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SEASONAL VARIATION OF DISTRIBUTION AND NEW RECORDS OF BENTHIC AMPHIPODS (*CRUSTACEA*) FROM ADMIRALTY BAY, KING GEORGE ISLAND, WEST ANTARCTIC

SEZONOWE ZMIANY W ROZMIESZCZENIU ORAZ NOWE DANE O FAUNIE OBUNOGÓW (*CRUSTACEA, AMPHIPODA*) ZATOKI ADMIRALICJI, WYSPA KRÓLA JERZEGO, ZACHODNIA ANTARKTYKA

ABSTRACT

In the Southern Ocean benthic communities, the amphipod crustaceans constitute a very speciose and often abundant group, showing a high biological diversity in terms of life styles, trophic types, habitat and size spectra. In 1993 rich materials of benthic invertebrates were collected from the upper sublittoral zone of Admiralty Bay. Samples were taken at various times during the year at depths ranging from 15 m to 150 m using trawls and baited traps. An analysis of the seasonal variation in relative abundance and bathymetrical distribution was made for the most common benthic amphipod species of the bay. Bathymetrical migration probably occurs in relation to ice formation and food availability depending on the season. Some of these seasonal variations as well as new records of benthic amphipods for the bay are reported.

INTRODUCTION

Investigation of the maritime Antarctic ecosystem of Admiralty Bay, King George Island, has been done chiefly by Polish, Belgian, Brazilian, and German teams during the last two decades (Rakusa-Suszczewski 1993). The Bay was selected as one of the key sites for the SCAR program "Ecology of the Antarctic Sea-Ice Zone (EASIZ)" 1994–2004 (SCAR 1994).

As in many other places in the Antarctic coastal and shelf ecosystem, the peracarid crustaceans, especially Amphipoda, are among the most important components of the Admiralty Bay zoobenthos due to their abundance, species richness and suspected ecological roles. They are principally basic food resources for a number of benthic invertebrates, fish, and seabirds. Although amphipods are a relatively prominent group among Admiralty Bay benthos (Table 1), their distribution and bioecology in winter conditions have been little studied. Biological sampling is often impossible or difficult because of the harsh austral winter environment.

In 1993, benthic invertebrates were sampled year-round in Admiralty Bay at depths ranging from 15m to 150m, using trawls and baited traps. The principle objective of this study was to gain some insight into the seasonal movements of benthic amphipods. An analysis of the seasonal variation in relative abundance and bathymetrical distribution was made for the most common benthic amphipod species of the Bay. Some of these seasonal variations as well as new records for the Bay are reported here.

Table 1. Number of peracarid crustacean species collected in Admiralty Bay

	No of species	References
Mysidacea	14	Konopko, unpubl. (1995)
Cumacea	13	Błażewicz, Jażdżewski 1996
Tanaidacea	12	Błażewicz, Jażdżewski 1997
Isopoda	59	Arnaud *et al.* 1986; Teodorczyk, unpubl. (1993)
Amphipoda	127	Jażdżewski *et al.* 1992; De Broyer, Jażdżewski 1993; Munn

MATERIAL AND METHODS

This material was collected by one of us (J. S.) using baited traps and Agassiz trawls along the transect "Section I" (see Fig. 1) in Admiralty Bay. Collection by both gears took place at various times per year and depths ranging from 15 m to 150 m over the course of 1993. Traps were left an average of 48 hours.

Table 2. Summary of collected amphipods

Samples obtained by trawls	16
Samples obtained by traps	14
Total number of taxa (species level)	76
Total number of individuals	24000
Depths studied	15 m–150 m

The key features of the Admiralty Bay can be summarized as follows:

– Area: 120 km^2; maximum depth: 530 m.

– Bottom temperature: from -1.8 to +1.8°C; bottom salinity: from 33.0‰ to 34.5‰.

– Tidal amplitude: average 1.4, but up to 2.5 m.

