CCSBT-ESC/2008/18
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Activities of southern bluefin tuna otolith collection and age estimation and analysis of the age data by Japan in 2019

2019 年の日本によるミナミマグロ耳石収集と年齢査定活動並びに年齢データの分析

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要約

日本は 2019 年にミナミマグロ耳石を 301 個体から収集した。年齢査定した 210 個体のデータを 2020 年データ交換で提出した。日本がこれまでに年齢査定した合計 5,269 個体の年齢データを分析し、尾叉長と年齢との関係を示した。

Summary

Japan collected otoliths from 301 southern bluefin tuna *Thunnus maccoyii* (SBT) individuals in 2019. The data of age estimated for 210 SBT were submitted in the 2020 data exchange. Age data in a total of 5,269 SBT individuals by Japan were analyzed to show relationships between fork length and age estimated.

1. Activities of otolith collection

In 2019, Japan collected otoliths from a total of 301 southern bluefin tuna *Thunnus maccoyii* (SBT) individuals. 246 out of 301 otoliths came from commercial longline vessels through the scientific observer program (Itoh et al., CCSBT-ESC/2008/17). In addition, 53 and 2 otoliths were collected from the age-1 trolling survey in 2020 and age-0 distribution survey in 2019, respectively (Itoh and Tsuda, CCSBT-ESC/2008/19).

2. Analysis of accumulated age dataset

The age estimation data from otoliths collected in 2019 will be provided through the CCSBT Scientific data exchange next year. Data of age estimated for 210 SBT were added this year. They were caught in 2016 or 2018, from Area 7, 8, or 9, ranged from 108 to 176 cm FL. Their estimated age was from 4 to 22. The dataset file was submitted in the CCSBT data exchange in 2020.

The total number of otoliths which was analyzed for age estimation reached 5,286 individuals for 21 years (Table 1). Table 2 shows the frequency of reliability of age estimation by fork length class, 17 otoliths out of 5,286 individuals (0.32%) were not able to be estimated its ages (readability is 0). No otolith was assigned to readability 5 (no doubt). These age data have been submitted to CCSBT from 2005.

Statistical values of 5,269 individuals that analyzed are shown for age estimated by 5 cm fork length class (Table 2) and fork length by age estimated (Table 3). Relationships between fork length and age estimated are shown in Fig. 1 and Fig. 2. While there are a few outliers, the majority of plots seems to be appropriate. Parameters of von Bertalanffy growth equation were estimated by the least square method as follows.

Linf = 181.4 cm, K = 0.164, t0 = -1.674 (year)

References

Anon (2002) Report of the Direct Age Estimation Workshop. Victoria, Australia. 11-14 June 2002.

Itoh, T., Tsuda, Y., Inoue, Y., Semba, Y. and Ochi, D. (2020) Report of Japanese scientific observer activities for southern bluefin tuna fishery in 2019. CCSBT-ESC/2008/17.

Itoh, T., and Tsuda, Y. (2020) Report of the piston-line trolling monitoring survey for the age-1 southern bluefin tuna recruitment index in 2019/2020. CCSBT-ESC/2008/19.

Table 1 Total number of otoliths, by year of catch and CCSBT statistical area, which have been analyzed and submitted its data to CCSBT since 2005.

Year	Area1	Area2	Area4	Area5	Area7	Area8	Area9	Other	Total
1997	14	10				32			56
1998			25			203	20	1	249
1999	1		73		144	332	36		586
2000		13	24		37	94	110		278
2001	13				70	56	206		345
2002	15		6		47	28	159		255
2003			60		42	78	302		482
2004	21	2	43		31	93	157		347
2005		29	46		5	83	251		414
2006		1	6			17	84		108
2007		1				194	104		299
2008			5		33	106	93		237
2009			7			141	77		225
2010		5	12			57		6	80
2011		10	5	18		26	39	3	101
2012			2		5	46	55		108
2014		2	1		222	37	97		359
2015			32	1		41	123		197
2016					44		235		279
2017					152				152
2018		3			23	75	28		129
Total	64	76	347	19	855	1,739	2,176	10	5,286

Table 2 Statistical value of fork length and age estimated at 5 cm fork length class in age estimated data by Japan.

