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Notes on fishes in Hornsund fjord area (Spitsbergen)

ABSTRACT: During marine ecological surveys conducted by Polish expeditions in South Spitsbergen area 14 fish species were collected. The length frequency, the diet and some other ecological informations are presented for the most common species.

Key words: Arctic, coastal fishes, food web.

Introduction

In contrast to the shelf and open sea waters of Spitsbergen the ichthyofauna of the fjords and coastal waters is poorly known. The only exception is the Isfjorden (West Spitsbergen) studied in this respect by Hofstein (1919) and Hognestadt (1963). Some information about Spitsbergen coastal fishes can be found also in the papers by Collet (1880), Ehrenbaum (1905) and Andriašev (1954, 1964).

Coastal areas might be important as feeding grounds for young commercial fishes in Spitsbergen region (Haug and Gulliksen 1982); this fact as well as the increasing interest in biology of the Arctic cod have called more attention to the Arctic coastal water fishes (Craig et al. 1982, 1985; Matišov 1986).

The purpose of the present study is to give preliminary informations on fish species occurrence, their feeding habits and ecology as a contribution to the wide ecological survey carried out by Polish expeditions in South Spitsbergen area (Klekowski and Opaliński, in press).

Material and methods

Fishes were collected in the years 1977, 1979, 1980, 1981/82 and mainly in 1984/85 as by-catch material during benthic sampling with the use of

different gear; sledge dredge, baited traps and partly with the use of bottom nets of mesh size from 50 to 200 mm.

The material collected is only qualitative one. Some earlier data on the fish presence in bird and seal stomachs collected in the area were joined to the present material (Lydersen, Gjertz and Węsławski 1985; Hałatienko, unpubl., Kopacz, unpubl.). Otoliths of fishes were measured to the nearest 0.1 mm and identified with the kind help of Dr. T. Linkowski from Sea Fisheries Institute in Gdynia.

Materials were collected in Hornsund and in coastal waters of sout-west Spitsbergen (Fig. 1).

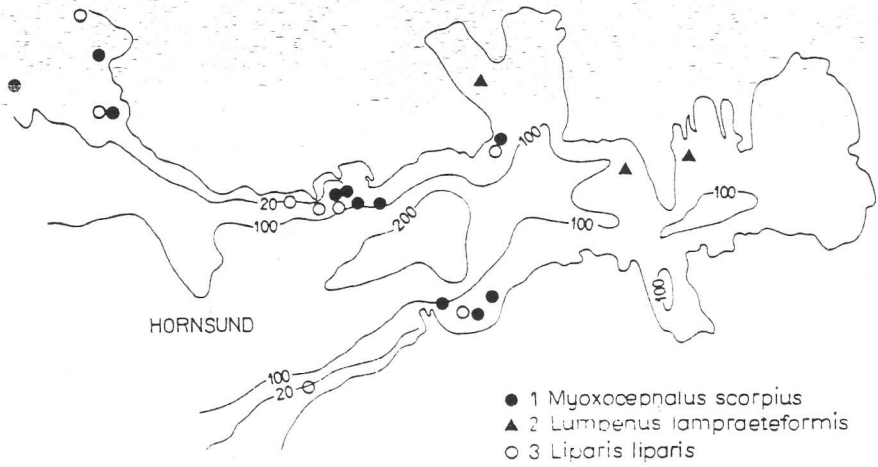

Fig. 1. Localities where fishes were sampled in 1984/85

Results and discussion

Family Cottidae

1. *Myoxocephalus scorpius* L.

The most common fish species in the present material; in all 148 specimens were caught in nets, baited traps and dredges. The most numerous were fishes in first and second year of life (3—9 cm length), the biggest specimen measured 30 cm (Fig. 2). This species was collected in the depth of 2 to 40 m, mostly among algae between 5 and 15 m. Species common throughout the whole area with the exception of near glacier bays.

