POLISH POLAR RESEARCH	12	3	461–472	1991

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Survey and distributional patterns of the amphipod fauna of Admiralty Bay, King George Island, South Shetland Islands

ABSTRACT: The paper presents a list of over 100 amphipod taxa hitherto recorded in the Admiralty Bay, South Shetlands (Tab. 1). In Tab. 2 the distributional patterns of Amphipoda in upper and middle sublittoral (depth 5–150 m) of the Admiralty Bay are given. Notes on the taxonomy of some taxa are presented.

Key words: Antarctic, South Shetlands, Amphipoda, zoobenthos.

Introduction

Recent ecological studies on the Southern Ocean significantly englarged our knowledge of the major animal groups inhabiting the Antarctic region. Amphipod crustaceans belong to the most important components of the Antarctic zoobenthos and during the last two or three decades many expeditions to this area have brought rich amphipod samples. Study of this material has largely extended the list of 524 species and subspecies of Southern Ocean gammaridean amphipods compiled by Lowry and Bullock (1976). Jażdżewski *et al.* (1991) basing on the literature reviewed until 1988, estimated the number of hitherto known species to be about 600. A review of all post-1975 literature till October 1991 allowed us to update this number to about 660 gammaridean amphipod species and subspecies occurring in the Southern Ocean (De Broyer and Jażdżewski, in press).

The amphipod fauna of the West Antarctic region, the most accessible area, is not surprisingly the best known, but so far most detailed studies concentrated to the shallow sublittoral zone (*see e.g.* Thurston 1974 a, b). and too few benthic

surveys have been undertaken below the phytal zone. In this region King George Island in the South Shetlands archipelago is particularly noticeable by the true "crowd" of 10 scientific bases established mainly on the shores of two large and deep embayments — namely Maxwell Bay and Admiralty Bay.

Extensive studies on amphipod fauna of waters off the Fildes Peninsula of King George Island (Maxwell Bay and Fildes Strait) were recently published by Rauschert (1988, 1989, 1990 a, b, 1991) who recorded over 100 species of these crustaceans.

First data on Amphipoda caught in Admiralty Bay come from Chevreux (1913) and K.H. Barnard (1932) who respectively studied the collections of the second French Antarctic Expedition and of the "Discovery" expeditions. Some further amphipod species were mentioned by Jażdżewski (1981) and Presler (1986). The short list of a dozen of species was then more than doubled as a result of a preliminary survey of Amphipoda by the early Polish Antarctic expeditions (Arnaud *et al.* 1986). Further Polish benthic studies carried out in 1989 using SCUBA technique extended the list to 56 taxa (Jażdżewski *et al.* 1991). In addition, from 1986 to 1991, the second author collected qualitative samples by hand nets, trawls and baited traps from the shore to 406 m in several parts of Admiralty Bay. Altogether these different Polish and Belgian samples constitute a large collection of more than 100 000 specimens. A possible long perspective in identification of the whole material inclines the authors to publish this further preliminary, but substantially enriched survey.

The present note aims thus at updating the faunal list of the Admiralty Bay amphipods and at preliminarily characterizing their distributional patterns.

Material and methods

Information about the environmental conditions in Admiralty Bay, the largest embayment in all the South Shetlands archipelago, can be found in the papers by Rakusa-Suszczewski (1980), Szafrański and Lipski (1982) and Lipski (1987). The bulk of the present material is formed by a series of quantitative Van Veen grab samples taken in the central part of Admiralty Bay in front of the Polish Antarctic Station "Arctowski", along the transect I of Jażdżewski *et al.* (1986), i.e. from Shag Point in the direction of Hennequin Point. The depths sampled were from 46 to 147 m (Van Veen grab; total surface: 0.1 m^2). Sampling was carried out in 1985 by J. Siciński and A. Koszałkowski. A second series of shallower quantitative samples was taken by SCUBA diving, using a Tvärminne sampler at depths of 4 to 30 m (3 replicates; total surface sampled: 0.17 m^2) (*see* Jażdżewski *et al.* 1991). For establishing the faunal list, data from some other qualitative samples have been added, representing however a minor part of our huge qualitative collection.

The estimation of frequency of occurrence and numerical dominance of species in the depth range studied is based on the rough scale used by Arnaud *et al.* (1986).

