, the Japanese yield in years up to 1970 was not nominal catch but landing in a year that include the catch in later months of the preceding year instead of that in the comparable months of the year. Biasses due to these two types of defects of data are not evaluated yet.

Yield of bigeye tuna increased with expansion of fishing up to 1971. However, rapid increase of fishing caused decline of hook rate in the latest year (Fig. 2). Though there obtained a discrepancy between relationships of the two kinds of catch against effort, the author likes to pay more attention on the relation of catch in number with fishing intensity, because this is originally based on nominal statistics in a year. It is also noted that the decline of hook rate as well as the above mentioned catch and effort relationship are indicative that the fishery approaches to the level of maximum sustainable yield.

References

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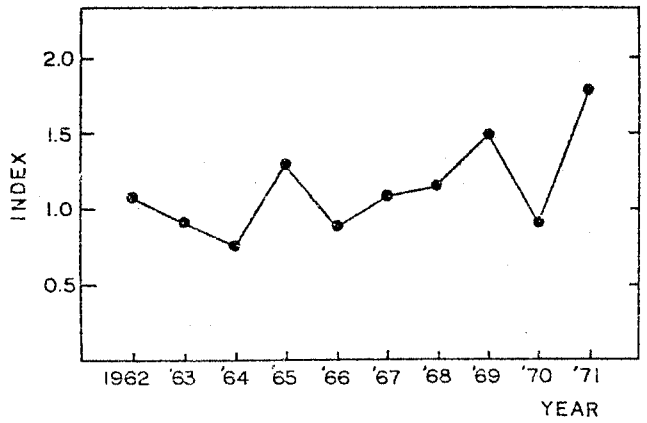

Fig. 1. Concentration index of Japanese longline fishery on bigeye tuna in the Atlantic Ocean, 1962-1971.

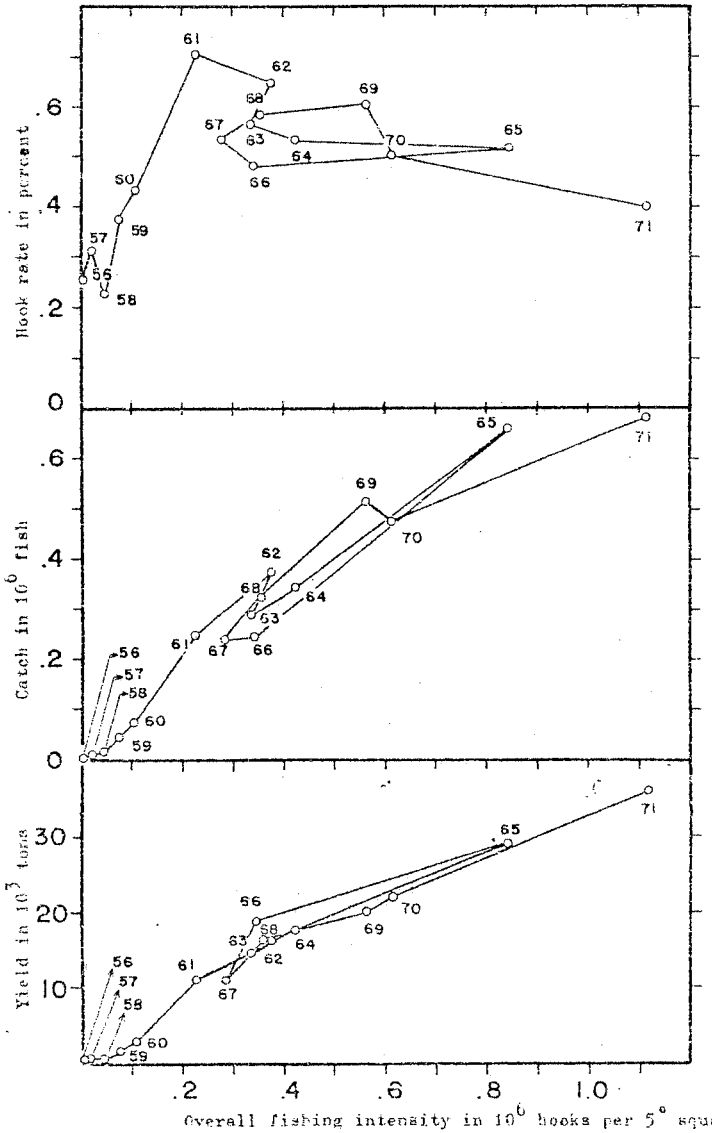

Fig. 2. Density in hook rate, catch in number, and yield in weight of bigeye tuna, against overall fishing intensity in the whole Atlantic longline fishery, 1956-1971.

