

AGE COMPOSITION OF THE ATLANTIC BIGEYE TUNA, 1965-1975

by

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SUMMARY

Revised in this report was the age composition of bigeye tuna caught by Atlantic longline fishery, 1965-75, based on the size data obtained by Japanese longline fishery. Since sample data were not complete, several ways of substitutions were made in time and space. Three sets of age data were estimated: whole Atlantic, North and South Atlantic.

RESUME

Le présent rapport fournit la structure démographique révisée du thon obèse pris à la palangre dans l'Atlantique, 1965-1975, à partir des données de taille de la palangre japonaise. Les données d'échantillonnage étant incomplètes, plusieurs substitutions spatio-temporelles ont été effectuées. Trois jeux de données sur l'âge ont été estimés: Atlantique entier, Atlantique Nord et Atlantique Sud.

RESUMEN

Este informe presenta una revisión de la estructura demográfica del patudo capturado por la pesquería palangrera en el Atlántico, de 1965 a 1975, basada en datos de talla procedentes de la pesquería de palangre japonesa. Dado que los datos de muestreo no estaban completos, se efectuaron varias substituciones en términos de tiempo y espacio. Se estimaron tres grupos de datos sobre edad: todo el Atlántico, Atlántico Norte y Atlántico Sur.

Introduction

Size data of catch, by being converted to age data, are one of the basic elements in the practice of analytical study on fishery population dynamics. An accurate catch history of age composition is technically essential for cohort analysis. In the instance of bigeye tuna in the Atlantic, only single estimate of age data, 1965-73, for longline catch were made available by relatively cursory procedure. In this report, revised and updated catch-at-age data on longline caught bigeye are presented based on more detailed statistics and procedures as explained below.

Basic size composition

Size frequency data of Atlantic bigeye tuna have been incomplete until recently, and continuous data available are limited to the Japanese data for longline fishery. As basic data to estimate overall age composition, adopted are Japanese length frequency data, 1965-75, which are already published in the series of the ICCAT Data Records. Tabulated in Table 1 are sample sizes in number of length measurements by quarter and ICCAT area (Fig. 1). It is obvious that, even within the Japanese data, there are many strata in time and space for which data substitution are necessary.

When substituting missing data on size composition, it is important that characteristics of seasonal change in size specific distribution as well as long term impact of fisheries should be taken into account. In this regard, three types of substitutions were applied for missing strata to complete the basic size data:

- 1st substitution (quarterly substitution).....the distribution of Atlantic bigeye by size is rather constant seasonally. During summer or winter, the size composition in the same area is regarded to be very similar within season. Quarterly missing size data are substituted each other by those adjoining quarter between first and fourth quarter or second and third quarter.
- 2nd substitution (average data substitution).....Even if the 1st substitution is exercised, there still remain missing strata. For them, supplied are quarterly average size compositions by area which are obtained from 1965-75 data combined.
- 3rd substitution (area substitution).....The size data in Area 3 have been very few, probably due to the low density of bigeye tuna. Average annual size composition of Area 4 is applied to Area 3 considering a rather tropical nature of Area 3.

Basic age composition

Long series of catch statistics by area, in terms of number of fish, have been provided for Japanese and Taiwanese longline fleet. These statistics were summarized by quarter and ICCAT area, and then assigned to the corresponding basic size compositions that are obtained in the above section. The quarterly catch by size thus prepared are converted to age data using the growth equation by Yukinawa and Yabuta (1963), which is well comparable to the equation estimated by Champagnat and Pianet (1974). The resultant age data are designated as basic age composition.

Overall age composition

Except Japanese and Taiwanese data, detailed longline catch statistics have not been available until recently. In addition, recent catch statistics of such countries are mostly in terms of weight. First, the catch statistics are partitioned to those of ICCAT area based on the geographic expansion of longline fishery of each country according to recently provided detailed statistics as follows:

Korea and Panama.....North-south separation of catch is already estimated by Kume (MS). Catch in south Atlantic is partitioned to two ICCAT areas employing Korean Task II statistics of 1974 and 1975 that were submitted to ICCAT. The average proportion between Area 5 and Area 6 is calculated as 1 for the former and 2 for the latter. Catch in the north Atlantic is assigned to Area 4.

Cuba.....North-south separation is also estimated by Kume (MS). Northern and southern catches are assigned to Area 4 and Area 5, respectively.

Argentine and Brazil.....Catches are assigned to Area 8.

Secondly, after allocating annual catches by ICCAT area as above, the catch weight is converted to number of fish by adopting weight-length relationship estimated by Sakagawa et al. (1976) based on annual basic size composition of each ICCAT area.

In the end, annual catches in number by ICCAT area of countries other than Japan and Taiwan are incorporated into basic age composition. The final and summarized overall age composition of Atlantic longline caught bigeye tuna by whole Atlantic, north and south Atlantic, 1965-75, are tabulated in Table 2.

References

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Table 1. Number of length measurements of bigeye tuna caught by Japanese Atlantic longline fishery, by quarter and ICCAT-area, 1965-75.

