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Citation	北海道大學水産學部研究彙報, 36(4), 200-209
Issue Date	1985-12
Doc URL	https://hdl.handle.net/2115/23891
Type	departmental bulletin paper
File Information	36(4)_P200-209.pdf



**Distribution and Feeding Habits of the Pelagic Smooth
Lumpsucker, *Aptocyclus ventricosus* (Pallas),
in the Aleutian Basin***

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Abstract

Smooth lumpsuckers were found to be widely distributed throughout the Aleutian Basin. A total of 148 smooth lumpsuckers collected in the summer months, 9 to 36 cm in total length, were divided into two groups according to length: a small-size group ranging from 9-16 cm and a large-size group ranging from 17-36 cm. Those fish which attained a length of at least 17 cm seemed to have approached the coast in the following year for spawning. They fed mainly on medusae and ctenophores, and occasionally on pelagic polychaetes and crustacea.

Introduction

Though the Cyclopteridae fishes are composed of benthic species, some epipelagic species were encountered at a considerable distance from the shore (Parin, 1969); e.g. the lumpsucker *Cyclopterus lumpus* occurs pelagically from the southern North Sea to about 80°N off Spitsbergen, usually in the upper 50-60 m (Blacker, 1983), while in the North Pacific the Pacific spiny lumpsucker *Eumicrotremus orbis* has been found in the stomachs of salmon sharks and lancetfishes (Sano, 1962; Hart, 1973).

Previous research on the smooth lumpsucker (*Aptocyclus ventricosus*) has reported its biological and ecological aspects, mainly breeding habits in the inshore zone (Gilbert and Burke, 1910; Shmidt, 1950; Honma, 1957) and rearing experiments of eggs and larvae (Kyushin, 1975). The fish are often found in stomachs of sea mammals such as Steller's sea lions, ribbon seals and harbor seals in adjacent waters of the Hokkaido (Kato, 1976, 1978, 1982) and in fur seals in the Bering Sea (Hart, 1973).

There is little information concerning offshore life of these fish except for only one reference by Kobayashi (1962) regarding the young found in the northwestern Pacific.

This paper discusses the distribution and feeding habits of the pelagic smooth lumpsucker in the Aleutian Basin.

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Table 1. Midwater trawl data.

Year	Vessel	Period	No. of operation	Cod end		Mean opening height of net (m)	Duration of tow (min.)	Towing speed (knot)
				Type	Mesh size (mm)			
1978	<i>Tomi Maru</i> No. 52	18 June- 16 July	78	double nets	100	30	30-66	3.3-3.5
1979	<i>Shotoku Maru</i> No. 35	6 June- 28 June	65	triple nets	90	27	54-90	3.0-3.8
1983	<i>Kaiyo Maru</i>	21 Jan- 17 Mar.	49	single net	73-74	16	2-62	3.0-3.8

Materials and Methods

Catch records of smooth lump suckers were extracted from log books of three cruises by Japanese research vessels of the Fisheries Agency of Japan in the Bering Sea where midwater trawl fishings for pelagic walleye pollock were conducted from June-July in 1978 and 1979 and from January-March in 1983 (Okada, 1979; Okada and Nakayama, 1983). Detailed records are given in Tables 1-4.

In the 1979 survey, smooth lump suckers were collected and either the total length of each fish or range of total length to the nearest 1 cm were measured on board the ship. Food items found in the stomachs were identified and unidentified food items were preserved in 10% formalin for later examination in the laboratory.

Results and Discussion

Smooth lump suckers constituted 0.1-4.5% of the total number caught and were second in number if rejected jellyfish (Table 5). Smooth lump suckers were caught in 45 of 78 stations in 1978, 31 of 65 stations in 1979 and 31 of 49 stations in 1983 (Figs. 1-3). Smooth lump suckers were widely distributed in the upper layers throughout the Aleutian Basin and highest catches tended to occur in the central waters. The number of fish collected during the night was higher than that of those collected during morning and daytime hours (Table 6). None were found at the stations in the eastern shelf area. Smooth lump suckers were rarely caught in bottom trawls during the summer months in the eastern Bering Sea where the water depth was 50-800 m.

