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## A survey of benthic gastropods of South-West Svalbard coastal waters

**ABSTRACT:** Benthic gastropods (45 taxa) inhabiting 11 coastal areas of South-West Svalbard are listed. The dominant species are indicated; frequency of occurrence of various gastropods in different areas is discussed.

**Key words:** Arctic, Svalbard, benthic gastropods.

### Introduction

The Norwegian archipelago of Svalbard is located between 74 and 81°N and between 10 and 35°E. The surface circulation in the region is substantially affected by the Warm West-Spitsbergen Current and the cold Sørkapp Current. Due to their bottom topography, nature of their coastline and hydrography, the south-west coasts of Svalbard are regarded as a region having the most complex environmental conditions in the whole Barents Sea basin. The Svalbard hydrography was treated by many authors (e.g. Lee 1952, Tantsura 1959, Swerpel 1985).

In addition to amphipods (Węśławski 1983, unpubl.), polychaetes (Gromisz, unpubl.) and bivalves (Różycki 1987a, unpubl.), gastropods are the most important constituents of coastal benthic communities of Svalbard.

Data on the gastropod fauna of the region were collected in the past during numerous expeditions and reported by Mörch (1869), Friele (1879), Krause (1892), Knipovich (1901), Hägg (1905) and Odhner (1915). More recent data are lacking except for those in Gulliksen, Holte and Jakola (1985) who discussed 7 gastropod species against the background of the soft bottom fauna of Raudfjorden and Van Mijenfjorden. Moreover, papers on skerry benthic communities (Różycki and Gruszczyński 1981), *Laminaria-*

-associated fauna (Różycki and Gruszczyński 1986) and Van Keulenfjorden macrobenthic assemblages (Różycki 1987b) have dealt with some gastropods of Svalbard as well.

The present work gives a preliminary description of gastropod fauna composition, domination and frequency of occurrence in 11 coastal areas of Svalbard.

## Material and methods

Data for studies on the occurrence, species composition, distribution and ecology of molluscs in coastal waters of South-West Svalbard were collected during Polish polar expeditions within 1977—1985. Table 1 summarizes information on materials collected. A total of 249 stations visited yielded 360 samples containing 4,479 gastropod specimens (empty shells were disregarded). The samples were collected mostly with bottom dredges and Ekman and Van Veen samplers. Additionally the following auxiliary techniques were used as well:

- 1) manual collection of gastropods from the skerry intertidal (Różycki and Gruszczyński 1981),
- 2) SCUBA diving and anchor dredging of *Laminaria*-associated fauna (Różycki and Gruszczyński 1986),
- 3) digging with a shovel to obtain materials for quantitative studies on Arctic estuarine fauna (Różycki and Gruszczyński, unpubl.).

Table 1

List of collected materials

area	number of stations	number of samples	gear sampling	number of specimens
Van Keulenfjorden	7	40	dredge	148
Isfjellbukta	5	5	dredge	7
Skoddebukta	44	44	dredge	933
Nottinghambukta	64	64	dredge, Ekman's samples, manual, anchor, shovel	452
Hyttevika	8	16	diving, manual, anchor	815
Steinvikå	5	15	manual, anchor	531
Hornsund (offshore)	48	58	dredge, van Veen's sampler	675
Isbjørnhamna	10	60	dredge, van Veen's sampler	447
Brepollen	44	44	dredge, van Veen's sampler	66
Gashamna	10	10	dredge	392
Sommergeldbukta	4	4	dredge	13

## Results

The samples collected from 11 coastal areas of South-West Svalbard (Fig. 1) were found to contain 45 gastropod taxa: 42 species and 3 genera were identified. The list of species is presented in table 2. Six species (*Acmaea virginea*, *Calliostoma formosa*, *Hydrobia ulvae*, *Onoba globulus*, *Nucella lapillus* and *Trophonopsis* sp.) are new for the Svalbard waters.

The species identified belong to two subclasses: the Prosobranchia and the Opisthobranchia. Prosobranchs are represented by 41 taxa belonging to 17 families of 3 orders, while 4 taxa belonging to 2 families from 1 order represent the Opisthobranchia.

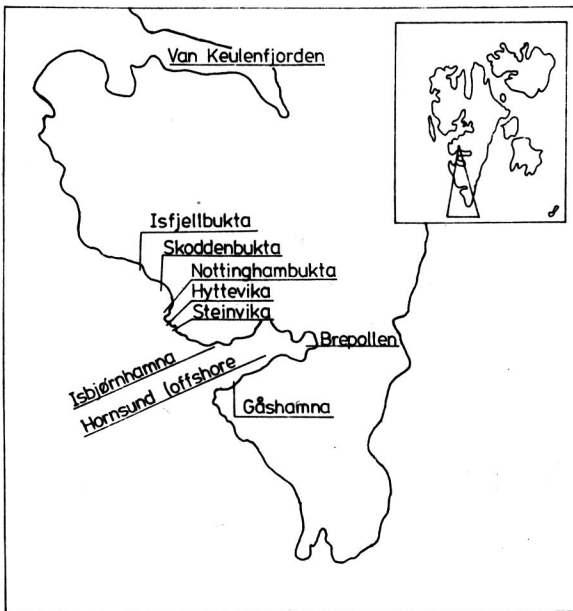


Fig. 1. Investigated fjords and bays at the south-western coasts of Svalbard Archipelago

