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Cumacea (Crustacea, Malacostraca) of Admiralty Bay, King George Island: a preliminary note

ABSTRACT: Cumacean crustaceans found in 188 qualitative and quantitative samples of zoobenthos collected in Admiralty Bay (King George Island, South Shetlands) by successive Polish Antarctic Expeditions in the years 1977–1989 were studied. In over 3000 individuals of these crustaceans 12 taxa were recognized. *Eudorella splendida* clearly dominated the material. Other common species were *Campylaspis maculata* and *Vaunthompsonia inermis*. The highest cumacean density amounted to 2618 ind.m^{-2}. Clear differences were observed between cumacean faunas of small grain sediment (muddy Ezcurra Inlet) and of mixed, coarser sediments (central part of Admiralty Bay with sand, gravel and mud). The dominance of *Eudorella splendida* was strongly marked in shallow Ezcurra Inlet whereas in deeper central part of Admiralty Bay the cumacean fauna was much more diversifield.

Key words: Antarctica, South Shetland Islands, Admiralty Bay, Crustacea, Cumacea.

Introduction

Cumacea are comparatively small malacostracan crustaceans occurring in the seas and oceans from upper sublittoral to the hadal depths. Total number of hitherto known Cumacea is estimated as about 1000 species (Schram 1986). Typically they live buried in the upper layer of soft bottom sediments; they are an important element of benthic communities and their position could be of a similar rank to that of Isopoda. Cumacean crustaceans of the Antarctic realm are a comparatively less known group of Malacostraca.

The first Antarctic Cumacea were described some hundred years ago. Fundamental for the knowledge of this group in the Antarctic were the pioneer papers by Zimmer (1902, 1907 a, b; 1908, 1909, 1913) and Calman (1917, 1918). Further important systematic and faunistic papers on Antarcic Cumacea are

those by Hale (1937), Gamô (1959, 1987), Lomakina (1968), Jones (1971) and Ledoyer (1974, 1977, 1993). We can expect that the number of 58 Antarctic and Subantarctic cumacean species mentioned by Ledoyer (1993) will be soon enlarged; only in last 8 years 14 new taxa were described from that region (Gamô 1987, Roccatagliata and Heard 1992, Ledoyer 1993, Mühlenhardt-Siegel 1994).

In the studies on Antarctic benthos Cumacea were quite often mentioned as its significant component, especially in terms of abundance. This importance of cumaceans in the Antarctic bottom fauna was observed mainly in soft sediments. Dayton and Oliver (1977) in McMurdo Sound have observed the record densities of Cumacea of over 30000 individuals per squ.m. In the South Shetlands area hundreds or thousands cumacean individuals per squ.m. were noted in shallow soft bottoms by Gallardo *et al.* (1977) in Chile (=Discovery) Bay of Greenwich Island and by Jażdżewski *et al.* (1986) in Admiralty Bay of King George Island.

Rather few detailed data on Cumacea of the West Antarctic area have been hitherto presented. Zimmer (1909) has recorded 11 species from South Georgia, Jones (1971) and Gallardo *et al.* (1977) have found 8 species in Chile Bay (Greenwich Island), Lowry (1975) has mentioned 4 cumacean taxa from Arthur Harbour (Anvers Island) and in the same area Richardson and Hedgpeth (1977) recorded 9 species of Cumacea. This crustacean group is completly absent in the preliminary list of benthic invertebrates of Admiralty Bay prepared by Arnaud *et al.* (1986) and the only information on Cumacea from that bay comes from the paper by Wägele and Brito (1990) who have mentioned 3 genera — *Eudorella, Vauthompsonia,* and *Campylaspis* — as main representatives of Cumacea. The holotype of recently described *Diastylipsis goekei* comes also from King George Island (Caleta Potter=Potter Cove) *see* Roccatagliata and Heard (1992).

Study area and material

Admiralty Bay is the largest bay in the whole South Shetland Islands archipelago with a surface area of about 120 km^2. It is a tri-furcated fjord broadly open to the Bransfield Strait with a deep main channel of maximum depth of over 500 m and three much shallower inner parts: Ezcurra, MacKellar and Martel Inlets (Fig. 1). Detailed information on morphology and hydrology of Admiralty Bay are given by Szafrański and Lipski (1982), Tokarczyk (1986), Lipski (1987), Sarukhanyan and Tokarczyk (1988) and Rakusa-Suszczewski (1993, 1995). Salinity and temperature are relatively stable throughout the whole bay, especially at the bottom. In central part of Admiralty Bay absolute minima and maxima are 32.0 and 34.2‰, and -1.9 and $+3.1$°C, respectively. Local summer increases of temperature or summer decreases in salinity due to the freshwater run-off are observed only in thin layer of suface waters.

