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## Amphipod crustaceans in the diet of pygoscelid penguins of the King George Island, South Shetland Islands, Antarctica

**ABSTRACT:** Information is presented concerning amphipod crustaceans eaten by three penguin species breeding on King George Island: *Pygoscelis adeliae*, *P. antarctica* and *P. papua*. In their stomachs 10 gammaridean and 3 hyperiidean amphipod species were found. The most abundant species was *Parathemisto gaudichaudii*. Noteworthy are the records of recently described and still poorly known species: *Eusirus propeperdentatus* and *Eusirus cf. tridentatus*. Some 15% of all amphipod specimens found in penguin stomachs were benthic species that are very common in the Antarctic littoral and which probably swarm.

**Key words:** Antarctic *Amphipoda*, penguin food, South Shetlands fauna

### 1. Introduction

Both in older and recent Antarctic literature one can find notes on *Amphipoda* found in penguin stomach contents (Chevreux 1905, 1906a, 1906b, 1913, Spandl 1927, K. H. Barnard 1930, Ealey 1954, Emison 1968, Bellan-Santini 1972a, De Broyer 1973, Thurston 1974b, Volkman, Presler and Trivelpiece 1980). Ealey (1954) observed large quantities of amphipods in the stomachs of Rockhopper penguins (*Eudyptes chrysocome*). In all other cases these crustaceans were only a minor food component, representing not more than a few percent of all organisms swallowed (Emison 1968, Volkman, Presler and Trivelpiece 1980). Amphipod species new to science have been described from such material, for instance *Waldeckia obesa* (Chevreux 1905), *Djerboa furcipes* (Chevreux 1906a), *Pontogeneiella brevicornis* (Chevreux 1906b), *Cylopus antarcticus* (Spandl 1927) and *Orchomene hureaui* (De Broyer 1973) thus indicating the importance of such studies to systematics and zoogeography. On the other hand by knowing the ecology of the prey we can increase our knowledge of the behaviour and ecology of the consumers.

The present note is a contribution to information on the species diversity of a component of the food of pygoscelid penguins, namely the amphipod crustaceans, group which plays an important role in the Antarctic ecosystem.

## 2. Material

A small collection of *Amphipoda* was kindly offered to the author by Mr. N. J. Volkman of Sedona (Arizona, USA). Material was collected by N. J. Volkman and W. Trivelpiece while studying the food of three sympatrically breeding pygoscelid penguins (Adélie — *Pygoscelis adeliae*, Chinstrap — *P. antarctica* and Gentoo — *P. papua*) on the shores of Admiralty Bay, King George Island, in the vicinity of Polish Arctowski Station during the austral summer 1977/1978. In all, 123 penguins (48 of *P. adeliae*, 29 of *P. antarctica* and 46 of *P. papua*) were dissected and in the stomachs of 27 of them amphipod crustaceans were found (22% of all samples). One sample was lost and therefore the present collection consisted of 26 samples: 15 from *P. adeliae*, 5 from *P. antarctica* and 6 from *P. papua*. Disregarding the loss of one sample, *Amphipoda* were present in 31% of Adélie, in 17% of Chinstrap and in 13% of Gentoo penguin stomachs. According to Volkman, Presler and Trivelpiece (1980), where the collecting methods are described in detail, the stomach contents of all investigated penguins consisted mainly of euphausiids: *Euphausia superba* and *E. crystallorophias*. These two species together constituted from 84.5 to 99.6% of the wet weight of the stomach contents and from 98.4 to 99.8% by number of prey items. *Amphipoda* which are the subject of the present study represented 0.1 to 0.3% by wet weight and 0.1 to 0.2 by number and ranked third in importance to euphausiids and the fish *Pleurogramma antarcticum*.

