POLSKIE ARCHIWUM HYDROBIOLOGII (Pol. Arch. Hydrobiol.)	42	4*	367–384	1995

One of the important

KRZYSZTOF JAŻDŻEWSKI[1], JAN MARCIN WĘSŁAWSKI[2], CLAUDE DE BROYER[3]

A COMPARISON OF THE AMPHIPOD FAUNAL DIVERSITY IN TWO POLAR FJORDS: ADMIRALTY BAY, KING GEORGE ISLAND (ANTARCTIC) AND HORNSUND, SPITSBERGEN (ARCTIC)

[1]Laboratory of Polar Biology, University of Łódź, Banacha 12/16, 90–237 Łódź, Poland
[2]Institute of Oceanography, Polish Academy of Sciences, P.O. Box 68, 81–712 Sopot, Poland
[3]Institut Royal des Sciences Naturelles de Belgique, Rue Vautier 29, B–1040 Brussels, Belgium

ABSTRACT

The amphipod faunas of two polar fjords – one in the Antarctic and the other in the Arctic – were studied in detail. A comparison of the taxonomical and distributional data hitherto obtained clearly shows that the amphipod fauna of the Antarctic fjord appears to be considerably richer in taxa at all levels. In Admiralty Bay, 106 species, 67 genera, 31 families have been recorded with Eusiridae s.l. as the most speciose family (or group of families) (23 species). In Hornsund, 58 species, 41 genera, and 22 families are known with Lysianassidae s.l. represented by 10 species as the richest family. Only 5 genera (one pelagic) are shared by the two localities. The longer history of isolated evolution and the higher heterogeneity of habitats are invoked as probable main causes to explain the higher Antarctic biodiversity.

RÉSUMÉ

Les faunes d'amphipodes de deux fjords polaires, l'un antarctique, l'autre arctique, ont été étudié en détail. Une comparaison des données taxonomiques et de distribution obtenues jusqu'ici montre clairement une plus grande richesse en taxa dans le fjord antarctique. Admiralty Bay contient 106 espèces appartenant a 67 genres et 31 familles avec les Eusiridae s.l. comme le groupe familial le plus riche en espèces (23 spp.). Hornsund abrite 58 espèces, regroupées en 41 genres et 22 familles et les Lysianassidae s.l. y sont les plus diversifiés, avec 10 spp. Seul 5 genres, dont un pélagique, sont communs aux deux fjords. Un plus long isolement évolutif et une plus grande hétérogénéité d'habitats sont susceptibles d'expliquer la biodiversité antarctique plus élevée.

Key words: Amphipoda, zoobenthos, species richness, taxonomic diversity, comparative distribution

*Biology and ecology of amphipod crustaceans, Krzysztof Jażdżewski, Claude De Broyer and Jan H. Stock [editors].

1. INTRODUCTION

Two Polish polar stations: "H. Arctowski" (Antarctic, King George Island) and "Hornsund" (Arctic, Spitsbergen) (Fig. 1) are situated on the shores of polar fjords, Admiralty Bay and Hornsund, respectively (Fig. 2). In both water bodies, biological investigations were carried out for many years, using various qualitative and quantitative collecting methods. The amphipod crustaceans, a group usually well represented in polar seas, were rather thoroughly studied (Węsławski 1983, 1990; Arnaud *et al.* 1986; Jażdżewski *et al.* 1986, 1991, 1992; Jażdżewski 1993; Gomes *et al.* 1993; Chapelle, De Broyer, in press.; Scailteur, De Broyer, in press.). This paper aims at a preliminary comparison of the faunistic results hitherto obtained, with full awareness that both faunal inventories are still far from complete.

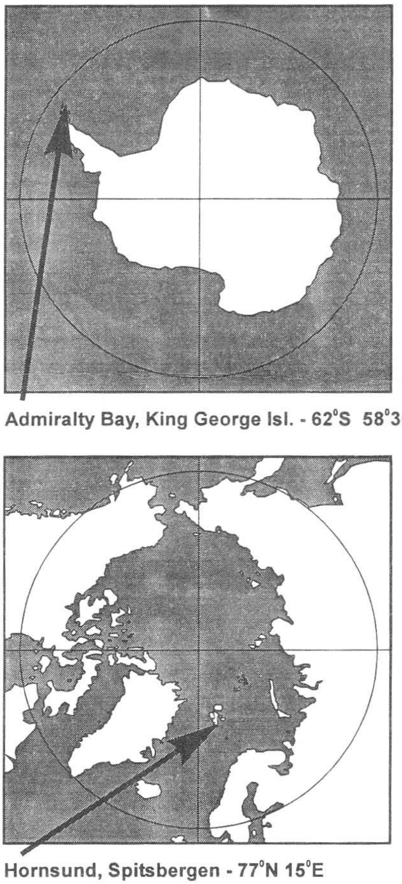


Fig. 1. Geographical location of investigated fjords

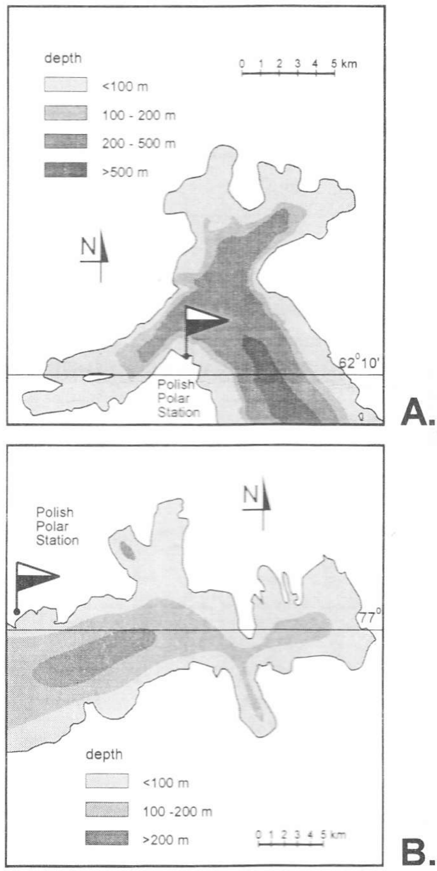


Fig. 2. Schematic maps of Admiralty Bay (A) and Hornsund (B)

2. MATERIAL AND METHODS

Characteristics of the two investigated polar fjords is briefly presented hereafter. The summarized description of Admiralty Bay is based on extensive literature reviews by Ligowski (1993) and Rakusa-Suszczewski (1993).

