



Seasonal length-weight relationships and weights at age of Pacific saury

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1. Introduction

Length-weight relationship and weights at age are essential for stock assessment studies. Since the weight of Pacific saury, especially age-1 fish, varies greatly from season to season, this information by season would be helpful. Therefore, this paper provides the length-weight relationship and weights at age information for Pacific saury for summer, autumn, and winter.

2. Materials and methods

The summer (June-July) sample was obtained through a biomass survey conducted by Japan (2003-2019). See Suyama et al. (2020) and Suyama et al. (2021) for details of the sampling locations. Autumn (August-December) samples were obtained from Japanese fishing vessels (2003-2019). See Suyama et al. (2020) and Suyama et al. (2021) for sampling locations. Winter (January-March) samples were obtained from Japanese research vessel surveys (2007 and 2011). See Fuji et al. (2021) for sampling locations. Samples were measured in the laboratory for knob length (KnL, to the nearest 0.1 cm) and body weight (BW, to the nearest 0.1 g), and sagittal otoliths were extracted. Otoliths were processed and aged according to Suyama et al. (2020).

The measurement data were pooled by season, and the a and b of $BW=aKnL^b$ were estimated for each season. The average weight of each year and age group was also calculated.

3. Results

The length-weight relationship was different among seasons (Fig. 1, Table 1). In particular, in winter, the Pacific saury was thinner than in summer and autumn (Fig. 2). Seasonal weights at age by year are shown in Tables 2, 3, and 4 and Fig. 2, with age-1 fish showing a decreasing trend in both summer and autumn in recent years.

4. References

- Fuji T, Nakayama S, Hashimoto M, Miyamoto H, Naya M, Suyama S, Kawabata A, Nakatsuka S (2021) Information of the surveys for Pacific saury conducted during winter season in 2007 and 2011. NPFC-2021-SSC PS07-WP11
- Suyama S, Matusi H, Fuji T, Nakayama S, Hashimoto M, Oshima K (2020) Age-determination and age-length keys for Pacific saury, *Cololabisa saira*, from 2000 to 2018. NPFC-2020-SSC PS06-WP16
- Suyama S, Miyamoto H, Fuji T, Hashimoto M (2021) Age-determination and age-length keys for Pacific saury, *Cololabisa saira*, from 2019 to 2020. NPFC-2021-SSC PS07-WP09

Table 1. Coefficients and R^2 of the estimated seasonal length-weight relationships

Season	a	b	R^2	N
Summer (Jun.-Jul.)	0.0015	3.3332	0.9457	66,573
Autumn (Aug.-Dec.)	0.0006	3.5969	0.8767	26,400
Winter (Jan.-Mar.)	0.0019	3.2167	0.9711	1,667

N: sample number.

Table 2. Mean weights at age (g) of Pacific saury during summer (June and July).

Year	Age-0			Age-1		
	Mean	SD	N	Mean	SD	N
2003	50.6	23.8	2,204	127.8	13.4	3,390
2004	47.7	25.2	4,349	129.1	26.2	1,731
2005	46.2	22.5	2,174	137.0	16.2	3,388
2006	45.1	22.6	2,177	141.0	19.1	2,223
2007	41.7	21.5	1,639	126.1	20.2	1,999
2008	43.5	15.8	409	129.1	21.6	1,802
2009	53.3	20.5	1,397	131.3	21.1	971
2010	50.4	29.1	1,787	118.6	16.6	2,331
2011	60.7	17.6	867	127.5	13.9	1,873
2012	53.9	22.1	2,324	128.9	15.9	1,343
2013	44.4	19.0	1,409	110.1	18.6	2,608
2014	55.2	21.2	2,062	127.9	18.6	2,001
2015	56.8	16.3	1,908	116.5	13.1	1,308
2016	51.1	20.8	1,363	118.3	16.1	1,700
2017	48.1	14.3	1,321	112.1	14.4	1,853
2018	45.8	21.5	1,084	113.5	17.3	1,401
2019	45.1	17.6	1,325	103.0	13.5	1,013

SD: standard deviation. N: sample number.

Table 3. Mean weights at age (g) of Pacific saury during autumn (August to December).

Year	Age-0			Age-1		
	Mean	SD	N	Mean	SD	N
2003	69.4	25.2	944	140.6	15.6	1,420
2004	90.0	15.6	921	154.0	24.9	1,209
2005	91.9	30.5	167	161.8	19.4	1,725
2006	75.1	25.6	389	146.8	15.7	783
2007	77.8	22.9	915	140.4	20.9	1,106
2008	72.3	24.8	242	140.3	18.3	960
2009	87.6	24.7	822	147.8	28.0	356
2010	64.1	17.7	717	131.7	15.8	609
2011	81.7	22.8	396	146.9	23.4	547
2012	79.3	24.1	877	148.5	23.3	775
2013	90.9	19.7	572	142.2	20.7	777
2014	79.5	17.3	399	156.0	18.6	1,005
2015	77.8	15.4	268	134.6	13.9	834
2016	75.0	22.5	361	129.0	16.5	941
2017	69.6	17.1	725	123.0	14.2	460
2018	76.7	15.0	642	127.5	15.5	1,089
2019	88.2	16.2	838	123.2	18.0	827

SD: standard deviation. N: sample number.

Table 4. Mean weights at age (g) of Pacific saury during winter (January to March).

Year	Age-0			Age-1		
	Mean	SD	N	Mean	SD	N
2007	44.2	16.7	1,149	108.3	15.5	18
2011	63.0	19.4	325	107.0	10.5	175

SD: standard deviation. N: sample number.