The systematic arrangement follows Barnard and Karaman (1991), partly emended by Jażdżewski and De Broyer (1990) and by Coleman and Barnard (1991).

Results and discussion

Faunistic survey

Table 1 summarizes all published information on the occurrence of Admiralty Bay amphipods. This relatively rich list of some 108 gammaridean taxa is clearly far from complete. Many taxa have been identified only to the generic level. Definitive clarification of the status of several taxa is waiting comparison with type-material.

Table 1

List of amphipod taxa recorded from Admiralty Bay

1. Chevreux 1913
2. K.H. Barnard 1932
3. Jażdżewski 1981
4. Arnaud *et al.* 1986
5. Presler 1986
6. Jażdżewski *et al.* 1991
7. present data

A Zoogeographic characterization:
W: West-antarctic
C: circumantarctic (= East + West antarctic)
S: subantarctic (= subantarctic islands + Magellanic region)
+: distributed outside the limits of the Southern Ocean

TAXON	1	2	3	4	5	6	7	A
GAMMARIDEA								
AMPELISCIDAE								
Ampelisca anversensis Karaman, 1975							•	C+S
Ampelisca richardsoni Karaman, 1975							•	C
AMPHILOCHIDAE								
Gitanopsis squamosa (Thomson, 1880)						•	•	W+S
DEXAMINIDAE								
Paradexamine fissicauda Chevreux, 1906				•		•	•	W
EOPHLIANTIDAE								
Wandelia crassipes Chevreux, 1906						•	•	W+
EPIMERIIDAE								
Epimeria georgiana Schellenberg, 1931		•						W
Epimeria macrodonta Walker, 1906	•							C
EUSIRIDAE								
Atyloella magellanica (Stebbing, 1888)						•	•	C+S+
Atylopsis cf. *emarginatus* Stebbing, 1888							•	S

Table 1 — continued

TAXON	1	2	3	4	5	6	7	A
Bovallia gigantea Pfeffer, 1888	●			●		●	●	W
Djerboa furcipes Chevreux, 1906			●	●		●	●	W
Eurymera monticulosa Pfeffer, 1888			●	●		●	●	W
Eusirus antarcticus Thomson, 1880		●						C+S+
Eusirus bouvieri Chevreux, 1911							●	C
Eusirus perdentatus Chevreux, 1912		●		●			●	C
*Eusirus propeperdentatus** Andres, 1979			●					C
*Eusirus microps** Walker, 1901			●					C
Eusirus sp. 1							●	
Eusirus sp. 2							●	
Gondogeneia antarctica (Chevreux, 1906)	●			●			●	W+S
Gondogeneia georgiana (Pfeffer, 1888)				●			●	W
Gondogeneia redfearni (Thurston, 1974)							●	W
Gondogeneia subantarctica (Stephensen, 1938)				●			●	W+S
Gondogeneia sp. (juv.)						●	●	
Liouvillea oculata Chevreux, 1912				●		●	●	W
Oradarea bidentata K.H. Barnard, 1932			●	●			●	W
Oradarea edentata K.H. Barnard, 1932						●	●	W+S
Oradarea walkeri Shoemaker, 1930							●	C
Paramoera edouardi Schellenberg, 1929	●					●	●	W
Paramoera hurleyi Thurston, 1974						●	●	W
Paramoera cf. *hurleyi* Thurston, 1974				●				W
Prostebbingia brevicornis (Chevreux, 1906)			●	●		●	●	W+S
Prostebbingia gracilis (Chevreux, 1912)				●		●	●	C
Schraderia gracilis Pfeffer, 1988						●	●	
Schraderia (?) sp.							●	
Eusiridae gen. sp. indet.							●	
EXOEDICEROTIDAE								
Methalimedon nordenskjoeldi Schellenberg, 1931						●	●	C
Parhalimedon turqueti Chevreux, 1906							●	W
GAMMARIDAE								
Paraceradocus gibber Andres, 1984				●				C
Paraceradocus miersii (Pfeffer, 1888)							●	W
IPHIMEDIIDAE								
Echiniphimedia hodgsoni (Walker, 1906)				●			●	C
Gnathiphimedia fuchsi Thurston, 1974							●	W
Iphimediella sp. 1							●	
Pariphimedia intergricauda Chevreux, 1906				●		●	●	W
Stegopanoploea joubini (Chevreux, 1912)		●					●	C
Iphimediidae gen. sp. indet. 1							●	
ISAEIDAE								
Gammaropsis longicornis Walker, 1906							●	C+S
Gammaropsis sp.							●	
Haplocheira barbimana (Thomson, 1879)							●	C+S+
Kuphocheira setimana K.H. Barnard, 1931				●			●	W
Isaeidae gen. sp. indet.							●	
Isaeidae (?)							●	