Admiralty Bay has a surface of 120 km^2, a maximum depth over 500 m, bottom temperatures ranging from –1.8 to +1.2°C, bottom salinities from 33.0 to 34.5‰, a tidal amplitude of about 2.5 m, a microphyto-benthic vegetation period from October to March, a phytoplankton production period from November to April and an average benthic fauna biomass of about 700 g · m^{-2} (f.w.). The most common littoral algae in Admiralty Bay are *Monostroma harriotti* and *Adenocystis utricularis*, those of the sublittoral are *Iridaea cordata*, *Ascoseira mirabilis*, *Desmarestia menziesi* and *Himantothallus grandifolius*. The primary production is estimated at about 60 g C · m^{-2} · yr^{-1}.

The following brief description of Hornsund is based on studies by Węsławski *et al.* (1988) and Eilertsen *et al.* (1989).

Hornsund has a surface of 200 km^{-2}, a maximum depth of about 250 m, bottom temperatures from –1.8 to +4°C, bottom salinities from 33.0 to 34.5‰, a tidal amplitude of 1.8 m, a phytoplankton production period of 3 months – from April to June – and an average benthos biomass of about 100 g · m^{-2}. In the littoral zone, the main species of algae are *Fucus distichus* and *Pylaiella* spp., in the sublittoral *Laminaria saccharina* and *Phycodrys rubens*. Primary production was estimated at around 130 g C · m^{-2} · yr^{-1}.

The familial arrangement of amphipod species follows the catalogue of De Broyer, Jażdżewski (1993), emended by Laubitz (1993) for the Caprellidea. To allow comparison with Tzvetkova's results (1995, this volume), in Eusiridae s.l. (see Barnard, Karaman 1991) in Tab. I Calliopiidae, Eusiridae s.s. and Pontogeneiidae are indicated in accordance with Bousfield, Shih (1994) and Bousfield, Hendrycks (1995).

Table I.

Amphipod fauna of Admiralty Bay, King George Island, Antarctica	Amphipod fauna of Hornsund, Spitsbergen, Arctic
Gammaridea	
Acanthonotozomellidae	
1. *Acanthonotozomopsis pushkini*	
Ampeliscidae	
2. *Ampelisca anversensis*	1. *Ampelisca eschrichtii*
3. *Ampelisca richardsoni*	2. *Byblis gaimardii*
	3. *Haploops tubicola*
Amphilochidae	
4. *Gitanopsis squamosa*	
Corophiidae s.l. [incl. Aoridae (A), Corophiidae s.s. (C) and Isaeidae (I)]	
5. *Haplocheira barbimana* (A)	4. *Unciola leucopsis* (A)
6. *Kuphocheira setimana* (A)	5. *Neohela monstrosa* (C)
7. *Gammaropsis longicornis* (I)	6. *Goesia depressa* (I)
8. *Gammaropsis* sp. (I)	
Dexaminidae	
9. *Paradexamine fissicauda*	7. *Atylus carinatus*
Eophliantidae	
10. *Wandelia crassipes*	
Epimeriidae	
11. *Epimeria georgiana*	

12. *Epimeria macrodonta*

13. *Epimeria monodon*

Eusiridae s.l. [incl. Calliopiiidae (C), Eusiridae s.s. (E) and Pontogeneidae (P)]

14. *Atylopsis cf. emarginatus* (C)

15. *Oradarea bidentata* (C)

16. *Oradarea edentata* (C)

17. *Oradarea walkeri* (C)

18. *Oradarea* sp. 1. (C)

19. *Eusirus bouvieri* (E)

20. *Eusirus cf. laticarpus* (E)

21. *Eusirus microps* (E)

22. *Eusirus perdentatus* (E)

23. *Eusirus propeperdentatus* (E)

24. *Eusirus* sp. 1 (E)

25. *Eusirus* sp. 2 (E)

26. *Eusirus* sp. 3 (E)

27. *Atyloella magellanica* (P)

28. *Bovallia gigantea* (P)

29. *Djerboa furcipes* (P)

30. *Eurymera monticulosa* (P)

31. *Liouvillea oculata* (P)

32. *Paramoera edouardi* (P)

33. *Paramoera hurleyi* (P)

34. *Prostebbingia brevicornis* (P)

35. *Prostebbingia gracilis* (P)

36. *Schraderia gracilis* (P)

8. *Apherusa glacialis* (C)

9. *Apherusa sarsi* (C)

10. *Calliopius laeviusculus* (C)

11. *Halirages fulvocinctus* (C)

12. *Rozinante gracilis* (C)

13. *Rhachotropis aculeata* (E)

14. *Weyprechtia pinguis* (P)

Exoedicerotidae

37. *Methalimedon nordenskjoeldi*

38. *Parhalimedon turqueti*

Gammarellidae

39. *Gondogeneia antarctica*

40. *Gondogeneia georgiana*

41. *Gondogeneia redfearni*

42. *Gondogeneia subantarctica*

15. *Gammarellus homari*

Gammarida: *Ceradocus* group

43. *Paraceradocus gibber*

44. *Paraceradocus miersii*

Gammaridae

16. *Gammarus oceanicus*

17. *Gammarus setosus*

18. *Gammarus wilkitzkii*

Iphimediidae

45. *Echiniphimedia hodgsoni*
46. *Gnathiphimedia fuchsi*
47. *Iphimediella* sp.
48. *Paraphimedia integricauda*
49. *Stegopanoploea joubini*

Ischyroceridae

50. *Jassa ingens*
51. *Jassa thurstoni*
52. *Jassa wandeli*

19. *Ischyrocerus anguipes*
20. *Ischyrocerus* sp. 1
21. *Ischyrocerus* sp. 2

Leucothoidae

53. *Leucothoe spinicarpa*

Liljeborgiidae

54. *Liljeborgia georgiana*
55. *Liljeborgia longicornis*
56. *Liljeborgia* sp.

Lysianassidae s.l.

