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Macrofauna associated with laminarians in the coastal waters of West Spitsbergen

ABSTRACT: The paper describes the communities of laminarians and their macrofauna at the western coasts of Spitsbergen. The following aspects are considered: specific composition of fauna, spatial distribution of animals within the algae, trophic structure of fauna associated with the laminarians. Some zoogeographic remarks are included.

Key words: Arctic, Spitsbergen, phytal, benthos.

1. Introduction

Faunistic and ecological descriptions of the biocenosis of the Spitsbergen littoral zone are still very scarce. Some most recent papers to be mentioned are those by Gromisz (1983), Legeżyńska et al. (in press) and Różycki (in press). There are also some works devoted to particular species, such as: *Balanus balanoides* (Feyling-Hansen 1953) or particular animal groups like Amphipoda (Węsławski 1983, unpubl. data) or Bivalvia (Różycki 1984, unpubl. data). A rocky littoral zone of these coasts was described by Różycki and Gruszczyński (1981).

The epifauna associated with algae has been already well investigated and described in other regions, such as Denmark (Hagerman 1966), Ireland (Seed and Boaden 1977, Shin 1981), USA (Gunnill 1983) or Australia (Fletcher and Day 1983). On the other hand, works devoted to the fauna of this habitat from the coasts of the Arctic Zone are lacking except of the work of Thorson (1933), in which, however, the author has presented a rather fragmentary description of the epifauna associated with *Desmarestia*, *Fucus* and Rhodophyta. In the waters of East Greenland. Ockelman (1958) distinguished the epifauna of the vegetation as a separate, one of three groups of the epifauna.

2. Study area and collecting methods

Studies were conducted in August 1980, in the area of the Nottinghambukta, Hyttevika and Steinvika Bays. These bays are situated at the western coasts of Spitsbergen, to the north from the Hornsund Fiord. The study area is presented in Fig. 1.

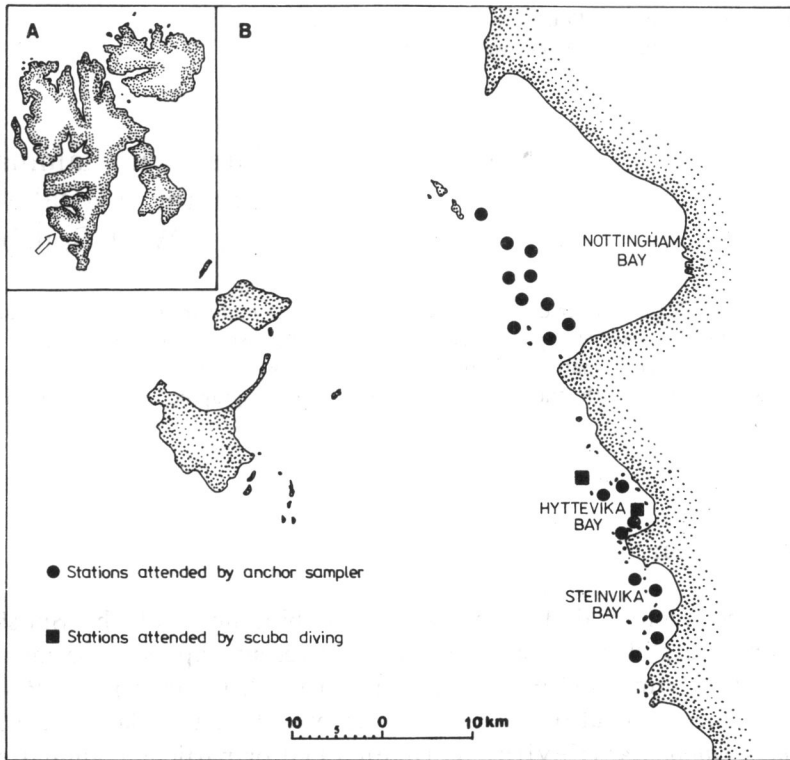


Fig. 1. Study area A. Outline of the Svalbard Archipelago with the study area marked with an arrow. B. Fragment of the western coast of Spitsbergen (one of the island of the archipelago) with sampling localities in the laminarian zone in the region of the Nottinghambukta, Hyttevika and Steinvika Bays.

2.1. Characteristics of the study area

Three studied bays are situated in a very interesting area from the hydrobiological point of view. This results from the fact that the south-western coasts of Spitsbergen are situated in the area in which warm, Atlantic water of the West Spitsbergen current mixes with cold, Arctic water of the East Spitsbergen current (Swerpel and Węśławski 1983, Węśławski and

Kwaśniewski 1983). The cooccurrence in the area of water masses of various origin exerts influence upon the diversity of the fauna.