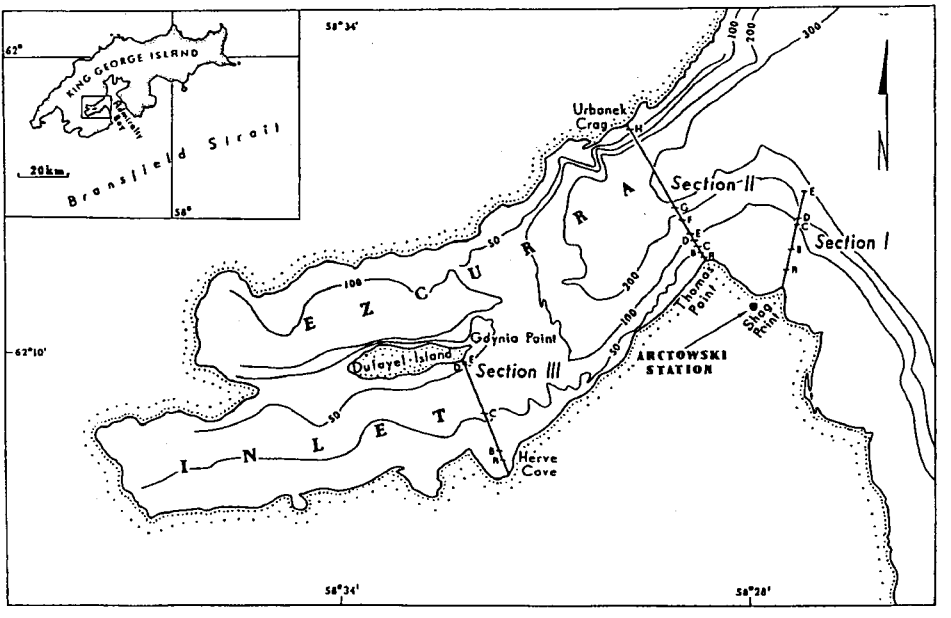
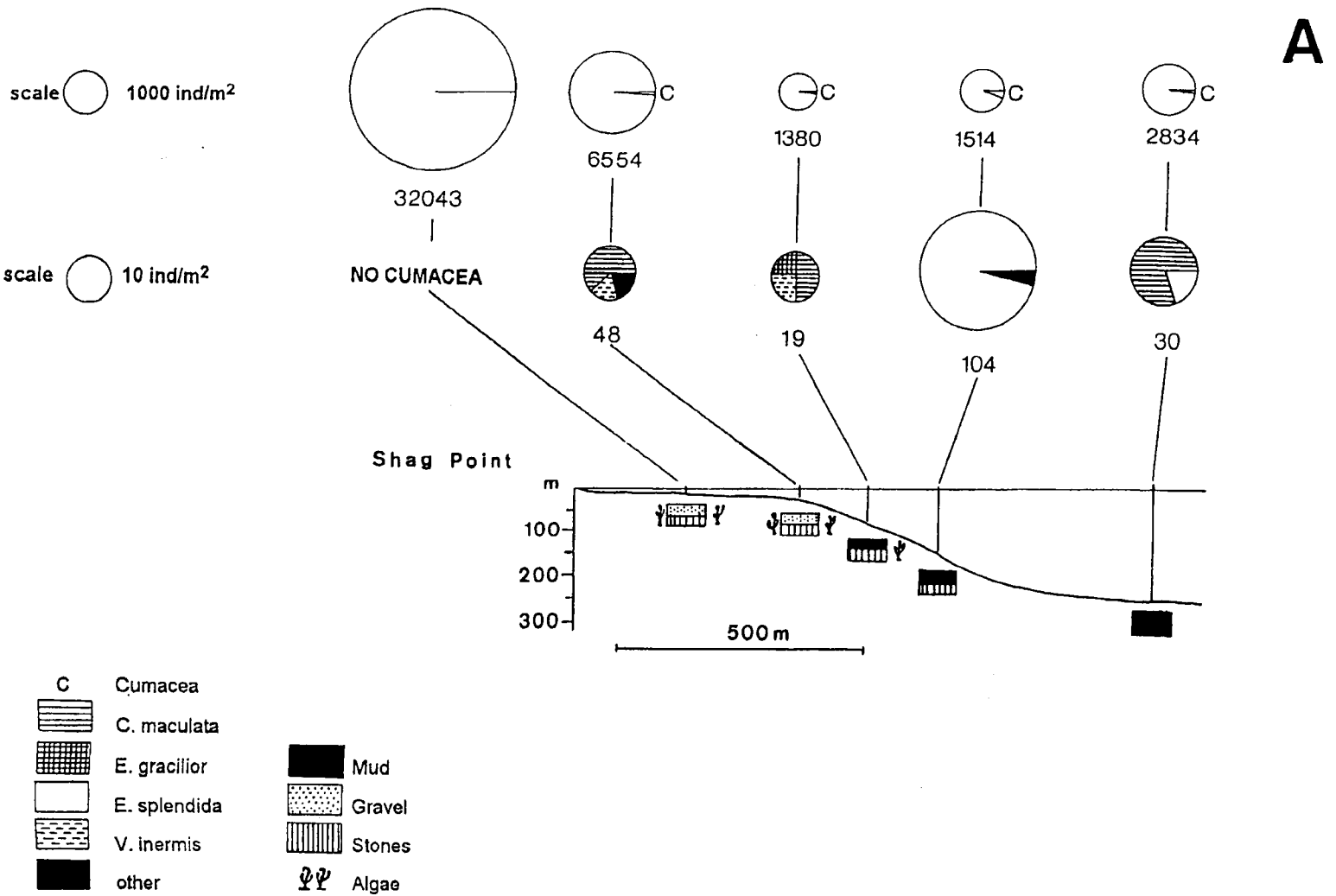


Fig. 1. Area of investigation showing the location of transects according to Jażdżewski *et al.* (1986).