Figure 2 shows the contribution of various taxa of the gastropod fauna and the role of dominant species. A dominant was a species contributing more than 5% of all the specimens collected. A total of 75.2% of all specimens examined belonged to 6 most abundant species among which *Margarites groenlandicus* (Prosobranchia) and *Cylichna alba* (Opisthobranchia) contributed 39.4% and 9.1% of all specimens, respectively.

The Prosobranchia are a dominant group (89.3% of the fauna); among them the Archeogastropoda (9 species), including *M. groenlandicus*, the most abundant species, contributed 48.0% to the fauna. The most diverse order



Sowerby, 1829)	6							6
<i>Natica clausa</i> Broderip et Sowerby, 1829	44		24		23			91
NEOGASTROPODA								
Muricidae								
<i>Nucella lapillus</i> (Linné, 1758)	2				1	4		7
<i>Trophonopsis clarthratus</i> (Linné, 1767)							12	12
Columbellidae								
<i>Astyris rosacea</i> (Gould, 1840)	38	42		1			28	109
Buccinidae								
<i>Buccinum angulosum</i> Gray, 1839	8							8
<i>Buccinum cyaneum</i> Bruguière, 1792	2			7				9
<i>Buccinum glaciale</i> Linné, 1761		9						9
<i>Buccinum hydrophanum</i> Hancock, 1846	13			22				35
<i>Buccinum scalariforme</i> Möller, 1842				9	19		10	38
<i>Buccinum undatum</i> Linné, 1758	3	24		4				31
<i>Buccinum undulatum</i> Möller, 1842		27		11		12		50
<i>Buccinum</i> spp.			1	6				7
<i>Colus latericeus</i> (Möller, 1842)				17				17
<i>Volutopsius deformatis</i> (Reeve, 1847)	1							1
<i>Volutopsius norvegicus</i> (Gmelin, 1791)							9	9
Cancellariidae								
<i>Admete viridula</i> (Fabricius, 1780)				9				9
Turridae								
<i>Oenopota decussata</i> (Cauthouy, 1839)		262						262
<i>Oenopota harpularia</i> (Cauthouy, 1839)		35		15				50
<i>Oenopota nobilis</i> (Möller, 1842)		139						139
<i>Oenopota pyramidalis</i> (Ström, 1768)		23		11		10		44
<i>Oenopota violacea</i> (Mighels et Adams, 1842)		12						12
<i>Oenopota</i> spp.							3	3
OPISTHOBRANCHIA								
PYRAMIDELLOMORPHA								
Retusidae								
<i>Retusa obtusa</i> (Montagu, 1803)	3			5	1			9
Scaphandridae								
<i>Cylichna alba</i> (Brown, 1827)	60	124	55	4	101	28	27	399
<i>Cylichna occulta</i> (Mighels et Adams, 1842)		26	3	1	22			52
<i>Cylichna</i> spp.		3						3

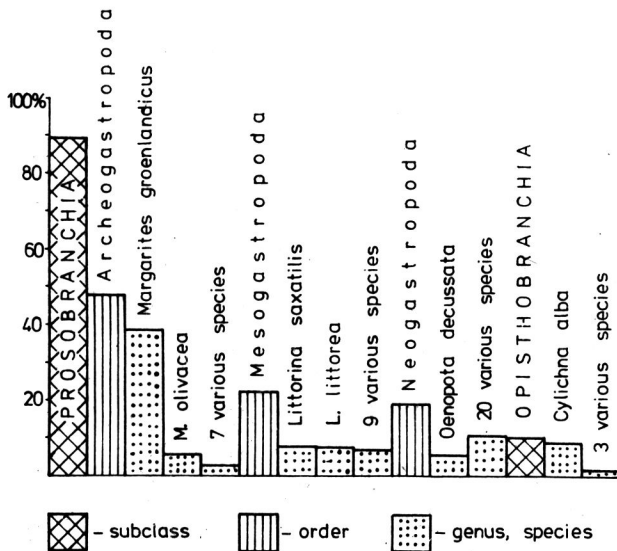


Fig. 2. The share of particular taxonomic units and dominant species in the gastropod fauna of south-western coasts of Svalbard Archipelago

was Neogastropoda, represented by 21 taxa and contributing 19.1% to the fauna, the lowest contribution among prosobranchs.