57. *Abyssorchomene plebs*
58. *Abyssorchomene rossi*
59. *Acontiostoma* sp.
60. *Cheirimedon femoratus*
61. *Cyphocaris richardi*
62. *Hippomedon kergueleni*
63. *Orchomenella acanthura*
64. *Orchomenella cavimanus*
65. *Orchomenella franklini*
66. *Orchomenella macronyx*
67. *Orchomenella rotundifrons*
68. *Orchomenella* cf. *ultima*
69. *Paralysianopsis odhneri*
70. *Pseudorchomene plebs*
71. *Socarnoides* cf. *kergueleni*
72. *Tryphosella murrayi*

22. *Anonyx nugax*
23. *Anonyx laticoxae*
24. *Anonyx sarsi*
25. *Lepidepecreum umbo*
26. *Menigrates obtusifrons*
27. *Onisimus caricus*
28. *Onisimus edwardsi*
29. *Onisimus littoralis*
30. *Onisimus brevicaudatus*
31. *Orchomenella minuta*

Melphidippidae

73. *Melphidippa* sp.

32. *Melphidippa goesi*

Melitidae

33. *Melita dentata*
34. *Melita formosa*

Odiidae

35. *Odius carinatus*

Oedicerotidae

74. *Monoculodes jazdzewskii*
75. *Monoculodes scabriculosus*
76. *Monoculodes* sp.
77. *Oediceroides lahillei*
78. *Oediceroides macrodactylus*

36. *Acanthostepheia malmgreni*
37. *Arrhis phyllonyx*
38. *Monoculodes borealis*
39. *Monoculodes longirostris*
40. *Monoculodes packardi*
41. *Paroediceros lynceus*

Phoxocephalidae

79. *Fuegiphoxus* sp.
80. *Harpiniopsis* sp.
81. *Heterophoxus trichosus*
82. *Heterophoxus videns*
83. *Parharpinia rotundifrons*
84. *Pseudoharpinia cariniceps*

42. *Harpinia serrata*

Phoxocephalopsidae

85. *Phoxocephalopsis deceptions*

Pontoporeiidae

43. *Pontoporeia femorata*

Pleustidae

86. *Parepimeria crenulata*

44. *Neopleustes pulchellus*
45. *Parapleustes bicuspis*
46. *Parapleustes monocuspis*
47. *Pleustes medius*
48. *Pleustes panoplus*
49. *Pleusymtes glabroides*

Podoceridae

87. *Podocerus* sp.

Stegocephalidae

88. *Andaniotes linearis*

50. *Stegocephalus inflatus*

Stenothoidae

89. *Antatelson walkeri*
90. *Metopoides* cf. *walkeri*
91. *Metopoides* sp.
92. *Probolisca ovata*
93. *Prothaumatelson nasutum*
94. *Thaumatelson herdmani*
95. *Torometopa antarctica*
96. *Torometopa* cf. *porcellana*

51. *Metopa bruzelii*

Synopiidae

97. *Cardenio paurodactylus*
98. *Syrrhoe nodulosa*

52. *Syrrhoe crenulata*

	Urothoidae	
99. *Urothoe* cf. *falcata*		
	Caprellidea	
	Caprellidae	
		53. *Caprella septentrionalis*
	Phtisicidae	
100. *Aeginoides gaussi*		
	Hyperiidea	
	Hyperiidae	
101. *Hyperia macrocephala*		54. *Hyperia galba*
102. *Themisto gaudichaudii*		55. *Hyperoche medusarum*
		56. *Themisto abyssorum*
		57. *Themisto libellula*
		58. *Themisto compressa*
	Vibillidae	
103. *Cyllopus lucasii*		
+ Lysianassidae non. det. 3 species.		

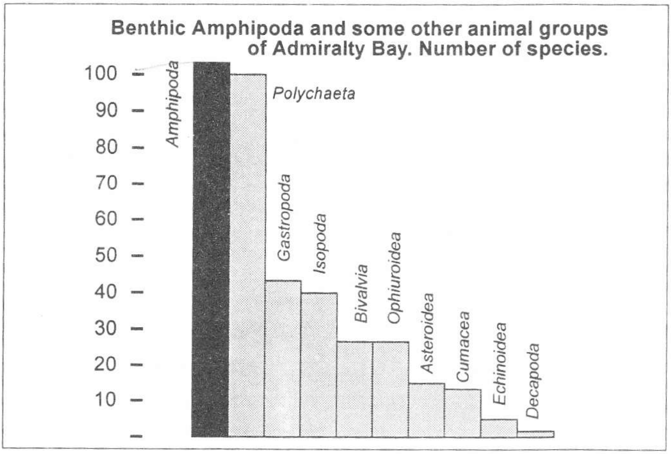
Taxonomic references can be found in De Broyer and Jażdżewski (1993) and Palerud and Vader (1991).

3. RESULTS

Despite the fact that the bottom macrofauna of both Admiralty Bay and Hornsund is still insufficiently known and that even primary lists of species in some benthic groups are still lacking, the hitherto obtained results seem to be worthy of comparison. Figure 3 presents for each fjord the number of species recorded in the main vagile benthic groups. The groups listed are limited to those studied with more or less similar intensity in both fjords. As usual in polar seas, polychaetes and molluscs, together with Amphipoda, play the leading roles in terms of number of species. According to our preliminary knowledge, the other benthic groups not yet fully elaborated like Hydrozoa or Bryozoa, should not take a better position in this ranking than, say, the fourth place.

Anyway, in both fjords, Amphipoda and Polychaeta rather distinctly outnumber in species richness the other major macrobenthos groups. In the case of these two groups, a higher biodiversity can be clearly observed in the Antarctic fjord.

A comparison of the two amphipod taxa lists (Tab. I) and the distribution of these taxa in families (Fig. 4) show some interesting features of these amphipod faunas. The Antarctic fjord is clearly more diversified than the Arctic one, also at family and generic levels, with 31 versus 22 families and 67 versus 41 genera. It is interesting to note the rather high position of Stenothoidae, Phoxocephalidae and Iphimedidae in the Antarctic fjord in contrast to the Arctic one, where these families are absent or play an inconspicuous role. The reverse is true for Pleustidae.