A total of 148 smooth lump suckers were collected and measured individually in the 1978 survey and ranged from 9 to 36 cm in total length. They were divided into two groups according to length; a small-size group of 9-16 cm and a large-size group of 17-36 cm (Fig. 4). The spawning season of the smooth lump sucker extends over three months from early February to early April in southern Hokkaido where the total length of the spawning population ranges from 27-39 cm (Kyushin, 1975). Kobayashi (1962) and Ueno (1970) indicated that the male fish changes its morphological characteristics (i.e., usually attains a body length of over 170 mm) when it reaches sexual maturity. Fish collected in the summer months had undeveloped

Table 2. Occurrences of *Aptocyclus ventricosus* in midwater trawl in the Aleutian Basin of 1978.

Operation number	Date	Time (J.S.T.+3 hours)	Trawling depth (m: depth of headline)	No. of fish
1	18 June	1351-1453	70	3
2	18	2141-2240	60	43
3	19	0705-0807	60-80	14
4	19	1635-1735	65	4
8	21	0415-0511	60-85	7
9	21	1208-1310	73	19
10	22	0014-0115	65	12
12	22	1700-1800	60-85	7
15	23	2208-2308	55	1
16	24	0650-0750	55	5
17	24	1459-1559	65-70	22
18	24	2308-0009	60	5
20	25	1714-1814	80	2
21	26	0204-0306	55-90	26
22	26	1134-1234	71-87	16
23	26	2216-2316	60-72	1
24	27	0608-0709	72	5
25	27	1508-1607	70	6
28	28	1224-1323	77	12
29	28	1939-2039	60	2
30	29	0319-0419	60	37
31	29	1039-1145	60	2
32	29	1756-1858	80	6
33	30	0148-0248	55	16
35	30	2031-2132	60	37
36	1 July	0518-0618	80-88	36
37	1	1402-1508	64	7
39	2	0755-0855	76	6
43	3	1257-1357	55-95	1
44	3	2103-2203	55	8
45	4	0359-0502	75	8
46	4	1159-1300	52	18
49	5	1058-1200	60-75	5
50	5	1956-2058	63	21
51	6	0155-0258	60-65	18
52	6	0912-1012	75	9
53	6	1606-1707	70	3
56	7	1431-1533	55-60	3
57	7	2159-2259	70	2
58	8	0559-0659	60	3
59	8	1336-1438	75	26
62	11	1250-1350	72-84	2
64	12	0600-0701	112	16
67	13	0353-0453	70	3
71	14	0715-0810	85	1

Table 3. Occurrences of *Aptocyclus ventricosus* in midwater trawl in the Aleutian Basin of 1979.

Operation number	Date	Time (J.S.T. +3 hours)	Trawling depth (m: depth of headline)	No. of fish	Total length range (cm)	Food item*
2	7 June	0807-0908	70	8	19-22	M
3	7	1340-1440	85	8	14-24	M, C
4	7	2007-2108	45	20	12-24	M
5	8	0910-1010	70	1	24	M, P
6	8	1308-1407	50	1	9	M, P, C
7	8	1850-2020	40	4	18-24	M, P, E
8	9	0812-0910	85	5	25-29	M
14	11	0800-0900	80	4	27-36	M
15	11	1349-1451	50	1	35	—
16	11	1935-2035	40	3	10-23	M
24	14	1314-1413	36	7	13-20	M
27	15	1003-1102	45	11	10-25	M
31	16	2013-2113	50	5	24-28	M
34	17	2150-2250	34	1	—	M
37	18	2110-2210	40	2	26	M
39	19	1409-1508	60	2	12-13	M
42	20	1302-1402	40	2	21-22	M
43	20	2005-2105	45	2	12-15	M
44	21	0825-0925	35	4	12-23	M
46	21	2105-2205	35	55	11-28	M, P
47	22	0910-1010	65-70	5	10-30	M
49	22	2010-2140	40 (100-70)	6	22-28	M
51	23	1513-1613	65	1	19	M
52	23	2103-2203	30	14	15-35	M
53	24	1130-1232	30	2	21-26	M
57	25	1533-1634	65	1	10	—
58	25	2035-2135	40	35	10-22	M
60	26	1551-1651	50	2	11-24	M
61	26	2102-2207	30	21	9-29	M
63	27	1453-1651	100	7	9-25	M
64	27	1845-2002	80	2	10-25	M

