

OVERALL FISHING INTENSITY, CATCH, CATCH BY SIZE AND SPAWNING INDICES  
OF YELLOWFIN TUNA IN THE ATLANTIC TUNA LONGLINE FISHERY, 1956-1977

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This report is an eighth issue of basic catch and effort and biological data on Atlantic yellowfin tuna, up to 1977, exploited by Japanese and other longlining countries.

1. Data sources and processing

Four kinds of data were utilized: catch in weight by country and fishing gear (ICCAT 1975-1978), Japanese longline catch and effort statistics by area (Fisheries Agency of Japan 1965-1979, Shiohama *et al.* 1965), Taiwanese longline catch and effort statistics by area (Institute of Oceanography, National Taiwan University 1973-1975, ICCAT personal communication for the 1975-1977 statistics) and length measurement data of the Japanese longline catches compiled by the Far Seas Fisheries Research Laboratory. Description on calculation method of the fishing intensity is given in the first report of this series (Honma 1973). Average year and procedures estimating the total fishing intensity and total catch in number of yellowfin tuna for the whole Atlantic longline fleets are the same as those explained in the seventh report (Honma 1978).

2. Catch

Annual catch of yellowfin tuna by the whole Atlantic longline fleets has remained in a fairly stable level between about 21,000 tons and 32,000 tons since 1966 (Fig. 1). The catch in 1977 was about 26,600 tons showing a slight increase by 1,600 tons compared with the previous year. On the other hand, the Japanese catch in 1977 decreased to a record low 1,467 tons accounting for only 5.5% to the total longline catch. Taiwanese catch has also showed drastic reduction to 329 tons, about 1.2% to the total longline catch.

In contrast to the decline of the catches by the Japanese and Taiwanese longline fleets, the catches of yellowfin by Korean, Cuban and Venezuelan longline fleets continued to increase and above all, the Korean catch accounts for 61% to the total longline catch in 1977 (Fig. 1). The Japanese catch of yellowfin in 1977 was estimated to be 41,000 fish and hook rate 0.44% (number of fish x 100 / number of effective hooks) (Table 1).

3. Fishing intensity and catch-effort relationship

In the recent years, the fishing intensities (number of effective hook/ 5° square) of the Japanese and Taiwanese longline fleets on the Atlantic yellowfin tuna are in a decreasing trend and in 1977, those were about 76,000 hooks, reduced to one half from the previous year, and about 59,000 hooks, respectively (Table 1).

On the other hand, the fishing intensity on this species by the whole longline fleets has shown the highest value in 1977, 2,010,000 hooks (Table 1).

Relationship between fishing intensity and hook rate, catch in number and catch in weight are shown in Figure 2. The hook rate of yellowfin in 1977 was low as those of the previous years. Despite the substantial increase of the fishing intensity, both catch in number and in weight of yellowfin by the Atlantic longline fleets remained as almost same level of the previous year (Fig. 2).

As mentioned before, after 1966, no trend of the increase in yellowfin catch by the Atlantic longline fisheries in response to the increased fishing effort was observed.

4. Size composition of the catch and spawning indices

Figure 3 shows length frequency distribution of the yellowfin caught by the Japanese longline boats in Carib and Guinea Areas. Breakdown of the frequency by quarter of the year and 2 cm fork length intervals is tabulated in Appendix Table 1.

In the Carib Area, three modes are observed at 104-108 cm, 124-128 cm and 144-148 cm classes. Comparing with the previous year's frequency distribution in this area (Honma 1979, Fig. 4), each position of the modes has shifted to larger length classes.

As in the previous year, in the Guinea Area, large fish above 120 cm dominated in the composition with two clear modes at 132-136 cm and 148-152 cm classes. Rate of number of fish below 140 cm to the total in 1977 composition in this area became higher than that in the previous year (Honma 1979, Fig. 4).

Spawning indices for both area showed that they still remained in the low level of the recent years (Fig. 4).

## References

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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 - 1977.