Bottom sediments of Admiralty Bay have not been studied extensively. Coarse sediments mixed with fine mud occur in central channel down to the depth of about 50 m, whereas in deeper parts and in inlets fine mud prevails (Siciński and Tatur, *unpubl.*). The freshwater inflow from large glaciers sourrounding inner parts of the bay is responsible for the generally lower water transparency and thicker layer of small grain size sediments of these inlets (Pęcherzewski 1980, Siciński and Tatur, *unpubl.*).

Materials were collected in the whole Admiralty Bay however the distribution of stations was rather uneven. The majority of samples were collected in the wide vicinity of the Polish *H. Arctowski* Station situated at Point Thomas, *i.e.* in the north–western part of the main channel of the bay, as well as in Ezcurra Inlet.

Cumacea were found in 82 out of total number of 252 qualitative samples taken by dredging and trawling, and in 106 of 162 quantitative ones (Van Veen grab). Most of quantitative data were obtained in 3 chosen transects (Jażdżewski *et al.* 1986). In sampling stations located along the transect at particular depth usually 3 replicate samples were taken. These quantitative estimations for Cumacea alone in three transects are presented in Figs 2 and 3.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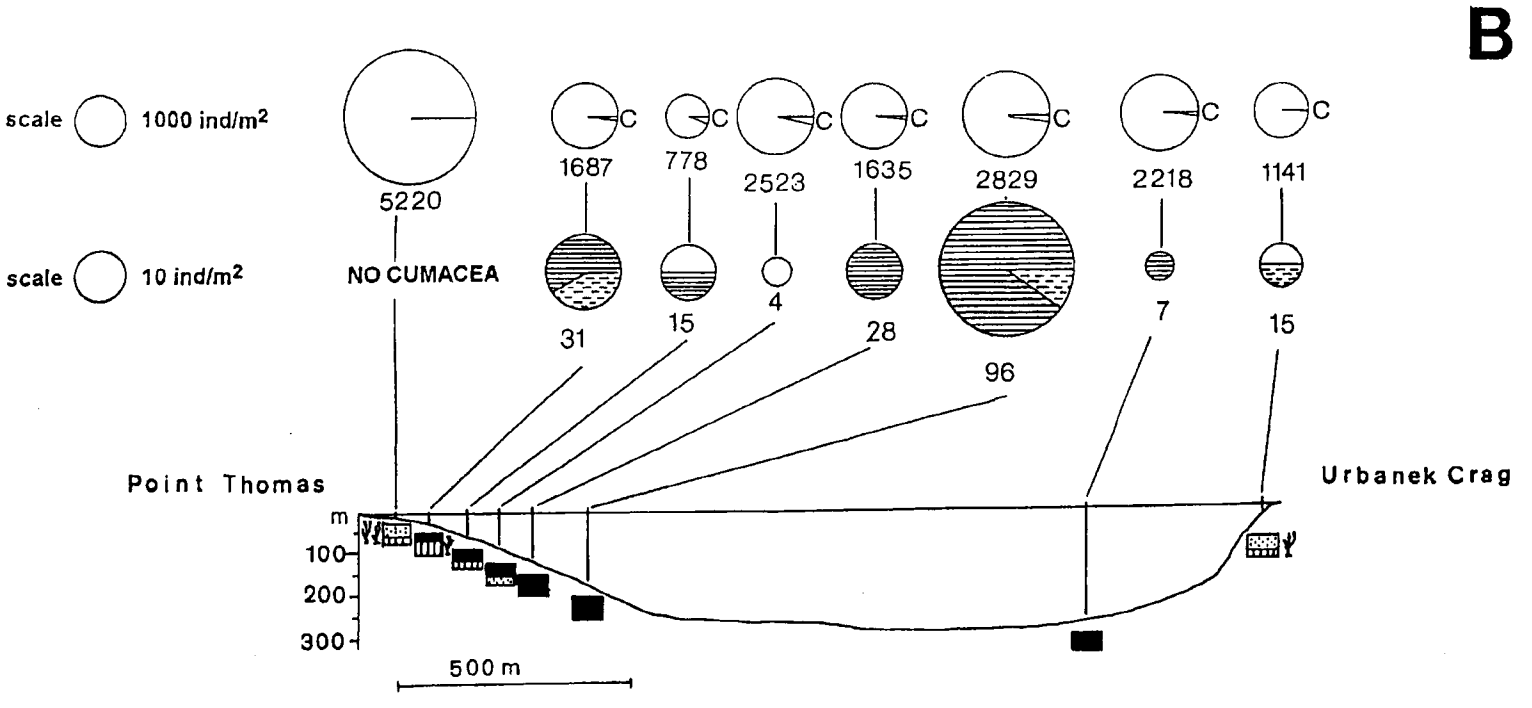

Fig. 2. The share of Cumacea (C) in total abundance of benthic animals (upper row) and the proportion between particular taxa (lower row) A. Section I, B. Section II of Jażdżewski *et al.* (1986).