## 3. Results

In 26 samples 116 amphipod specimens were found and 110 of them were determined. The species and number of specimens in each sample is listed below with the collectors' sample designation:

- No. 3, *Pygoscelis papua*, male, 7 Nov. 1977: *Waldeckia obesa* — 1.  
 No. 10, *P. adeliae*, female, 10 Nov. 1977: *Parathemisto gaudichaudii* — 27.  
 No. 15, *P. adeliae*, male, 11 Nov. 1977: *Parathemisto gaudichaudii* — 1.  
 No. 16, *P. antarctica*, female, 13 Nov. 1977: *Gammaridea* indet. — 1,  
*Parathemisto gaudichaudii* — 6.  
 No. 17, *P. adeliae*, female, 13 Nov. 1977: *Eusirus* sp. indet. — 1, *Parathemisto gaudichaudii* — 18.  
 No. 19, *P. adeliae*, female, 14 Nov. 1977: *Eurymera monticulosa* — 1,  
*Cheirimedon femoratus* — 1, *Hippomedon kergueleni* — 1, *Parathemisto gaudichaudii* — 1.  
 No. 25, *P. adeliae*, male, 27 Nov. 1977: *Parathemisto gaudichaudii* — 1.  
 No. 26, *P. adeliae*, male, 28 Nov. 1977: *Eusirus cf. tridentatus* — 6.

- No. 27, *P. papua*, female, 28 Nov. 1977: *Eusirus cf. tridentatus* — 1.  
 No. 28, *P. adeliae*, female, 30 Nov. 1977: *Eusirus cf. tridentatus* — 3, *Cylopus lucasii* — 1, *Parathemisto gaudichaudii* — 1.  
 No. 31, *P. antarctica*, male, 3 Dec. 1977: *Eusirus cf. tridentatus* — 1, *Parathemisto gaudichaudii* — 3.  
 No. 32, *P. adeliae*, male, 3 Dec. 1977: *Eusirus cf. tridentatus* — 1, *Parathemisto gaudichaudii* — 1.  
 No. 33, *P. papua*, male, 3 Dec. 1977: *Eusirus propeperdentatus* — 1.  
 No. 39, *P. adeliae*, male, 4 Dec. 1977: *Hyperia macrocephala* — 1.  
 No. 40, *P. papua*, male, 4 Dec. 1977: *Hyperia macrocephala* — 1.  
 No. 42, *P. adeliae*, female, 4 Dec. 1977: *Hyperia macrocephala* — 1.  
 No. 48, *P. adeliae*, male, 16 Dec. 1977: *Parathemisto gaudichaudii* — 1.  
 No. 49, *P. adeliae*, female, 16 Dec. 1977: *Cyphocaris richardi* — 1.  
 No. 51, *P. adeliae*, male, 16 Dec. 1977: *Hyperia macrocephala* — 1, *Parathemisto gaudichaudii* — 3.  
 No. 52, *P. papua*, female, 16 Dec. 1977: *Eurymera monticulosa* — 4, *Pontogeneiella brevicornis* — 1, *Eusiridae* indet. — 1.  
 No. 62, *P. papua*, female, 28 Dec. 1977: *Djerboa furcipes* — 3, *Oradarea bidentata* — 5, *Eusiridae* indet. — 3.  
 No. 93, *P. antarctica*, male, 6 Jan. 1978: *Cylopus lucasii* — 1.  
 No. 108, *P. antarctica*, ? , 21 Jan. 1978: *Hyperia macrocephala* — 1.  
 No. 120, *P. adeliae*, female, 2 Feb. 1978: *Parathemisto gaudichaudii* — 1.  
 No. 121, *P. adeliae*, male, 4 Feb. 1978: *Parathemisto gaudichaudii* — 7.  
 No. 126, *P. antarctica*, female, 7 Feb. 1978: *Hyperia macrocephala* — 1.

Pelagic species, as expected, dominated the present material, constituting about 85% of all collected specimens. The frequencies of occurrence of the

Table I.  
Amphipoda in the stomachs of pygoscelid penguins of the King George Island