Table 1 — continued

TAXON	1	2	3	4	5	6	7	A
ISCHYROCERIDAE								
Jassa ingens (Pfeffer, 1888)						●	●	W
Jassa thurstoni Conlan, 1990							●	W
"Jassa" wandeli Chevreux, 1906						●	●	W
Jassa sp. (juv.)						●		
LEUCOTHOIDAE								
Leucothoe spinicarpa (Abildgaard, 1789)							●	C+S+
LILJEBORGIIDAE								
Liljeborgia georgiana Schellenberg, 1931							●	C
Liljeborgia longicornis (Schellenberg, 1931)		●						W+S+
Liljeborgia sp.							●	
LYSIANASSIDAE s.l.								
Abyssorchomene plebs (Hurley, 1965)				●	●			C
Cheirimedon femoratus (Pfeffer, 1888)			●	●	●	●	●	C
*Cyphocaris richardi** Chevreux, 1905			●					C+S+
Hippomedon kergueleni (Miers, 1875)			●	●	●	●	●	C+S
Orchomenella acanthura (Schellenberg, 1931)							●	W
Orchomenella cavimana (Stebbing, 1888)							●	C+S
Orchomenella franklini Walker, 1903				●			●	C
Orchomenella macronyx Chevreux, 1905							●	C
Orchomenella rotundifrons K.H. Barnard, 1932				●	●	●	●	W
Orchomenella cf. *ultima* (Bellan-Santini, 1972)						●	●	C
Orchomenella sp. (juv.)						●	●	
Paralysianopsis odhneri Schellenberg, 1931							●	C+S
Pseudorchomene coatsi (Chilton, 1912)							●	C+S
Socarnoides cf. *kergueleni* Stebbing, 1888							●	W+S
Tryphosella murrayi (Walker, 1903)							●	
Waldeckia obesa (Chevreux, 1905)		●	●	●	●		●	C
MELPHIDIPPIDAE								
Melphidippa sp. 1							●	
OEDICEROTIDAE								
Monoculodes jazdzewskii De Broyer, 1980							●	C
Monoculodes scabriculosus K.H. Barnard, 1932				●		●	●	W+S
Monoculodes sp.							●	
Oediceroides lahillei Chevreux, 1911						●	●	W+S
Oediceroides macrodactyla Schellenberg, 1931		●						W
Oedicerotidae gen. sp. indet.						●		
PHOXOCEPHALIDAE								
Fuegiphoxus sp.							●	
Harpiniopsis sp.							●	
Heterophoxus trichosus K.H. Barnard, 1932				●		●	●	W
Heterophoxus videns K.H. Barnard, 1930		●					●	C+S+
"Parharpinia" rotundifrons (K.H. Barnard, 1932)				●		●	●	W
Pseudharpinia cariniceps (K.H. Barnard, 1932)		●					●	W
Pseudharpinia sp. (?)							●	
PHOXOCEPHALOPSIDAE								
Phoxocephalopsis deceptionis Stephensen, 1947				●		●	●	W
PLEUSTIDAE								
Parepimeria crenulata Chevreux, 1912		●					●	W
PODOCERIDAE								
Podocerus sp.							●	