Results and discussion

In the 188 samples examined, a total of 3065 cumacean specimens representing four families, seven genera, and at least 12 species were present. These data are summarized below:

Fam.: **Diastylidae** Bate, 1856	N	ZS
Diastylis anderssoni armata Ledoyer, 1993	51	E+W
Diastylis corniculata Hale, 1937	4	E+W
Diastylis helleri Zimmer, 1907	11	E+W
Diastylopsis goekei Roccatagliata *et* Heard, 1992	57	E+W
Fam.: **Leuconidae** G. O. Sars, 1878		
Eudorella gracilior Zimmer, 1907	92	E+W
Eudorella splendida Zimmer, 1902	1842	E+W+S
Leucon sp.	97	
Fam.: **Bodotriidae** T. Scot, 1901		
Vaunthompsonia inermis Zimmer, 1909	349	W
Vaunthompsonia meridionalis G. O. Sars, 1887	16	W+S
Fam.: **Nannastacidae** Bate, 1907		
Cumella australis Calman, 1907	50	E+W
Cumella pectinifera Gamô 1987	31	E+W
Campylaspis maculata Zimmer, 1907	406	E+W

(N — number of specimens; ZS — zoogeographical status; W — western Antarctic; E+W — circumantarctic; W+S — Western and subantarctic; E+W+S — circumantarctic and subantarctic).

Our material of *Leucon* resembles *L. sagitta* Zimmer and *L. kerguelensis* Zimmer. Doubts concerning the identity of *Leucon kerguelensis* and its possible synonymy expressed by M. Ledoyer (*personal commun.*) incline the present authors to keep the name *Leucon* sp. only. Approximately 50 specimens from our Admiralty Bay collection were poorly preserved, damaged or too immature to identify with certainty. Some specimens that formally could be determined as *Diastylis inornata* Hale have also strong affinities to the genus *Leptostylis*, may be more than to *Diastylis* s.str. The distribution and taxonomic status of *Diastylis inornata* is still unsettled. This problem was also raised recently by Ledoyer (1993, *personal commun.*). Until the type material can be studied and compared with other specimens attributed to this species the generic and distributional status of *D. inornata* will remain uncertain.

Noteworthy is the presence in our materials of three quite recently described taxa: *Cumella pectinifera* Gamô, 1987, *Diastylis anderssoni armata* Ledoyer,