*M: Medusae and ctenophores, C: Copepods, E: Euphausiids, P: Pelagic polychaetes

gonads, whereas the female smooth lump suckers in the winter months had developed gonads with eggs measuring 2.19 mm in average diameter (Okada, 1983). No eggs of the smooth lump sucker were collected in the vertical hauls of the Norpac Net in the 1983 survey. The mature eggs of the smooth lump sucker in the inshore zone measured 2.38 mm in average diameter, are demersal and adhere solidly to one another after artificial fertilization and washing with sea water (Kyushin, 1975). The majority of the large-size group in the 1979 survey seemed to have approached the coast in the following year for spawning. According to Vinogradov (Shmidt, 1950), spawning in Avachinskaya Bay takes place in the drained zone; after

Table 4. Occurrences of *Aptocyclus ventricosus* in midwater trawl in the Aleutian Basin of 1983.

Operation number	Date	Time (J.S.T. + 3 hours)	Trawling depth (m : depth of headline)	No. of fish
1	21 Jan.	0726-0828	150-215	2
3	23	0700-0800	200-240	11
4	25	0847-0947	255-280	9
5	25	1612-1712	210-250	3
6	26	0636-0706	220-235	6
7	26	1120-1140	260-280	8
8	26	1635-1655	270-295	6
9	27	0638-0738	260-280	27
10	27	1346-1406	260-270	5
11	28	0636-0736	265-280	16
12	28	1526-1626	345-375	2
13	30	0643-0653	360-385	4
14	30	1319-1349	280-300	3
15	31	0640-0740	320-340	4
16	31	1733-1833	300-340	3
17	1 Feb.	1732-1802	275-300	1
18	2	0637-0652	265-310	2
19	2	1258-1328	375-400	8
20	13	0641-0741	400-450	4
22	13	1541-1556	510-525	6
24	14	1522-1602	480-515	1
26	17	0700-0800	310-350	7
27	17	1424-1524	325-365	6
28	19	1308-1323	225-255	3
29	21	0815-1915	240-260	2
30	21	1510-1610	280-310	1
31	22	0735-0835	310-340	2
32	23	0740-0755	350-380	3
41	26	1251-1301	470-480	1
48	16 Mar.	1508-1608	160-190	5
49	17	0641-0711	140-150	1

spawning, mass mortality of the females was observed, but the males 'brood', remaining in the drained area in spite of the preying birds. This observation may explain the notable absence of smooth lumpsuckers of over 30 cm in length in this survey.

The stomach contents mainly contained medusae, ctenophores and possibly those digested matter (Table 3; Fig. 5). Pelagic polychaetes, copepods and euphausiids rarely occurred. Larger fishes tended to take larger prey. Food items of the smooth lumpsucker were considerably different from those of other fishes in the Aleutian Basin. Namely, salmonids fed on copepods, euphausiids, pteropods, squids and fishes (Nishiyama, 1970; Kanno and Hamai, 1971; Takeuchi, 1972) and

Table 5. Catch records of midwater trawl on pelagic walleye pollock survey on the Aleutian Basin of 1978, 1979 (summer) and 1983 (winter)

Common name	Scientific name	Catch in number		
		1978*	1979	1983**
Walleye pollock	<i>Theragra chalcogramma</i>	79,747	4,996	229,179
Smooth lump sucker	<i>Aptocyclus ventricosus</i>	506	242	160
Pink salmon	<i>Onchrhynchus gorbuscha</i>	2	9	—
Chum salmon	<i>O. keta</i>	3	7	—
Chinook salmon	<i>O. tshawytscha</i>	1	3	4
Sockeye salmon	<i>O. nerka</i>	—	2	—
Spiny lump sucker	<i>Eumicrotremus orbis</i>	1	1	—
Northern smooth tongue	<i>Leuroglossus schmidti</i>	—	4	—
Ragfish	<i>Icosteus aenigmaticus</i>	6	3	—
Atka mackerel	<i>Pleurogrammus monopterygius</i>	1	—	—
Turbot	<i>Atheresthes stomias</i>	1	—	—
Greenland halibut	<i>Reinhardtius hippoglossoides</i>	—	—	1
Eulachon	<i>Thaleichthys pacificus</i>	7	—	—
Capelin	<i>Mallotus villosus</i>	294	—	—
Eelpout	Zoarcidae	1	—	—
Longnose lancetfish	<i>Alepisaurus ferox</i>	—	—	1
Pacific lamprey	<i>Entosphenus tridentatus</i>	1	1	—
Other fishes				56
Giant squid	<i>Moroteuthis robusta</i>	8	1	1
Eight-armed squid	<i>Gonatopsis borealis</i>	—	107	6
Squids		45	7	130
Dall's porpoise	<i>Phocoenoides dalli dalli</i>	1	1	—
Jellyfish		519	?	1
Total		81,144	5,384	229,539