Nottinghambukta is an Arctic estuary, reaching in its western limits, a maximal depth of 2–2.5 m. The bottom is rocky, covered with muddy sediments. In summer the mean temperature reaches the values of 4–6°C resulting from the mixing of surface water masses of a temperature of 2–5°C and fresh waters of land origin of a temperature of 1.5–2.5°C. Salinity is 15–20‰ on the average and depends upon the amounts of fresh waters flow into the sea (Legeżyńska et al., in press). Annual temperatures at the bottom of the bay range from –1.9 to +8.0°C (Moskal and Zajączkowski, unpubl data).

The Hyttevika and Steinvika Bays constitute quite similar habitats. The bottom is rocky; the bays attain maximal depth of 4–6 m. In summer, hydrological conditions are formed by such factors as sun radiation, tidal phenomena and in flow of small, numerous streams fed by melting snow and ice.

2.2. General characteristics of the hydrodynamics of the community of laminarians

Hydrodynamics is the main, complex factor among the abiotic factors which may influence the association connected with the zone of laminarians.

In the discussed bays the wave action of the sea is to a large extent eliminated by the Dünoyane Islands and by the belts of skerries. In the Nottinghambukta, during storms the wave height reaches only 30 cm (Legeżyńska et al., in press). We did not observe any noticeable displacement of bottom sediment that could damage benthic assemblages (Perkins 1976).

The tidal currents may be most important. In the Nottinghambukta they may reach $18 \text{ cm} \cdot \text{s}^{-1}$ (Legeżyńska et al., in press), whereas in the Hyttevika and Steinvika Bays they are much weaker.

2.3. Material

The material was obtained using an anchor with 4 arms; algae were drawn out together with stones to which they were fixed, and all animals from the stones, from the thalli of algae and from rhizoids were collected. We have analysed only the satisfactory hauls, i.e. those in which at least 5 large thalli of algae were caught, which happened in about 60–75% of the cases. In other hauls, less thalli were caught or there occurred catches in which there were no algae at all.

Additionally, in two localities in the Hyttevika Bay, 2 samples were collected by diving. These samples, containing 2 large laminarians each, were covered in the water with polyethylene bags, in order to eliminate the possibility of escaping of vagile animals.

A total of 59 samples were collected: 30 in the Nottinghambukta Bay (10 localities 3 samples each), 14 in the Hyttevika Bay (4 localities 3 samples each plus samples from diving) and 15 in the Steinvika Bay (5 localities 3 samples each). The material was sieved on sieves with 1 mm meshes, preliminarily segregated and then preserved in a 4% formalin.

3. Results

3.1. Vegetation

The hard bottom of the investigated bays: Nottinghambukta, Hyttevika and Steinvika, was covered with abundant vegetation, consisting mainly of brown algae (Phaeophyta) and scarce small Chlorophyta. A list of all large algae is presented in Tab. I. *Laminaria saccharina* and *Alaria esculenta*

Table I

Brown algae overgrowing the rocky bottom at the west coasts of Spitsbergen

Species	Nottinghambukta	Hyttevika	Steinvika
FUCACEAE			
<i>Fucus</i> sp.	++	-	-
LAMINARIACEAE			
<i>Laminaria saccharina</i> Lam.	+++	+++	+++
<i>Laminaria digitata</i> Lam.	+	++	+
<i>Alaria esculenta</i> (Grey)	+	+++	++
<i>Phyllaria dermatodea</i> (De la Pyl)	-	++	+

+++ — very abundant

++ — abundant

+ — rare

- — absent

are the two species dominating among the brown algae. Laminarians occurred in a density of about 5—10 clumps per 1 m². Less frequently we observed single specimens of these algae or their more dense aggregations. The thalli of the largest algae reached about 1.8 m in length.

3.2. Fauna composition

In bushes of laminarians overgrowing the bottom of the three bays we have recorded 54 invertebrate taxa and one fish taxon. A list of all animals associated with laminarians is presented in Tab. II. The group

Table II

Macrofauna associated with the laminarian zone in the coastal waters of West Spitsbergen