<i>Amphipoda</i>	<i>Pygoscelis adeliae</i> (15 ind.)	<i>Pygoscelis antarctica</i> (5 ind.)	<i>Pygoscelis papua</i> (6 ind.)	Totally (26 ind.)
<i>Djerboa furcipes</i>			3 (1)	3 (1)
<i>Eurymera monticulosa</i>	1 (1)		4 (1)	5 (2)
<i>Eusirus propeperdentatus</i> *)			1 (1)	1 (1)
<i>Eusirus cf. tridentatus</i> *)	10 (3)	1 (1)	1 (1)	12 (5)
<i>Oradarea bidentata</i>			5 (1)	5 (1)
<i>Pontogeneiella brevicornis</i>			1 (1)	1 (1)
<i>Cheirimedon femoratus</i>	1 (1)			1 (1)
<i>Cyphocaris richardi</i> *)	1 (1)			1 (1)
<i>Hippomedon kergueleni</i>	1 (1)			1 (1)
<i>Waldeckia obesa</i>			1 (1)	1 (1)
<i>Gammaridea</i> indet.		1 (1)	5 (2)	6 (3)
<i>Cylopus lucasii</i> *)	1 (1)	1 (1)		2 (2)
<i>Hyperia macrocephala</i> *)	3 (3)	2 (2)	1 (1)	6 (6)
<i>Parathemisto gaudichaudii</i> *)	62 (11)	9 (2)		71 (13)
Totally	80	14	22	116

\*) Pelagic species. The number of penguin stomachs, in which particular amphipod species were found, is given in brackets.

three commonest species were: *Parathemisto gaudichaudii* — 50%, *Hyperia macrocephala* — 23% and *Eusirus cf. tridentatus* — 19%. Among 17 specimens of benthic amphipods there were 7 different species which reflects the diversity of this group in Antarctic waters. The present material is insufficient for detailed comparison of three penguin species with regard to their amphipod prey composition, however the marked difference especially between *Pygoscelis adeliae* and *P. papua* in the quantity of ingested *Parathemisto gaudichaudii* (Table I) could be of some significance. The diet of Gentoo penguins at King George Island was found to be significantly different from the other two penguin species both in general composition (it eats much more fish) as well as in the prey size class preferences (Volkman, Presler and Trivelpiece 1980). It should be remembered, however, that Ealey (1954) has found *P. gaudichaudii* in the stomachs of Gentoo penguins at Heard Island.

*Eusirus cf. tridentatus* was found 5 times in the stomachs of all three penguin species over a comparatively short time span. Sample numbers 26, 27, 28, 31 and 32 were taken between 28th of November and 3rd of December 1977. The species was found in no other samples and may have undergone a temporary increase in numbers within the foraging range of penguins from the study rookery.

### 3.1. Systematic account

Suborder: *Gammaridea*

Fam. *Eusiridae* (sensu J. L. Barnard 1972)

*Djerboa furcipes* Chevreux, 1906

This species is known from Kerguelen, the Crozet Islands, South Georgia and from West Antarctica. It inhabits mainly mixed bottoms with sediment and algae; depth range—down to 110 m (Thurston 1974a, Lowry and Bullock 1976). From the South Shetland Islands it was known only from Deception Island where it was found in the stomach contents of *Trematomus* sp. (Thurston 1974b).

*Eurymera monticulosa* Pfeffer, 1888

A common West-Antarctic and Subantarctic littoral species, occurring mainly in algae growing on rocky bottoms down to the depth of 40 m (Thurston 1974a, Lowry and Bullock 1976). Thurston (1974a) assumes the swarming habits of *E. monticulosa*. In Admiralty Bay this is one of the commonest species (Jażdżewski, unpubl. data).

*Eusirus propeperdentatus* Andres, 1979

This is the second record of this recently described species. It was found by the German Antarctic Expedition 1975/1976 in several RMT 1 and RMT 8 hauls performed between 6th and 10th of February 1976 at a time station some 20 km south of Elephant Island (61°30'S, 55°00'W) (Andres 1979). A very rich material of several hundreds of specimens of this species was obtained from 5 hauls taken between 600 and 400 m whereas 6 hauls taken at depths between 400 and 50 m contained only 15 specimens and none at all were found in the hauls taken

in the top 50 m. Andres (1979) was able to demonstrate that this species undergoes an upward migration at night.