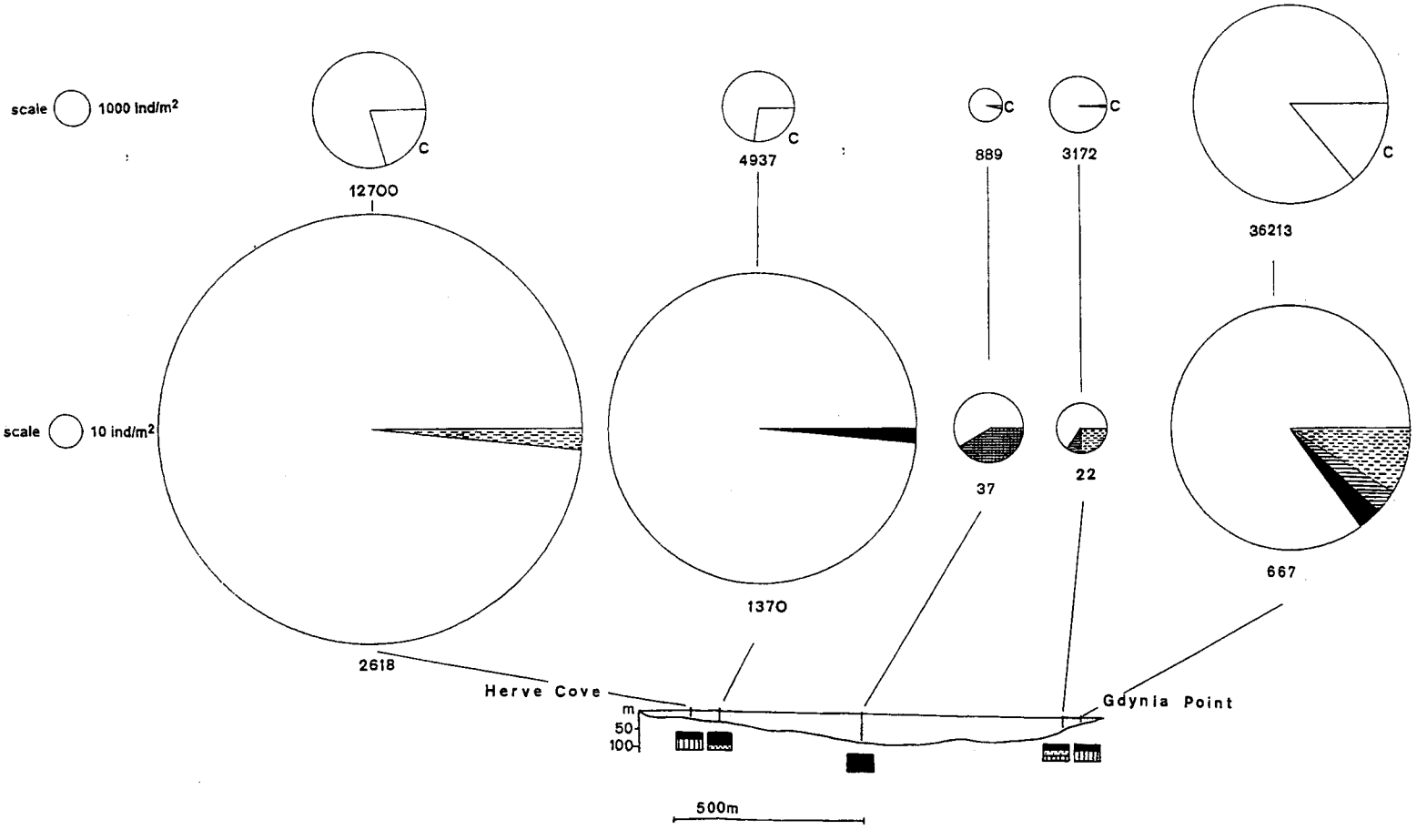

Fig. 3. The share of Cumacea (C) in total abundance of benthic animals (upper row) and the proportion between particular taxa (lower row). Section III of Jażdżewski *et al.* (1986). Legend as in Fig. 2.

1993 and *Diastylopsis goekei* Roccatagliata *et* Heard, 1992. All other species can be recognized as comparatively common ones in the Antarctic region.

Figures 4–6 show the distribution of particular species in Admiralty Bay. Relative abundance (number of individuals per sample) of three dominant taxa was calculated for qualitative and quantitative samples together.

Zoogeographic analysis of species found in Admiralty Bay, carried out according to the system proposed by De Broyer and Jażdżewski (1993) shows that 8 taxa have a circumantarctic distribution (E+W), 1 species has circumantarctic and subantarctic distribution (E+W+S), 1 species occurs both in West Antarctic and in Subantarctic (W+S) and one is hitherto known only from West Antarctic (W).

Despite the preliminary character of our data and the fact that those parts of Admiralty Bay that were deeper and more remote from *H. Arctowski* Station were much less studied, some clear tendencies in the distribution of Cumacea in this basin can be observed.

In the Ezurra Inlet of the bottom of thick layer of small grain sediments a distinctly higher cumacean abundance was noted. Cumacea were here in shallow places (15–30 m) a conspicuously subdominant group in the whole benthic fauna (Jażdżewski *et al.* 1986). A clear dominance of *Eudorella splendida* over other cumaceans was observed (Fig. 3). In contrast to this situation the share of Cumacea in the benthos of two other transects situated at the end of main Admiralty Bay channel of the bottom of distinctly coarser sediments was rather inconspicuous; the leading species among Cumacea were here *Campylaspis maculata* and *Vaunthompsonia inermis* (Figs 2 A and B). At the same time the diversity of Cumacea was distinctly lower in stations situated in Ezcurra Inlet than in the main Admiralty Bay channel.

As it was already mentioned some cumacean species were recorded in neighbouring areas in comparable depth ranges. Jones (1971) and Gallardo *et al.* (1977) recorded in Chile Bay of Greenwich Island 8 species: *Diastylis helleri, Diastylopsis annulata, Leptostylis crassicauda, Eudorella gracilior, Leucon antarctica, Vaunthompsonia inermis, V. meridionalis* and *Campylaspis maculata*. High faunistic similarity of this list to the list of Admiralty Bay species is clear. The distribution of *E. gracilior* in Chile Bay was shown by Gallardo *et al.* (1977); this species was among the dominants in the benthos with maximal densities surpassing 60 ind. per 0.1 squ.m. (600 ind. m^{-2}). A rather distinct preferences of *E. gracilior* for the depth range of 30–50 m was observed by these authors.

In Arthur Harbor of Anvers Island (Palmer Archipelago) in two shallow, muddy stations (depth about 20 m) Lowry (1975) has recorded *Diastylis* sp., *Eudorella* sp., *Vaunthompsonia inermis* and *V. meridionalis* (determined by R. Given). Here also, especially in station I, *Eudorella* sp. was a most important cumacean of rather high abundance and frequency; this taxon with high bioindex score was placed among the dominant bottom fauna organisms. Richardson and