Fork length		N_Readability						Age estimated (readability 1-5)					
class	N	0	1	2	3	4	5	N	mean	median	min	max	SD
30-	2			2				2	0.0	0	0	0	0.00
35-	0												
40-	0												
45-	6				6			6	1.0	1	1	1	0.00
50-	42			12	30			42	1.1	1	1	2	0.30
55-	28	1		13	14			27	1.3	1	1	2	0.45
60-	2			2				2	2.0	2	2	2	0.00
65-	0												
70-	1			1				1	2.0	2	2	2	
75-	1			1				1	2.0	2	2	2	
80-	8			8				8	2.8	3	2	4	0.71
85-	69		1	53	15			69	2.7	3	2	6	0.74
90-	98		4	71	23			98	2.8	3	2	5	0.77
95-	110			73	37			110	3.6	4	2	11	1.12
100-	178	1	4	123	47	3		177	3.8	4	1	7	0.93
105-	245		9	163	69	4		245	4.2	4	2	7	0.97
110-	194		1	133	58	2		194	4.7	5	2	9	1.08
115-	221		10	133	76	2		221	5.2	5	2	11	1.15
120-	236		6	145	81	4		236	5.6	5	3	12	1.29
125-	224		4	134	79	7		224	6.3	6	4	11	1.33
130-	265		4	154	99	8		265	6.5	7	4	11	1.18
135-	288		7	175	102	4		288	7.2	7	4	13	1.45
140-	351	1	5	209	123	13		350	7.9	8	4	13	1.52
145-	400	1	9	245	137	8		399	8.7	9	4	19	1.78
150-	499	3	20	317	154	5		496	9.5	9	5	17	1.95
155-	434		11	276	135	12		434	10.3	10	6	20	2.10
160-	419	3	19	257	134	6		416	11.5	11	6	24	2.66
165-	296	2	20	182	86	6		294	13.1	13	4	31	3.58
170-	297	4	33	165	89	6		293	15.4	15	6	29	3.87
175-	170	1	22	94	53			169	17.1	16	7	36	5.14
180-	112		16	62	33	1		112	19.0	18	9	32	4.67
185-	49		7	32	10			49	19.5	19	8	35	5.94
190-	22		6	12	4			22					
195-	11		1	5	5			11	24.0	23	11	33	6.18
200-	5		1	3	1			5	25.0	27	20	28	3.39
205-	3			2	1			3	26.7	28	24	28	2.31
Total	5,286	17	220	3,257	1,701	91	0	5,269					

Table 3 Statistical values of fork length at age in age estimated data by Japan.

Age class	N	mean	median	min	max	SD
0	2	32.5	32.5	32	33	0.71
1	65	53.8	53.0	48	103	6.66
2	110	88.2	90.0	51	118	13.64
3	279	100.5	101.0	80	124	9.03
4	394	109.3	108.0	84	165	10.81
5	492	118.5	118.0	92	154	10.86
6	475	128.4	128.0	88	171	12.43
7	524	138.5	138.0	103	176	11.40
8	526	145.1	145.0	116	185	10.47
9	512	150.9	151.0	112	185	9.28
10	392	154.7	155.0	121	182	9.18
11	309	157.9	158.0	96	195	9.61
12	252	160.7	161.0	124	188	9.16
13	173	164.2	164.0	138	188	8.85
14	143	166.1	166.0	146	187	8.32
15	113	169.1	170.0	149	187	7.97
16	121	171.6	172.0	148	193	8.61
17	65	171.1	172.0	152	184	7.00
18	62	175.1	174.5	163	195	8.19
19	57	174.5	175.0	145	191	8.54
20	36	175.5	175.0	158	201	7.79
21	40	179.1	178.5	167	196	7.20
22	23	179.7	177.0	170	195	7.57
23	22	179.4	175.5	168	200	10.31
24	18	180.7	180.0	162	207	9.36
25	7	179.9	184.0	167	191	9.15
26	15	178.3	178.0	165	197	7.43
27	9	184.8	181.0	174	203	10.58
28	10	187.7	184.0	172	205	12.72
29	5	183.2	184.0	172	195	9.73
30	5	184.0	182.0	178	196	6.96
31	3	178.3	185.0	165	185	11.55
32	2	187.5	187.5	184	191	4.95
33	1	197.0	197.0	197	197	
34	1	186.0	186.0	186	186	
35	3	185.0	188.0	176	191	7.94
36	1	177.0	177.0	177	177	
37						
38						
39						
40						
41						
42						
43						
44						
45	1	191.0	191.0	191	191	