Many specimens of *E. propeperdentatus* were obtained during the I Polish Antarctic Marine Research Expedition 1975/1976 (I PAMRE) at the same time (7th of February 1976) some 80 km south of the above mentioned station of Andres (1979). The commercial krill trawl was hauled for several hours at a depth of 580—500 m. In the net, together with some 1000 kg of *Euphausia superba* obviously fished in the upper water layers there were hundreds of specimens of *Eusirus propeperdentatus* (De Broyer and Jażdżewski, in press). A part of this material was used in the studies by De Broyer (1977) and Opaliński and Jażdżewski (1978) who mistakenly identified material as *Eusirus perdentatus*. Numerous krill hauls taken at the same time and in the same area but within the upper 100 m failed to catch *E. propeperdentatus*.

*Eusirus cf. tridentatus* Bellan-Santini et Ledoyer, 1974

The description and figures of *Eusirus tridentatus* are to be found in the paper by Bellan-Santini (1972b) under the name "*Eusirus antarcticus* Thomson, 1880". This description was based on one female specimen (24 mm) found in the stomach of *Notothenia coriiceps neglecta* caught off Adelie Land. The name "*Eusirus tridentatus* n. sp." for this form was used by Bellan-Santini and Ledoyer (1974) who mentioned also the second specimen (55 mm) of this species coming from the materials of the Chilean Antarctic Expedition. I cannot accept the view of Lowry and Bullock (1976) who synonymized *E. tridentatus* with *E. antarcticus*. The present well preserved material of 12 specimens (20—50 mm) of both sexes is fairly uniform and agrees well with the description of Bellan-Santini (1972b), the only difference being the much degree of setosity of the posterior peraeopods in the specimens of this material. However the specimen depicted by Bellan-Santini, judging from her figures, was obviously damaged and it is possible that long, delicate setae were broken due to ingestion and digestion. I am of the opinion that the strong denticulation of the posterior margin of the 3rd epimeral plate and of the basis of the posterior peraeopods in *Eusirus antarcticus* (Bellan-Santini and Ledoyer 1974, Thurston 1974b) is a good character to distinguish *E. tridentatus* whose 3rd epimera and peraeopods are posteriorly nearly smooth or at most with very shallow and sparse denticulation. Until a comparison can be made with typical material of *E. tridentatus*, the present author leaves the specimens in this collection under the provisional name *Eusirus cf. tridentatus*. *E. cf. tridentatus* is undoubtedly a pelagic species, probably of circumantarctic distribution. Lowry and Bullock (1976, p. 6) are incorrect when they state that the description of *E. tridentatus* was "... based on specimens from the Kerguelen Islands, the Adelie Coast and the Chilean Antarctic Expedition.". The species in question was only mentioned in the paper concerning amphipods of the Kerguelen Islands but was not found there (Bellan-Santini and Ledoyer 1974).

*Oradarea bidentata* K. H. Barnard, 1932

This abundant littoral species occurs commonly around the Antarctic Peninsula and throughout the Scotia Arc, inhabiting bottoms of boulders

and algae (Thurston 1974a, Lowry and Bullock 1976). In the South Shetlands Archipelago it was hitherto recorded only from the Deception Island (Thurston 1974a).

*Pontogeneiella brevicornis* (Chevreux, 1906)

This is one of the most abundant littoral West-Antractic and Subantarctic amphipod species. It has been found mostly on bottoms of sand, boulders and algae (Thurston 1974a, Lowry and Bullock 1976). Thurston (1974a) has suggested that this species may swarm.

Fam.: *Lysianassidae*.

*Cheirimedon femoratus* (Pfeffer, 1888)

*Cheirimedon femoratus* is a very common species of circumantarctic distribution. It has been collected on various types of bottom and over a fairly wide depth range: from the low tide down to more than 300 m (Thurston 1974a, Lowry and Bullock 1976). In Admiralty Bay *C. femoratus* is one of the most abundant and frequently occurring amphipod species, caught in hundreds in the baited nets, mainly at depths of 15–30 m (Jażdżewski, unpubl. data). The necrophagous habits of this species have been recorded frequently in the literature, however the studies by Bregazzi (1972) showed that *C. femoratus* is only a facultative necrophage. *C. femoratus* has been found in the stomachs of pygoscelid penguins (Chevreux 1906b, Bellan-Santini 1972a) as well as in the stomachs of nototheniid fishes (Bellan-Santini 1972b, Thurston 1974b).