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 <sup>+</sup> square	Hook rate (%)	Catch in number of fish	Yield in tons	Intensity in 1000 hooks per 5 <sup>+</sup> square	Catch in 1000 fishes	Yield in tons	Intensity in 1000 hooks per 5 <sup>+</sup> square
1956	4.91	12,028		2.0							
1957	4.28	258,544	13,198	48.3							2.0
1958	4.50	746,490	27,159	132.8					272	13,894	30.3
1959	4.10	1,097,535	44,071	216.4					775	28,203	137.2
1960	3.38	1,158,534	50,822	279.1					1,144	45,927	225.5
1961	2.65	980,339	42,609	303.2					1,212	53,142	291.8
1962	1.49	990,472	41,973	543.7					967	44,929	319.7
1963	1.29	885,796	37,717	566.3			285		1,088	46,434	597.5
1964	0.96	879,188	35,106	749.9			409		1,011	43,522	646.4
1965	0.83	927,267	36,918	913.7			350		959	38,660	817.7
1966	0.72	394,538	22,354	450.8			162		1,002	40,068	987.3
1967	0.94	366,046	12,824	316.3			1,100		449	26,690	513.0
1968	0.84	274,181	13,913	264.1	0.83	276,962	2,675		485	20,935	427.2
1969	0.76	241,832	9,966	260.9	0.66	233,743	7,862	270.2	694	27,437	679.2
1970	0.65	189,569	6,809	237.4	0.47	109,890	10,799	286.9	694	30,302	799.5
1971	0.56	292,062	10,629	425.5	0.40	188,972	7,071	194.4	657	30,451	938.5
1972	0.51	159,010	6,497	253.8	0.58	185,008	4,370	394.4	915	28,556	1,561.0
1973	0.48	108,585	3,803	184.1	0.44	120,199	4,705	261.5	677	25,577	1,314.0
1974	0.40	94,700	3,475	121.9	0.43	95,629	2,655	219.0	1,320	31,607	1,972.8
1975	0.40	116,319	4,192	239.8	0.27	46,060	2,327	175.3	866	29,461	1,509.3
1976	0.56	103,879	3,360	152.1	0.20	21,208	1,736	85.7	686	27,709	1,589.1
1977	0.44	41,483	1,467	76.3	0.10	7,262	329	59.2	616	25,061	1,168.3
									723	26,628	2,010.9

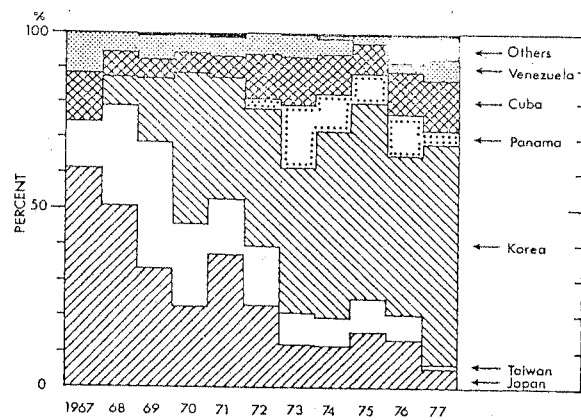
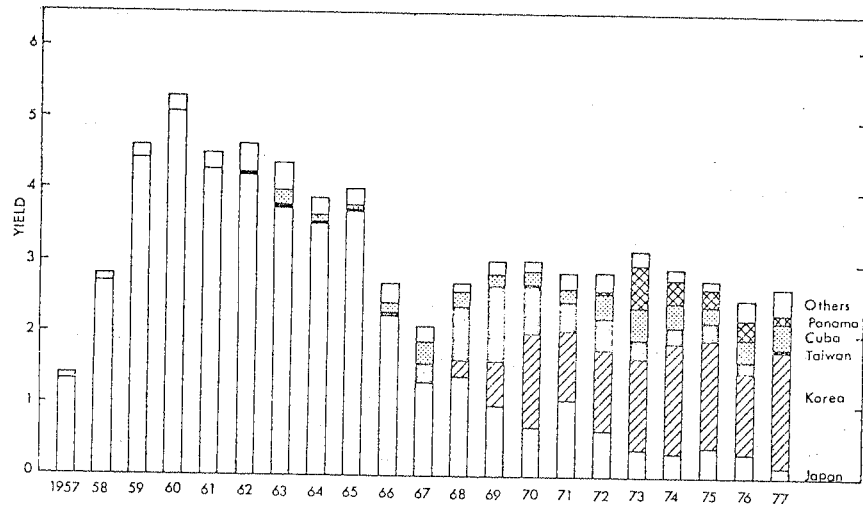


Fig. 1. Yield in ten thousand tons (upper panel, 1957-1977) and yield in percent (lower panel, 1967-1977) of yellowfin tuna by country in the Atlantic longline fishery.