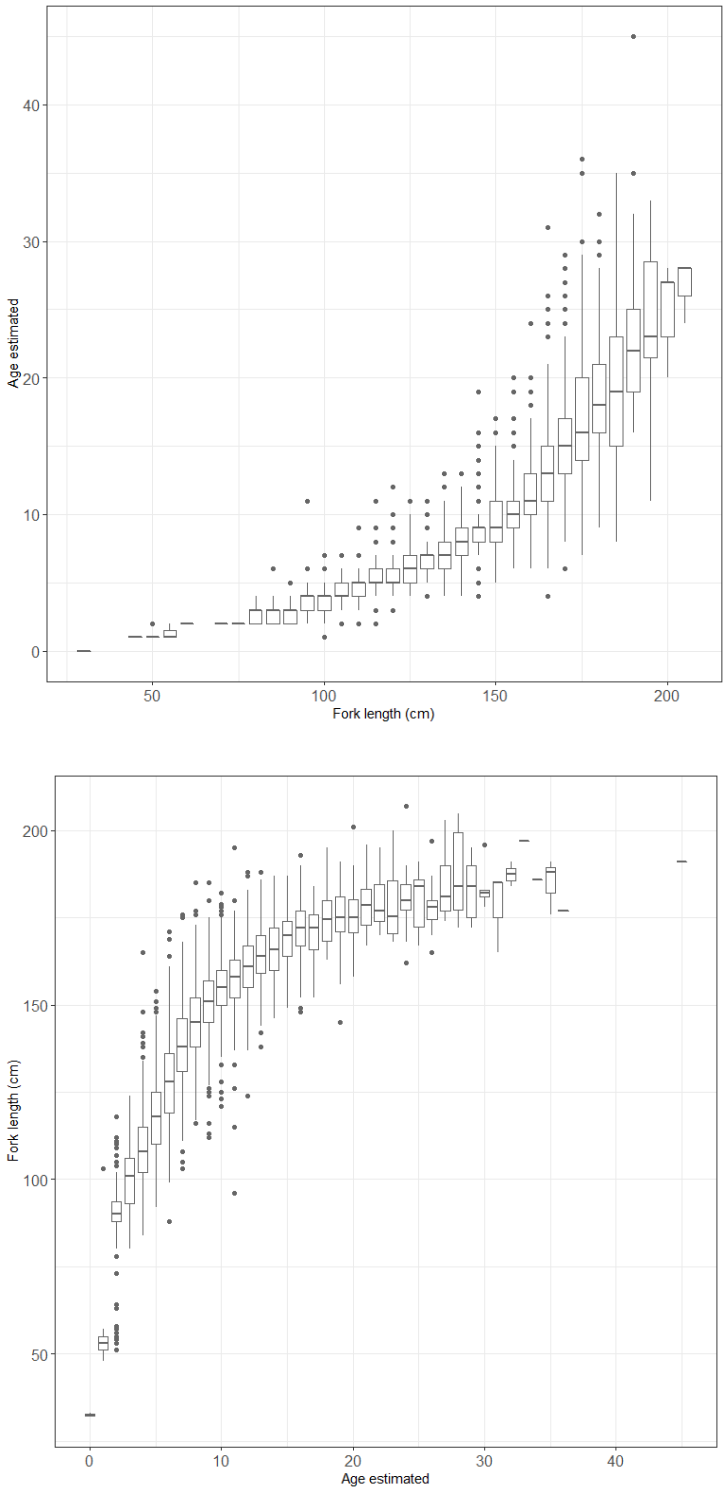

Fig. 1 Boxplot of age estimated at fork length in 5 cm class in Japanese age estimated data (Upper panel). Boxplot of fork length at age estimated in Japanese