Table 1 — continued

TAXON	1	2	3	4	5	6	7	A
STEGOCEPHALIDAE								
Andaniotes linearis K.H. Barnard, 1932							•	C+S
STENOTHOIDAE								
Antatelson walkeri (Chilton, 1912)							•	W
Metopoides cf. *walkeri* Chevreux, 1906							•	
Metopoides sp.							•	
Probolisca ovata (Stebbing, 1888)				•		•	•	W+S
Prothaumatelson nasutum (Chevreux, 1912)				•		•	•	W
Thaumatelson herdmani Walker, 1906							•	C
Torometopa antarctica (Walker, 1906)		•					•	C
Torometopa cf. *antarctica* (Walker, 1906)				•				C
Torometopa cf. *porcellana* (K.H. Barnard, 1932)							•	W+S
SYNOPIIDAE								
Cardenio paurodactylus Stebbing, 1888.						•	•	W+S
Syrrhoe nodulosa K.H. Barnard, 1932		•						C
CAPRELLIDEA								
CAPRELLIDAE								
Aeginoides gaussi Schellenberg, 1926		•						C
HYPERIIDEA								
HYPERIIDAE								
*Hyperia macrocephala** (Dana, 1853)			•					C+S
*Themisto gaudichaudii** Guérin-Méneville, 1825			•					C+S
VIBILIIDAE								
Cyllopus lucasii Bate, 1862			•					C+S

* Only in penguin stomachs

The comparison of the amphipod faunal lists of Admiralty Bay and of the Fildes Peninsula region (Rauschert 1990 a, b, 1991) obviously shows the limitations of our knowledge of the West Antarctic amphipods.

In two lists, each of some 100 taxa, only 40 species occur in both areas whereas over 60 spp were apparently recorded only from Admiralty Bay and the same number only from Fildes Peninsula waters. It is quite probable that the apparent differences between the amphipod faunas of these two localities are mainly due to insufficient sampling as well as to differences in taxonomical treatment due in part to the lack of in-depth revisions of many generic and family groups. Taxonomical comparison of the material from the two localities would most probably lead to an enlarged list of common species. For instance there could be species in common among taxa provisionally determined as "sp." or "cf".

Rauschert's (1991, p. 42) supposition that "Diese auffällige Artenarmut (of Admiralty Bay) lässt sich vermutlich durch die relativ abgeschlossene Lage der Bucht mit ihrer stagnierenden Wassermasse erklären" comes from overlooking the preliminary character of the faunistic survey of Arnaud *et al.* (1986) who mentioned only 31 amphipod species, but expected at least the double as final

number of species. On the other hand, the hydrology of Admiralty Bay has been described in several papers (among others by Szafrański and Lipski (1982) and Lipski (1987)), emphasizing the importance of the water exchange with the Bransfield Strait.

Taxonomical remarks

Recent taxonomical rearrangement in the family *Ischyroceridae* (Conlan 1989, 1990, J.L. Barnard and Karaman 1991) has supported the view expressed by Thurston (1974a) and Jażdżewski *et al.* (1991) that "*Jassa*" *wandeli* (*Jassa falcata* form 1 of Thurston) is a valid species. However its correct generic assignment has to wait for the description of a genus promised by Conlan (1989, 1990). As it comes from Conlan's revision (1990) true *Jassa falcata* does not occur in the Southern Hemisphere and therefore Rauschert's (1990a, 1991) *J. falcata* is most probably another species.

After thorough examination of *"Parharpinia" rotundifrons,* we tentatively accept the view of J.L. Barnard and Drummond (1978) and J.L. Barnard and Karaman (1991) that this species does not fit either to *Parharpinia* or to *Paraphoxus* Sars. Until a new genus is established we retain this taxon as *"Parharpinia" rotundifrons.*

Stenothoids urgently need serious revision since many characters hitherto used to discriminate different genera (like presence or absence of hardly visible and often overlooked accessory flagellum) were not correctly observed and illustrated, especially in older descriptions. Species of our Admiralty Bay material hitherto assigned to *Proboloides* Della Valle (Arnaud *et al.* 1986, Jażdżewski *et al.* 1991) after revisions of J.L. Barnard and Karaman (1987, 1991) should be removed to *Metopoides* Della Valle and *Torometopa* J.L. Barnard and Karaman. The present determination of *Metopoides* cf. *walkeri* comes from our belief that *Metopoides sarsi* Pfeffer is not conspecific with *M. walkeri. M. sarsi* was very inadequately described by Pfeffer (1888). Doubts on the synonymization of *M. walkeri* with *M. sarsi* by Chilton (1912) were expressed already by Thurston (1974a); we fully agree with this author that P7 basis shape, which is of critical importance in stenothoids classification even at the generic level (see J.L. Barnard and Karaman 1991), is quite different in the respective drawings of Pfeffer (1888) and of Chevreux (1906).