Food of *M. scorpius* consisted of 27 taxa, mainly of Polychaeta and Gammaridea. Smallest specimens feed on Harpacticoida and Ostracoda (Tab. 1). Present data on the diet suggest that small fishes are feeding

Table 1

Food of *Myoxocephalus scorpius* from Hornsund; n — number of samples (total = 148), F — frequency (%), D — domination (%)

Food item \ years of observations	1977		1979		1984/1985			
	n = 25		n = 37		fish length 2—5 cm n = 74		fish length 5—20 cm n = 12	
	F	D	F	D	F	D	F	D
Priapulida	—	—	—	—	—	—	8	1
Polychaeta	60	6	66	36	62	10	58	10
Bivalvia n.det.	—	—	—	—	5	0.3	—	—
Gastropoda n.det.	16	2	21	4	5	0.3	8	1
Ostracoda	—	—	—	—	27	0.6	8	1
Harpacticoida	—	—	21	6	70	66	—	—
Cumacea	—	—	—	—	14	10	8	1
Synidotea nodulosa	—	—	—	—	1	0.3	—	—
Mysis oculata	—	—	—	—	—	—	17	2
Lysianassidae	—	—	—	—	3	0.3	—	—
Onisimus littoralis	—	—	—	—	—	—	17	2
O. edwardsi	—	—	—	—	—	—	8	3
Anonyx sarsi	24	6	9	6	—	—	50	27
Syrrhoe crenulata	—	—	—	—	1	0.3	—	—
Monoculodes longirostris	—	—	—	—	5	0.6	—	—
Paraoediceros lynceus	—	—	—	—	6	10	8	1
Pleustes panoplus	—	—	—	—	1	0.3	—	—
Parapleustes bicuspis	—	—	—	—	1	0.3	—	—
Ischyrocerus sp.	68	35	63	27	1	0.3	25	8
Gammarellus homari	24	8	3	0.5	—	—	50	12
Gammarus setosus	44	26	36	18	—	—	25	21
G. oceanicus	—	—	—	—	—	—	8	7
Gammarus sp. n.det.	—	—	—	—	3	0.3	—	—
Caprella septentrionalis	4	1	6	2	—	—	—	—
Decapoda larvae	—	—	—	—	5	0.3	—	—
Pisces juv. n.det.	16	16	3	0.5	—	—	17	3

close to the bottom on small discretely vagile invertebrates, while large fishes feed on nektobenthos from the phytal zone.

M. scorpius was found in Ringed seal, Kittiwakes, Eiders and Black guillemots stomachs.

This species was reported by other authors as a common one in fjords on hard bottom in phytal zone (Hofstein 1919, Hognestadt 1963). The feeding habits of the Baffin Island population were different from presented here; J. A. Moore and J. W. Moore (1974) reported pelagic amphipods and sea snails as main prey object.

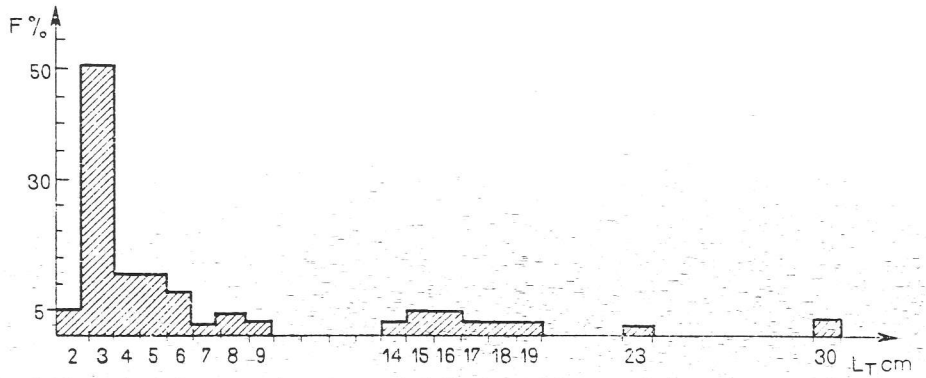

Fig. 2. Length frequency of *Myoxocephalus scorpius* (130 specimens) caught in August-September 1984 and 1985 in Hornund

Family Liparidae

2. *Liparis liparis* (L.)