age estimated data (Lower panel).

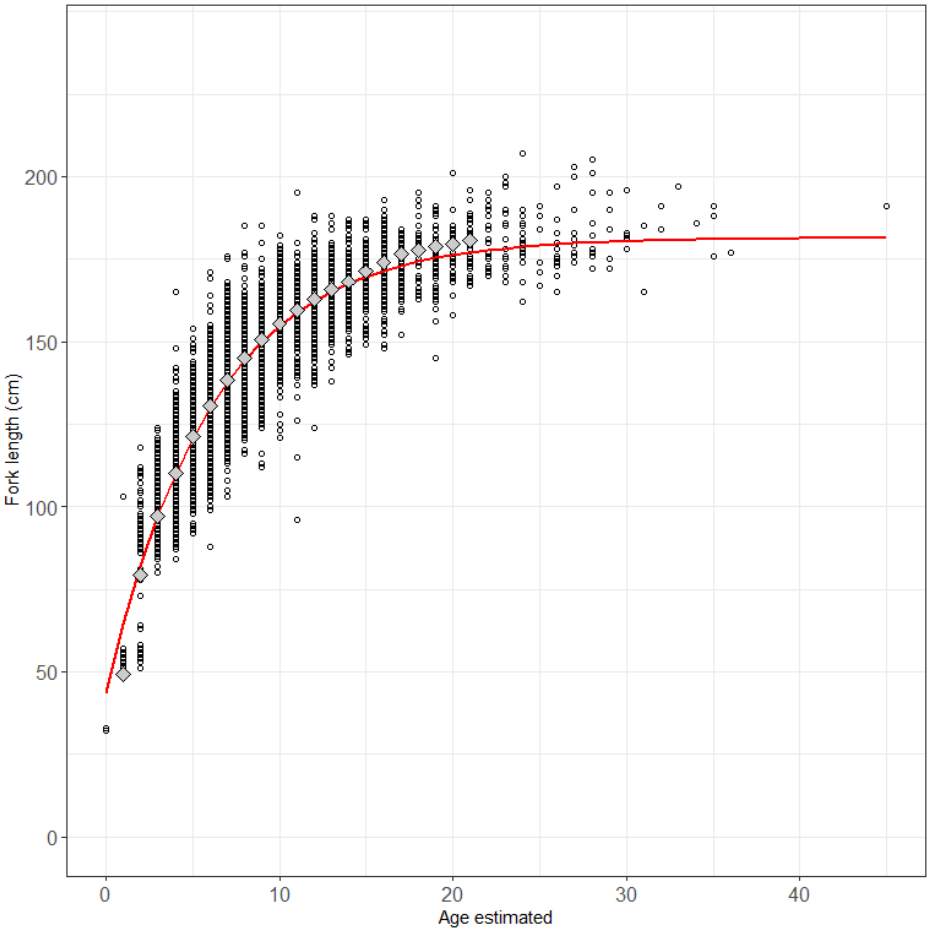

Fig. 2 von Bertalanffy curve and length plots for Japanese age estimated data. Diamonds are length-at age used in CCSBT.