

A REVIEW OF AGE AND GROWTH OF CANADIAN GIANT BLUEFIN AS ESTIMATED FROM OTOLITHS

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SUMMARY

Aging of bluefin tuna based on thin otolith sections has been conducted in Canada since 1974. The growth assessed from banding on otoliths shows a high degree of variability for the older-aged giants which predominate in the Canadian fishery. This makes the length-age relationship of little value but is useful in assigning catch-at-age to this portion of the west Atlantic bluefin stock.

The catch-at-age matrix derived from this aging material ranges from ages 14 to 39 and indicates a slight increasing trend in mean age since 1979.

RESUME

La détermination de l'âge du thon rouge, basée sur les fines sections d'otolithes a été menée à bien au Canada depuis 1974. La croissance évaluée à partir des anneaux montre un pourcentage élevé de variabilité pour les thons géants les plus âgés qui prédominent dans la pêcherie canadienne. Ceci fait que la relation longueur-âge est de faible valeur mais utile pour attribuer la prise à un âge donné à ce pourcentage du stock de thon rouge de l'Atlantique ouest.

La matrice de la prise à un âge donné dérivant de ce matériel de détermination de l'âge qui se situe entre les âges 14 à 39 depuis 1979, indique une légère tendance à la hausse de la moyenne d'âge.

RESUMEN

Desde 1974, se ha estado llevando a cabo en Canadá la determinación de la edad del atún rojo basándose en las secciones finas de otolitos. El crecimiento evaluado a partir de los anillos muestra un alto grado de variabilidad para los atunes gigantes con edades superiores, que predominan en la pesquería de Canadá. Ello resta valor a la relación talla-edad, pero resulta útil a la hora de asignar captura a una edad dada a esta parte del stock de atún rojo en el Atlántico Oeste.

La matriz de captura a una edad dada deducida de este material, para su determinación, oscila entre las edades 14 a 39 e indica una tendencia ligeramente creciente en la edad media desde 1979.

INTRODUCTION

Biological sampling of bluefin tuna (*Thunnus thynnus*, L.) from Canadian inshore fishing areas has taken place since 1974. A time series of the following statistics has been accumulated: caliper fork length, tape flank length, girth measurements, round weight, sex and otolith age estimates. This data set spans the period 1975 to 1985. During 1986 the fishery was very poor and no port sampling was able to be conducted.

Age estimates have been produced for this fishery on many occasions (Caddy et al. MS1976, Hurley and Iles MS1980, Hurlbut et al. MS1984, Clay and Hurlbut MS1985). Several of these studies have indicated a very weak relationship between age and length for ages over 15 years. Current aging of bluefin is being conducted for the purpose of estimating catch-at-age rather than an age-length relationship. The techniques used to collect, section, and interpret the ages from the otoliths were those described by Caddy et al.

AGE AND GROWTH

The data set for 1982 is made up of 359 fish with age estimates - males composing 56% of the total. Ages in 1982 ranged from 10 to 37. The mean age of tuna in the fishery has continued to increase and in 1984 stood at 25.7 for males and 28.2 for females. The 1985 data set is not comparable to earlier years. It is composed of samples taken almost exclusively from the St. Margarets Bay trap fishery - a fishery taking consistently smaller fish than the fisheries in the southern Gulf of St. Lawrence.

The high degree of variability of age-at-length for the older ages was presented graphically by Hurlbut et al. (MS1984). Without the younger age groups to 'lengthen' the age-length curve, the coefficients of variation for 1983 and 1984 were less than 0.05. The absence of younger fish in this fishery (total catch is now composed of fish over the age of 14 years) results in a very poor relationship between age and length.

Over the last two years some attempts have been made to validate these ages, however the results to date have not been encouraging. The limited size range of these fish makes work on only Canadian sampling very difficult to interpret. An international validation project might be one way to solve this problem.

CATCH-AT-AGE MATRIX

The catch-at-age matrices were developed from this length-at-age data (Tables 1, 2 and 3). In recent years the Canadian fishery

for bluefin tuna has been exploiting fish ranging in age from 20 to 35 years. Since 1979 there appears to be a trend toward increasing mean age ranging from approximately 21 to 25 years for males and 21 to 28 years for females. To date the apparently strong 1973 year class (Anon 1985) has not yet made the appearance that was expected.

REFERENCES

- Anon (1985) 1984 SCRS Report "A" (Species reports) - Bluefin. ICCAT Col.Vol.Sci.Pap. XXIII(1):20-25.
- Caddy, J.F., C.A. Dickson and M.J. Butler (MS1976) Age and growth of giant bluefin tuna (*Thunnus thynnus*) taken in Canadian waters in 1975. Fish.Res.Bd.Canada. MS Rept. No. 1395.
- Clay, D. and T. Hurlbut (MS1985) Catch-at-age and estimates of growth of Canadian bluefin tuna. ICCAT Col. Vol. Sci. Pap. XXIV: 143-148.
- Clay, D., T. Hurlbut and L. Currie (MS1984) Biological studies on bluefin tuna (*Thunnus thynnus*, L.) in Canadian waters during 1982 and 1983, with a preliminary look at some 1984 statistics. ICCAT Col.Vol.Sci.Pap. XXII:240-247.
- Hurlbut, T., D. Clay and L. Currie (MS1984) Age of bluefin tuna (*Thunnus thynnus*, L.) in Canadian waters. ICCAT Col.Vol. Sci.Pap. XXII:248-252.
- Hurley, P.C.F. and T.D. Iles (MS1980) Age and growth of bluefin tuna taken in Canadian waters in recent years. ICCAT Col.Vol. Sci.Pap. XV(2):284-287.

