

ESTIMATED AGE COMPOSITIONS OF ALBACORE HARVESTS BY JAPANESE  
AND TAIWANESE LONGLINE FISHERIES IN THE ATLANTIC OCEAN

by

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SUMMARY

Using the length and catch data obtained from the longline fishery from 1956 to 1974, the age compositions of albacore catches in the Atlantic Ocean were estimated. Length data of 81,620 albacore were converted to age composition, taking into account the season sampled. The average age composition was estimated by  $5^{\circ}$  x  $10^{\circ}$  area and by semester (summer and winter). Based on the pattern, the total age composition of albacore caught by the Japanese and Taiwanese longline fisheries in the Atlantic Ocean was estimated.

RESUME

La structure démographique des prises de germon dans l'Atlantique a été estimée à partir des données de longueur et de capture de la pêcherie palangrière de 1956 à 1974. Les données de longueur de 81.620 germons ont été converties en structure démographique en tenant compte de la saison d'échantillonnage. La structure démographique moyenne a été estimée par zone de  $5^{\circ}$  x  $10^{\circ}$  et par semestre (été-hiver). Ce patron a permis d'estimer la structure démographique de l'ensemble des prises de germon des palangriers japonais et taiwanais dans l'Atlantique.

RESUMEN

Presenta una estimación de la composición por edad de las capturas de atún blanco en el Atlántico; basada en los datos de talla y captura de la pesquería palangrera (1956-1974). Teniendo en cuenta la época del muestreo, los datos de talla de 81.620 peces se convierten en datos de composición por edad, cuya media se estima por zonas de  $5^{\circ}$  x  $10^{\circ}$  y semestres (invierno y verano). En base a dicho patrón se estima la composición por edad del atún blanco capturado por las pesquerías palangreras de Japón y Taiwan en el Atlántico.

## 1. Basic data

- 1) All available length measurement data collected by Japanese longline fleet from 1956 to 1974, including research boats.
- 2) Annual catch statistics by area on Japanese longline fishery, 1956-1974. <sup>1/2/</sup>
- 3) Annual catch statistics by area on Taiwanese longline fishery, 1967-1974. <sup>3/-10/</sup>

## 2. Data processing

1) Data collected from the North and South Atlantic Oceans were treated separately as those representing the different stocks. Length frequency distributions were converted into age compositions using the age-length key from the Bard's growth equation :  $L = 134.4 (1 - e^{-0.183(t+0.35)})$  <sup>11/</sup>

In this procedure, July 1st was assumed to be the day to which age should be counted backward and the seasonal change in growth was considered. The result is shown in Table 1.

2) After compiling by quarter and by area (lat. 5° × Long. 10°) for all years available, these age compositions were re-arranged into two semesters, the "Summer" (2nd and 3rd quarters) and the "Winter" (1st and 4th quarters), since there were no significant differences in age compositions between the two adjoining quarters in each semester.

A total of 81,620 albacore were measured and data were collected widely from the fishing grounds except for a few areas. For these areas lacking information, age compositions were estimated from those in the adjacent areas.

Age compositions of albacore thus obtained by area fell under either of the following four patterns:

Pattern A : All comprising 6-year old fish and older.

Pattern B : Fish more than 85% are 6-year olds and older.

Pattern C : 5-year old fish and younger dominate, with 5-year olds over 4-year olds.

Pattern D : 5-year old fish and younger dominate, with 4-year olds over 5-year olds.

Figure 1 shows the distribution of areas characteristic either of the above four patterns. Table 2 gives the average percentage age compositions calculated

by pattern and by semester for both the northern and southern stocks.

3) From Japanese and Taiwanese statistical tables, yearly catches in number of albacore were summed up in each "pattern", and then assigned to each age group according to the average percentage compositions as shown in Table 2.

### 3. Result

Table 3 shows the annual age composition in terms of percentage for the albacore harvests by Japanese and Taiwanese fisheries in the North and South Atlantic Oceans.