Species	Zoogeogr. form	Trophic group
1	2	3
CALCAREA		
<i>Amphoriscus glacialis</i> (Haeckel)	bor.-Arct.	suspension feeder
<i>Grantia compressa</i> (Fabricius)	bor.-Arct.	..
<i>Leucosolenia complicata</i> (Montagu)	bor.-Arct.	..
HYDROZOA		
<i>Sertularia tenera</i> G. Sars	bor.-Arct.	suspension feeder
ANTHOZOA		
<i>Actinia equina</i> (Linnaeus)	bor.	predator
<i>Edwardsia finmarchica</i> Calgren	bor.-Arct.	..
POLYCHAETA		
<i>Spirorbis spirillum</i> (Linnaeus)	Arct.-bor.	suspension feeder
<i>Euchone analis</i> (Kröyer)	Arct.	..
<i>Euchone papillosa?</i> (M. Sars)	Arct.-bor.	suspension feeder
<i>Amphitrite cirrata</i> O. F. Müller	Arct.-bor.	..
<i>A. birulai</i> Soloviev	Arct.	detritus feeder
<i>Nainereis quadricuspida</i> (Fabricius)	Arct.-bor.	predator
<i>Flabelligera affinis</i> M. Sars	Arct.-bor.	..
<i>Lepidonotus squamatus</i> (Linnaeus)	bor.	detritus feeder
<i>Harmothoe imbricata</i> (Linnaeus)	Arct.-bor.	..
<i>H. rarispina</i> (M. Sars)	Arct.-bor.	..
<i>Eusyllis monilicornis</i> Malmgren	Arct.-bor.	..
<i>Nereis pelagica</i> Linnaeus	bor.	..
PANTOPODA		
<i>Phoxichilidium femoratum</i> (Rathke)	Arct.-bor.	predator
CRUSTACEA		
<i>Gammarellus homari</i> (Fabricius)	bor.	predator
<i>Caprella septentrionalis</i> Kröyer	bor.	predator + scavenger
<i>Anonyx sarsi</i> Steele et Brunel	Arct.-bor.	..
<i>Ischyrocerus anguipes</i> (Kröyer)	bor.	detritus feeder
<i>Caliopius laevisculus</i> (Kröyer)	bor.	detritus feeder
<i>Gammarus oceanicus</i> Segerstråle	bor.-Arct.	predator
<i>Gammarus</i> sp. juv.		
<i>Pleusymtes glabroides</i> (Dunbar)	bor.-Arct.	predator
<i>Weyprechtia pinguis</i> (Kröyer)	Arct.	..
<i>Hyas coarctatus</i> Leach	bor.-Arct.	predator + scavenger
GASTROPODA		
<i>Margarites groenlandicus</i> (Gmelin)	Arct.-bor.	grazer
<i>M. olivacea</i> (Brown)	Arct.-bor.	..
<i>Buccinum cyaneum</i> Bruguiere	bor.-Arct.	predator
<i>Lepeta coeca</i> (Müller)	Arct.-bor.	grazer
<i>Cingula castanea</i> (Müller)	bor.-Arct.	..
<i>Acmaea virginea</i> (Müller)	bor.	..

	1	2	3
BIVALVIA			
<i>Hiattella arctica</i> (Linnaeus)		bor.-Arct.	suspension feeder
<i>Musculus corrugatus</i> (Stimpson)		Arct.	..
<i>M. laevigatus</i> (Gray)		bor.-Arct.	..
<i>M. niger</i> (Gray)		bor.-Arct.	suspension feeder
<i>Astarte</i> sp.			..
BRYOZOA			
<i>Eucratea loricata</i> (Linnaeus)		Arct.-bor.	suspension feeder
<i>Retepora cellulosa</i> (Linnaeus)		Arct.-bor.	..
<i>Cribilina annulata</i> (Fabricius)		Arct.-bor.	..
<i>Tegella spitsbergensis</i> (Bidenkap)		Arct.-bor.	..
<i>Electra pilosa</i> (Linnaeus)		Arct.-bor.	..
<i>E. crustulenta</i> Borg		Arct.	..
<i>Tricellaria ternata</i> (Ellis et Solander)		Arct.-bor.	..
<i>Lichenopora verrucaria</i> (Fabricius)		bor.-Arct.	..
<i>L. hispida</i> (Fleming)		Arct.-bor.	..
<i>Diplosolen obelia</i> (Waters)		bor.-Arct.	..
<i>Flustra foliacea</i> (Linnaeus)		bor.	..
<i>Oncousoecia canadensis</i> Osburn		Arct.	..
<i>Alcyonidium disciforme</i> Sm.		Arct.	..
HOLOTHURIOIDEA			
<i>Elpidia glacialis</i> Théel		Arct.	suspension feeder
PISCES			
<i>Myoxocephalus</i> sp. juv.			predator

of Bryozoa was richest in species (13); they were followed by Polychaeta (12) and Amphipoda (9). Other groups of animals were represented by a lower number of species. The epifauna connected with laminarians is formed both by sessile and vagile forms.