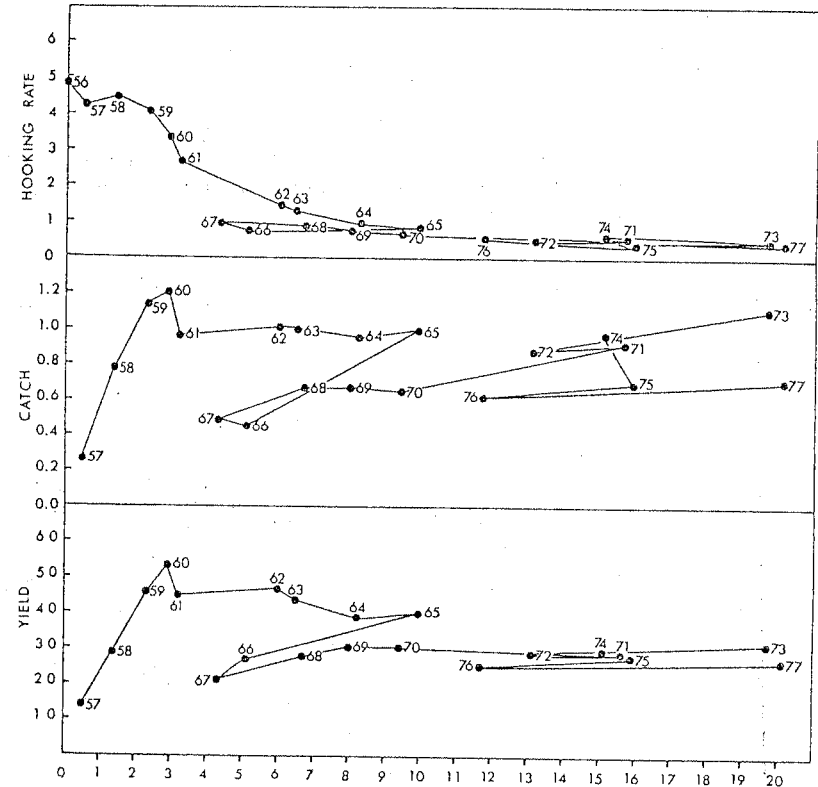


Fig. 2. Hook rate in percent (upper panel), catch in million fish (central panel) and yield in thousand tons (lower panel) of yellowfin tuna against overall fishing intensity in hundred thousand hooks per 5° square in the Atlantic longline fishery, 1956-1977.