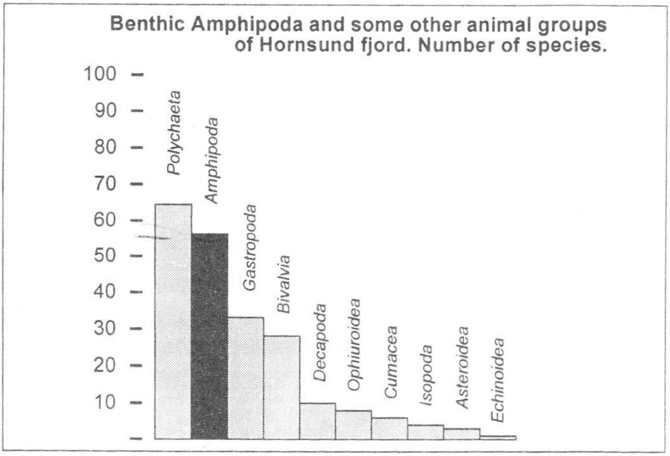


Fig. 3. Comparative species richness of most speciose macrobenthic groups in both fjords

Of the suborder Gammaridea, 63 genera were recorded in Admiralty Bay versus 38 genera in Hornsund. Only 5 genera (*Ampelisca, Melphidippa, Monoculodes, Orchomenella* and *Syrrhoe*) are present in both basins and among them it is worth mentioning that the synopiid *Syrrhoe* is a pelagic genus, usually of wider occurrence than the benthic genera. As can be expected in pelagic Hyperiidea, represented by 3 genera in each basin, 2 of them – *Hyperia* and *Themisto* – are in common.

The zoogeographical status of the benthic Amphipoda of both fjords is shown in Fig. 5. In Hornsund, Arctic-boreal species clearly dominate (and with the large percentage of boreal species, this indicates its subarctic – or transitional – character) whereas in Admiralty Bay the share of circumantarctic

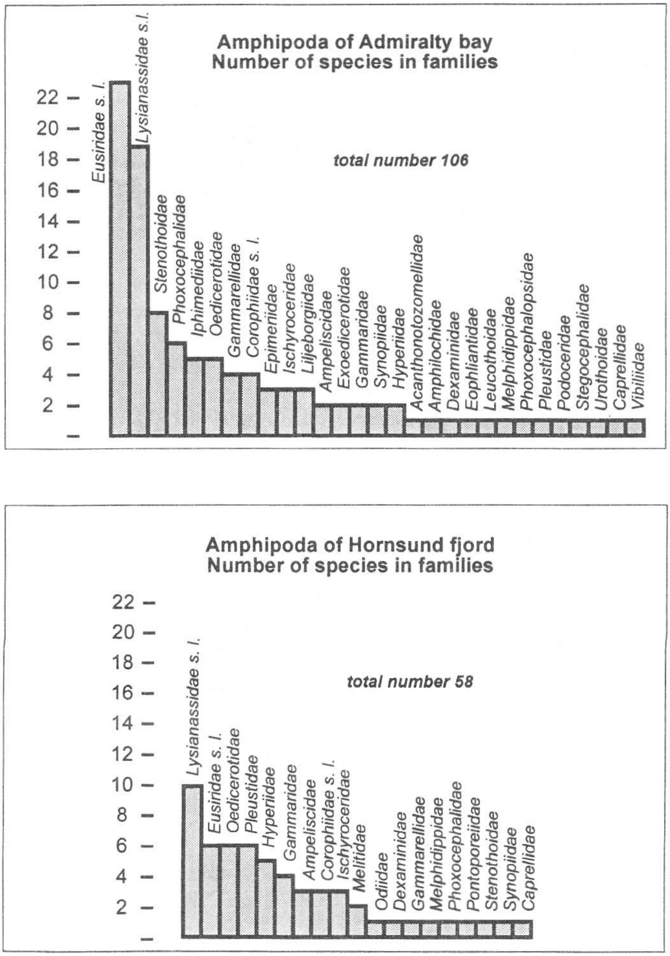


Fig. 4. Comparative amphipod species richness per families in both fjords

species (i.e. occurring in the East and West Antarctic), strictly West Antarctic species and total Southern Ocean species (i.e. circumantarctic + West Antarctic + *Subantarctic Islands + Magellanic*) is more or less balanced.

Figure 6 presents a rough sketch of distribution of dominant amphipod taxa in some particular habitats of the water bodies under study. This very preliminary picture gives however some idea of the differences between both fjords at the habitats level.

In Figure 7, some comparative data on the quantitative distribution of Amphipoda are given. Quantitative studies of bottom fauna were carried out more intensively in Admiralty Bay (Jażdżewski *et al.* 1986, 1991; Jażdżewski 1993; Jażdżewski, Siciński 1993), than in Hornsund (Görlich *et al.* 1987). Hitherto obtained data indicate that amphipod

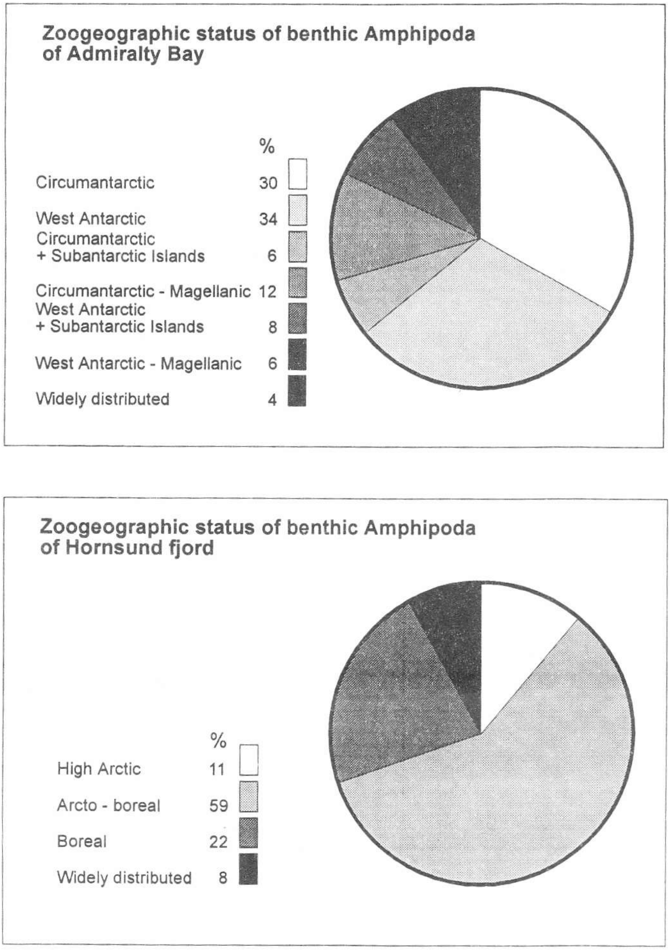


Fig. 5. Zoogeographic composition of benthic amphipod fauna in both fjords

abundance and biomass in particular depth ranges are several times higher in Admiralty Bay than in Hornsund. This is in agreement with the difference in average total benthos biomass between both fjords, which is of the same order of magnitude.