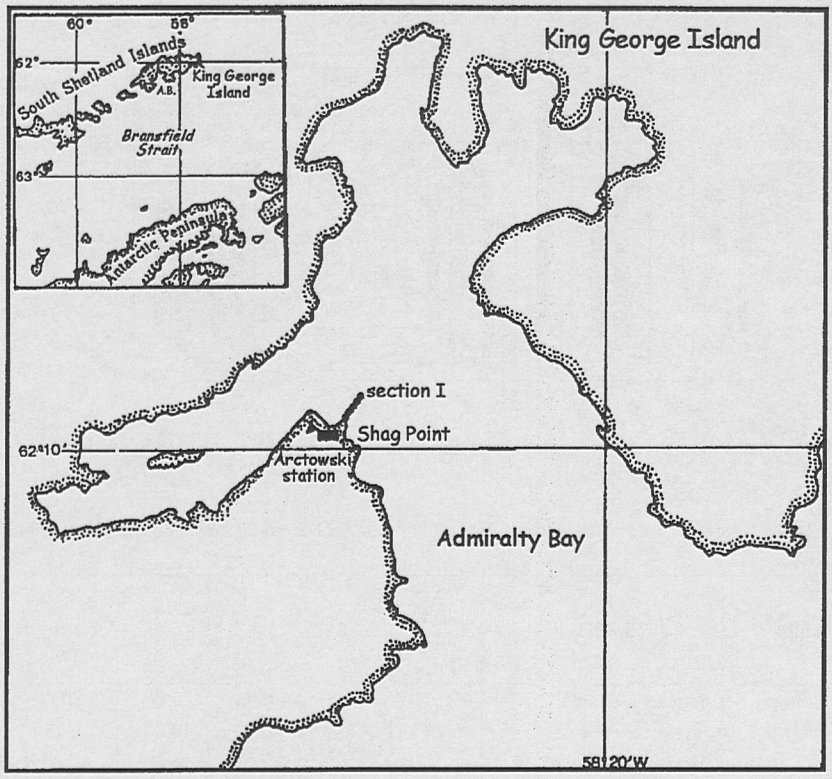

Fig. 1. Map of Admiralty Bay, King George Island, South Shetlands, the loction of sampling site (section I)

– Microphytobenthos vegetation period: from October till March. Phytoplankton production period: from November till April. Primary production: estimated to about 60 $gC.m^{-2}.yr^{-1}$.

– Average zoobenthos biomass: about 700 $gFW.m^{-2}$.

– Shores: glaciers and icefalls constitute about half of the Bay shoreline; stony beaches, rocks and rocky cliffs the other half (these are important factors influencing the hydrological regime of the Bay and the land-sea interactions).

– Phytal zone: about one third of the bottom surface. Very rich, diverse and dense aggregations of macroalgae occur within the depth range 10–60 m, especially in the central part of the Bay.

– Sediments: bottom sediments diverse, particularly in the shallower sublittoral. Usually sands, muddy sands and muds. Taking into account the ϕ coefficient (median grain size), sediments range from medium sand to the very fine silt. Bottom sediments are usually poorly or very poorly sorted and contain pretty large amounts of coarse sand, gravel, pebbles and stones („drop-stones"), especially in the central basin of the Bay (Siciński 1998).

RESULTS

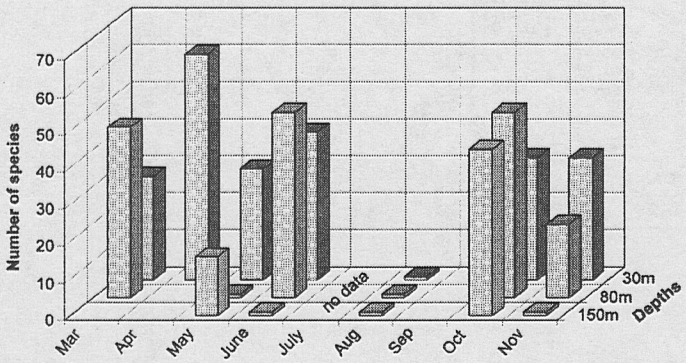

Fig. 2. Number of amphipod taxa collected by trawls per month along section I

Table 3. New records of amphipods for Admiralty Bay collected by trawls during the mission

Family	Species	No of collected individuals	f	a_s	a_t	Vertical distribution	Ovigerous females
Dexaminidae	*Polycheria dentata*	2	12.5	0.43	0.06	80	
Eusiridae s.l.	*Atylopsis fragilis*	20	25	2.98	0.62	50 & 150	X
Eusiridae s.l.	*Metaleptamphopus pectinatus*	2	6.3	0.29	0.06	30,	
Eusiridae s.l.	*Rhachotropis antarctica*	3	12.5	0.78	0.09	80 & 150	X
Eusiridae s.l.	*Schraderia acuticauda*	77	37.5	5.43	2.41	30 to 150	X
Lysianassidae	*Podoprionides incerta*	2	12.5	0.22	0.06	30 & 80	
Melphidippidae	*Melphidippa antarctica*	2	12.5	0.76	0.06	80 & 150	
Melphidippidae	*Melphisubchela prehenda*	3	12.5	1.62	0.09	150	
Sebidae*	*Seba dubia*	17	6.25	20.9	0.53	80	

f – frequency of species in trawls; as – relative abundance with respect to total amphipods in the sample; at – relative abundance with respect to total amphipods in all the samples; f, as, at in %; * New family for the Bay.