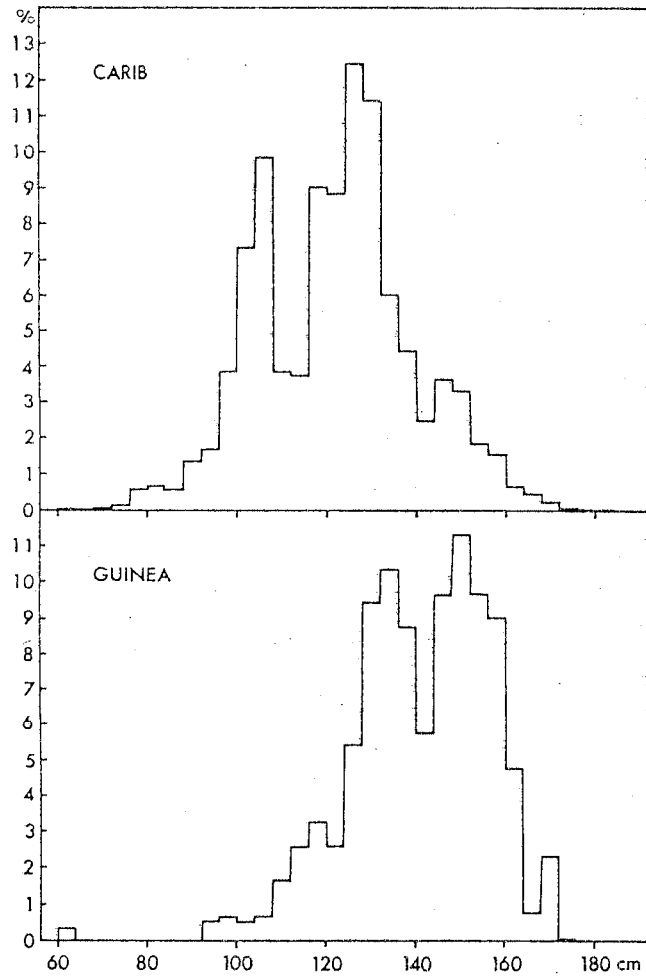


Fig. 3. Percentage length composition of yellowfin tuna caught by Japanese longline fishery in the Atlantic Ocean (CARIB and GUINEA areas) in 1977.

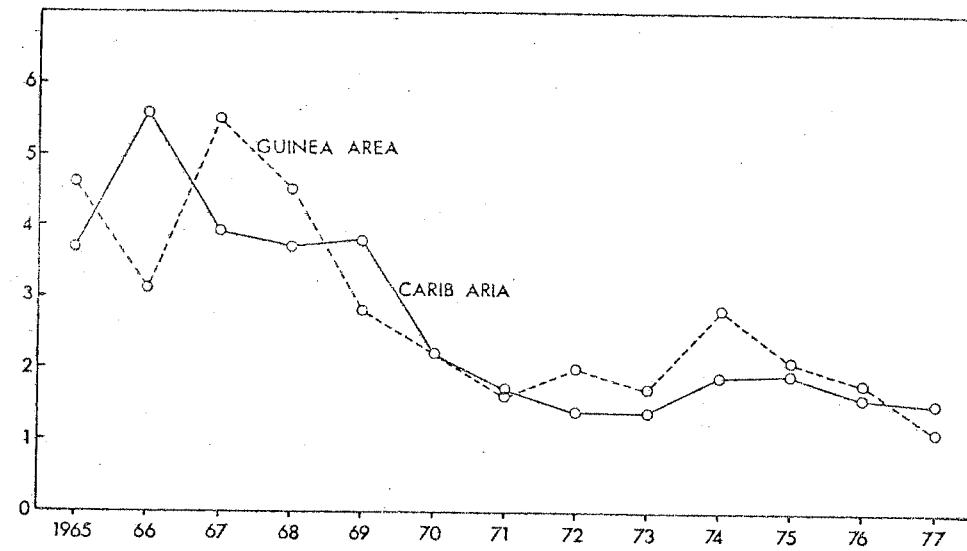


Fig. 4. Spawning index of yellowfin tuna in the Atlantic longline fishery of Japan, 1965-1977.

Appendix table 1. Catch of yellowfin tuna by length class in Japanese longline fishery, 1977.

A. CARIB AREA

Length class	Jan.-Mar.	Apr.-June	July-Sep.	Oct.-Dec.	Total
62 - 64	3	-	-	-	3
64 - 66	1	-	-	-	1
66 - 68	-	-	-	-	-
68 - 70	3	-	-	17	20
70 - 72	-	-	-	-	-
72 - 74	5	-	-	4	9
74 - 76	11	-	4	24	39
76 - 78	4	-	16	37	57
78 - 80	15	-	4	143	162
80 - 82	18	7	4	115	144
82 - 84	28	3	29	49	109
84 - 86	43	7	69	37	156
86 - 88	23	10	20	20	73
88 - 90	118	10	40	17	185
90 - 92	222	3	80	17	322
92 - 94	188	62	125	-	375
94 - 96	73	52	140	12	277
96 - 98	37	151	193	4	385
98 - 100	61	329	683	37	1110
100 - 102	32	69	856	12	969
102 - 104	56	165	1615	29	1865
104 - 106	25	210	2022	73	2330
106 - 108	29	182	1197	49	1457
108 - 110	24	140	738	49	951
110 - 112	10	75	358	78	521
112 - 114	13	21	394	102	530
114 - 116	10	89	558	258	915
116 - 118	24	168	498	519	1209
118 - 120	62	196	1052	962	2272
120 - 122	61	69	523	1027	1680
122 - 124	116	65	507	1060	1748
124 - 126	85	302	843	1223	2453
126 - 128	138	429	1125	671	2363
128 - 130	170	515	1575	327	2587
130 - 132	66	216	1225	307	1814
132 - 134	47	137	832	192	1208
134 - 136	43	251	678	139	1111
136 - 138	10	134	414	734	1318
138 - 140	35	292	503	147	977
140 - 142	18	103	254	156	531
142 - 144	21	96	189	107	413
144 - 146	14	206	289	122	631
146 - 148	4	185	469	107	765
148 - 150	3	285	469	58	815
150 - 152	3	72	309	73	457
152 - 154	1	48	205	58	312
154 - 156	1	137	234	24	396
156 - 158	4	44	193	41	282
158 - 160	1	52	240	17	310
160 - 162	-	3	109	24	136
162 - 164	4	10	105	4	123