4. DISCUSSION

This preliminary comparison, incomplete as it may be, nevertheless shows the definite distinctness of the amphipod faunas of the two polar fjords.

At the present state of knowledge (Tzvetkova 1995, this volume; De Broyer, Jażdżewski 1993), it can be said that the Hornsund gammaridean

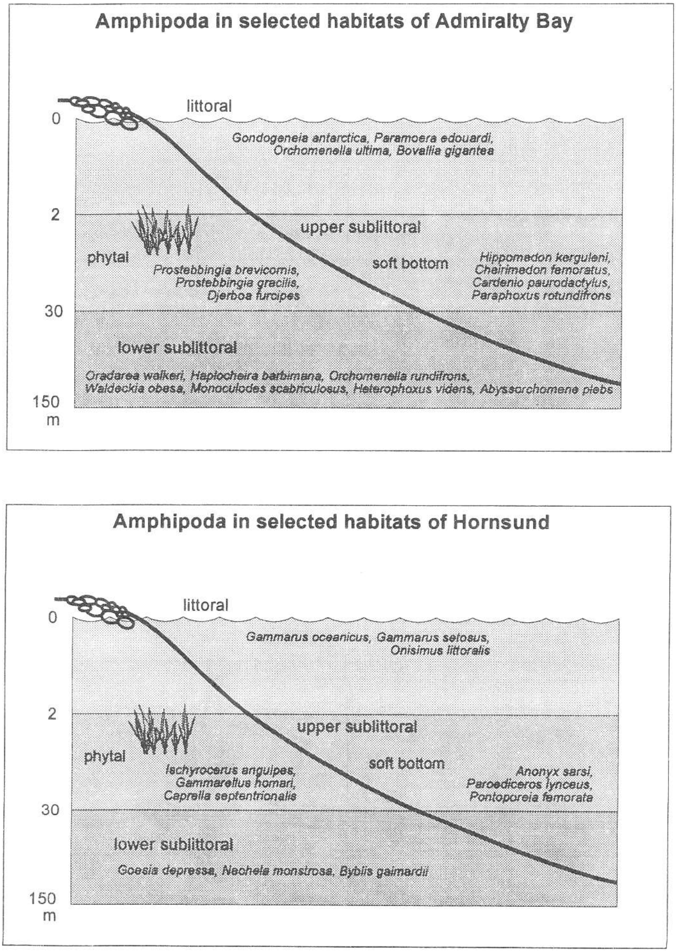


Fig. 6. Distribution of characteristic amphipod species in selected habitats in both fjords

amphipod fauna (53 species) comprises about 10% of the Arctic fauna of this group, whereas that of Admiralty Bay (103 species) constitutes some 19% of the strictly Antarctic gammaridean amphipod fauna.

General comparisons of Arctic and Antarctic zoobenthos were previously made by a few number of authors, namely Knox (1970), Hedgpeth (1969, 1971), George (1977), Knox, Lowry (1977), Hempel (1985), and more recently by Dayton (1990). Most of these authors stressed that the species richness in most benthic groups is undoubtedly much higher in the Antarctic than in Arctic bottom communities. This is also true for the species diversity – in the sense of Hurlbert (1971) – according to Poore, Wilson (1993) and Brey *et al.* (1994).

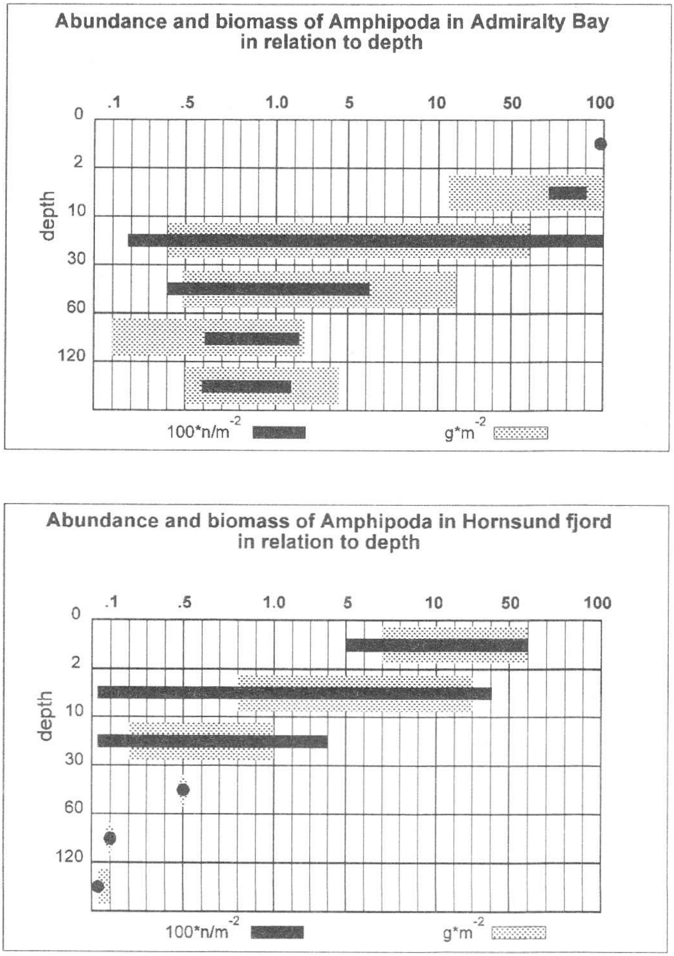


Fig. 7. Comparative quantitative distribution of benthic amphipods related to depth in both fjords