#### References

- 1) Shiohama, T., K. Myojin and H. Sakamoto : The catch statistic data for the Japanese tuna long-line fishery in the Atlantic Ocean and some simple considerations on it. Rep. of Kankai Reg. Fish. Lab., No 21, 1-131. (1965).(in Japanese with English summary).
- 2) Annual report of effort and catch statistics by area on Japanese tuna longline fishery, 1962-1974. (Ser.) : Res. and Develop. Dept. Fish. Agency of Japan.
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- 9) Report on survey of production and marketing of Taiwan's tuna longline fishery, 1969. : Taiwan fisheries bureau. (1970).
- 10) report on survey of production and marketing of Taiwan's tuna longline fishery, 1970. : Ibid. (1971).
- 11) Bard, F.-X. : Etude sur le germon (Thunnus alalunga, Bannaterre 1788) de l'Atlantique nord elements de dynamique de population. Coll. Vol. of Sci. Pap., vol.II(SCRS-1973), 198-224. (1974).

Table 2 Average percentage age compositions of albacore in the Atlantic Ocean calculated by pattern and by semester.

Stock	Pattern	Month	Age											T. %	Samples
			2	3	4	5	6	7	8	9	10	11	12		
NORTH	A	Apr.-Sep.			0.4	4.5	25.1	42.8	18.6	6.9	1.5	0.1	0.1	100.0	3916
		Oct.-Mar.			0.4	6.8	31.7	31.6	23.3	5.6	0.4	0.2	0.1	100.0	1600
	B	Apr.-Sep.			1.1	24.8	48.4	18.5	4.7	1.5	0.6	0.3	0.1	100.0	2902
		Oct.-Mar.	0.3	2.8	7.2	27.4	30.6	16.9	10.1	2.7	0.6	0.2	1.2	100.0	2244
C	Apr.-Sep.	0.1	0.1	1.6	56.8	31.2	7.9	1.9	0.4				100.0	2333	
	Oct.-Mar.	0.3	3.7	17.7	42.0	19.9	12.4	3.3	0.6	0.1			100.0	4049	
D	Apr.-Sep.	1.0	23.0	42.3	17.3	10.4	3.6	2.0	0.4				100.0	492	
	Oct.-Mar.	0.9	23.0	30.1	20.5	16.2	6.3	2.3	0.6	0.1			100.0	3090	
SOUTH	A	Apr.-Sep.			0.3	5.0	29.2	44.2	13.9	5.5	1.4	0.4	0.1	100.0	1585
		Oct.-Mar.			0.1	4.4	23.2	35.6	24.4	9.4	2.3	0.4	0.2	100.0	14269
	B	Apr.-Sep.		0.4	7.8	23.3	43.0	20.8	3.9	0.7	0.1			100.0	4577
		Oct.-Mar.		2.5	10.4	24.5	41.0	15.4	5.2	0.9	0.1			100.0	805
C	Apr.-Sep.		2.0	11.1	46.7	33.1	5.5	0.8	0.7		0.1		100.0	2217	
	Oct.-Mar.	0.2	1.2	13.3	56.3	23.5	4.5	0.9	0.1				100.0	1854	
D	Apr.-Sep.	0.7	10.1	47.3	29.0	8.9	3.3	0.6	0.1				100.0	33235	
	Oct.-Mar.	0.7	11.8	43.1	28.1	9.5	5.2	1.5	0.1				100.0	2452	

Table 1 Assumed age-length relationship which is estimated from the Bard's growth equation for Atlantic albacore.

Age	Fork Length (cm)					
	Jul.-Sep.	Oct.-Dec.	Jan.-Mar.	Apr.-Jun.	Apr.-Jun.	Apr.-Jun.
3	57-69	60-72	63-74	67-77		
4	70-80	73-82	75-84	78-87		
5	81-89	83-91	85-93	88-94		
6	90-96	92-98	94-100	95-101		
7	97-103	99-104	101-105	102-107		
8	104-108	105-109	106-110	108-111		
9	109-112	110-113	111-114	112-115		
10	113-116	114-117	115-117	116-118		
11	117-119	118-119	118-120	119-121		
12	120-	120-	121-	122-		

