

POSSIBLE REGULATORY MEASURES OF YELLOWFIN TUNA  
FISHERIES IN THE ATLANTIC OCEAN, BASED ON  
INFORMATION UP TO AUGUST 1973 \*

by

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SUMMARY

Parent stock size of yellowfin tuna up to 1970 was large enough to maintain recruitment. However, as long as the fishing does not change, a further increase in effort may not increase the yield for many years. It is preferable to keep the fishery from rapidly increasing the effort.

\* Data partially reproduced in Data Record, Vol. 3

RESUME

Le stock reproducteur de l'albacore a été suffisamment important jusqu'en 1970 pour maintenir le niveau du recrutement. Cependant, un accroissement plus poussé de l'effort dans les conditions actuelles de pêche n'entraînerait pas d'accroissement du recrutement pendant de nombreuses années. Il vaut mieux éviter un accroissement rapide de l'effort dans la pêcherie.

\* Données partiellement reproduites dans le Vol. 3 du Recueil de Données Statistiques.

RESUMEN

El stock reproductor de rabil hasta 1970 fué lo suficientemente importante como para mantener el reclutamiento. Sin embargo, un nuevo aumento del esfuerzo, siempre que no cambie la modalidad de la pesca, puede no aumentar necesariamente la producción durante un largo periodo de años. Es preferible preservar la pesquería de una rápida expansión del esfuerzo.

\* Datos parcialmente reproducidos en el Vol. 3 de la Colección de Datos Estadísticos.

The Council of the International Commission for the Conservation of Atlantic Tunas, ICCAT, adopted the recommendation drafted by the Panel 1 for regulating capture of yellowfin tuna weighing less than 3.2 kg, at the Second Regular Meeting held in 1972. At the occasion, the Working Group on Yellowfin Tuna Regulations was established:

"To study the desirability and feasibility of concrete measures for the conservation and the management of yellowfin stock in the Convention Area from the scientific and practical viewpoint (ICCAT 1972b, p. 30)".

Preceding the Meeting of Council, the ICCAT Standing Committee for Research and Statistics, SCRS, requested its members to provide necessary information for better assessment of yellowfin tuna stock. Unfortunately the works have not progressed rapidly as some attendants were afraid. However, almost all the countries fishing tunas in the Atlantic Ocean reported the catch statistics up to 1972, at least the provisional estimates, to the Secretariat (ICCAT 1973). The rapid compilation of catch statistics permits us to roughly examine the adequacy of conclusions reached at the said meeting.

#### 1. Amount of yield

Yield of yellowfin tuna in the Atlantic Ocean reached the highest record of 100,000 tons in 1972 (Table 1). Not only the surface fishery first produced 70,000 tons, but also the longline yield recovered to 30,000 tons. The large yield seems to due to two strong year-classes having occurred in 1969 and 1970 (2- and 3-ages), and to intensified fishing in the year (ICCAT 1972b, p. 51). It may be concluded that the parent stocks in 1969 and 1970 were large enough to retain size of recruitment, but that further increase of effort would not necessarily result in rise of long-term yield.

#### 2. Relation between effort and yield

Longline fishery mainly catches 2- or 3-age and older fish (Table 2). Dominant age in the surface fishery was 2- or 3-ages up to 1969, but changed to 1-age since then (Table 3). Biomass of an unfished year class of yellowfin tuna reaches at the peak between 2.0 and 3.0 years after birth (e.g. ICCAT 1971). Furthermore, exploitation of older members may insert less effect on number of eggs produced by the stock than capture of younger member: a fishery catching 3-age and older may not severely deplete the egg production (e.g. Hayasi *et al.* 1972). Examination of models indicates that amount of yield taken by a fishery catching 2- or 3-age and older fish may hardly decrease with increase of fishing effort. When 1-age fish enter into the exploited phase, the yield may reach at the maximum for a definite amount of fishing effort.

Actually yield of the stocks in the Indian Ocean and western Pacific Ocean exploited only by longline fishery did not decrease for extensive increase of the fishery even if the hook rate dropped remarkably (Honma et al. 1971, Honma and Suzuki 1972). There appear three levels in longline yield in the Atlantic Ocean corresponding to expansion of surface fishery, in each of which increase of the effort did not decrease the yield (ICCAT 1972a). In the eastern tropical Pacific Ocean, the yield by surface fishery exhibited a maximum for a particular amount of effort up to the late 1960's when the fishery exploited 1-age and older fish (Schaefer 1957, 1967), although recent change of the fishery tremendously raised the yield (e.g. IATTC 1973).

### 3. Conclusion

Increase of yield in 1972 indicates that the parent stock size in 1969 and 1970 was sufficiently large to retain the recruitment. However, intensified exploitation of 1-age group since 1969 might affect reproduction of the stock in 1972 and onwards. Until any evidence would be obtained for increased effort resulting in rise of yield, it is required to save rapid expansion of fisheries, preferably limiting the total yield at or around 70,000 tons on the average.