Our *Metopoides* sp. cannot be assigned to any stenothoid species recently described by Rauschert (1990b) from the neighbouring area. However, formal taxonomic decision will wait for the examination of expected additional material.

An interesting observation was done by the second author who caught *Prothaumatelson nasutum* in great numbers (106 specimens) in a baited trap at the depth of 50 m.

Distributional patterns

Table 2 attempts to document some distributional characteristics based on a comparison of two series of quantitative samples from the transect I in front of the Polish Antarctic Station.

One series of samples can be considered as belonging to the upper sublittoral zone, whereas the second was taken in the middle sublittoral. The bottom betwen 4 and 10 m consisted of a coarse sand underlain by gravel; below 15 m the bottom becomes sandy and muddy but always with coarse gravel and some stones.

Both in the upper and middle subslittoral soft bottom samples may include also dead algae (algal meadows were intentionally not sampled with Tvärminne sampler) and bryozoan clumps.

Table 2

Preliminary distributional patterns of selected Admiralty Bay amphipods

A: series taken in the range 4–30 m (SCUBA, Tvärminne sampler; Jażdżewski *et al.* 1991)
B: series taken in the range 46–147 m (Van Veen grab; present data)
a) depth range
b) frequency in the amphipod samples — * < 15%
** 15–25%
*** > 25%
c) % share in the all material — + < 2%
++ 2–4%
+++ 4–8%
++++ > 8%

TAXON	A	B	a	b	c
GAMMARIDEA					
AMPELISCIDAE					
Ampelisca anversensis		●	60–145	*	+
Ampelisca richardsoni		●	60–66	*	+
AMPHILOCHIDAE					
Gitanopsis squamosa	●		10–30	**	+
DEXAMINIDAE					
Paradexamine fissicauda	●	●	15–46	**	+
EOPHLIANTIDAE					
Wandelia crassipes	●	●	20–126	*	+
EUSIRIDAE					
Atyloella magellanica	●		30	*	+
Atylopsis cf. emarginatus		●	46	*	+
Bovallia gigantea	●		0.5–30	**	+
Djerboa furcipes	●		20–25	*	+
Eurymera monticulosa	●		0.5–60	*	+
Gondogeneia sp. (juv.)	●		4–30	**	+
Liouvillea oculata	●		10–30	*	+

Table 2 — continued

TAXON	A	B	a	b	c
Oradarea edentata	●		10–30	***	+
Oradarea walkeri		●	46–126	***	+
Paramoera edouardi	●		15–25	**	++
Paramoera hurleyi	●		4–30	***	+
Prostebbingia brevicornis	●	●	4–90	***	++++
Prostebbingia gracilis	●		4–30	***	++++
Schraderia gracilis	●		10–30	***	+++
GAMMARIDAE					
Paraceradocus miersi		●	88	*	+
IPHIMEDIIDAE					
Iphimediella sp. 1		●	46–88	*	+
Pariphimedia integricauda	●		15–30	**	+
Stegopanoploea joubini		●	46–126	**	+
ISAEIDAE					
Gammaropsis longicornis		●	60	*	+
Haplocheira barbimana		●	46–88	**	+
Kuphocheira setimana		●	60–88	*	+
ISCHYROCERIDAE					
Jassa ingens	●		15	*	+
Jassa thurstoni		●	46	*	+
"Jassa" wandeli	●		15	*	+
LEUCOTHOIDAE					
Leucothoe spinicarpa		●	46	*	+
LILJEBORGIIDAE					
Liljeborgia georgiana		●	145	*	+
LYSIANASSIDAE					
Cheirimedon femoratus	●	●	4–90	***	+++
Hippomedon kergueleni	●	●	4–145	***	++++
Orchomenella acanthura		●	46–165	**	+
Orchomenella cavimana		●	46–60	**	+
Orchomenella macronyx		●	44–170	*	+
Orchomenella rotundifrons	●	●	5–146	**	+
Orchomenella cf. *ultima*	●		10–30	***	+++
Orchomenella sp. (juv.)	●		10–30	*	+
Paralysianopsis odhneri		●	147	*	+
Waldeckia obesa		●	15–145	***	+
MELPHIDIPPIDAE					
Melphidippa sp.		●	145	*	+
OEDICEROTIDAE					
Monoculodes scabriculosus	●	●	4–145	***	++
Monoculodes jazdzewskii		●	120–145	*	+
Oediceroides lahillei	●		15	*	+
PLEUSTIDAE					
Parepimeria crenulata		●	60	*	+
PHOXOCEPHALIDAE					
Harpiniopsis sp.		●	60–126	*	+
Heterophoxus trichosus	●		5–30	**	+
Heterophoxus videns		●	46–147	***	+