Among animals associated with macrophytes there are representatives of various groups of consumers (Tab. II); their mutual proportions are

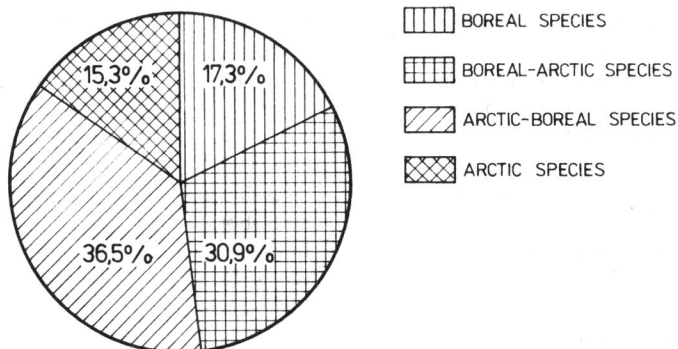


Fig. 2. Trophic diversity of the fauna associated with laminarians.

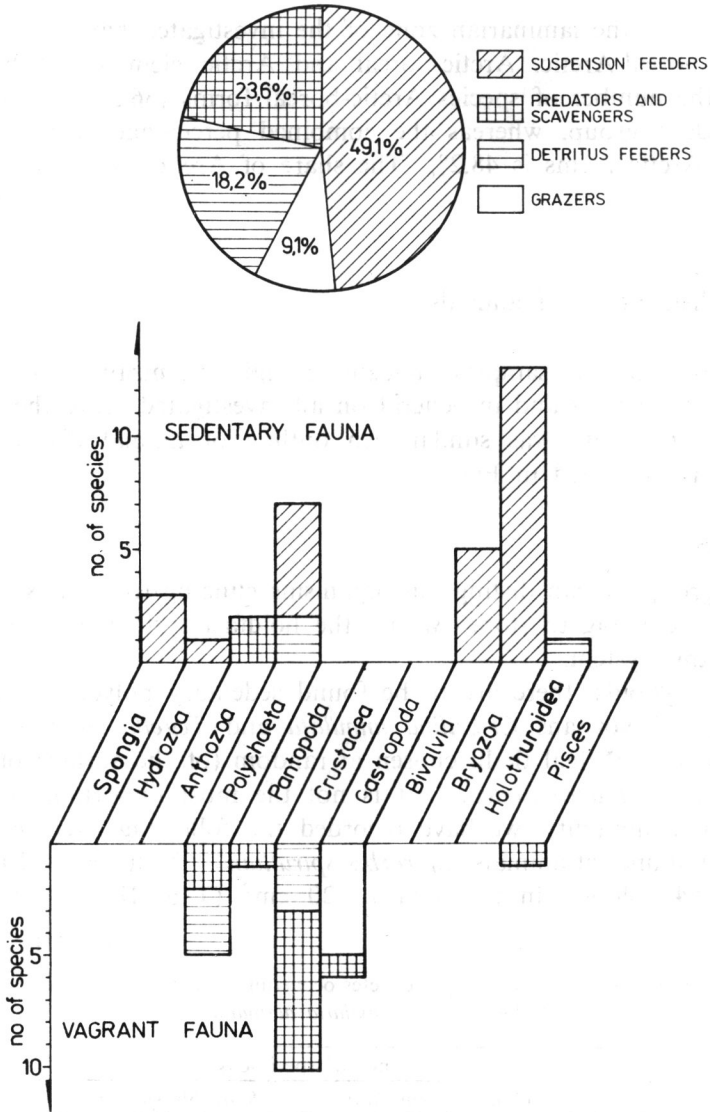


Fig. 3. Zoogeographic composition of the macrofauna from the laminarian zone of the western coasts of Spitsbergen.

presented in Fig. 2. Almost all animals clinging to the surface of algae and stones are sessile filtrators. They are represented mainly by sponges, *Bryozoa* and molluscs. In respect to number of species, the necrophagous and predatory animals, which are represented mainly by some amphipods, crabs snails (*Buccinum cyaneum*), polychaetes, actinians and fish of the genus *Myoxocephalus*. Herbivorous grazers are represented by 5 species of snails.

The fauna of the laminarian zone of the investigated bays is represented by boreal, boreal-Arctic, Arctic-boreal and Arctic elements (Tab. II). In respect to the number of species Arctic-boreal forms (36.5%) constitute the most abundant group, whereas the combined percentage share of boreal and boreal-Arctic forms is 48.2%. The share of Arctic forms is the lowest (Fig. 3).