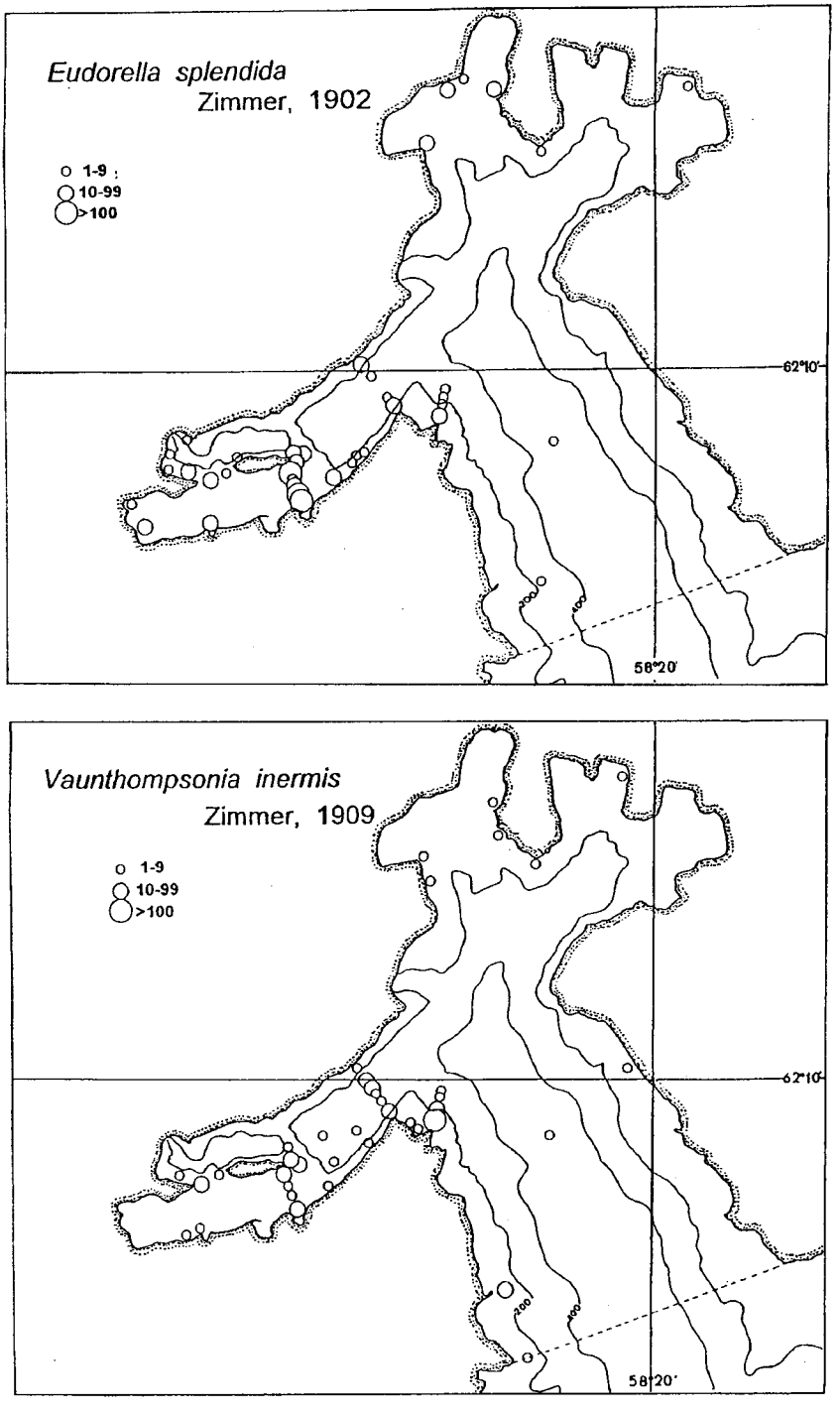

Fig. 4. The distribution of Cumacea in Admiralty Bay. Relative abundance (individuals per sample) is indicated.