The nine species in Table 3 represent new records for the Bay. The material still has some species to be determined and many to be verified, therefore it is likely that this preliminary list will be expanded. Several of these species have been recorded from Maxwell Bay, also on King George Island. Comparison of as and at columns in the table gives some indication of whether or not the sample is representative of a patchily distributed species. For example, *S. dubia* could have a patchy distribution due to its high abundance relative to the sample (a_s) and low frequency (f) and low total relative abundance (a_t). The presence of ovigerous females has

been noted because this indicates that the species are breeding populations in the Bay rather than accidental occurrences.

The relative abundance of the top five species in trawls from each depth per season are presented on Fig. 3. Although the number of samples and individuals is low, it is nevertheless possible to note some patterns. For example, *Schraderia gracilis* and

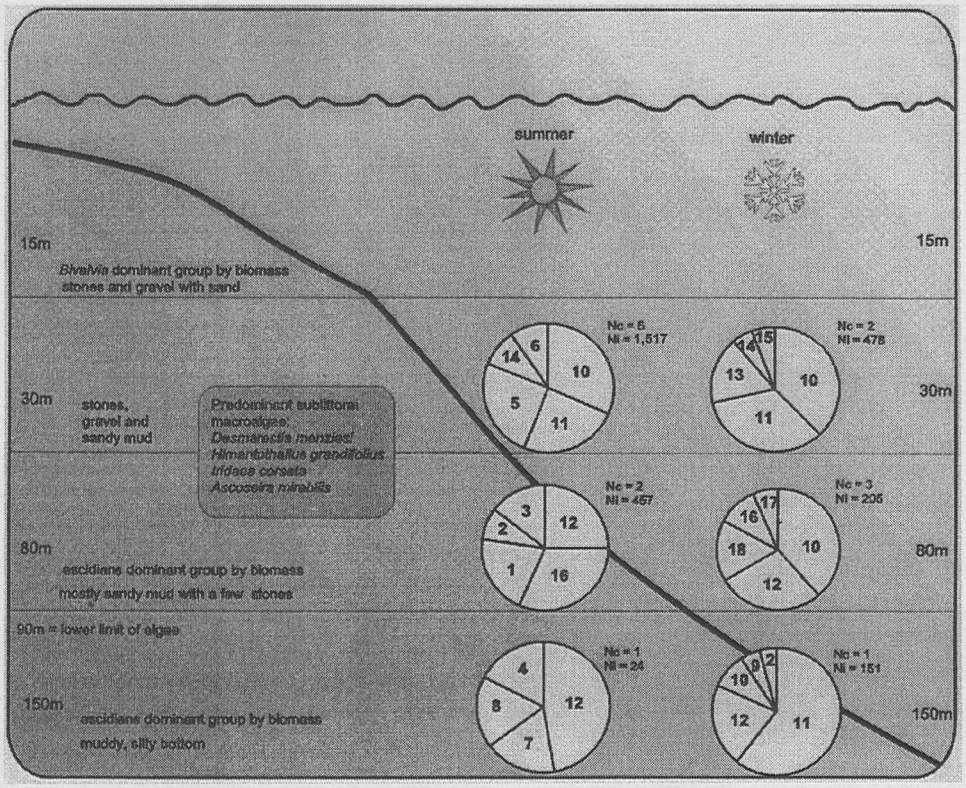

Fig. 3. Seasonal bathymetrical variations of benthic amphipods along section I, Admiralty Bay

Djerboa furcipes are among the five most abundant species for both seasons at 30 m. At other depths they are among the top five but only in the winter. One possible explanation for this, if it is not an artifact of sampling, is that in the winter the two herbivorous species descend to eat algae that has either died and sunk. It is quite interesting that this is the first time that *Djerboa furcipes* has been collected below the phytal zone. The reasons for its descent below the phytal zone are undetermined, however, attraction to decaying algae may be one cause to explore. Stomach content analysis may give some clues. Some species are common to more than one assemblage and have high relative abundance at more than one depth. Overall, there are clearly different assemblages which vary with depth.

The general habitat characterization has been added in order to emphasize the apparent "zoning" which occurs in many flora and fauna taxa. It is thought that sediment type may be one factor that heavily influences such zoning.

Traps at 80 m were collected in both summer and winter seasons. This is the only depth where it is possible to make seasonal comparisons. In addition, due to the low number of samples that were taken, it is only possible to get a general impression of the patterns of variation that occur. Since there have been some studies of necrophagous amphipods along the same transect in previous years (Presler 1986) it is possible to make loose comparisons with that information. At 15 m, winter (June) *Cheirimedon femoratus* is the dominant species. At 20–25 m summer (February) *Hippomedon kergueleni* is the dominant species, followed by *C. femoratus*. At 50 m, summer (March) *Hippomedon kergueleni* and *Cheirimedon femoratus* are equally dominant.