3.3. Microdistribution of animals

An analysis of our samples indicates a high organization of the fauna inhabiting laminarians and in general on all investigated algae the structure of animal community was similar. An outline of animal distribution on algal thalli is presented in Fig. 4.

Sessile benthos

In this group we can distinguish organisms clinging to various fragments of algae and clinging to stones within the holdfast system of algae as well as outside this system.

On the phylloids, there are to be found sedentary polychaetes *Spirorbis spirillum* and bryozoans *Cribrilina annulata* and *Tegella spitsbergensis*. In seven fragments of algal thalli chosen at random (of the surface of 20 cm² each) of *Phyllaria dermatodea*, that is not the most important component of this algal community, we have recorded the following average densities of two most abundant animals: *Spirorbis spirillum* — 20 tubes, and *Cribrilina annulata* — 54 colonies in the area of 20 cm² (Tab. III). Animals most

Table III

Density of bryozoans and polychaetes occurring in an area of 20 cm² of the thalii of *Phyllaria dermatodea*

no. of area	no. of specimens	
	<i>Cribrilina annulata</i>	<i>Spirorbis spirillum</i>
1	125	25
2	19	21
3	77	14
4	21	22
5	65	15
6	18	27
7	54	19
mean	54	20

frequently attached to cauloids were two species of Bryozoa, *Electra pilosa* and *Retepora cellulosa*. Colonies of the latter species most frequently ring-like envelop the cauloids of *Laminaria digitata*. Similarly to cauloids, rhizoids