Table 11 Extent of fishing ground in 5° square unit based on "average years from 1966 through 1979", 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 1956-1971.

Month	Area	1956		1957		1958		1959		1960	
		X	f	X	f	X	f	X	f	X	f
Total	1,855.72	78	0.5	2,832	17.8	6,605	41.7	11,973	76.2	16,225	103.9
1	158.45	-	-	-	-	555	3.5	857	5.4	649	4.1
2	154.30	-	-	11	0.1	163	1.1	370	2.4	702	4.5
3	125.38	-	-	8	0.1	214	1.7	260	2.1	540	4.3
4	141.97	-	-	61	0.4	181	1.3	539	3.8	886	6.2
5	156.35	-	-	215	1.4	409	2.6	895	5.7	1,100	7.1
6	166.28	8	0.0	214	1.3	809	4.9	1,75	6.5	2,044	12.3
7	151.77	3	0.0	373	2.5	612	4.0	1,673	11.0	2,206	14.5
8	154.42	17	0.1	238	1.5	212	1.4	1,092	7.1	1,632	10.6
9	157.13	18	0.1	390	2.5	792	5.0	1,126	7.2	1,979	12.6
10	168.47	23	0.1	437	2.6	999	5.9	1,810	10.7	1,274	7.6
11	157.37	2	0.0	289	1.8	650	4.1	1,612	10.2	1,867	11.9
12	163.83	6	0.0	595	3.6	1,010	6.2	663	4.0	1,338	8.2

Table 1. (continued).

Month	1961		1962		1963		1964		1965		1966	
	X	f	X	f	X	f	X	f	X	f	X	f
Total	34,615	222.1	57,122	369.1	50,505	329.8	64,233	416.0	125,672	824.2	48,066	319.1
1	1,578	10.0	1,357	8.6	1,565	9.9	1,590	10.0	8,003	50.5	4,652	29.4
2	1,576	10.2	4,225	27.4	4,615	29.9	4,073	26.4	8,014	51.9	9,033	58.5
3	1,088	8.7	3,260	26.0	3,431	27.4	4,705	37.5	11,936	95.2	6,942	55.4
4	1,287	9.1	3,482	24.5	5,770	40.6	4,457	31.4	11,743	82.7	4,239	29.9
5	2,405	15.4	7,364	47.1	7,630	48.8	3,919	25.1	8,758	56.0	3,663	23.4
6	3,118	18.8	3,977	23.9	1,231	7.4	1,620	9.7	8,787	52.8	2,813	16.9
7	6,262	41.3	6,131	40.4	2,274	15.0	3,837	25.3	16,881	111.2	2,934	19.3
8	6,626	42.9	7,858	50.9	7,584	49.1	9,994	64.7	15,673	101.5	3,631	25.5
9	1,228	7.8	6,552	41.7	6,661	42.4	9,264	59.0	11,798	75.1	3,564	22.7
10	3,548	21.1	7,069	42.0	5,494	32.6	9,110	54.1	11,122	66.0	3,408	20.2
11	4,190	26.6	3,945	25.1	3,212	20.4	6,332	40.2	8,347	53.0	1,850	11.8
12	1,708	10.4	1,903	11.6	1,038	6.3	5,332	32.5	4,610	28.1	1,337	8.2

Month	1967		1968		1969		1970		1971	
	X	f	X	f	X	f	X	f	X	f
Total	33,769	217.8	34,865	224.7	43,803	285.3	37,761	246.2	98,661	641.9
1	2,318	14.6	2,498	15.8	1,099	6.9	2,315	14.6	4,989	31.5
2	5,289	34.3	1,980	12.8	2,086	13.5	3,357	21.8	6,458	41.9
3	2,001	16.0	2,135	17.0	2,397	19.1	3,272	26.1	7,717	61.5
4	2,301	16.2	1,474	10.4	4,716	33.2	3,352	23.6	11,729	82.6
5	1,840	11.8	2,549	16.3	6,226	39.8	2,437	15.6	10,486	67.1
6	1,247	7.5	3,463	20.8	3,892	23.4	2,480	14.9	7,329	44.1
7	2,532	15.4	4,480	29.5	5,567	36.7	3,742	24.7	9,007	59.3
8	1,662	10.8	4,487	29.1	6,596	42.7	2,700	17.5	5,370	34.8
9	3,046	19.4	5,182	33.0	5,299	33.7	4,094	26.1	7,832	49.8
10	4,484	26.6	4,627	27.5	2,518	14.9	3,885	23.1	13,863	82.3
11	4,433	28.2	1,460	9.3	1,863	11.8	3,818	24.3	8,969	57.0
12	2,815	17.2	531	3.2	1,545	9.4	2,309	14.1	4,913	30.0

Table 2. Historical catch and effort statistics of Japanese longline fishery and those estimated for the whole longline fishery in the Atlantic Ocean, 1956-1971.