Knox and Lowry (1977) gave a detailed comparison between the benthos of the Southern and North Polar Oceans emphasizing on Polychaeta and Amphipoda. But when dealing with species richness, their comparison of Arctic and Antarctic amphipod faunas was inadequate. Already in the discussion between J. Just, G. Knox and M. J. Dunbar that followed the Knox, Lowry (1977, p. 462) presentation at the conference on Polar Oceans, it was pointed out that they had used for comparison the Arctic data from Zenkevitch (1963), mentioning 262 amphipod species for the Barents Sea only, which is typically "low Arctic" (Zenkevitch 1963) or "subarctic" in the sense of Dunbar (1986). This non representative number has been uncritically repeated in later Arctic/Antarctic benthos diversity comparisons (White 1984, Hempel 1985). Knox, Lowry (1977) did not take into account

Gurjanova's (1951) data which already indicated for the (Russian) lower and high Arctic (Barents, White, Kara, Laptev, East-Siberian and Chukchi Seas) a total number of over 470 gammaridean species.

An up-to-date precise and meaningful comparison of the diversity of the whole Antarctic and Arctic amphipod faunas still remains difficult due to problems in delimitations of comparable regions, limitations of taxonomic knowledge, disagreement on higher classification and lack of comparable quantitative data on species richness, species diversity and equitability. These limitations are to some extent also valid for the smaller Arctic and Antarctic areas under study and are well illustrated, for example, by the striking differences between the amphipod faunal lists of two neighbouring bays of King George Island: Maxwell Bay (Rauschert 1990 a, b, 1991) and Admiralty Bay (Jażdżewski *et al.* 1991, 1992). These differences, partly due to taxonomic difficulties, may also indicate the long way before complete and accurate faunal lists will be ready for comparatively well-known areas.

The recent De Broyer, Jażdżewski (1993) catalogue recorded 784 gammaridean amphipod species for the Southern Ocean, taken in the wide sense (Deacon 1982, 1984), thus including both Antarctic and Subantarctic Regions, the latter limited to the north by the loosely defined Subtropical Convergence (as located by Deacon 1982) and comprising the Tristan da Cunha district, according to Hedgpeth (1969). The total number of strictly Antarctic (south of Polar Front) gammaridean amphipod species can be estimated at present at some 470, plus 24 unidentified taxa (De Broyer, Jażdżewski 1993, updated).

The most recent information on lower and high Arctic Gammaridea compiled by Tzvetkova (1995, this volume) indicates that some 520 species were recorded in the Russian Arctic (this shows – by the way – that four decades after Gurjanova's 1951 opus the increase in species recorded was about 8%). However, that number does not account for the extra-Russian Arctic seas fauna and would probably be significantly greater if, for example, northern Norwegian Sea amphipods (boreal and subarctic in origin) inhabiting the Arctic region as far north as Spitsbergen waters were added, as well as the American – Greenland Arctic faunal elements which could not have been recorded by Tzvetkova. For the characterization of the Spitsbergen fauna in particular, the difficulty lies in adequate delimitation of the Arctic zone, due to the marked asymmetry of North Atlantic hydrological conditions caused by the Gulf Stream, strongly influencing hydrological phenomena as far north as Spitsbergen waters and adding a lot of boreal and subarctic elements to the fauna of this otherwise high Arctic region. In this respect, the comprehensive list of 740 species of gammaridean Amphipoda from the northeastern Atlantic and Norwegian Arctic compiled by Palerud, Vader (1991) cannot be directly used in our comparisons because it encompasses both Arctic and boreal faunas and does not indicate distributional traits.

On the other hand, an adequate comparison between the strictly Arctic faun (i.e. the deep sea/abyssal Arctic and high Arctic sub-regions of Zenkevitch 1963) and the strictly Antarctic fauna (i.e. south of the Polar Front) woul require to exclude from the total number of (Russian) Arctic species, the typica low Arctic faunal elements (from the Barents and White Seas, Zenkevitc 1963) which could be compared, at least on the base of similar temperatur range, to the Subantarctic fauna.

So we can expect from the presently available data, taking in mind all th above limitations, that the amphipod species richness of the two strictly pola regions would appear rather comparable.

Endemicity rate of the whole Southern Ocean amphipod fauna was recently calculated anew by De Broyer, Jażdżewski (1993) as about 76%, and the rate for benthic Amphipoda alone (Gammaridea + Caprellidea) as 85%. The same percentages for the Antarctic region *sensu stricto* are about 71 and 78%, respectively. In comparison, the level of endemism of Arctic gammaridean Amphipoda given by Gurjanova (1951) – and calculated anew by the present authors with similar results – can be estimated as some 25–30%.

An attempt to compare the species richness by families for Admiralty Bay (Fig. 4) with similar histograms compiled from Knox, Lowry (1977) and De Broyer, Jażdżewski (1993) for the whole West Antarctic (= Scotia) region once more shows the limitations related to our increasing but still insufficient taxonomic knowledge. When comparing the sequence of the most speciose West Antarctic families compiled from Knox, Lowry (1977) with that drawn from the De Broyer, Jażdżewski (1993) catalogue, one can see important change in this order; except for the two dominating families (or better, complexes of families), Lysianassidae s.l. and Eusiridae s.l., other families changed seriously their place due to various reasons. Some simply disappeared because of nomenclatural and systematic revisions but the importance of some others seriously increased due to recent thorough elaboration of new material (this is the case of tiny Stenothoidae that firmly occupy now the third place in this ranking). The arrangement of dominant families in the Admiralty Bay amphipod fauna is very similar to that of the whole West Antarctic region, but Lysianassidae s.l., yield here slightly to Eusiridae s.l., whereas Oedicerotidae and Phoxocephalidae are on somewhat more advanced places. Except for the three first families, this picture could perhaps be changed by more thorough future studies.

According to Tzvetkova (1995, this volume), – who did not pool together the three eusiroidean families – the most speciose (Russian) Arctic families are Lysianassidae (s.l.), Oedicerotidae, Stenothoidae, Ampeliscidae and Pleustidae. In Hornsund, in concordance with this ranking, Lysianassidae s.l., Oedicerotidae and Pleustidae are the families richest in species. Stenothoidae, however, despite their high position in Tzvetkova's (l.c.) whole (Russian) Arctic ranking are very poor in species (only one species in Hornsund).