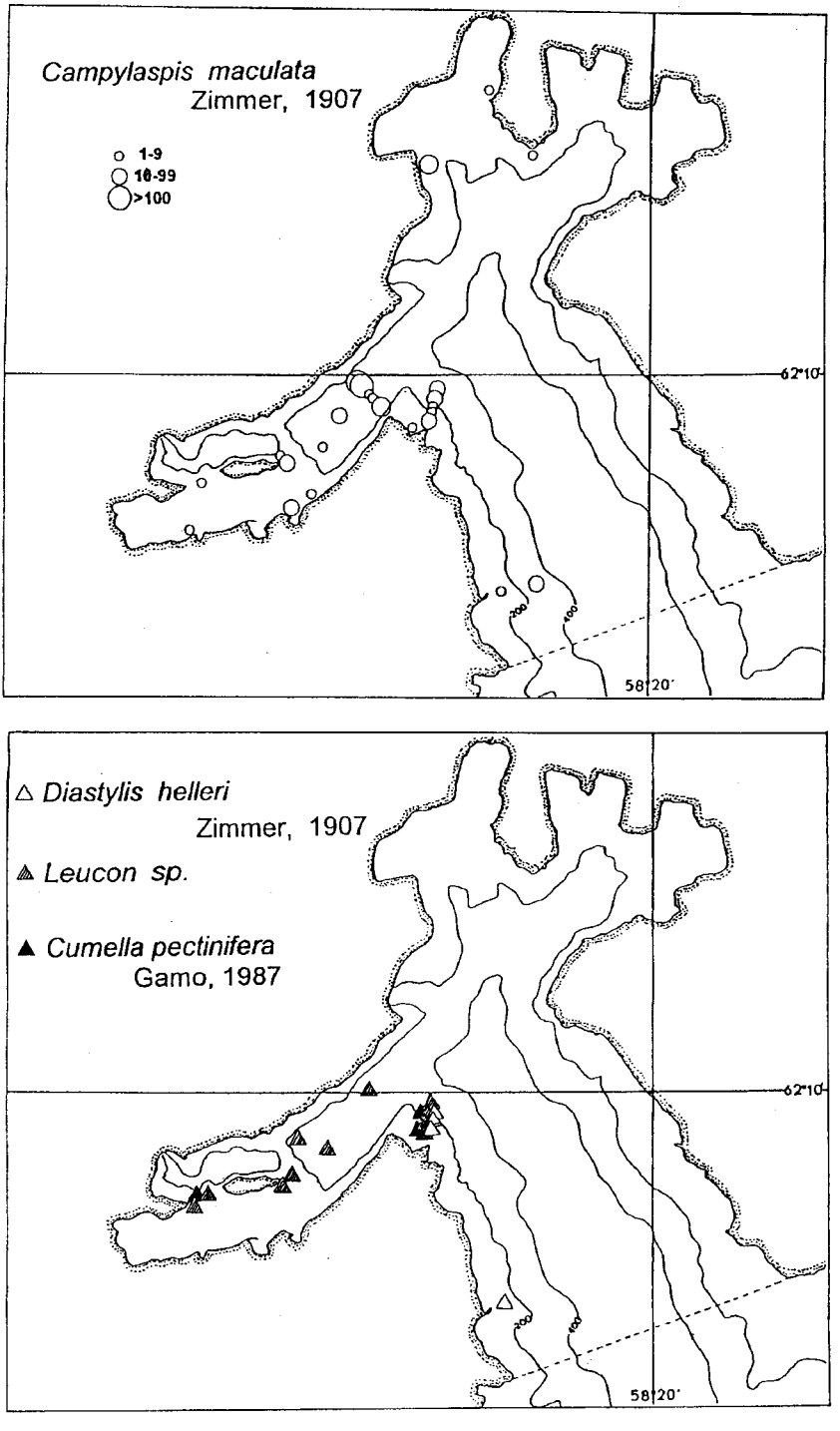

Fig. 5. The distribution of Cumacea in Admiralty Bay. Relative abundance (individuals per sample) or simple occurrence are indicated.

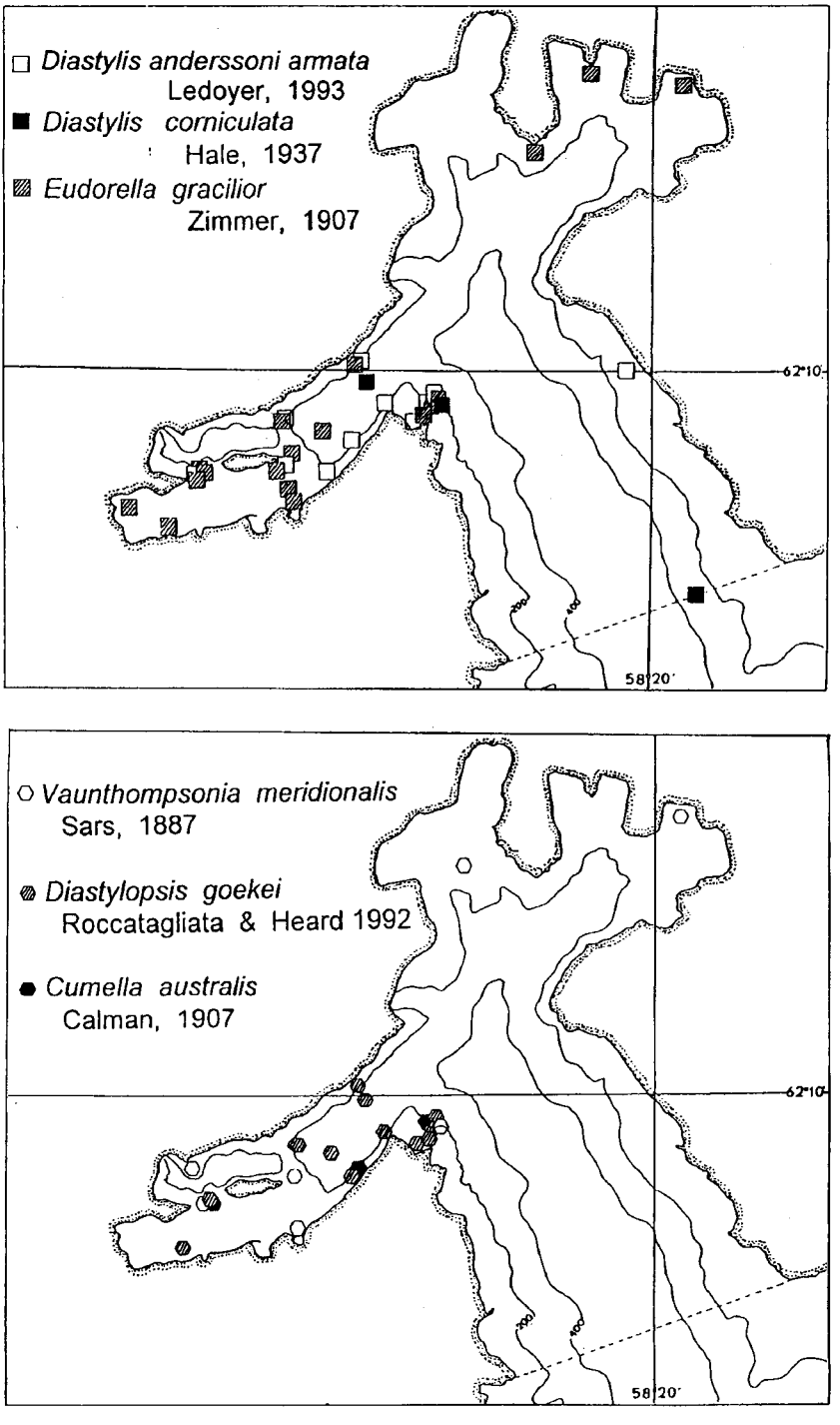

Fig. 6. The distribution of Cumacea in Admiralty Bay.