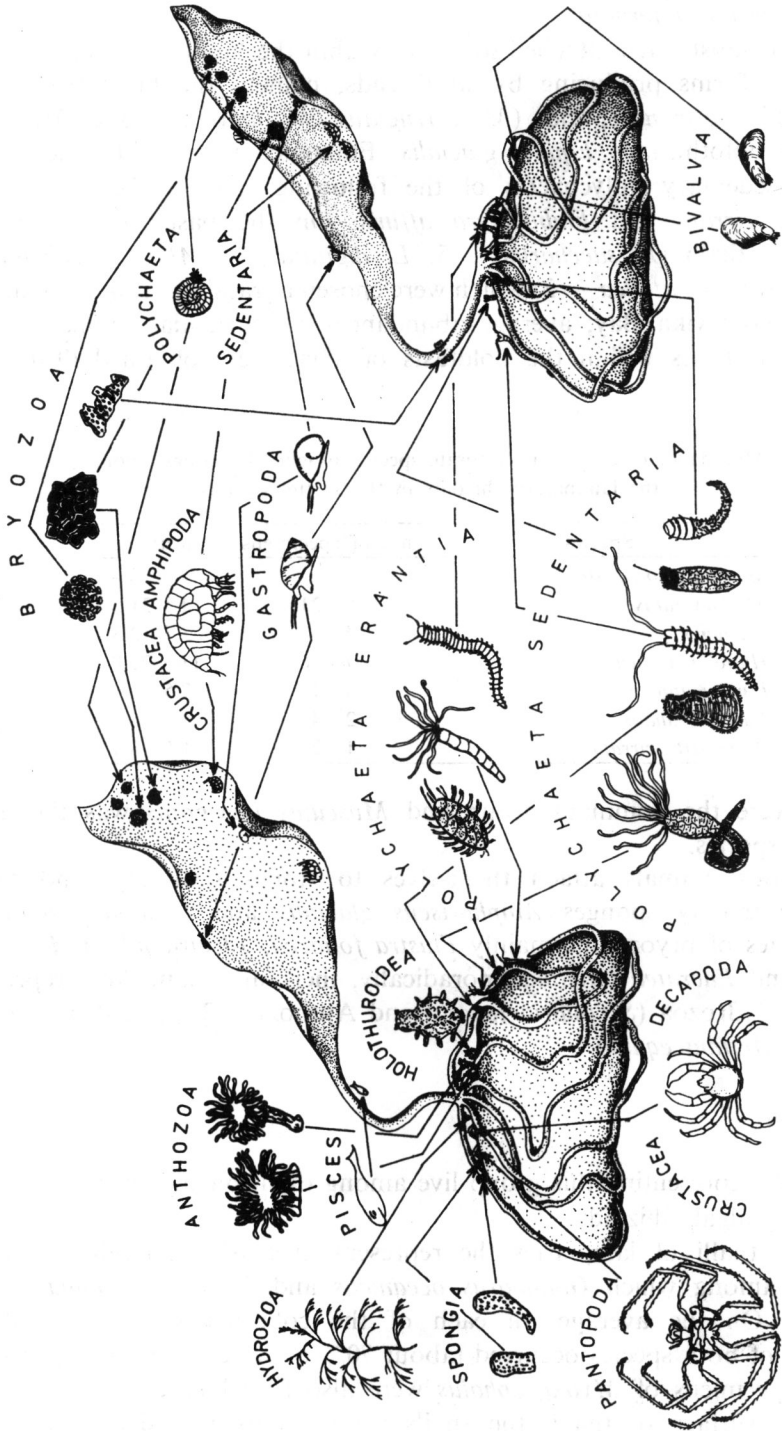


Fig. 4. Sketch of the distribution of various animals on the laminarians.

are overgrown by bryozoans: *Lichenopora verrucaria*, *Oncousoecia canadensis* and *Tricellaria ternata*.

Animals most often attached to stones within the holdfast system of algae are mainly forms producing byssal threads, namely the bivalves *Hiatella arctica* and *Musculus* species (*M. corrugatus*, *M. laevigatus* and *M. niger*) as well as holothurians *Elpidia glacialis*. Entangled in rhizoids, there were tubes of sedentary polychaetes of the following species: *Euchone analis*, *Amphitrite cirrata* and *Flabelligera affinis*. On the basis of an analysis of 17 algal thalli (*L. saccharina* — 5, *L. digitata* — 4, *Alaria esculenta* — 5 and *Phyllaria dermatodea* — 2) which were chosen at random from the material from the Hyttevika Bay, average abundances of particular animal species attached to stones within the holdfasts of algae were obtained (Tab. IV).

Table IV
Abundance of chosen invertebrate species attached to stones among the laminarian rhizoids in the Hyttevika Bay

Species	no. of specimens	mean %
<i>Musculus corrugatus</i>	1—4	2.5 5.4
<i>M. laevigatus</i>	8—21	14.5 31.5
<i>M. niger</i>	4—7	5.5 12.3
<i>Hiatella arctica</i>	7—16	11.5 25.0
<i>Elpidia glacialis</i>	4—11	7.5 16.3
<i>Euchone analis</i>	2—4	3.0 6.5
<i>Amphitrite cirrata</i>	1—2	1.5 3.0

Bivalves were the dominant group and *Musculus laevigatus* was the most abundant species.

Numerous animals attach themselves to stones near algal holdfasts. These are mainly sponges *Amphoriscus glacialis* and *Grantia compressa*, many species of bryozoans, mainly *Flustra foliacea*, *Electra pilosa*, *Retepora cellulosa* and *Eucratea loricata*. Sporadically, there are found here representatives of Hydrozoa (*Sertularia tenera*) and Anthozoa (2 species) with more often met *Actinia equina*.

Herpobenthos

Animals representing this group live among thalli on the surface of thalli and among algal rhizoids.

Among thalli of laminaries the representatives of 7 amphipod species occurred, among which *Gammarus oceanicus* and *Gammarus homari* were dominant. On the average, in each of the collected samples about 75 specimens of both species occurred (about 70% of which were *G. oceanicus*). Juvenile specimens of *Myoxocephalus* were also found here.

On the surface of thalli, the snails were mainly recorded (5 species).

with *Margarites groenlandicus* being the dominant one. On single thalli of all 4 species of laminarians snails occurred in numbers ranging from 28 to 73 and they were mainly juveniles. A rather characteristic crustacean living on algal thalli was the amphipod *Caprella septentrionalis*. In the whole collected material this species was recorded on the average in 3–4 specimens per each laminarian thallus.

Among algal rhizoids, vagile polychaetes (Errantia), were mainly recorded, the most abundant being *Harmothoe imbricata* (on the average there were 7 specimens of this species per 1 laminarian thallus). Sporadically, in the algal holdfast crabs (*Hyas coarctatus*) and pycnogonids (*Phoxichilidium femoratum*) were recorded.

4. Discussion

At the West Spitsbergen shores laminarian zone begins at a depth of 2–3 m, and its lowest limit extends down to about 15 m (Węśławski 1978). Brown algae, *Laminaria digitata*, *L. saccharina*, *Alaria esculenta* and *Phyllaria dermatodea*, which overgrow shallow (2–6 m) bottom of the Nottinghambukta, Hyttevika and Steinvika Bays, are typical macrophytes inhabiting the rocky coasts of the Spitsbergen Archipelago (Svendsen 1959). These algae constitute habitat for diversified fauna, mainly invertebrates.