Without a better knowledge of the evolutionary history of the group and of the processes of its adaptive radiation (which implies i.a. precise investigations on the habitats, microhabitats as well as on the ecofunctional roles at the species level), it is premature to expect the precise determination of the causes of the amphipod diversity in the two polar regions.

The comparison of the two polar marine environments presented by George (1977), Knox, Lowry (1977), Hempel (1985) or Dayton (1990) indicate some possible causes. It seems obvious, for example, that the early separation of the Antarctic from the Gondwana land mass can allow a higher biodiversity and a higher degree of endemism of this fauna. On the other hand, the Pleistocene glacial epoch has much destroyed the old Arctic basin Tertiary fauna, because of both the ice sheet presence and the reduced salinity. This basin is still in the phase of repopulation by numerous species, mainly of Atlantic origin, after the recent glaciations of the Northern Hemisphere but for the benthos, because of predominantly nonplanktonic dispersal modes, these invasions are limited and relatively slow (Dayton 1990). The Spitsbergen fjords are free of an ice sheet for only the last 10 000 years (Matishov 1987).

One ecological factor, already mentioned by Knox, Lowry (1977), seems to be of great importance in creating substantial differences in bottom fauna diversity and abundance between the two compared regions. This is the important share of poorly sorted, coarse terrigenic materials in bottom sediments around the whole Antarctic continent, reaching very far from the continent on the deep Antarctic shelf. All stones dropped from icebergs that permanently calve from the Antarctic ice-cap glaciers create numerous nuclei of substrates for the extraordinary rich sessile filter-feeders fauna like Porifera, Bryozoa or Ascidiacea. These animal groups flourishing in the Antarctic sublittoral serve in turn as an ideal habitat for an extremely diversified vagile fauna, including of course amphipod crustaceans. Such ecological circumstances are also present in the Arctic, especially in the Northern Greenland Sea but, in general, play there a much less important role. In the Arctic, mud and clay prevail on the bottoms due to a more important input of river-borne sediments. Such a difference should mainly account for the lower bottom fauna biomass and diversity usually noted for the Arctic in comparison with the Antarctic. Despite the lack of comparative data obtained for instance from photographic or video surveys, it is obvious from the observations of trawl, dredge and grabs samples that the types of favourable habitats to amphipods are much less diversified in Hornsund than in Admiralty Bay.

In conclusion, one can say from this preliminary comparison that the different evolutionary histories and heterogeneity of habitats invoked to explain differences in faunal diversity at the level of the two polar basins, can also stand as probable main causes for the different amphipod faunal diversity in the two investigated polar fjords.

6. REFERENCES

Arnaud, P. M., Jażdżewski, K., Presler, P., Siciński, J. 1986. Preliminary survey of benthic invertebrates collected by Polish Antarctic Expeditions in Admiralty Bay (King George Island, South Shetland Islands, Antarctica. *Pol. Polar Res.*, 7, 7–24.

Barnard, J. L., Karaman, G. S. 1991. The families and genera of marine gammaridean amphipoda (except marine gammaroids). *Rec. Austral. Mus.*, Suppl. 13, 1–866.

Bousfield, E. L., Shih, C. 1994. The phyletic classification of amphipod crustaceans: problems in resolution. *Amphipacifica*, 1, 76–134.

Bousfield, E. L., Hendrycks, E. A. 1995. The amphipod superfamily Eusiroidea in the North American Pacific region. I. Family Eusiridae: systematics and distributional ecology. *Amphipacifica*, 1, 3–59.

Brey, T., Klages, M., Dahm, C., Gorny, M., Gutt, J., Hain, S., Stiller, M., Arntz, W. E., Wägele, J. W., Zimmermann, A. 1994. Antarctic benthic diversity. *Nature*, 368, 297.

Chapelle, G., De Broyer, C. [in press]. Life history and seasonality of the reproduction in the Antarctic scavenger amphipod *Waldeckia obesa* (Chevreux). Proc. VIth SCAR Symp. Antarct. Biol., Venice, 1994.

Dayton, P. K. 1990. 12. Polar Benthos. In: Smith, W. O. [Ed.] *Polar Oceanography, Part B. Chemistry, Biology & Geology*. Academic Press, San Diego, 631–675.

Deacon, G. E. R., 1982. Physical and biological zonation in the Southern Ocean. *Deep-Sea Res.*, 29: 1–15.

Deacon, G. E. R., 1984. *The Antarctic circumpolar ocean*. Cambridge University Press, 180 pp.

De Broyer, C., Jażdżewski, K. 1993. Contribution to the marine biodiversity inventory. A checklist of the Amphipoda (Crustacea) of the Southern Ocean. *Doc. Trav. Inst. roy. Sci. nat. Belg.*, 73, 1–155.

Dunbar, M. J. 1986. Arctic Marine Ecosystems. *Oceanus*, 29, 36–40.

Eilertsen, H. C., Taasen, J. P., Węsławski, J. M. 1989. Phytoplankton studies in fjords of West Spitsbergen; physical environment and production in spring and summer. *J. Plankton Res.*, 11, 1245–1260.

George, R. Y. 1977. Dissimilar and similar trends in Antarctic and Arctic marine benthos. In: Dunbar, M. J. [Ed.] *Polar Oceans. Proc. Polar Oceans Conf.*, McGill University, Montreal, 391–408.

Gomes, V., Van Ngan, P., De Broyer, C., Passos, M. J. A. C. R. 1993. Chromosomes of the Antarctic amphipod *Waldeckia obesa* Chevreux. *Hydrobiologia*, 262, 109–113.

Görlich, K. A., Węsławski, J. M., Zajączkowski, M. 1987. Suspension settling effect on macrobenthos biomass distribution in the Hornsund fjords, Spitsbergen. *Polar Res.*, 5, 175–192.

Gurjanova, E. F. 1951. Bokoplavy morej SSSR i sopredel'nych vod (Amphipoda – Gammaridea) [Amphipods of the seas of USSR and surrounding waters (Amphipoda – Gammaridea]. *Opredeliteli po Faune SSSR*, Akad. Nauk SSSR, 41, 1–1029.

