

A NOTE ON THE USE OF LENGTH FREQUENCY AS AN ESTIMATE OF AGE

Akira Suda
Far Seas Fish. Res. Lab.
Shimizu, Japan

A note on the use of length frequency as an estimate of age

Akira Sada (Shimizu)

1. The major technique to estimate age composition in catch is to divide length frequency distribution into component modal groups. However, there is no appropriate key to assess the accuracy of the results obtained by this method. In this regard, a few scientists have been working on the scale reading to determine the age of tuna. Their results are that the scale method is appreciable to young age groups with good accuracy and, as a matter of fact, the results are more or less similar to those obtained by use of length frequency. At the same time, scale technique provides with material to give some idea about the accuracy of age composition estimated by use of length frequency data.

In Fig. 1 is illustrated length frequency distribution by age-ring class determined by scale reading for the immature group of North Pacific albacore (Yabuta & Yukinawa, 1963). In Table 1 are given mean value, standard deviation, difference between mean lengths of successive age-ring groups and 2.15t-value ($t=(m-x)/\sigma$) shown for an index of the range of substantial occurrence of each group ($P(2.15)/P(0) = 0.1$). With the exception of youngest group, 2.15t-values almost coincide with intervals between mean values of successive age-ring group. Thus, it means that, except the case of youngest group, the original component curve corresponding to each age-ring group is hardly detectable in the length frequency distribution.

2. Another problem is the gap of length frequency distribution between male and female in the mature group. An example for the North Pacific albacore which matures at 6 age is demonstrated in Fig. 2. Whether the gap is an indication of difference of growth rate or of survival rate between sexes is not yet disclosed. It appears that such gap between sexes becomes appeared clearly when fish get matured. If this is the case, probably such gap takes place in relatively younger age groups of yellowfin tuna since the fish gets matured younger. Actually, such possibility is indicated in Fig. 3 for yellowfin (In the figure, notation for sex is reversed, namely open circle indicates males). For the fish larger than 130cm (3 or 4 age), the gap of modal length between sexes become significant. It is noted that the gap is also accompanied by remarkable difference in sex ratio, in other words the predominance of males (Table 2).

3. In the case of albacore, spawning group is not major component of the commercial catch but for the South Pacific and Indian Ocean. However, mature fish are comprised significantly in the commercial catch of yellowfin and it possibly causes essential bias in estimating age composition on the basis of length frequency data. Until now, we have not necessarily been aware of the problem, but, sooner or later, the re-examination of conventional methods of the estimation of age composition will become essential subject.

Table 1. Mean length, standard deviation and 2.15t-value of each age-ring group in the North Pacific albacore (Calculated employing data in Yabuta & Yukinawa, 1963)

Ring-group	r2	r3	r4	r5
Mean length	55.0cm	68.9	77.0	85.0
Standard deviation	3.35cm	4.80	5.02	3.30
2.15t-value	7.20cm	10.32	10.79	7.10
Interval between mean lengths	13.0cm	8.1	8.0	

Table 2. Sex-ratio of yellowfin tuna caught by the longline fishery in the Eastern Tropical Pacific Ocean by 10cm class (Suda & Schaefer, 1965)

Length class	Number of fish observed		Percentage of male	Chi-square
	(male)	(female)		
- 89cm	21	12	63.6	2.455
91 - 99	98	84	53.8	1.210
101 -109	311	243	56.1	8.347**
111 -119	834	588	58.6	42.577**
121 -129	1915	1479	56.4	56.009**
131 -139	2800	2595	51.9	7.790**
141 -149	3294	2618	55.7	77.296**
151 -159	2714	1162	70.0	621.441**
161 -169	1163	120	90.6	847.895**
171 -	73	7	91.3	54.450**

Fig. 1. Length frequency distribution by age-ring group
(Yabuta & Yukinawa, 1963)