*Cyphocaris richardi* Chevreux, 1905

This cosmopolitan bathypelagic species of a characteristic bright red-orange colour has been recorded frequently in the Southern Ocean (Lowry and Bullock 1976, Opaliński and Jażdżewski 1978, Andres 1979). Most of the records were based on the hauls made at depths of several hundreds or even thousands meters or at least from such depths up to the surface. Andres (1979) has shown that the highest density of this species in the waters off the South Shetlands Archipelago occurs between 400 and 600 m as was for *Eusirus propeperdentatus*. The above mentioned big haul taken during the cruise of r/v "Profesor Siedlecki" (I PAMRE) on 7th February 1976 contained several hundreds of *Cyphocaris richardi* together with hundreds of *E. propeperdentatus* (De Broyer and Jażdżewski, in press). These data agree well with those of Andres (1979) whose abundant material of this species also came from depths of 400–600 m.

*Hippomedon kergueleni* (Miers, 1875)

This is one of the commonest Antarctic and Subantarctic amphipod species found throughout the Southern Ocean at various depths down to 750 m (Lowry and Bullock 1976). *H. kergueleni* was caught in considerable numbers in baited traps by Bregazzi (1972) at the South Orkney Islands. It is also one of the commonest necrophagous amphipods collected in baited nets in Admiralty Bay mainly at the depths of 5–30 m (Jażdżewski, unpubl. data). As is the case with *Cheirimedon femoratus*, Bregazzi (1972) is of the opinion that the necrophagy of *H. kergueleni* is facultative.

*Waldeckia obesa* (Chevreux, 1905)

This species is one of the most conspicuous circumantarctic necrophagous

amphipods. Its depth range is wide—from the low tide down to 550 m (Bellan-Santini 1972a, Arnaud 1970, 1974, Lowry and Bullock 1976). In Admiralty Bay *W. obesa* is one of the commonest and most abundant animals caught in hundreds in flesh-baited traps. A preference for the depths greater than 30 m has been observed (Jazdzewski, unpubl. data). Suborder: *Hyperiidea*

Fam.: *Vibiliidae*

*Cylopus lucasii* Bate, 1862

This is a circumantarctic species frequently recorded around South Georgia (Hurley 1969). The present author's unpublished observations indicate that in the Drake Passage and the Scotia Sea it is a common planktonic species. It was reported from a penguin stomach by K. H. Barnard (1930).

Fam.: *Hyperiidae*

*Hyperia macrocephala* (Dana, 1853)

According to Bowman (1973) this is a species of circumantarctic distribution and despite few hitherto published records it is probably widespread and comparatively abundant. The two largest collections of *H. macrocephala* come from the Ross Sea. A total of 253 specimens were found by Emison (1968) in the stomachs of Adélie penguins from the Cape Crozier rookery and some 150 specimens were collected from medusae in the Mc Murdo Sound area by C. Ray (Bowman 1973). The comparatively high frequency of the occurrence of *H. macrocephala* in the present small collection (Table I) indicates that this species is a rather common pelagic crustacean in the South Shetlands area, although it had not been recorded previously from this region.

*Parathemisto gaudichaudii* (Guerin, 1825)

*Parathemisto gaudichaudii* is a very conspicuous pelagic amphipod with a bipolar distribution. In the Southern Ocean it occurs in great swarms being there the commonest and most abundant hyperiid species (Hardy and Gunther 1935, Hurley 1955, 1960, 1969, Marr 1962, Vinogradov 1962, Kane 1966). In many commercial krill hauls it constituted a noticeable admixture to the euphausiid catches in the Scotia Sea (pers. unpubl. observations). It is somewhat surprising, therefore, that *P. gaudichaudii* has been found as a constituent of penguin diets only by Ealey (1954) who has recorded this species (as *Euthemisto antarctica*) to be a major food of the Rockhopper penguin and has noted its presence in the Gentoo penguin stomachs.