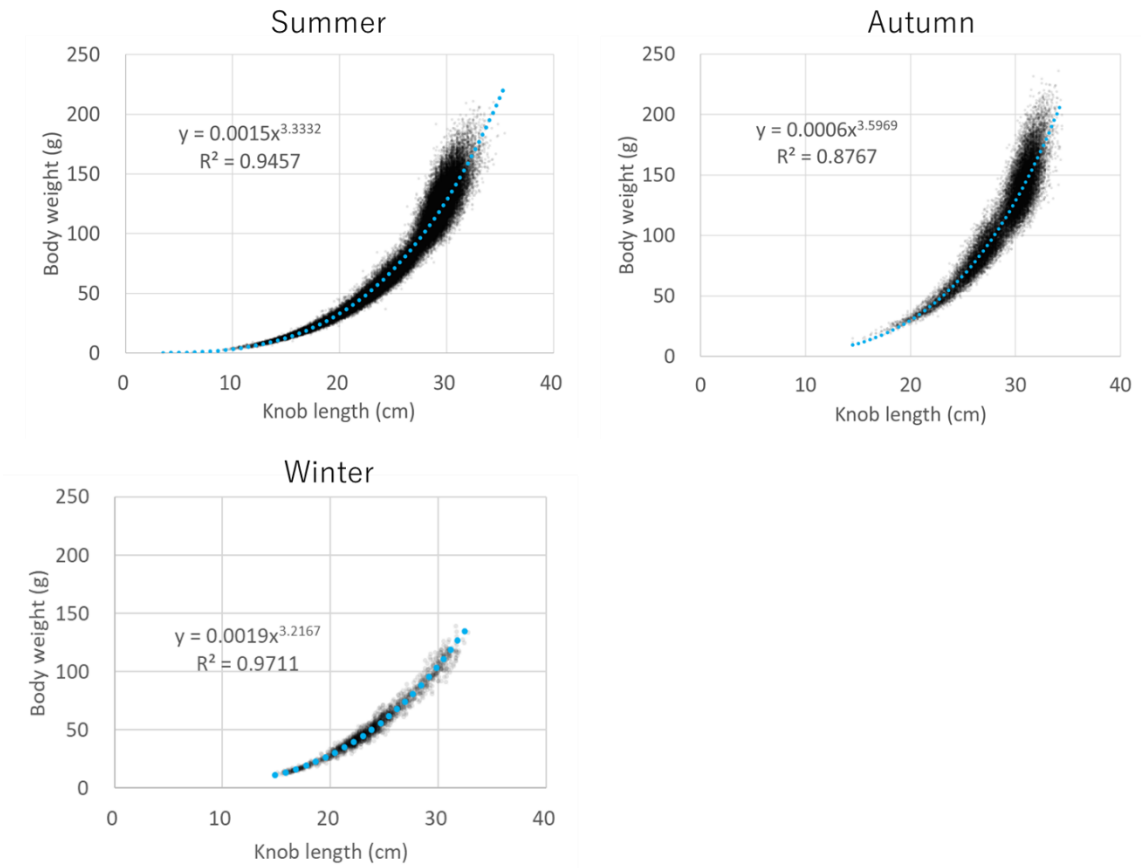


Figure 1. Length-weight relationships in summer, autumn and winter.

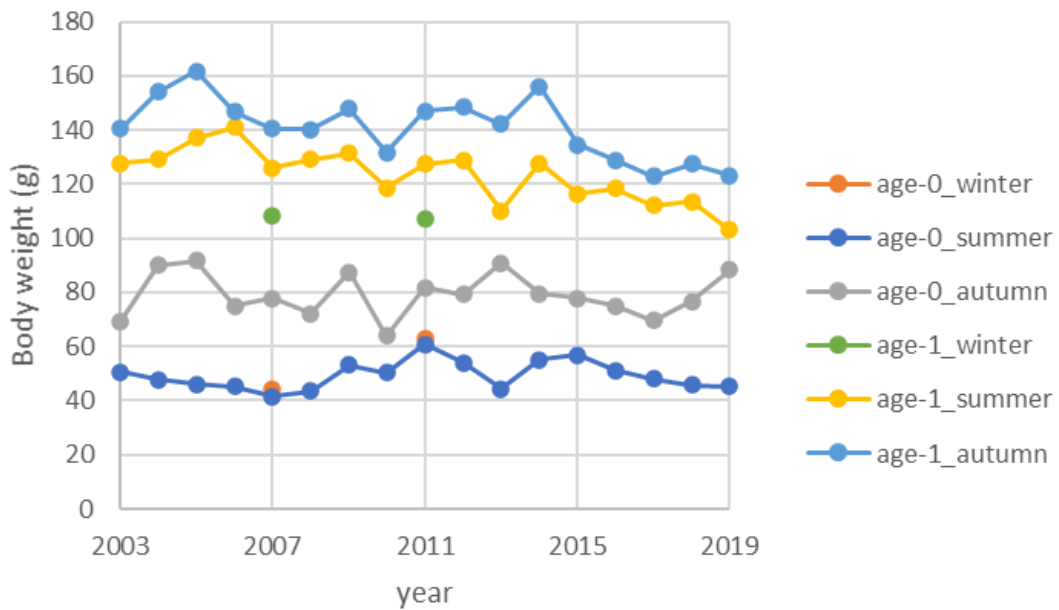


Figure 2. Time series of mean weights at age in each season.