*: Okada (1978), **: Okada and Nakayama (1983)

walleye pollock fed on copepods, euphausiids, appendicularians and fishes (Kikuchi and Tsujita, 1977; Okada, 1979; Yoshida, 1984). Isakson et al. (1971) show that lump suckers were found to have fed on miscellaneous worms and amphipods in the inshore zone. Only one Pacific spiny lump sucker in the 1979 survey (TL 11.5 cm at trawling station number 7) fed on pteropods. However, the smooth lump suckers in the Aleutian Basin fed exclusively on medusae and ctenophores (*Beroe cucumis*).

These results are similar to those obtained for the lump sucker, *Cyclopterus lumpus* in the North Atlantic Ocean. Lump suckers feed mainly on plankton; jellyfish, ctenophores, pelagic worms and crustacea (Blacker, 1983). According to Garrod and Harding (Blacker, 1983) in a plaice spawning area off the northeast coast of England (probably from June to July), their stomach contents were composed of plaice and other fish eggs, a plaice larva, ctenophores, euphausiids, decapods and amphipods and remains of polychaetes.

In conclusion, further study to delineate the life history of the smooth lump sucker is strongly encouraged. However, it must be assumed that the pelagic

Table 6. Comparison of CPUE (No./60 min.) and average trawling depth by time of the smooth lumpsucker caught by midwater trawl.

Time (J. S. T. +3 hours)	Number of trawl	CPUE (No./60 min.)	Average depth (m)
1978 Morning (0301-1200)	15	10.4	73
Daytime (1201-2000)	17	9.1	71
Night (2001-0300)	13	14.6	62
1979 Morning (0301-1200)	7	5.5	65
Daytime (1201-2000)	11	3.1	57
Night (2001-0300)	13	12.7	44
1983 Dawn (0636-0730)	9	11.3	283
Morning (0730-1200)	7	6.0	284
Daytime (1200-1630)	11	8.3	350
Dusk (1630-1833)	4	6.5	280

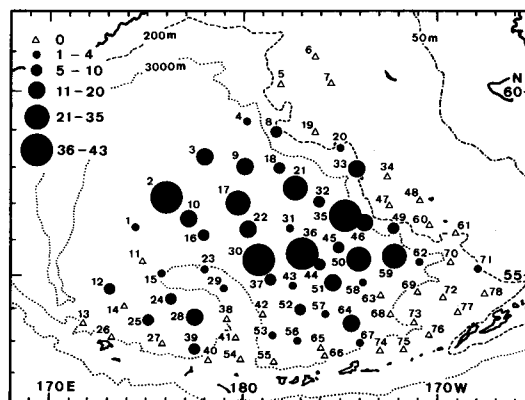


Fig. 1. Distribution of the CPUE (No./60 min.) of the smooth lumpsucker caught by midwater trawl on the Aleutian Basin in 1978 survey. Figure shows operation number.

smooth lumpsucker population in the Aleutian Basin, 77% of which consists of adult fish, is not in competition with other species for food and has fewer predators than in the inshore zone. Therefore, the pelagic life style of smooth lumpsuckers seems to be an important factor in maintaining their population.

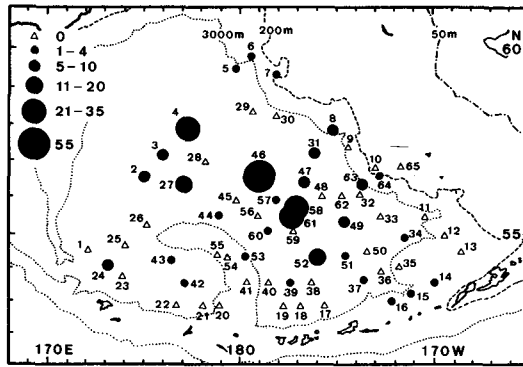


Fig. 2. Distribution of the CPUE (No./60 min.) of the smooth lump sucker caught by midwater trawl on the Aleutian Basin in 1979 survey. Figure shows operation number.