Strong differences between summer and winter seasons in the dominance of some amphipod species collected in baited traps at a depth of 80 m were observed (Fig. 4). *Abyssorchomene plebs* was a clear dominant in summer. *Waldeckia obesa*, on the contrary, was the most abundant species in winter. These observations are

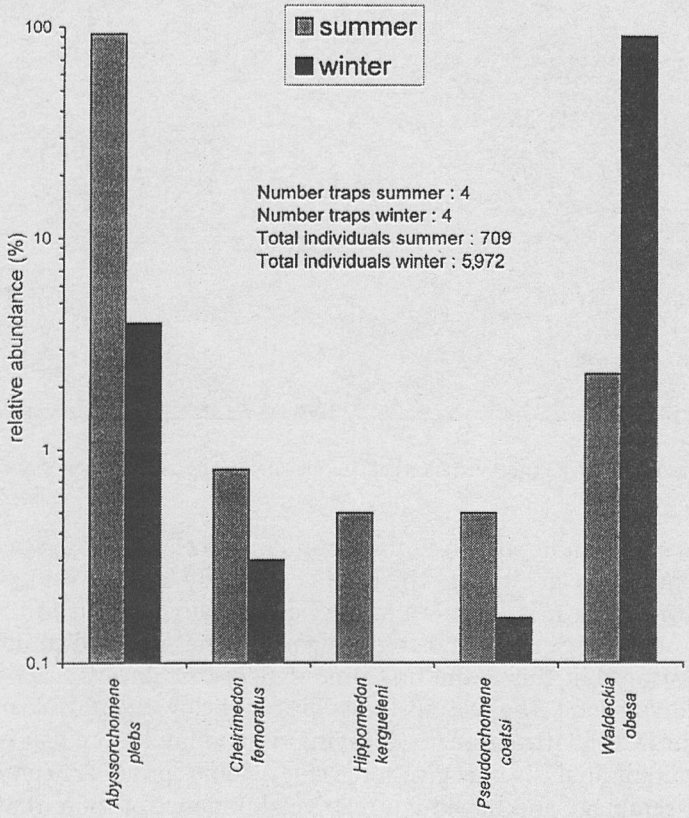

Fig. 4. Relative abundance of the most abundant species collected in traps at 80 m

concordant with the data of Presler (1986) from the same area who was studied necrophagous invertebrates of Admiralty Bay.

Bregazzi (1972) found from another Antarctic site that the seasonal distribution of *C. femoratus* was linked to primary production, therefore having marked seasonal differences in distributions and that of *H. kergueleni* independent of seasonal phytoplankton production (primary production) and thus free of seasonal fluctuations.

CONCLUSIONS

The patterns that emerge from the analysis are similar to the patterns found in quantitative sampling from other studies of the same area despite the fact that these samples were not collected in a quantitative manner. The qualitative results presented here shed further light on the patterns of assemblages in the benthos of Admiralty Bay. To further refine our understanding of the coastal ecosystem of Admiralty Bay, more quantitative interseasonal studies would more firmly establish patterns that may exist. In addition, other studies such as the identification of the trophic guilds to which the species belong and aquarium studies for behavioral observations of individual species would supplement this information and give us a way to interpret why the patterns occur.

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STRESZCZENIE

W ekosystemie Oceanu Południowego skorupiaki obunogie są znaczącym komponentem zespołów dna morskiego. Przejawia się to ich dużym bogactwem i gatunkową różnorodnością, zróżnicowaniem biologii, behawioru pokarmowego oraz szerokim spektrum zajmowanych habitatów. W Zatoce Admiralicji stwierdzono do tej pory 127 gatunków obunogów.

W 1993 roku w płytszym sublitoralu Zatoki Admiralicji na głębokościach od 15 m do 150 m zebrano materiały fauny dennej, w tym znaczące ilości obunogów, przy zastosowaniu trałów dennych i pułapek z mięsem.

Analiza zmian względnej liczebności obunogów oraz ich rozmieszczenia w cyklu rocznym wskazuje na sezonowe migracje w profilu pionowym. Należy to prawdopodobnie wiązać z dostępnością pokarmu.

W zgromadzonej kolekcji obunogów dziewięć gatunków stwierdzono w Zatoce Admiralicji po raz pierwszy. *Schraderia acuticauda* był wśród nich najliczniejszy i stosunkowo często spotykany.

Wśród gatunków łowionych do pułapek z mięsem na mniejszych głębokościach dominowały *Cheirimedon femoratus* i *Hippomedon kergueleni*. Głębiej (80 m) obserwowano wyraźne różnice w dominacji gatunków łowionych do pułapek z mięsem. *Abyssorchomene plebs* był wyraźnym dominantem w okresie letnim. *Waldeckia obesa*, przeciwnie, był licznie reprezentowany w sezonie zimowym.