Appendix table 1.(continued) A. CARIB AREA (continued)

Length class	Jan.-Mar.	Apr.-June	July-Srp.	Oct.-Dec.	Total
164 - 166	3	-	120	-	123
166 - 168	-	-	44	8	52
168 - 170	-	10	44	4	58
170 - 172	-	7	20	-	27
172 - 174	-	-	20	-	20
174 - 176	-	-	-	-	-
176 - 178	-	-	-	-	-
178 - 180	-	-	4	4	8
180 - 182	-	-	-	4	4
Total	1983	5618	22241	8743	38584

Appendix table 1. (continued) B. GUINEA AREA

Length class	Jan.-Mar.	Apr.-June	July-Sep.	Oct.-Dec.	Total
60 - 62	1	-	-	1	2
62 - 64	1	-	-	1	2
64 - 66	-	-	-	-	-
66 - 68	-	-	-	-	-
68 - 70	-	-	-	-	-
70 - 72	-	-	-	-	-
72 - 74	-	-	-	-	-
74 - 76	-	-	-	-	-
76 - 78	-	-	-	-	-
78 - 80	-	-	-	-	-
80 - 82	-	-	-	-	-
82 - 84	-	-	-	-	-
84 - 86	-	-	-	-	-
86 - 88	-	-	-	-	-
88 - 90	-	-	-	-	-
90 - 92	-	-	-	-	-
92 - 94	-	4	-	-	4
94 - 96	1	-	-	1	2
96 - 98	-	4	-	-	4
98 - 100	2	-	-	2	4
100 - 102	-	-	-	-	-
102 - 104	3	-	-	3	6
104 - 106	2	-	-	2	4
106 - 108	2	-	-	2	4
108 - 110	7	-	-	6	13
110 - 112	3	-	-	3	6
112 - 114	4	4	-	3	11
114 - 116	10	-	-	9	19
116 - 118	6	-	-	5	11
118 - 120	14	-	1	12	27
120 - 122	8	-	-	7	15
122 - 124	8	-	-	7	15
124 - 126	18	13	2	16	49
126 - 128	5	4	2	4	15
128 - 130	12	31	3	10	56

Appendix table 1. (continued) B. GUINEA AREA (continued)

Length class	Jan.-Mar.	Apr.-June	July-Sep.	Oct.-Dec.	Total
130 - 132	10	31	5	9	55
132 - 134	16	9	3	14	42
134 - 136	14	45	9	12	80
136 - 138	9	18	5	8	40
138 - 140	18	22	7	16	63
140 - 142	10	13	6	9	38
142 - 144	12	4	4	10	30
144 - 146	17	40	5	15	77
146 - 148	12	9	5	10	36
148 - 150	18	49	11	16	94
150 - 152	10	13	7	9	39
152 - 154	14	13	4	12	43
154 - 156	8	49	7	7	71
156 - 158	8	27	5	7	47
158 - 160	5	40	10	4	59
160 - 162	8	9	4	7	28
162 - 164	6	13	4	5	28
142 - 146	1	-	5	1	7
166 - 168	-	-	2	-	2
168 - 170	1	13	2	1	17
170 - 172	-	9	1	-	10
172 - 174	-	-	1	-	1
Total	305	490	121	262	1176