Age and growth of bluefin

Table 1. Catch at age matrix for male Atlantic bluefin tuna from Canadian waters (thus excluding the Canadian purse seine fishery off New England). The data from 1985 is not comparable to that of the earlier years (see text).

Male bluefin tuna catch at age

Year	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Age											
<=10	0	0	0	4	0	35	2	0	0	0	0
11	6	0	7	4	8	6	17	0	0	0	0
12	0	0	0	0	0	6	8	2	0	0	1
13	6	0	7	0	16	6	0	2	0	0	0
14	6	10	7	4	8	6	25	2	3	0	0
15	17	20	15	4	8	36	8	2	3	0	1
16	51	47	22	12	0	0	17	8	9	5	0
17	62	91	52	20	0	6	17	6	18	15	2
18	17	111	104	43	23	30	17	6	27	0	0
19	90	124	216	106	70	42	8	8	18	20	0
20	73	77	202	78	39	36	0	8	35	5	0
21	107	104	141	78	31	36	25	10	27	0	0
22	128	161	112	90	16	76	42	16	32	25	1
23	90	138	119	63	0	65	42	16	54	25	0
24	39	54	157	67	16	12	25	30	63	10	1
25	11	40	60	31	8	36	66	42	119	50	0
26	17	23	30	12	0	36	0	16	110	80	0
27	0	0	7	4	8	42	25	22	75	70	0
28	0	3	0	0	0	18	0	24	32	60	0
29	0	0	0	0	0	6	8	32	57	25	1
30	6	0	0	0	0	6	8	24	27	15	1
30+	0	0	0	0	0	0	0	42	35	30	2
Sum	724	1006	1259	619	249	539	358	317	745	435	10

+ sample numbers only

Age and growth of bluefin

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Table 2. Catch at age matrix for female Atlantic bluefin tuna from Canadian waters (thus excluding the Canadian purse seine fishery off New England). The data from 1985 is not comparable to that of other years (see text).

Female bluefin tuna catch at age

Year	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Age											
<=10	0	7	7	0	0	12	0	2	0	0	0
11	0	0	0	0	8	0	8	0	0	0	0
12	0	0	0	0	8	0	0	4	0	0	0
13	0	0	0	0	8	0	8	0	0	0	1
14	0	3	0	4	0	0	0	12	0	0	0
15	6	3	0	0	0	6	8	14	0	0	0
16	6	3	0	8	0	8	8	20	3	0	1
17	34	27	22	12	16	0	0	20	3	5	0
18	11	34	22	12	47	6	0	26	3	5	0
19	17	37	60	47	31	6	0	8	0	5	0
20	34	34	22	27	62	18	17	8	0	5	0
21	67	20	22	71	8	42	17	24	6	0	1
22	51	40	67	71	31	36	42	24	3	0	0
23	11	37	74	39	16	12	25	34	6	0	0
24	11	30	67	59	39	30	25	52	27	5	0
25	11	34	37	16	39	12	50	54	21	5	0
26	0	13	22	35	16	12	42	34	30	15	1
27	0	7	15	4	0	24	33	8	18	20	4
28	0	0	0	4	0	12	17	14	32	5	3
29	0	0	7	0	0	0	33	20	30	10	1
30	0	0	0	4	0	0	33	10	6	10	0
30+	0	0	0	0	0	12	25	10	73	65	2
Sum	258	330	446	413	327	238	389	396	263	155	14

◆ sample numbers only

Age and growth of bluefin

Table 3. Catch at age matrix for Atlantic bluefin tuna (sexes combined) from Canadian waters (thus excluding the Canadian purse seine fishery off New England). The data from 1985 is not comparable to that of other years (see text).

Sexes combined bluefin tuna catch at age

Year	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Age											
<=10	0	7	7	4	0	47	2	2	0	0	0
11	6	0	7	4	16	6	25	0	0	0	0
12	0	0	0	0	8	6	8	6	0	0	1
13	6	0	7	0	24	6	8	2	0	0	1
14	6	13	7	8	8	6	25	14	3	0	0
15	23	23	15	4	8	42	16	16	3	0	1
16	57	50	22	20	0	0	25	28	12	5	1
17	96	118	74	32	16	6	17	26	21	20	2
18	28	145	126	55	70	36	17	32	30	5	0
19	107	161	276	153	100	48	8	16	18	25	0
20	107	111	224	105	100	54	17	16	35	10	0
21	173	124	164	149	39	77	42	34	33	0	1
22	179	202	180	161	47	112	84	40	35	25	1
23	101	176	194	102	16	76	67	50	60	25	0
24	50	84	224	126	55	42	50	82	90	15	1
25	22	74	97	47	47	48	115	96	140	55	0
26	17	36	52	47	16	48	42	50	140	95	1
27	0	7	22	8	8	65	58	30	93	90	4
28	0	3	0	4	0	30	17	38	65	65	3
29	0	0	7	0	0	6	41	52	87	35	2
30	6	0	0	4	0	6	41	34	33	25	1
30+	0	0	0	0	0	12	25	52	108	95	4
Sum	982	1336	1705	1032	576	777	747	713	1008	590	24

♠ sample numbers only