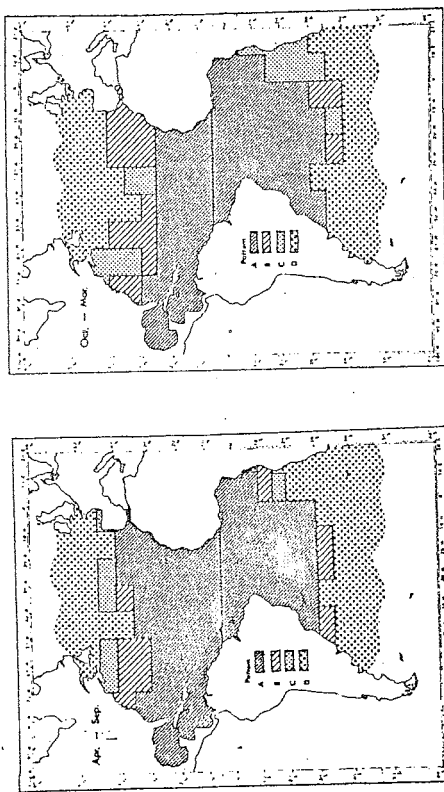


Figure 1 Distribution of areas by "pattern" which is characterized in age composition, and by semester.

Table 3 Estimated age compositions in terms of percentage for Atlantic albacore harvested by Japanese and Taiwanese longline fishery.

by Japanese fishery

## --North stock--

Year \ Age	2	3	4	5	6	7	8	9	10	11	12-	Total
1956				4.8	26.0	42.3	19.2	7.7	0.9			100.0
1957			0.4	5.3	27.2	39.2	20.1	6.5	1.1	0.1	0.1	100.0
1958			0.4	5.8	28.8	36.5	21.2	6.2	0.9	0.2		100.0
1959			0.4	6.0	29.4	35.5	21.7	6.1	0.8	0.2	0.1	100.0
1960			0.4	5.7	28.7	36.7	21.1	6.2	0.9	0.2		100.0
1961			0.4	5.7	28.5	37.1	21.0	6.2	0.9	0.2		100.0
1962			0.4	4.6	25.3	42.4	18.7	6.9	1.5	0.1	0.1	100.0
1963			0.4	5.5	26.5	41.1	18.3	6.6	1.4	0.1	0.1	100.0
1964		1.6	2.8	7.7	25.9	37.8	16.7	6.0	1.3	0.1	0.1	100.0
1965	0.2	4.5	7.2	11.9	25.9	30.6	13.8	4.7	1.0	0.1	0.1	100.0
1966	0.3	7.8	11.2	15.3	26.0	24.4	10.6	3.5	0.7	0.1	0.1	100.0
1967	0.2	4.2	7.3	15.9	27.0	27.6	12.4	4.2	0.9	0.1	0.2	100.0
1968	0.2	4.7	9.5	17.5	25.0	26.3	11.7	4.0	0.8	0.1	0.2	100.0
1969	0.2	3.7	7.3	16.9	26.0	27.7	12.6	4.3	0.9	0.1	0.3	100.0
1970	0.2	4.1	8.4	18.0	25.5	26.9	11.7	4.0	0.9	0.1	0.2	100.0
1971	0.3	5.9	11.4	26.3	24.6	19.8	8.4	2.7	0.5		0.1	100.0
1972	0.4	7.2	12.3	28.5	25.4	15.8	7.5	2.1	0.4	0.1	0.3	100.0
1973	0.4	6.2	13.9	28.9	24.9	15.8	7.4	1.9	0.3	0.1	0.2	100.0
1974	0.3	5.1	10.9	29.6	26.5	16.5	8.0	2.2	0.4	0.1	0.4	100.0