Year and quarter	ICCAT-area for bigeye tuna						
	1	2	4	5	6	7	8
1965 I	-	270	504	46	140	-	-
II	330	-	325	-	-	276	-
III	-	-	470	398	-	1,549	-
IV	-	-	-	-	72	-	-
1966 I	-	-	206	-	617	63	-
II	265	-	106	312	76	442	-
III	-	219	650	-	-	183	-
IV	-	-	693	-	-	-	-
1967 I	-	-	-	-	-	159	-
II	-	-	-	-	-	-	-
III	-	-	170	-	-	-	-
IV	-	-	-	74	142	53	-
1968 I	-	-	326	233	201	439	-
II	1,055	-	53	187	-	361	162
III	-	-	675	-	-	-	-
IV	-	-	249	-	-	-	-
1969 I	-	-	-	-	-	527	-
II	-	-	-	-	-	899	1,222
III	182	-	-	-	-	759	2,346
IV	-	-	-	-	-	-	330
1970 I	-	-	-	-	-	635	645
II	-	815	-	-	-	-	857
III	-	-	-	-	-	1,126	257
IV	1,544	-	55	-	-	-	-
1971 I	-	-	481	-	-	740	-
II	374	998	1,125	-	-	2,462	-
III	782	-	343	-	-	2,496	-
IV	2,283	825	-	-	-	583	263
1972 I	400	757	1,241	-	-	345	-
II	98	-	-	-	-	-	-
III	1,741	-	-	-	-	671	-
IV	1,709	258	-	119	-	1,960	-
1973 I	-	1,219	112	936	-	2,114	-
II	-	-	-	125	-	-	-
III	590	-	-	-	-	168	392*
IV	6,379	-	-	-	-	1,925	-
1974 I	203	1,250	-	-	-	55	77*
II	-	-	-	-	-	-	-
III	317	251	283	66	-	2,858	-
IV	646	821	-	-	-	2,095	56*
1975 I	-	2,842	4,668	-	-	-	-
II	248	1,925	1,327	1,125	-	2,703	-
III	-	557	3,182	1,911	-	10,063	-
IV	7,192	1,919	-	3,021	-	6,393	-

Note: Size data for ICCAT area 3 are not available.

* Obtained from experimental cruise.

Table 2. Age composition of Atlantic bigeye tuna caught by longline fishery, 1965-1975, in three areas: Whole Atlantic, North Atlantic (ICCAT area 1-4 combined) and South Atlantic (ICCAT area 5-8 combined).

Whole Atlantic

Age	Year	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
1	17,160	7,217	2,048	5,347	9,858	10,570	22,585	19,565	19,906	12,274	12,107	-
2	64,057	22,846	21,385	34,805	93,979	37,593	92,837	97,439	143,834	69,066	72,868	-
3	124,397	54,479	43,759	80,955	103,889	101,331	144,983	154,380	203,338	233,068	183,160	-
4	176,024	65,705	49,709	106,629	105,112	104,714	192,532	97,849	117,566	187,450	211,723	-
5	135,748	49,249	40,692	63,603	76,896	81,291	141,552	95,315	94,560	115,616	124,100	-
6	91,427	24,557	23,523	38,286	45,880	47,431	73,366	60,326	58,266	78,116	77,086	-
7	38,262	12,363	11,710	17,342	23,197	22,417	30,354	27,345	21,999	36,848	49,532	-
8	7,034	2,773	2,355	3,726	5,155	6,149	7,921	6,019	4,275	13,413	27,002	-
9	1,571	224	219	670	599	876	1,204	845	664	2,969	5,903	-
10+	182	32	43	68	66	109	272	235	46	652	1,239	-
Total	655,862	239,445	195,443	351,431	464,631	412,481	707,606	559,318	664,454	749,474	764,720	-

North Atlantic

Age	Year	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
1	3,924	4,163	400	1,598	1,496	4,633	8,768	16,795	8,696	6,498	3,434	-
2	22,829	15,324	7,879	12,837	11,852	19,906	44,840	51,409	80,907	38,726	36,970	-
3	66,188	31,484	24,308	30,937	25,454	57,955	72,232	81,105	128,848	166,632	119,492	-
4	94,700	34,299	24,320	33,183	43,990	63,817	123,118	43,699	75,151	147,006	143,709	-
5	72,396	23,384	15,886	27,641	34,064	45,262	82,949	48,323	44,324	87,221	82,977	-
6	51,765	8,357	3,444	13,832	14,952	20,472	30,399	26,090	17,607	55,521	50,880	-
7	22,079	3,673	995	4,836	5,926	7,994	7,572	10,070	6,532	24,948	32,481	-
8	3,686	792	433	1,159	1,161	1,842	1,102	1,995	1,026	10,397	20,663	-
9	1,384	134	95	340	287	520	330	248	328	2,438	4,408	-
10+	168	30	31	16	40	48	104	15	31	593	738	-
Total	339,119	121,640	77,791	126,379	139,222	222,449	371,414	279,749	363,450	539,980	495,752	-

South Atlantic

Age	Year	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
1	13,236	3,054	1,648	3,749	8,362	5,937	13,817	2,770	11,210	5,776	8,673	-
2	41,228	7,522	13,506	21,968	82,127	17,687	47,997	46,030	62,927	30,340	35,898	-
3	58,209	22,995	19,451	50,018	78,435	43,376	72,751	73,275	74,490	66,436	63,668	-
4	81,324	31,406	25,389	73,446	61,122	40,897	69,414	54,150	42,415	40,444	68,014	-
5	63,352	25,865	24,806	35,962	42,832	36,029	58,603	46,992	50,236	28,395	41,123	-
6	39,662	16,200	20,079	24,454	30,928	26,959	42,967	34,236	40,659	22,597	26,206	-
7	16,183	8,690	10,715	12,506	17,271	14,423	22,782	17,275	15,467	11,900	17,051	-
8	3,348	1,981	1,922	2,567	3,994	4,307	6,819	4,024	3,249	3,016	6,339	-
9	187	90	124	330	312	356	874	597	336	531	1,495	-
10+	14	2	12	52	26	61	168	220	15	59	501	-
Total	316,743	117,805	117,652	225,052	325,409	190,032	336,192	279,569	301,004	209,494	268,968	-