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	0.256	0.2	..	0.5	0.2	..	0.5
1957	0.307	8.7	0.5	17.8	8.7	0.5	17.8
1958	0.224	14.8	0.5	41.7	14.8	0.5	41.7
1959	0.374	44.8	1.5	76.2	44.8	1.5	76.2
1960	0.435	70.6	2.9	103.9	73.0	3.0	107.5
1961	0.703	243.3	11.0	222.1	247.7	11.2	226.1
1962	0.649	370.7	15.7	369.1	375.4	15.9	373.8
1963	0.565	285.3	14.5	329.8	289.2	14.7	334.3
1964	0.535	343.7	17.3	416.0	347.7	17.5	420.8
1965	0.517	649.8	28.5	824.2	661.2	29.0	838.7
1966	0.483	232.1	17.6	319.1	247.9	18.8	340.9
1967	0.536	180.9	8.5	217.8	230.2	11.1	284.4
1968	0.587	204.6	10.3	224.7	323.8	16.3	355.6
1969	0.602	263.6	10.3	285.3	510.5	20.3	562.2
1970	0.501	180.2	9.0	246.2	475.1	22.6	618.2
1971	0.400	395.0	20.8	641.9	685.6	36.1	1,114.1

Table 3. Estimated amount of catch of bigeye tuna in the Atlantic Ocean, 1960-1972, in 1,000 tons.

Country	Gear	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972*1
Grand total*2		3.0	11.2	16.0	17.6	20.5	29.1	18.8	11.6	17.3	23.5	25.1	41.7	
Total by gear	Longline	3.0	11.2	15.9	14.7	17.5	29.0	18.8	11.1	16.3	20.3	22.6	36.1	
	Surface	..	..	0.0	2.9	3.0	0.1	0.0	0.5	1.0	3.2	2.5	5.6	
Argentine	Longline	0.1	0.2	0.2	0.2	0.2	0.4	0.2	0.1	0.3	0.2	0.1	0.0	0.0
Brazil	Longline				..	..	..	..	..	..	..	..	0.0	
Cuba	Longline	..	..	..	..	..	0.1	0.3	0.3	0.9	1.0	4.1	3.2	
France*3	Surface	..	..	..	2.7	2.8	-	..	..	..	1.6	1.2	0.5	0.3
Japan	Subtotal*2	2.9	11.0	15.7	14.5	17.3	28.7	17.6	9.0	11.3	10.7	9.1	21.0	19.5
	Longline	2.9	11.0	15.7	14.5	17.3	28.5	17.6	8.5	10.3	10.3	9.0	20.8	19.2
	Surface	-	-	0.0	0.0	0.0	0.1	0.0	0.5	1.0	0.5	0.1	0.2	0.3
Korea	Longline	-	-	-	..	..	..	0.2	0.3	0.2	1.6	4.1	7.4	5.7
Panama	Longline				..	..	..	..	..	..	..	..	..	0.1
South Africa	Surface	..	0	0	0.2	0.2	..	..	..	..	..	..	..	-
Spain	Surface				..	..	..	..	..	..	1.1	1.2	4.4	1.3
Taiwan	Longline	-	-	0.0	0.0	0.0	-	0.5	1.9	4.6	7.2	5.3	4.7	
United States	Surface	-	-	-	..	..	..	..	..	..	..	..	0.5	
Venezuela	Longline	..	..	..	..	..	..	..	..	0.0	0.0	0.0	0.0	-

Notes: 1) Source of data: 1963-1972 from ICATT Statistical Bulletin, Vol.3 (1973) and 1960-1962 from Hisada 1972.
2) ..: no data available, -: none, 0.0 or 0: magnitude known to be more than zero but less than half the unit or final digit used.
*1 Includes provisional figures
*2 Minor discrepancy is due to the rounding of numbers.
*3 Catches from Ivory Coast and Senegal have been included with French catch, in order to protect the privacy of private enterprises of the former two.