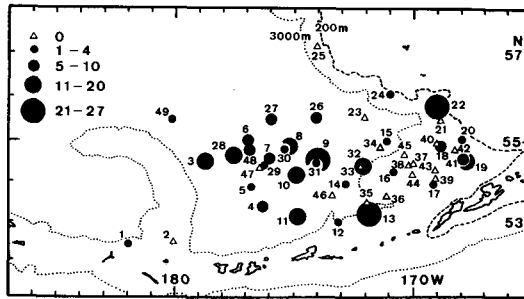


Fig. 3. Distribution of the CPUE (No./60 min.) of the smooth lump sucker caught by midwater trawl on the Aleutian Basin in 1983 survey. Figure shows operation number.

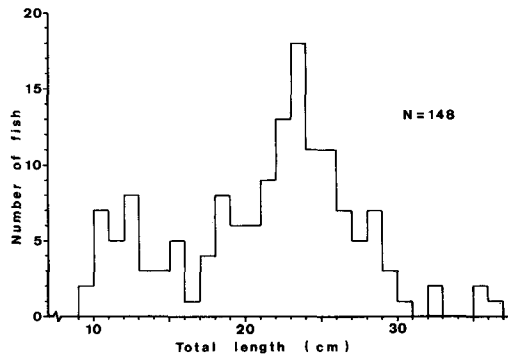


Fig. 4. Size distribution of the smooth lump sucker collected from the Aleutian Basin in 1979 survey.

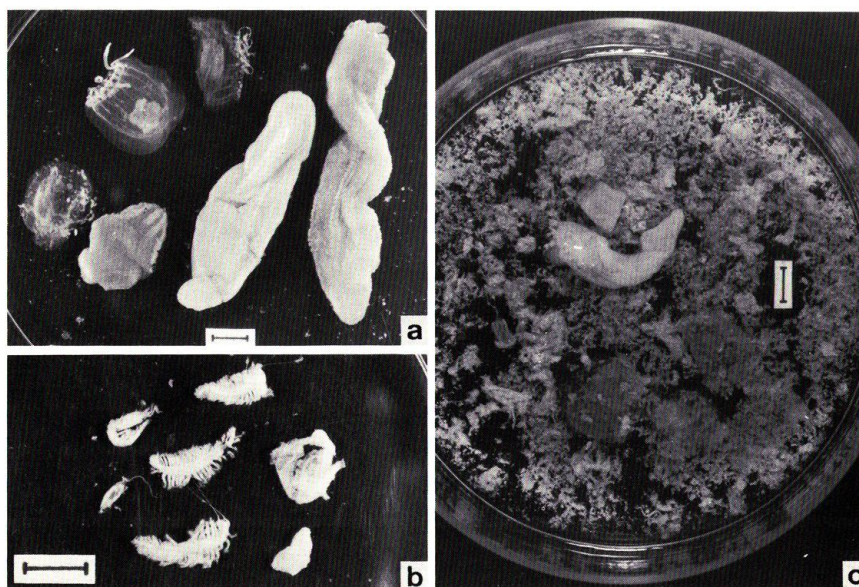


Fig. 5. Medusae, ctenophores (a), pelagic polychaetes, euphausiid, copepod (b) and digested matter (c) in the smooth lumpsuckers preserved in 10% formalin. Scale indicates 1 cm.

Acknowledgements

The authors wish to express their sincere thanks and appreciation to Professor S. Mishima and Dr. H. Ogi of the Faculty of Fisheries Hokkaido University and Dr. K. Okada of the Far Seas Fisheries Research Laboratory, for reading the manuscript and for their helpful advice in the present study. Finally, we would not have been able to have obtained field data without the cooperation of staff and crew members of R/V *Tomi Maru* No. 52, R/V *Shotoku Maru* No. 35 and R/V *Kaiyo Maru* of the Fisheries Agency of Japan.

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