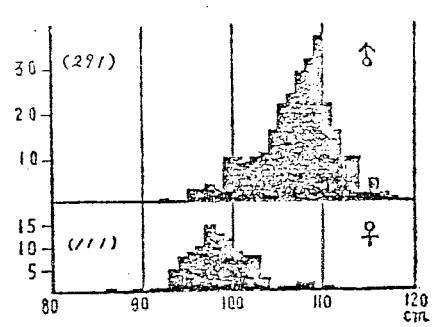
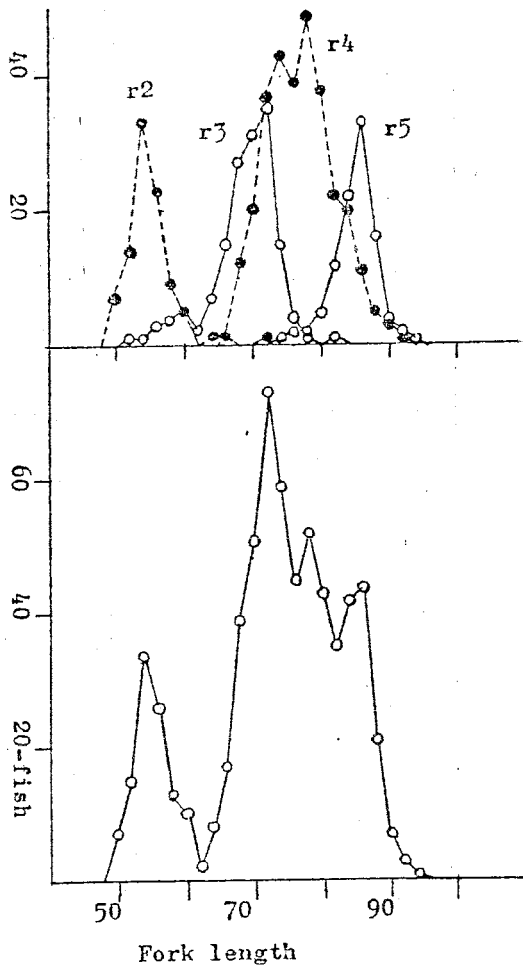


Fig. 2. Length frequency distribution of albacore by sex in the North Equatorial Current area (Spawning group of the North Pacific group) (Suda, 1956)

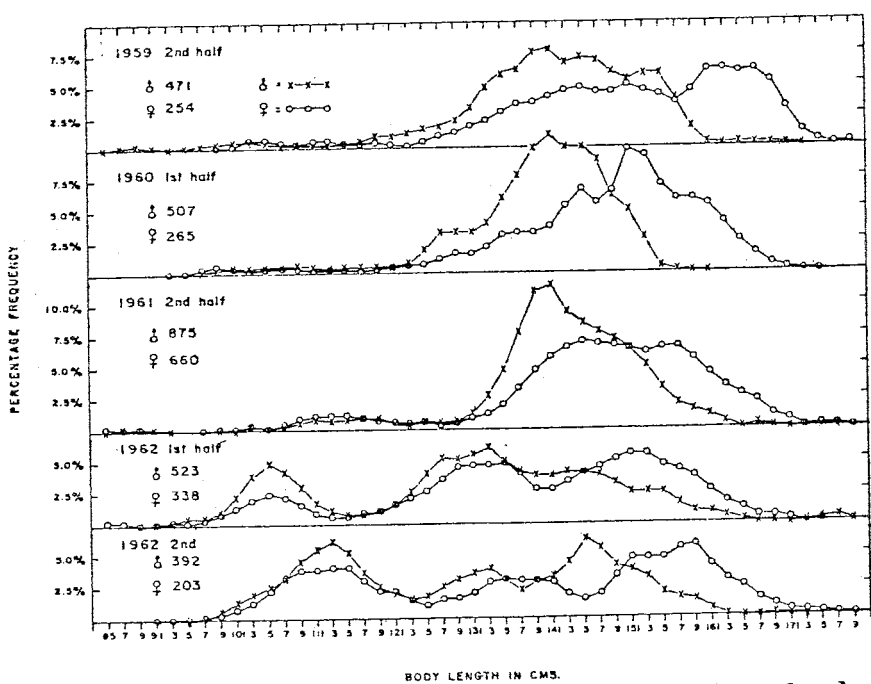


Fig. 3. Comparison of length frequency distribution of males and females of yellowfin tuna caught north of the Equator and east of 150°W (Suda & Schaefer, 1965)