31 specimens were collected. Their length frequency is presented in fig. 3. This species was captured in shallow water among algae, 6 specimens were collected during low tide under stones.

Food of *L. liparis* consisted of Harpacticoida, *Gammarus* spp., *Ischyrocerus* sp. and occasionally other crustaceans (Tab. 2).

Table 2

Food of *Liparis liparis* from Hornsund; N = 31. F — frequency (%), D — somination (%)

Food item	Year of observations					
	1977		1979		1984/85	
	F	D	F	D	F	D
Ischyrocerus sp.	100	21	80	20	19	6
Harpacticoida gen.	60	53	60	61	63	79
Gammarus sp.	60	16	20	4	31	2
Polychaeta n.det.	40	6	20	2	19	2
Caprella septentrionalis	20	2	—	—	—	—
Lysianassidae n.det.	20	2	—	—	—	—
Ostracoda	—	—	20	2	19	2
Paroediceros lynceus	—	—	—	—	6	1
Mysis oculata	—	—	—	—	19	2
Hyas sp. (zöea)	—	—	—	—	6	0.3
Hyas sp. (juv.)	—	—	—	—	6	0.3
Cumacea n.det.	—	—	—	—	6	0.3
Onisimus edwardsi	—	—	—	—	12	1
Gammarellus homari	—	—	—	—	19	2
Orchomene minuta	—	—	—	—	12	1
Number of fish analysed	5		10		16	

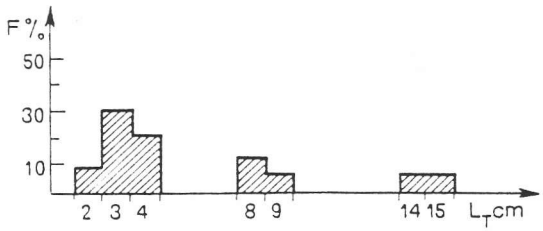

Fig. 3. Length frequency of *Liparis liparis* (18 specimens) caught in August-September 1984, Hornsund

L. liparis was found in the stomachs of Ringed seals, Eiders and Guillemots.

Other authors reported this species as a littoral one, however in Isfjorden it was found down to 280 m as a common fish (Hofstein 1919, Hognestadt 1963).

Family Gadidae

3. *Boreogadus saida* Lepechin

Only 9 specimens were captured in dredge and baited traps in contrast to the rich material obtained from vertebrates stomachs. *B. saida* was captured in Hornsund from the depth of 0 to 60 m, but was also often observed while swimming in the vicinity of ice holes in fast ice of inner fjord basins. This fish was the most common food object for most of the sea birds examined.

Table 3

Food of *Boreogadus saida* from Hornsund and adjacent waters. Materials collected in April—May 1985 and 1987; N = 15, fish length 23—165 mm; F — frequency, D — domination

Food item	F (%)	D (%)
Calanus sp. (*finmarchicus* ?)	80	43
Hyperia galba	33	19
Parasagitta sp. (*arctica* ?)	33	8
Euphausiacea (*Thysanoessa* sp. ?)	27	1
Themisto libellula	20	3
Isochyrocerus sp.	20	3
Hyas araneus (zöea)	20	1
Harpacticoida	13	19
Themisto abyssorum	7	2
Gammarellus homari	7	0.3
Mysis oculata	7	0.3
Dajus mysidis	7	0.3