The distribution of species among the areas studied was as follows: Van Keulenfjorden yielded 8 species; Isfjellbukta 1 species; Skoddebukta 22 species; Nottinghambukta 8 species; Hyttevika and Steinvika 6 species each; open Hornsund waters 22 species; Isbjornhamna 8 species; Brepollen 4 species; Gashamna 14 species; and Sommerfeldbukta 2 species.

The species differed in their frequency of occurrence in the areas sampled. The gastropods may be grouped in the following way:

- 1) very common species, recorded from 7—11 areas (*M. groenlandicus* and *C. alba*);
- 2) common species, found in 5—6 areas (*Margarites olivacea*);
- 3) frequent species, inhabiting 3—4 areas (*Onoba globulus*, *O. mighelsi*, *Natica clausa*, *Nucella lapillus*, *Astyris rosacea*, *Buccinum scalariforme*, *B. undatum*, *B. undulatum*, *Oenopota pyramidalis* and *Cylichna occulta*).

Among the remaining species 8 were rare, recorded in 2 areas, and 18 were sporadic, found in 1 area only. Most gastropod species collected in the coastal waters of Svalbard belong to two latter categories and together make up 62% of all the taxa identified.

It is worth noticing that some of the rare and sporadic species (*Littorina littorea*, *L. saxatilis*, *Turritellopsis acicula*, *Oenopota decussata* and *O. nobilis*) occurred in relatively abundant populations. On the other hand,

abundantly occurring were also such very common species as *Margarites groenlandicus*, *M. olivacea* and *Cylichna alba*.

## Discussion

The authors mentioned in the Introduction differ in their estimates of gastropod species richness in Svalbard waters, the numbers given ranging from 35 (Hägg 1905) to 87 (Odhner 1915); the species lists reported are in many instances different as well.

The differences may have been brought about by certain objective (natural causes). The collections described were made within a time span of 150 years; the first systematic collection of Svalbard molluscs dates back to 1838 (Mörch 1869). Changes in hydrography that had taken place over the 150 years must have affected the composition of the fauna. A convincing picture of changes in the species composition and ranges of warm- and cold-water constituents of the Svalbard's west coast benthic fauna during the last 100 years is presented by Blacker (1965) and Dyer et al. (1984).

Another set of reasons which can be invoked to explain differences in various species lists published could be termed subjective. They include:

- 1) different collection techniques and tools;
- 2) different number of samples examined;
- 3) erroneous identifications;
- 4) taxonomic synonymy.

After a taxonomic revision of the earlier species lists, based mainly on papers by Macpherson (1971) and Høisaeter (1986), the total number of gastropod species inhabiting the Svalbard coastal waters should be set at 61. The 6 already mentioned species new for the region raise that figure to 67, out of which the presence of 55 species has been confirmed.

The materials collected are still inadequate because, while certain areas were intensively studied, other received little attention (see tab. 1). Moreover, the results obtained may be biased, particularly with respect to the rare and sporadic species and to those represented by low numbers of specimens (see tab. 2). In view of these reservations, the results presented can be only a starting point to further analyses of coastal Svalbard biota.

My most sincere thanks are due to Dr. J. M. Węślawski of the Institute of Oceanology, Polish Academy of Sciences, Sopot, for collecting a substantial number of samples. I thank the Directors of Institute of Oceanography, Gdańsk University and Institute of Oceanology, Polish Academy of Sciences for placing the materials at my disposal, which has made this study possible.

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Received May 14, 1988

Revised and accepted February 5, 1989



## Streszczenie

Materiały do badań (tab. 1) zbierano w latach 1977—1985, w przybrzeżnych wodach środkowo- i południowo-zachodniego Svalbardu (rys. 1). Łącznie zebrano 4479 osobników ślimaków, których pełny wykaz przedstawiono w tab. 2. W badanym materiale grupę dominującą stanowią przedstawiciel Prosobranchia — 41 taksonów i 89,3% wszystkich zebranych okazów. Udział 5-ciu najliczniejszych gatunków: *Margarites groenlandicus*, *M. olivacea*, *Littorina saxatilis* i *L. littorea* (Prosobranchia) oraz *Cylichna alba* (Opisthobranchia) wynosił 75,2% (rys. 2).

W poszczególnych akwenach notowano występowanie od 1 (w Isfjellbukta) do 22 gatunków ślimaków (w otwartych wodach Hornsundu i Skoddebukta). Pod względem frekwencji oznaczone gatunki podzielono na 5 grup: bardzo pospolite (występujące w 7—11 akwenach — 2 gatunki), pospolite (występujące w 5—6 akwenach — 1 gatunek), częste (występujące w 3—4 akwenach — 10 gatunków), rzadkie (występujące w 2 akwenach — 8 gatunków) oraz występujące sporadycznie (notowane tylko w 1 akwenie — 18 gatunków). Wśród ślimaków zebranych w przybrzeżnych wodach Svalbardu najwięcej jest gatunków rzadko i sporadycznie spotykanych, stanowią one bowiem 62% wszystkich oznaczonych taksonów.