Hedgpeth, J. W. 1969. Distribution of selected groups of marine invertebrates in waters south of 35°S latitude. *Antarctic Map Folio Series*, American Geographical Society, New York, Folio 11, 1–4, pls 1–29.

Hedgpeth, J. W. 1971. Perspectives of benthic ecology in Antarctica. In: Quam, L. O. [Ed.] *Research in the Antarctic. Am. Assoc. Adv. Sci. Publ.*, 93, 93–136.

Hempel, G. 1985. On the biology of polar seas, particularly the Southern Ocean. In: Gray, J. S., Christiansen, M. E. [Eds.] *Marine biology of polar regions and effect of stress on marine organisms*. Wiley & Sons, 3–33.

Hurlbert, S. H. 1971. The nonconcept of species diversity: a critique and alternative parameters. *Ecology*, 52, 575–586.

Jażdżewski, K. 1993. 12. Zoobenthos, 12.4. Amphipoda. In: Rakusa-Suszczewski, S. [Ed.] *The maritime antarctic coastal ecosystem of Admiralty Bay*. Dept. Antarctic Biology, Pol. Acad. Sci., Warsaw, 108–116.

Jażdżewski, K., De Broyer, C., Teodorczyk, W., Konopacka, A. 1992 (1991). Survey and distributional patterns of the amphipod fauna of Admiralty Bay, King George Island, South Shetland Islands. *Pol. Polar Res.*, 12, 461–472.

Jażdżewski, K., Jurasz, W., Kittel, W., Presler, E., Presler, P., Siciński, J. 1986. Abundance and biomass estimates of the benthic fauna in Admiralty Bay, King George Island, South Shetland Islands. *Polar Biol.*, 6, 5–16.

Jażdżewski, K., Siciński, J. 1993. 12. Zoobenthos, 12.1. General remarks. In: Rakusa-Suszczewski, S. [Ed.] *The maritime antarctic coastal ecosystem of Admiralty Bay*. Dept. Antarctic Biology, Pol. Acad. Sci., Warsaw, 83–95.

Jażdżewski, K., Teodorczyk, W., Siciński, J., Kontek, B. 1991. Amphipod crustaceans as an important component of zoobenthos of the shallow Antarctic sublittoral. *Hydrobiologia*, 223, 105–117.

Knox, G. A. 1970. Antarctic marine ecosystems. In: Holdgate, M. W. [Ed.] *Antarctic Ecology*. Academic Press, London and New York, 1, 69–96.

Knox, G. A., Lowry, J. K. 1977. A comparison between the benthos of the Southern Ocean and the North Polar Ocean with special reference to the Amphipoda and the Polychaeta. In: Dunbar, M. J. [Ed.] *Polar Oceans. Proc. Polar Oceans Conf.* McGill University, Montreal, 432–462.

Laubitz, D. R. 1993. Caprellidea (Crustacea: Amphipoda): towards a new synthesis. *J. Nat. Hist.*, 27, 965–976.

Ligowski, R. 1993. Morskie okrzemki (Baccilariophyceae) w ekosystemie Antarktyki i ich znaczenie jako wskaźnika źródła pokarmu u kryla (*Euphausia superba* Dana) [Marine diatoms (Baccilariophyceae) in Antarctic ecosystem and their importance as an indicator of food source of krill (*Euphausia superba* Dana)]. Wyd. Uniwersytetu Łódzkiego, Łódź, 241 pp.

Matishov, G. G. 1987. Mirovoj Okean i oledenenie zemli [World Ocean and the glaciation of the Earth]. *Mysl, Moskwa, 248 pp.*

Palerud, R., Vader, W. 1991. Marine Amphipoda Gammaridea in North-East Atlantic and Norwegian Arctic. *Tromura, Naturvitenskap, Univ. Tromso*, 68, 1–97.

Poore, G. C. B., Wilson, G. D. F. 1993. Marine species richness. *Nature*, 361, 597–598.

Rakusa-Suszczewski, S. [Ed.] 1993. *The maritime antarctic coastal ecosystem of Admiralty Bay*. Dept. Antarctic Biology, Pol. Acad. Sci, Warsaw, 216 pp.

Rauschert, M. 1990a. Neue Stenothoidae (Crustacea, Amphipoda, Gammaridea) aus dem Sublittoral von King George (Süd-Shetland-Inseln). *Mitt. zool. Mus.*, Berlin, 66, 3–39.

Rauschert, M. 1990b. New Amphipods from the sublittoral of King George Island: faunistic contribution to ecological investigations. *Geod. geophys. Vervöff.*, 16: 477–458.

Rauschert, M. 1991. Ergebnisse der faunistischen Arbeiten im Benthal von King George Island (Südshetlandinseln, Antarktis). *Ber. Polarforsch.*, 76, 1–75.

Scailteur, G., De Broyer, C. [in press]. Feeding biology of *Eurymera monticulosa* Pfeffer, 1888 (Crustacea, Amphipoda) in Admiralty Bay, King George Island, Antarctica. *Antarct. Science.*

Tzvetkova, N. L. 1995. The general distribution of Amphipoda Gammaridea in the North and Far-East Russian Seas. In: Jażdżewski, K., De Broyer, C., Stock, J. H. [Eds]

Proceedings of the VIIIth International Colloquium on Amphipoda. Łódź, Poland, 1994. *Pol. Arch. Hydrobiol.*, 42, 335–346.

Węsławski, J. M. 1983. Observations on the coastal water Amphipoda from Hornsund, SW Spitsbergen. *Pol. Arch. Hydrobiol.*, 30, 199–207.

Węsławski, J. M. 1990. Distribution and ecology of coastal waters Amphipoda from south Spitsbergen. *Pol. Arch. Hydrobiol.*, 37, 503–519.

Węsławski, J. M., Zajączkowski, M., Kwaśniewski, S., Jezierski, J., Moskal, W. 1988. Seasonality in Arctic fjord ecosystem. *Pol. Polar Res.*, 6, 185–189.

White, M. G. 1984. Marine benthos. In: Laws, R. M. [Ed.] *Antarctic Ecology*. Academic Press, London, 2, 421–461.

Zenkevitch, L. 1963. *Biologija morej SSSR* [*Biology of the Seas of the U.S.S.R.*]. "Nauka", Moskwa, 955 pp.