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Table 1. Yield of yellowfin tuna in the Atlantic Ocean, 1963-1972.

Year	Total	Longline	Surface fisheries				Others & Unclassified
			Subtotal	Pole-and-line	Purse seine	Unclassified	
1963	68.7	43.0(63)	23.3(34)	5.3(8)	0.2(0)	17.8(26)	2.4(3)
1964	65.5	38.3(58)	25.6(39)	6.6(10)	0.6(1)	18.4(28)	1.6(2)
1965	66.8	39.4(59)	26.8(40)	4.1(6)	1.1(2)	21.6(32)	0.6(1)
1966	64.0	25.6(40)	37.7(59)	2.9(5)	5.4(8)	29.4(46)	0.4(1)
1967	57.3	20.2(35)	36.4(64)	2.9(5)	6.9(12)	26.6(46)	0.7(1)
1968	81.2	25.9(32)	54.6(67)	3.8(5)	14.3(18)	36.5(45)	0.7(1)
1969	90.3	28.3(31)	61.6(68)	16.1(18)	39.6(44)	5.9(7)	0.4(0)
1970	73.8	28.4(38)	44.7(61)	9.2(12)	28.4(38)	7.1(10)	0.7(1)
1971	72.0	28.5(40)	43.1(60)	10.8(15)	24.0(33)	8.3(12)	0.4(1)
1972	* 87.0	20.5(24)	66.4(76)	13.8(16)	41.7(48)	10.9(13)	0.5(1)
	**96.4	29.9(31)	66.4(69)	13.8(14)	41.7(43)	10.9(11)	0.5(1)

Numerals in parentheses denote percentages to annual total.

Numerals for 1972 are provisional estimates, either the reported figures, \*, or plus average on yields of Brasil, Cuba, Taiwan and Venezuela seemingly by longlining in 1970 and 1971.

After ICCAT (1973).

Table 2. Catch by age of yellowfin tuna in Japanese longline fishery in major Atlantic fishing grounds, 1965-1970.

	1965	1966	1967	1968	1969	1970
<b>Total</b>	899	381	348	262	204	171
1	10	13	3	5	2	11
2	159	35	37	55	80	83
3	525	181	200	137	70	57
4	185	141	93	57	46	17
5	20	11	14	7	5	2
6	0	0	-	0	-	-
7+	0	0	-	0	-	-
<b>Total</b>	257	209	75	89	81	114
1	3	3	2	3	1	10
2	44	17	18	29	29	59
3	139	98	36	26	25	36
4	66	87	15	29	24	9
5	5	3	3	3	3	1
6	0	-	-	-	-	-
7+	0	-	-	0	-	-
<b>Total</b>	642	172	273	173	123	57
1	7	10	1	2	2	1
2	115	18	20	27	52	25
3	376	82	163	112	45	21
4	129	53	78	29	22	9
5	16	8	11	4	3	1
6	0	0	-	0	-	-
7+	0	0	-	0	-	-

Calculated from catch by length class provided by Honma (1972) and growth equation given by Le Guen and Sakagawa (1973) which provides the length interval by age as: 30-86 cm for 1-age, 87-124 cm for 2-age, 124-148 cm for 3-age, 148-164 cm for 4-age, 164-176 cm for 5-age, 176-182 cm for 6-age, and larger for older ages.

Table 3. Catch by age of yellowfin tuna in FIS and US-Canada surface fisheries in the eastern Atlantic, 1967-1971.

Year	Age	Total	FIS-pole-and-line	FIS-purse seine	US-Canada purse seine
1967	<b>Total</b>	1,483	997	485	-
	0	0	0	0	-
	1	277	187	90	-
	2	826	636	191	-
	3	349	168	181	-
	4	27	6	21	-
	5	3	0	3	-
6+	1	0	0	-	
1968	<b>Total</b>	3,193	2,400	497	296
	0	0	0	0	0
	1	671	611	59	1
	2	2,185	1,704	262	219
	3	150	65	58	27
	4	150	18	92	41
	5	30	1	21	8
6+	7	0	6	1	
1969	<b>Total</b>	2,115	1,034	561	520
	0	0	0	0	0
	1	532	369	137	26
	2	734	508	210	17
	3	636	145	144	347
	4	160	10	44	107
	5	45	3	21	21
6+	8	0	6	2	
1970	<b>Total</b>	3,272	1,222	1,251	819
	0	0	0	0	0
	1	2,132	953	772	407
	2	763	218	232	313
	3	208	40	127	42
	4	126	10	82	36
	5	36	1	15	20
6+	5	0	3	1	
1971	<b>Total</b>	2,517	1,098	1,154	265
	0	0	0	0	0
	1	1,331	669	515	147
	2	959	414	466	79
	3	86	12	63	11
	4	111	3	89	20
	5	29	1	20	9
6+	2	0	2	0	

After Lenarz and Sakagawa (1972).