In the investigated bays the epifauna of the laminarian zone is formed by animals belonging to 11 classes; 55 taxa were recorded with bryozoans, polychaetes and amphipods being the richest groups. Bryozoans are widespread in Arctic waters, they frequently constitute the main component of benthos (Gostilovskaja 1978). At the coasts of Jan Mayen Island Bryozoa and Amphipoda were the most conspicuous animal components in macrophyte communities of the rocky bottom (Gulliksen 1974). Amphipods belong to the most abundant invertebrates of the Arctic littoral. According to the recent studies of Węśławski (1983, unpubl. data) in the coastal waters of south-western Spitsbergen 47 species of Amphipoda were recorded. In the present study the following amphipod species were dominant: *Gammarus oceanicus* and *Gammarellus homari*, whereas according to Węśławski (1978), among Amphipoda inhabiting laminarians of the Isbjörnhamna Bay (South-Western Spitsbergen) the following species were dominant: *Ischyrocerus anguipes* (60–90%) and *Gammarellus homari* (4–5%); less abundant were: 1) among thalli: *Onisimus littoralis*, *Gammarus oceanicus* and *G. setosus*, and 2) at the bases of laminarians: *Anonyx nugax*, *Paroediceros lynceus*, *Onisimus edwardsii* and *Tmetonyx autus*. This author mentioned also that most of Amphipoda escape the fishing gears. In the littoral of the Bear Island, Christiansen (1965) recorded mainly *Hydrozoa* on the thalli of

Laminaria, *Alaria* and *Fucus*, in our study at Spitsbergen shores of this group only *Sertularia tenera* was recorded.

Due to the abundance and size of specimens bivalves occurring among the rhizoids of algae constitute an important group of the epifauna. In respect to abundance the following species are dominant: *Musculus laevigatus* and *Hiatella arctica*, which was already observed by Różycki (unpubl. data). Both the above mentioned species as well as *Mya truncata*, constituted the main animal component of the laminarian community of *Desmarestia* at eastern coasts of Greenland (Thorson 1938). According to Stanley (1970) 3 species of the genus *Musculus*, found in our materials, inhabit mainly the rhizoids of laminarians. We have observed that the specimens of *Hiatella arctica* were most frequently rooted into the holdfast system of laminarians, and the shells of majority of specimens were much deformed due to growing among the rhizoids. The attaching of these bivalves to stones with byssal threads was rarely observed.

The lack of the amphipod *Gammarus setosus* in our material can be explained by its possible escape during fishing; in the region of the Van Keulen Fjord (West Spitsbergen), in the phytal zone this species was very abundant (Różycki, in press). In the epifauna of the laminarian zone of our study the absence of barnacles (Cirripedia), *Balanus balanoides* and *B. crenatus*, was striking, since these species were so numerous in the biocenosis of the tidal zone in the Steinvika and Hyttevika Bays (Różycki and Gruszczyński 1981). Investigations carried out in various geographical regions showed that Cirripedia including *B. crenatus*, belong to the components of the epifauna of the laminarian zone (Shin 1981).

In the waters of Spitsbergen animals associated with laminarians are mainly represented by sessile benthos and by less diversified herpobenthos.

Among animals occurring in the laminarian zone the filtrators are the most abundant group. According to Golikov and Averincev (1977) filtrators are dominant in Arctic waters in general. The second trophic group in respect to the number of species are predatory and necrophagous species. A low diversity in this habitat exhibit detritus-feeders, which probably find scarce food among the rhizoids of algae. The trophic structure of this algal community results from the interaction between particular groups of species, mainly the competition, that is strongly suggested by MacArthur and Connell (1971).

Many animal species associated with laminarians may be of practical importance as bioindicators of various water masses. The present investigations have proved that the studied fauna of Nottinghambukta, Hyttevika and Steinvika Bays is dominated by the Arctic-boreal forms, whereas the share of Arctic forms is low. Such a situation proves the influence of warm waters of Atlantic origin at the western coasts of Spisbergen in accordance

with the hydrological picture of this area (Swerpel and Węśławski 1983). A similar biogeographic picture for western coasts of Spitsbergen was presented by Węśławski (1983, data unpubl.) on the basis of the composition of the amphipod fauna, and by Różycki (unpubl. data) on the basis of Bivalvia.