#### 4. Discussion

In several papers mentioned in the introductory part of this article at least 25 amphipod species have been recorded in the diet of Antarctic penguins. Specimens of *Hyperia galba* mentioned in the diet of the Rockhopper and Gentoo penguin by Ealey (1954) are unlikely to belong to this species which has an Arctic-boreal distribution (Bowman 1973). It is most probable that the species involved was *Hyperia spinigera* (see Thurston 1977). The present paper adds 4 more species to this list namely *Eusirus*

*propeperdentatus*, *E. cf. tridentatus*, *Oradarea bidentata* and *Hippomedon kergueleni*.

The most comprehensive list of *Amphipoda* registered in the penguin diet is given by Emison (1968). In the samples taken from 207 Adélie penguins nearly 3500 amphipod specimens were found and 14 species were identified. *Amphipoda*, as was the case in the study by Volkman, Presler and Trivelpiece (1980), occupied third place in the diet of penguins after euphausiids (mainly *Euphausia crystallorophias*) and fishes (mainly *Pleurogramma antarcticum*), usually accounting for 1–2% by number of the food organisms. The frequency of occurrence of amphipods in all 207 samples is not stated, however in 37 complete samples collected from the killed penguins (the remaining samples were taken by sucking out a portion of food from living birds) the frequency of the occurrence of all *Amphipoda* was 100%. This frequency is much higher than the 22% found in the stomachs studied by Volkman, Presler and Trivelpiece (1980) that have provided material for the present note. The species composition of Emison's amphipod material is very interesting. Over 2500 specimens were *Orchomene plebs* and *Orchomene rossi* in the ratio 7:1. Next in order of abundance were *Epimeriella macronyx* (267 specimens), *Hyperia macrocephala* (253), *Eusirus microps* (167) and *Hyperiella dilatata* (156). In the 37 complete samples the frequency of both *Orchomene* species was about 90%; *Hyperia macrocephala*, 70%; *Hyperiella dilatata*, 46%; *Eusirus microps*, 38%; and *Epimeriella macronyx*, 35%.

Emison (1968) mentioned that "... none of the amphipods were bottom-dwelling species ..." (p. 210, excepting *Orchomene pinguides* and *Paramoera walkeri*). However *Orchomene plebs* and *O. rossi* are usually considered as necrophagous benthic species (Hurley 1965, Arnaud 1970, 1974, Bellan-Santini 1972a). Only in the recent paper by Andres (1979) there is an indication of a pelagic mode of existence for these species. Similarly *Epimeriella macronyx*, *Cheirimedon fougneri* and *Uristes murrayi* have been treated as benthic species and not as pelagic ones.

It is probable that necrophagous lysianassids like *Cheirimedon* spp., *Orchomene* spp., *Hippomedon kergueleni* and *Waldeckia obesa* form a comparatively frequent prey of penguins because of the presumed swarming of these amphipods around penguin or seal carcasses in shallow water. A similar role as an additional food source may be assumed for *Eurymera monticulosa* and *Pontogeneiella brevicornis*. These common, shallow water species which appear to form dense aggregations (Thurston 1974a) would be available to penguins near the shore just before landing at the rookeries. A similar suggestion was expressed by Emison (1968) with regard to *Paramoera walkeri* and *Orchomene pinguides*.

In the light of Emison's observations concerning the high frequency of occurrence and the relative abundance in penguin stomachs of *Orchomene plebs* the total absence of this species in the present material is interesting and difficult to explain as *O. plebs* is one of the commonest and most widespread necrophagous organisms in Admiralty Bay (Jażdżewski, unpubl. data).

At least two amphipod species recorded in the present study, *Cyphocaris richardi* and *Eusirus propeperdantatus*, are known mainly from depths exceeding

several hundreds of meters. Conroy and Twelves (1972) in the South Orkneys area observed *Pygoscelis papua* to dive to depths of 100 m, whereas *P. adeliae* and *P. antarctica* are believed to feed mainly at the surface. It is possible, therefore, either that these bathypelagic species sometimes ascend into the surface layers or that pygoscelid penguins dive deeper than was hitherto suspected.