Table 2 — continued

TAXON	A	B	a	b	c
"Parharpinia" rotundifrons	●		4–30	***	+++
Pseudharpinia cariniceps		●	88–120	*	+
PHOXOCEPHALOPSIDAE					
Phoxocephalopsis deceptionis	●		5–15	*	+
STENOTHOIDAE					
Antatelson walkeri		●	46	*	+
Probolisca ovata	●	●	10–60	**	+
Prothaumatelson nasutum	●		25–30	*	+
SYNOPIIDAE					
Cardenio paurodactylus	●		4–25	***	+
UROTHOIDAE					
Urothoe sp.	●	●	6.5–147	*	+

It appears from Tab. 2 that quite a few species have a relatively wide bathymetric range, namely: *Hippomedon kergueleni, Monoculodes scabriculosus, Orchomenella rotundifrons, Urothoe* sp. and *Wandelia crassipes*. The majority of species collected in the middle sublittoral (46–147 m) were not found in the upper range of 4 to 30 m. In the upper sublittoral, the numerically dominant species were *Prostebbingia brevicornis, P. gracilis* and *Hippomedon kergueleni;* next places were occupied by *Schraderia gracilis, "Parharpinia" rotundifrons, Orchomenella* cf. *ultima* and *Cardenio paurodactylus* (Jażdżewski *et al.* 1991). In the middle sublittoral the dominance was poorly marked; *Orchomenella acanthura* and *Heterophoxus videns* were relatively abundant while *Stegopanoploea joubini, Kuphocheira setimana, Haplocheira barbimana, Monoculodes scabriculosus* and *Waldeckia obesa* were frequent but not numerous.

Presler (1986), who studied in particular the distribution of necrophagous amphipods of Admiralty Bay in the same transect in similar depth range (5–90 m), observed clear preference for deeper waters of *Abyssorchomene plebs* (summer range: 60 to 90 m; winter occurrence: 60 m), whereas that of *Hippomedon kergueleni* (summer: 5 to 30 m; winter occurrence: 15 m) and *Orchomenella rotundifrons* (summer: 15 to 30 m; winter: ?) for shallower waters. *Cheirimedon femoratus* was taken in small numbers at all depths in summer but was particularly abundant between 5 and 15 m in winter.

The large amphipod material which is still waiting elaboration, the numerous taxonomic uncertainties as well as the rapid increase of taxonomic revisions allow us to conclude that the number of amphipod species of Admiralty Bay could still be raised considerably.

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Received October 2, 1991
Revised and accepted November 20, 1991

Streszczenie

W pracy zestawiono listę ponad 100 taksonów obunogów (Amphipoda) podawanych do tej pory z wód Zatoki Admiralicji (Tab. 1). Listę tę porównano z podobną listą zestawioną dla Zatoki Maxwella oraz wód otaczających Półwysep Fildes przez Rauscherta (1990a, 1991). Przedyskutowano różnice pomiędzy tymi dwoma zestawieniami i sformułowano pogląd, iż w rzeczywistości fauna Amphipoda obu akwenów jest zapewne bardzo podobna, co powinny pokazać dalsze badania materiału oraz nowe rewizje taksonomiczne.

W Tab. 2 przedstawiono charakter występowania pospolitych gatunków obunogów w sublitoralu Zatoki Admiralicji, w zakresie głębokości 5–150 m.

Omówiono problemy taksonomiczne związane z kilkoma gatunkami antarktycznych Amphipoda.