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New data on the distribution of stenothoid amphipods (Crustacea) from Scotia Arc, West Antarctic

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Abstract: This paper presents new records of stenothoids from the Scotia Arc (West Antarctic). Altogether twenty species were recorded, two of which are reported in the West Antarctic for the first time. In addition, two species are here recorded for the first time since their description. New data on distribution are supplemented by taxonomical remarks on the collected species.

Key words: Antarctic, Scotia Arc, Amphipoda, Stenothoidae, taxonomy, distribution.

Introduction

The Scotia Arc is composed of four archipelagos: South Georgia and Shag Rocks, South Sandwich Islands, South Orkney Islands and South Shetland Islands, connecting the southern tip of South America and the Antarctic Peninsula (Fig. 1). The islands of the Scotia Arc constitute an exclusive, semi-continuous connection between Antarctica and other continents (Arntz 2005). From the biogeographical point of view the Scotia Arc islands belong to the Antarctic Region and the West Antarctic province (De Broyer *et al.* 2007). It is a region of great biogeographical importance because many typically Antarctic species attain there their northern limits of distribution. On the other hand, South Georgia is an area, where several Magellanic species attain their southernmost distribution limits (Tatian *et al*. 2005; Barnes *et al*. 2006). In the region of the Scotia Arc the climate change was observed in recent years, documented by the rise of air temperature and the retreat of glaciers (Barnes 2005; Clarke *et al*. 2007). Additionally, the appearance of alien marine and terrestrial species was recorded there (Olech 1996; Barnes 2005; Frenot *et al*. 2005). The region is much visited by tourists and ship traffic is relatively intensive (Barnes 2005; Chwedorzewska and Korczak 2010). A summary of recent studies on the Sco-

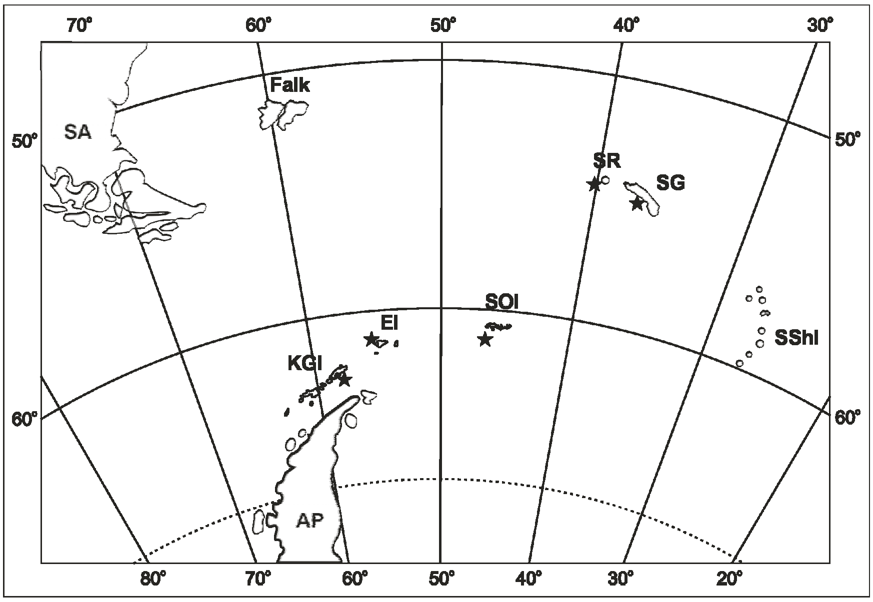

Fig. 1. Study area; the asterisks show localities of sampling stations. SA – South America, Falk – Falkland Islands, SR – Shag Rocks, SG – South Georgia, SShI – South Sandwich Islands, SOI – South Orkney Islands, EI – Elephant Island, KGI – King George Island, AP – Antarctic Peninsula.

tia Arc is to be found in the special volume of *Scientia Marina* "The Magellan-Antarctic connection: links and frontiers at high southern latitudes" (2005, vol. 69, suppl. 2).

Even though this region has been studied already during many years there is still a need to study the diversity of marine fauna as in most places species accumulation curves do not reach the asymptote (Barnes 2008; own data). Furthermore the studies of the benthos have usually been restricted only to the particular locality or habitat. Also most research has focused on animal groups of big size and easy identification (Barnes 2008; Barnes *et al*. 2006, 2009c). This paper presents the results of a study of one Amphipod family, the Stenothoidae. Although amphipods play an important role in Antarctic benthic communities, stenothoids are often neglected while identifying the collected material, due to their small size and difficulty of identification.

Material and methods

The material for the present study came from the following locations in the Scotia Arc: Shag Rocks, South Georgia, South Orkney Islands (Powell Basin), South Shetland Islands (King George Island and Elephant Island) (Fig. 1). Samples were collected using Van Veen grabs during the 9th Polish Antarctic Expedition (1984–86) and Polish Antarctic IPY Expedition in 2007 (King George Island, Admiralty Bay) (45 samples). The samples taken by the British Antarctic Survey were collected using epibentic sledges in 2006 (9 samples). The material consisted of almost 150 individuals.

The material was fixed using 4% formalin, then washed in freshwater and transferred to 75% alcohol, sorted under a dissecting microscope and preserved in 70% alcohol. Slides were prepared with glycerin and stored in Faure's fluid. Pencil drawings were done using various compound microscopes with camera lucida; inking was done by using the software Adobe Illustrator.

Data on the distribution of stenothoid amphipods discussed here are summarized in Table 1.

The material collected by the Polish team is deposited in the University of Łódź (ULCA), the material collected by the British Antarctic Survey in the British Museum, London (NHMUK).