That *Parathemisto gaudichaudii* as an item of penguin diet is noted here only for the second time is probably attributable to its subantarctic distribution pattern (Kane 1966). In the subantarctic region *P. gaudichaudii* is an important food item in the diet of some pelagic fishes (Rembiszewski, Krzeptowski and Linkowski 1978) and many bird species (Ealey 1954, Linkowski and Rembiszewski 1978). With the exception of the work of Ealey (1954) and that presented here other penguin-feeding studies have been made in more southerly localities where *P. gaudichaudii* is absent or at least very rare. Furthermore, with exception of the study by Emison (1968), other analyses have been somewhat haphazard. One should also consider, however, the possibility of non-random choice of food organisms by penguins. It is quite possible that they can intentionally avoid some crustaceans, distinguishing between brighter (krill) and darker (*Parathemisto*) swarms. Marr (1962) expressed surprise that such an abundant pelagic species as *P. gaudichaudii* had been so rarely recorded in the stomach contents of baleen whales and he also assumed that for unknown reasons intentional choice was involved.

This study of the food of pygoscelid penguins, although based on rather few samples, has provided interesting faunistic data. Noteworthy are the second record of *Eusirus propeperdentatus* and the third of *E. cf. tridentatus*. The presence of *Hyperia macrocephala* is also worthy of mention as it is the first record of this rarely collected species from the South Shetlands area (Bowman 1973).

To the total of 42 species of *Amphipoda* hitherto known from the King George Island area (Chevreux 1913, K. H. Barnard 1932, Stephensen 1947, Thurston 1974a, 1974b, Lowry and Bullock 1976, Jażdżewski, unpubl. data) further 6 species are added by this study: *Djerboa furcipes*, *Eusirus propeperdentatus*, *E. cf. tridentatus*, *Cyphocaris richardi*, *Cyllopus lucasii* and *Hyperia macrocephala*.

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## 5. Summary

The present paper discusses the species composition of *Amphipoda* collected from the stomachs of three pygoscelid penguin species (*Pygoscelis adeliae*, *P. antarctica* and *P. papua*)

sympatrically breeding of the King George Island, South Shetlands Archipelago. 10 gammaridean and 3 hyperiidean amphipod species were found (Table I). The most common and abundant was pelagic hyperiid *Parthemisto gaudichaudii*. Among other amphipods noteworthy were *Eusirus propeperdentatus* and *Eusirus cf. tridentatus* — the species only recently described and still poorly known. Several benthic *Amphipoda* found in penguin stomachs belonged to very common Antarctic littoral species presumably of swarming habits.

## 6. Резюме

Разработано материал *Amphipoda* из желудков 3 видов пингвинов из рода *Pygoscelis* (*P. adeliae*, *P. antarctica*, *P. papua*), гнездящихся на острове Кинг Джорж в архипелаге Южно-Шетландских островов. В желудках этих птиц найдено 13 видов бокоплавов: 10 из подотряда *Gammaridea* и 3 из подотряда *Hyperiidea* (таблица I). Наиболее обычным и многочисленным оказался планктонный *Parthemisto gaudichaudii*. Интересной находкой является обнаружение недавно описанных и пока слабо изученных видов рода *Eusirus*: *E. propeperdentatus* и *E. cf. tridentatus*. Около 15% найденных бокоплавов принадлежит к донным видам, обитающим в массовом количестве на антарктической литорали.

## 7. Streszczenie

Omówiono skład gatunkowy *Amphipoda* znalezionych w pokarmie 3 gatunków pingwinów z rodzaju *Pygoscelis* (*P. adeliae*, *P. antarctica* i *P. papua*) gnieźdzących się na wyspie Króla Jerzego w archipelagu Południowych Szetlandów. W żołądkach badanych ptaków stwierdzono 13 gatunków obunogów, w tym 10 gatunków z podrzędu *Gammaridea* i 3 z podrzędu *Hyperiidea* (Tabela I). Najpospolitszym i najliczniejszym okazał się planktonowy *Parthemisto gaudichaudii*. Interesującym odkryciem było znalezienie dwu niedawno opisanych i jeszcze słabo poznanych gatunków: *Eusirus propeperdentatus* i *Eusirus cf. tridentatus*. Około 15% znalezionych osobników *Amphipoda* reprezentowało pospolite gatunki bentosowe, występujące masowo w antarktycznym litoralu.

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