

AGE AND GROWTH OF BLUEFIN TUNA TAKEN IN CANADIAN WATERS IN RECENT YEARS

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SUMMARY

The fitting of the von Bertalanffy growth curve to fork-length-at-age data from 1,095 giant bluefin tuna taken in Canadian waters produced a lower L_{∞} and higher k -value than previously reported.

RESUME

L'ajustement de la courbe de croissance de von Bertalanffy aux données de longueur fourche/âge pour 1.095 thons rouges pris dans les eaux canadiennes a donné une valeur de L_{∞} plus faible, et une valeur de k plus élevée, que ce qui avait auparavant été signalé.

RESUMEN

El ajuste de la curva de crecimiento de von Bertalanffy a los datos de longitud horquilla, según edad, de 1.095 atunes rojos gigantes, pescados en aguas de Canadá, produjeron un L_{∞} más bajo y un valor " k " más alto de lo que había sido descrito con anterioridad.

Bluefin tuna taken in Canadian waters have been sampled as part of a monitoring program from 1975 to 1979. Caliper fork lengths were measured, sex was determined and when possible, otoliths were removed. The technique used for collecting, preparing, sectioning and reading bluefin tuna otoliths was described by Butler et al. (1977). Age estimates were successfully assigned to 1095 bluefin. Mean length, length range and sample size at each age are shown for each sex in Table 1. This data includes the data used by Butler et al. (1977) as a subset and now contains approximately three times the number of observations. The range of age estimates now extends to 30 years. Length, rather than weight, was the measurement chosen for this analysis due to the significant seasonal increase in weight demonstrated in giant bluefin tuna previously (Butler, 1974) and to the fact that these samples were collected over a five month period each year.

To estimate the growth rate of the bluefin tuna stock entering Canadian waters, separate fits of the mean fork-length-at-age data were determined for males and females using the procedure of Allen (1967). This procedure uses mean length-at-age data weighted by the number of observations in each age interval. Since the data deals predominantly with estimated ages of 11 years and greater, data from Mather and Schuck (1960) for ages 1 to 4 were used for both sexes in the fitting procedure. The inclusion of this data produced a realistic fit (Fig. 1) with estimates of the parameters of the von Bertalanffy growth equation of:

Males	L_{∞} =280.7	k=0.153	t_0 =-0.051
Females	L_{∞} =270.9	k=0.144	t_0 =-0.209

When these parameter estimates are compared to previous estimates for Atlantic bluefin tuna (Table 2), it can be seen that the estimates of L_{∞} produced here are lower than any previously reported while those of k are higher. This is a result of the data set used in the present study consisting predominantly of fish of larger size and greater age than those used in previous studies.

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Table 1. Sample size, mean fork-length-at-age, and length range of bluefin tuna taken in Canadian waters.

AGE	Males				Females			
	n	\bar{x}	Min.	Max.	n	\bar{x}	Min.	Max.
6	-	-	-	-	1	150.0	-	-
7	-	-	-	-	-	-	-	-
8	1	253.0	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-
11	4	239.4	230.0	241.0	1	238.0	-	-
12	-	-	-	-	1	262.0	-	-
13	4	253.1	239.5	265.0	1	245.0	-	-
14	7	255.7	249.0	263.0	2	252.0	242.0	262.0
15	13	262.9	243.5	279.0	2	244.0	233.0	255.0
16	29	263.6	247.0	288.0	4	249.1	241.5	260.0
17	50	261.9	242.0	281.0	22	252.5	239.0	272.0
18	64	263.5	238.5	297.0	24	258.6	242.0	290.0
19	118	266.7	217.0	289.0	37	257.7	236.0	281.0
20	88	268.6	247.0	293.0	34	259.3	237.0	290.0
21	93	268.2	243.0	290.0	40	257.2	237.0	286.0
22	111	269.9	247.5	292.0	51	258.7	240.0	284.0
23	49	269.5	243.0	286.0	35	258.4	244.0	285.0
24	63	271.3	252.0	300.0	40	259.5	241.0	286.0
25	31	271.2	252.5	298.0	26	259.7	242.0	297.0
26	17	274.8	258.0	287.0	18	261.2	238.5	272.0
27	3	264.1	259.0	269.0	5	257.5	248.0	270.5
28	1	270.0	-	-	1	255.0	-	-
29	1	277.0	-	-	1	249.0	-	-
30	1	269.2	-	-	1	289.5	-	-

Table 2. Parameter estimates for the von Bertalanffy growth model of Atlantic bluefin tuna.

Source	L_{∞}	k	t_0
Rodriguez-Roda (1971)	356	0.09	-0.89
Mather et al. (1973)	296	0.10	-
Sakagawa and Coan (1974)			
from Mather and Schuck	437	0.06	-1.49
from Mather and Jones	447	0.05	-1.59
Butler et al. (1977)			
males	287	0.13	-0.33
females	277	0.12	-0.80
Bard et al. (1978)	318	0.11	-0.62
Parrack and Phares (1979)	313	0.09	-0.96
Farrugio (1980)	351	0.08	-1.09
Compean-Jimenez and Bard (1980)	370	0.07	-1.58
Present study			
males	281	0.15	0.05
females	271	0.14	-0.21

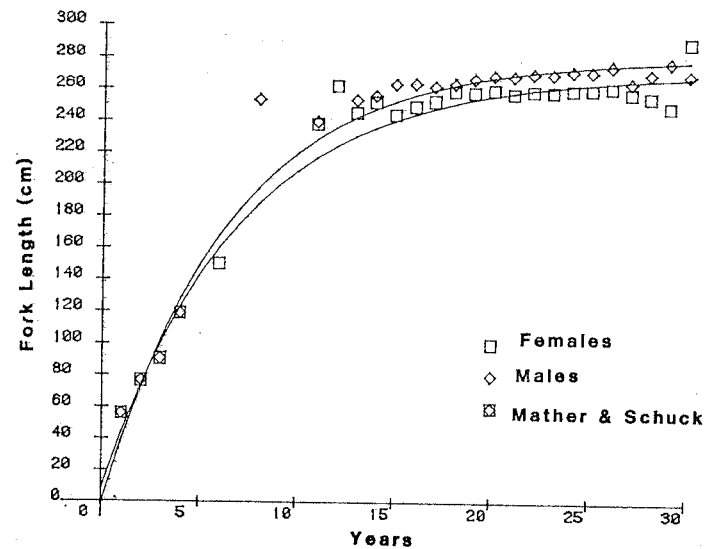


Figure 1. Fitting of the von Bertalanffy growth curve to mean fork-length-at-age data for bluefin tuna taken in Canadian waters.