## --South stock--

Year \ Age	2	3	4	5	6	7	8	9	10	11	12-	Total
1956			0.2	4.9	27.9	42.3	16.2	6.3	1.7	0.4	0.1	100.0
1957			0.2	4.7	25.9	39.5	19.5	7.6	1.9	0.4	0.2	100.0
1958			0.2	4.6	25.4	38.8	20.5	7.9	2.0	0.4	0.2	100.0
1959			0.1	4.5	23.8	36.5	23.3	9.0	2.2	0.4	0.2	100.0
1960			0.1	4.5	23.7	36.2	23.6	9.1	2.2	0.4	0.2	100.0
1961		0.1	0.7	5.8	25.2	36.3	21.3	8.2	1.8	0.4	0.2	100.0
1962		0.1	1.5	8.9	25.1	33.0	20.9	8.0	1.9	0.4	0.2	100.0
1963		0.3	1.9	10.2	25.0	31.9	20.4	7.9	1.9	0.3	0.2	100.0
1964		0.5	2.9	13.1	25.7	30.7	18.0	7.0	1.7	0.3	0.1	100.0
1965	0.3	4.3	20.4	18.4	19.5	20.8	10.9	4.1	1.0	0.2	0.1	100.0
1966	0.5	6.7	31.5	21.9	14.2	14.0	7.1	2.8	0.7	0.1		100.0
1967	0.3	5.0	22.6	19.9	17.7	19.9	10.3	3.9	1.0	0.2	0.1	100.0
1968	0.4	6.4	30.4	23.0	16.2	14.3	6.3	2.3	0.6	0.1		100.0
1969	0.2	3.8	18.7	21.9	25.4	18.6	7.9	2.7	0.6	0.1	0.1	100.0
1970	0.6	8.3	37.4	27.9	12.8	8.0	3.5	1.2	0.3			100.0
1971	0.5	7.4	35.1	30.2	14.6	8.3	2.7	0.9	0.2	0.1		100.0
1972	0.6	8.7	39.0	28.0	13.5	7.1	2.4	0.7	0.1			100.0
1973	0.5	8.3	36.2	31.2	14.9	6.4	1.9	0.5	0.1			100.0
1974	0.6	9.1	39.4	31.8	13.2	4.7	1.0	0.2				100.0

by Taiwanese fishery

## --North stock--

Year \ Age	2	3	4	5	6	7	8	9	10	11	12-	Total
1967			0.4	5.9	29.0	36.2	21.4	6.1	0.9	0.2		100.0
1968		0.5	7.7	27.0	37.1	18.6	6.1	1.1	0.1	0.2		100.0
1969	0.3	7.3	11.4	15.3	23.4	25.3	12.2	3.9	0.7	0.1	0.2	100.0
1970	0.1	1.9	4.1	11.6	26.2	33.6	15.6	5.3	1.1	0.1	0.1	100.0
1971	0.3	5.2	10.0	19.3	24.3	24.8	11.3	3.7	0.8	0.1	0.3	100.0
1972	0.4	9.4	15.3	21.8	22.7	18.2	8.6	2.6	0.5	0.1	0.3	100.0
1973	0.3	6.2	11.0	19.0	24.0	23.9	10.9	3.6	0.7		0.3	100.0
1974	0.4	9.1	12.6	12.7	22.7	25.3	12.3	4.0	0.7	0.1	0.1	100.0

## --South stock--

Year \ Age	2	3	4	5	6	7	8	9	10	11	12-	Total
1967	0.6	9.0	42.9	31.1	10.6	4.1	1.2	0.3	0.1			100.0
1968	0.6	8.3	39.0	27.9	12.8	7.5	2.7	1.0	0.2			100.0
1969	0.4	6.5	29.5	24.3	15.6	13.7	6.8	2.5	0.6	0.1		100.0
1970	0.4	6.1	28.5	21.8	15.6	15.4	8.3	3.1	0.7	0.1		100.0
1971	0.5	6.7	31.5	22.4	15.6	13.8	6.6	2.4	0.6	0.1		100.0
1972	0.5	7.3	34.4	24.4	14.3	11.2	5.3	1.9	0.4	0.1		100.0
1973	0.5	7.7	35.6	25.1	13.9	10.2	4.8	1.7	0.4	0.1		100.0
1974	0.4	6.4	31.0	27.3	17.6	10.9	4.4	1.5	0.3	0.1		100.0