Investigations on Amphipoda assemblages in the Isbjörnhamna Bay (Hornsund) proved that the laminarian zone is a very diversified biocenosis (Węśławski 1978). It is therefore an important element of the ecosystem of coastal waters of Spitsbergen. Fishes of the families Cottidae and Liparidae are feeding there on Amphipoda (*Ischyrocerus*, *Gammarus* and *Gammarellus*) and on Polychaeta (Węśławski 1978, Hałatienko, unpubl. data). In the laminarian zone the feeding of the following bird species was observed: guillemots (*Uria*) and eider (*Somateria mollissima*) Węśławski 1978, Różycki, unpubl. data).

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5. Резюме

Исследования видового состава фауны, связанной с ламинариями, проводились в августе 1980 года на поверхности 3 небольших бухт — Ноттингамбукта, Гиттевика и Стейнвика вблизи западного побережья Шпицбергена (рис. 1). Скалистое дно этих бухт густо заросло бурными водорослями, принадлежащими к видам: *Alaria esculenta* (Grey), *Laminaria digitata* Lam., *Laminaria saccharina* Lam. и *Phyllaria dermatodea* (De la Pyl) (табл. I). С этими макрофитами связана специфическая фауна, в составе которой обнаружено 55 таксонов животных (табл. II). По отношению к числу видов доминировали мшанки, многощетниковые черви и бокоплавы (всего 34 вида).

Животные, связанные с ламинариями, представляют разные трофические группы, причем по отношению к числу видов доминируют сесильные фильтраторы, прикрепляющиеся к камням и водорослям. Наиболее многочисленными представителями этой трофической группы являются губки, мшанки и двустворчатые моллюски.

В исследуемых бухтах Шпицбергена арктическо-бореальные формы составляют наиболее многочисленную группу видов, хотя большое участие принимают также формы бореальные и бореально-арктические (рис. 3). Это соответствует общей гидрологической схеме этого района.

Эпифауна, связанная с ламинариями, состоит из форм сесильных и вагильных. Сесильный бентос составляет преобладающую группу (58,2%). В этой группе можно выделить группу организмов, прикрепляющихся к различным фрагментам водорослей (каулоиды, филлоиды, ризоиды), а также прикрепленные к камням в границах ризондальной системы водорослей, как и за ее пределом. Большая численность некоторых видов животных была обнаружена на слоевищах водорослей (табл. III), а также на

камнях в пределах их ризоидальной системы (табл. IV). Вагильные животные наблюдались среди слоевищ, на них и даже между ризоидами вородослей. Типичное размещение животных в исследуемом биотопе представлено на рис. 4.

6. Streszczenie

Badania składu gatunkowego fauny związanej z laminariami prowadzono w sierpniu 1980 roku na obszarze 3 niewielkich zatok: Nottinghambukta, Hyttevika i Steinvika, przy zachodnich wybrzeżach Spitsbergenu (rys. 1). Skaliste dno tych zatok jest obficie porośnięte przez glony brunatne należące do gatunków: *Alaria esculenta* (Grey), *Laminaria digitata* Lam., *Laminaria saccharina* Lam., i *Phyllaria dermatodea* (De la Pyl) (tab. I). Z makrofitami tymi jest związana specyficzna fauna, w składzie której stwierdzono 55 taksonów zwierząt (tab. II). Pod względem liczby gatunków dominowały mszywioly, wieloszczety i skorupiaki obunogie (łącznie 34 gatunki).

Zwierzęta związane z laminariami reprezentują różne grupy troficzne, przy czym pod względem liczby gatunków dominują tu sesylne filtratory (rys. 2), przyczepiające się do kamieni i glonów. Ta grupa troficzna jest reprezentowana najliczniej przez gąbki, mszywioly i małże.

W badanych zatokach Spitsbergenu formy arktyczno-borealne stanowią najliczniejszą grupę gatunków, a wysoki jest również udział form borealnych i borealno-arktycznych (rys. 3). Układ taki jest zgodny z ogólnym schematem hydrologicznym, notowanym w tym rejonie.

Na epifaunę związaną z laminariami składają się formy osiadłe, jak i ruchliwe. Bentos osiadły stanowi grupę dominującą (58,2%). W grupie zwierząt osiadłych możemy wyróżnić organizmy przytwierdzające się do różnych fragmentów glonów (kauloidy, fylloidy, ryzoidy) oraz przytwierdzone do kamieni w obrębie systemu przylgowego glonów, jak i poza nim. Duże zagęszczenie niektórych gatunków zwierząt notowano niejednokrotnie na plechach glonów (tab. III) oraz na kamieniach w obrębie systemu przylgowego glonów (tab. IV). Zwierzęta ruchliwe występowały wśród plech, na plechach oraz wśród ryzoidów glonów. Szkic typowego rozmieszczenia zwierząt w badanym siedlisku przedstawia rys. 4.

7. References

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