Hedgpeth (1977) who have studied soft bottom benthos of 14 stations in the area of Arthur Harbor in the depth range 5–700 m (but mostly between 18 and 65 m) have listed 9 cumacean taxa: *Diastylis anderssoni, Diastylopsis annulata, Makrokylindrus* n.sp., *Eudorella gracilior, Leucon sagitta, Leucon* n.sp., *Vaunthompsonia inermis, V. meridionalis* and *Campylaspis maculata* (determined by N. S. Jones). This list is also rather similar to our list. Again *Eudorella gracilior* belonged there to the dominant species in several distinguished bottom fauna assemblages of Arthur Harbor with the density reaching 1800 ind.m^{-2}.

It is interesting enough that *E. splendida* — the species that was so clearly the dominant cumacean in the Ezurra Inlet of Admiralty Bay — was absent in the materials of Gallardo *et al.* (1977) and Richardson and Hedgpeth (1977). Noteworthy their cumacean dominant — *E. gracilior* – was also present and rather common in our materials, but, except of one station never so numerous as *E. splendida.*

On the other hand there exists some similarity of Admiralty Bay cumacean fauna with that of Morbihan Bay (Kerguelen Islands) studied by Ledoyer (1974). *Eudorella splendida* belonged there to dominant species of Cumacea occurring frequently and, at the depth of 40–60 m, in rather high abundance. Another more common species in Morbihan Bay was *Vaunthompsonia meridionalis* — a cumacean occurring also in Admiralty Bay.

Zimmer (1909) and Lomakina (1968) listed 11 species of Cumacea recorded at South Georgia. These were *Diastylis anderssoni, D. helleri, Leptostylis antipa, Diastylopsis annulata, Leucon sagitta, Eudorella gracilior, E. splendida, Cyclaspis quadrituberculata, Vaunthompsonia inermis, V. meridionalis* and *Campylaspis maculata.* It is obvious that there is a clear faunistic similarity between South Georgian and South Shetlands cumacean fauna, at least on the level of most common and abundant species.

Recent study by Ledoyer (1993) of the Cumacea of the eastern Weddell Sea areas (Halley Bay, Kapp Norvegia) was based on the material collected in the depth range of 200–2000 m. Therefore it is not astonishing that in his list of 29 species found there only four were in common with Admiralty Bay (*Diastylis anderssoni armata, D. corniculata, E. gracilior and Cumella australis*).

The list of 12 (13?) species recorded from Admiralty Bay is probably still rather incomplete. Materials of bottom fauna of this basin were rather unevenly collected. Samplings were concentrated in the vicinity of *H. Arctowski* Station and in depths not exceeding 200 m. Deeper parts of Admiralty Bay, and especially those situated near its entrance from the Bransfield Strait, were inadequately sampled and when they were sampled at all — often large mesh size nets were used and small animals were usually washed out of these samples during trawling. For such a large, deep basin, well representing typical West Antarctic habitats, we should expect that our preliminary list of Cumacea will be doubled, when new and old hitherto not yet identified materials will be elaborated.

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Streszczenie

Artykuł przedstawia wyniki opracowania kolekcji skorupiaków z grupy Cumacea zebranych w latach 1977–1989 w Zatoce Admiralicji (Wyspa Króla Jerzego, Szetlandy Południowe (fig. 1) w czasie kolejnych Polskich Wypraw Antarktycznych PAN. Wśród ponad 3000 osobników Cumacea stwierdzono przedstawicieli co najmniej 12 taksonów. Zdecydowanym dominantem w tym materiale był *Eudorella splendida,* zaś innymi pospolitymi gatunkami były *Campylaspis maculata* i *Vauthompsonia inermis.* Najwyższe zagęszczenie Cumacea w Zatoce Admiralicji przekraczało 2600 osobników na 1 m^2; obserwowano je na stosunkowo niewielkich głębokościach mulistego fjordu Ezcurra, gdzie dominacja *E. splendida* zaznaczała się szczególnie silnie, a fauna Cumacea była mało różnorodna. Znacznie wyższe bogactwo gatunkowe w tej grupie skorupiaczej

obserwowano w głębszej, centralnej części Zatoki Admiralicji, gdzie przeważały osady o grubszym ziarnie. Udział ilościowy Cumacea w zoobentosie Zatoki Admiralicji, względną liczebność najpospolitszych gatunków oraz rozmieszczenie poszczególnych taksonów przedstawiono na fig. 2–6.