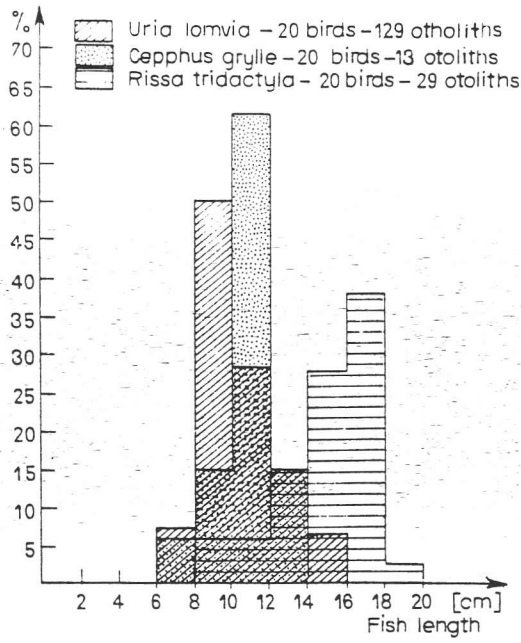

Fig. 4. Length frequency of *Boreogadus saida* found in stomachs of three bird species in April 1985. Fish length defined according to Frost and Lowry (1981)

Guillemots diving for food feed on smaller specimens of *B. saida* than surface feeding Kittiwakes (Fig. 4). Food of *B. saida* (Tab. 3) consists of *Calanus finmarchicus* and other small pelagic crustaceans.

B. saida by other authors is claimed the key species in Arctic marine ecosystem (Andriašev 1954, Craig et al. 1982) commonly found in Spitsbergen and Greenland fjords (Hofstein 1919, Jensen 1948, Hognestadt 1963). This species is connected with Arctic water mass and ice pack biocenose; probably this is the reason of scarce occurrence of *B. saida* along West Spitsbergen coast unlike to abundant presence of this species in other Arctic regions (Klukov 1937, Craig et al. 1982).

Family Lumpenidae

4. *Lumpenus lampraeteformis* Walb.

5 specimens were caught on muddy bottom near glacier bays of the depth 30 to 60 m. Length range was 40—80 mm, weight 619—1000 mg. Only one stomach contained food consisting of *Arrhis phyllonyx* (Amphipoda, Oedicerotidae), Polychaeta and Harpacticoida.

Other authors reported this species as a common member of fjord fauna

inhabiting silty bottom at the depth of 100—150 m (Hofstein 1919, Hognestadt 1963).

Other fish species recorded from Hornsund were found either in numbers smaller than 5 individuals or were determined only from otolithes found in the birds stomachs. Their characteristic is presented in tabs. 4 and 5.

Out of fish species presented in tab. 5, *Gadus morrhua* and *Benthosema glaciale* were not reported from coastal and shallow waters of Spitsbergen. In present material both species were determined from the otoliths found in stomachs of pelagic feeding birds (Kittiwakes, Guillemots and Little auks). The presence of *Gadus morrhua* in Spitsbergen area is known, when mesopelagic *Benthosema glaciale* surface occurrence was rarely observed

Table 4

Less common fisches found in Hornsund in 1984 1985

Species	Length (mm)	Weight (mg)	Otolith size (mm)	Food
Clupea harengus	76	2900		empty stomach
Clupea harengus	75	2200		empty stomach
Clupea harengus	76	2100		empty stomach
Clupea harengus	57	1150		empty stomach
Clupea harengus	68	1850		*Calanus* sp. 9
Lumpenus lampracteformis	59	619	0.7 × 0.4	*Arrhis phyllonyx* 1 Harpacticoida 15 Polychaeta 1
Eumicrotremus spinosus	66	16100		*Gammarus oceanicus* 2 Hyperiidae 15
Icelus bicornis	44	1500	1.1 × 1.6	*Oikopleura* sp. 15
Reinhardtius hippoglossoides	44	700	1.2 × 1.2	Polychaeta 5
Anarchichas sp. juv.	54	1100	1.0 × 0.9	Amphipoda n.det. 1
Triglops pingeli	86	6100	1.3 × 2.6	empty stomach

Table 5

Fish otoliths found in 26 bird stomachs examined

Species	Number of otoliths measured	Range of fish length (cm)	Medium fish length (cm)
Benthosema glaciale	64	4—6	5
Boreogadus saida	215	5—25	11
Gadus morrhua	32	10—23	15
Careproctus reinhardti	40	5—10	8

(Ehrenbaum 1905, Hognestadt 1961). *Careproctus reinhardti* is known as coastal fish from Isfjorden (Hofstein 1919, Hognestadt 1963).

Comparing the fish fauna of Isjorden with that of Hornsund one should remember that Isfjorden area is about 4—5 times bigger than that of Hornsund, has better contact with Atlantic waters and greater depths. These factors are responsible for the presence of 35 fish species in Isfjorden versus 14 noted in Hornsund. In both fjords the most common are *M. scorpius*, *L. liparis* and *B. saida*.

The scarcity of fish fauna in South Spitsbergen coastal waters is probably caused by strong influence of fresh water inflow from glaciers, decreased salinity, large amount of sediments in water and comparatively low benthos and plankton biomass of the fjord in contrast to the rich shelf of Spitsbergen (Węsławski, unpubl.).

Other stressing factor can be the high pression of marine birds which are extremely abundant along SW Spitsbergen coasts (Stempniewicz and Węsławski, in press).

Similar set of species — predomination of small littoral fishes from the families Cottidae and Liparidae was reported from other coastal Arctic regions (Jensen 1948, Andriašev 1964, Craig et al. 1985).

The distribution of pelagic fishes in Spitsbergen area is well correlated with climatic and hydrographic conditions and their changes in recent years. Namely the increasing inflow of Atlantic waters reported by Blacker (1957) has brought common observations of *Clupea harengus* larvae and juveniles along West Spitsbergen. This species was not observed along Spitsbergen until 1932 (Iversen 1934), rarely found in 1950—1960 (Hognestadt 1963) and noted more commonly in last years even in fjord areas.

In conclusion it is possible to state that among fishes of Hornsund only *Myoxocephalus scorpius*, *Liparis liparis* and *Lumpenus lampraeteformis* were found to form a permanent share in the community of the fjords biocenose, whereas other species are more or less off coast forms (*Boregadus saida*, *Clupea harengus*), freshwater species (*Salvelinus alpinus*) or rarely occurring littoral species like *Triglops pingeli*, *Icelus bicornis*, *Eumicrotremus spinosus*. As prey object for marine birds the most important are *Boreogadus saida*, *Gadus morrhua*, *Careproctus reinhardti* and *Benthosema glaciale*.

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Streszczenie

W czasie prowadzenia różnorodnych prac biologicznych w Hornsundzie zebrano 14 gatunków ryb litoralnych. Najpospolitszym gatunkiem był *Myoxocephalus scorpius*, znajdowany w strefie fytalu na głębokości 2—30 m. Odżywiał się głównie Polychaeta i Gammaridea,

sam zaś stanowił pokarm foki obrączkowanej i mew trójpalczastych. Inne gatunki ryb reprezentowane były mniej licznie; wśród nich najważniejszą rolę w Hornsundzie odgrywa dorszyk polarny (*Boreogadus saida*), należący do podstawowych składników pokarmu większości ptaków morskich tego rejonu. Stwierdzono na podstawie pomiarów otolitów znajdowanych w żołądkach ptaków, że nurzyki (*Uria lomvia*) odżywiają się mniejszymi osobnikami, niż mewy trójpalczaste (*Rissa tridactyla*), a wśród wszystkich analizowanych ptaków niewiele tylko żerowało na dorosłych osobnikach *Boreogadus saida*. Inne, znajdowane w Hornsundzie gatunki ryb to: *Lumpenus lampraeteformis*, *Salvelinus alpinus*, *Eumicrotremus spinosus*, *Clupea harengus*, *Anarchichas* sp., *Icelus bicornis*, *Triglops pingeli*, *Reinhardtius hippoglossoides*, *Liparis liparis* oraz stwierdzone na podstawie obecności otolitów w żołądkach ptaków: *Gadus morrhua*, *Benthosema glaciale* i *Careproctus reinhardti*.