Acronyms used in morphological descriptions: A1, 2 – antenna 1, 2; acc. – accessory; art – article; Cx– coxal plate; Ep – epimeral plate; flag – flagellum; Gn1, 2 – gnathopod 1, 2; Hd – head; IP – inner plate; LL – lower lip; Md – mandible; Mx1, 2 – maxilla 1, 2; Mxp – maxilliped; OP – outer plate; P3–7 – peraeopod 3–7; Ped – peduncle; Pl – pleopod; T – telson; U1–3 – uropod 1–3; UL – upper lip.

Results

Stenothoidae Boeck, 1871

Genus *Metopoides* Della Valle, 1893

Metopoides Della Valle, 1893: 907.

Diagnostic characters. — A1 acc. flag. usually with 2 articles (can be very small). Md palp 3 articles, the last one short; Mx1 palp 2 articles, Mx2 IP much shorter than OP; Mxp IP well separated, OP half to quarter length of merus. Gn1, 2 subchelate, similar to each other in shape but not in size; Gn2 palm smooth or serrated, carpus usually longer than wide. P5 basis linear, P6, 7 basis expanded and lobate, merus tip usually not reaching half of merus length. T longer than twice the width.

Sixteen species included. — *M. angusta* Rauschert, 1990; *M. bellansantiniae* (Bushueva, 1988); *M. clavata* Schellenberg, 1931; *M. crassa* Schellenberg, 1931; *M. curvipes* Schellenberg, 1926; *M. elliptica* Schellenberg, 1931; *M. heterostylis* Schellenberg, 1926; *M. lanceolata* Rauschert, 1990; *M. lata* Rauschert, 1990; *M. leptomanus* Rauschert, 1990; *M. longicornis* Schellenberg, 1931; *M. magellanica* (Stebbing, 1888); *M. pollex* Krapp-Schickel, 2009; *M. sarsii* (Pfeffer, 1888); *M. typica* (Walker, 1906); *M. typicamimus* Andres, 1995.

Remarks. — In his monograph about the amphipods of the Gulf of Naples Della Valle (1893) created two new genera of stenothoids by stressing the similarity to the extant genera *Probolium* and *Metopa*: for *Metopa gregaria* he coined the

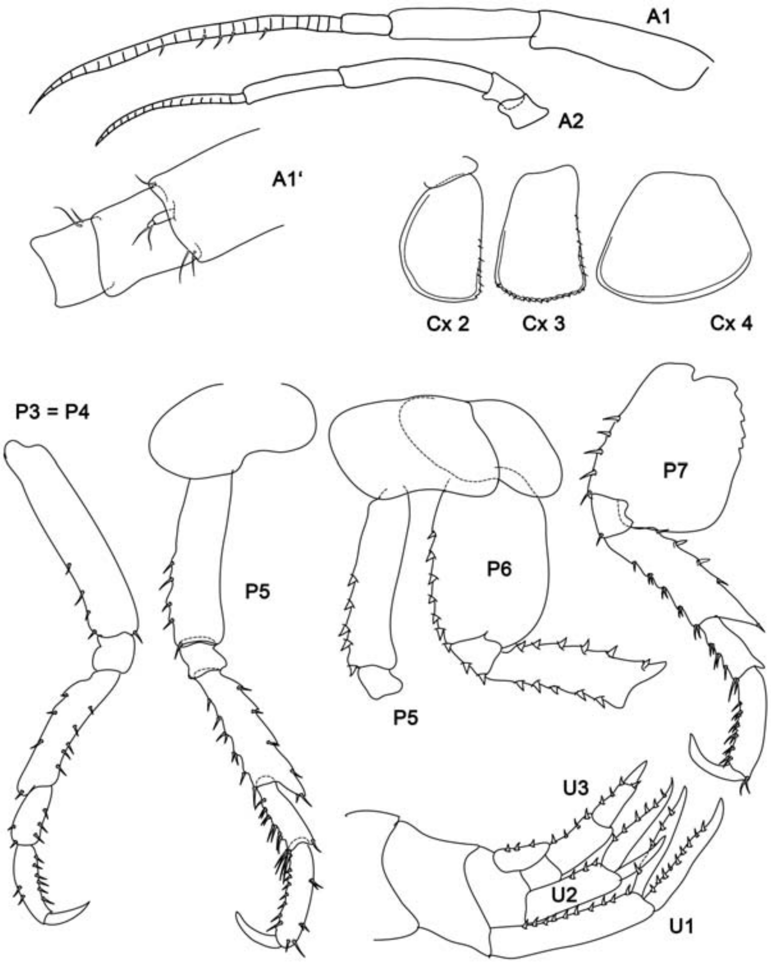

Fig. 2. *Metopoides clavata* (body length 7 mm, South Georgia), slide NHMUK 2011.80X1.

genus *Proboloides,* for *Metopa magellanica* the genus *Metopoides,* but without defining the gender of the new genera. The ending – *oides* in Greek (also *-ideus*, *-a*, *-um* in Latin) can be used in different ways, and Stebbing (1906) interpreted these genera as masculine, with *e.g.* Rauschert (1990, 1991), Andres (1995), Krapp-Schickel (2009b, 2011a) following him, while Barnard and Karaman (1991) or De Broyer *et al.* (2007) cited the species with feminine ending. As both type species originally were with a feminine specific name, it is probably better to keep them with this gender.

Metopoides clavata Schellenberg, 1931
(Figs 2, 3)

Metopoides clavata Schellenberg, 1931: 103, fig. 55.
Metopoides clavatus; Krapp-Schickel 2009b: 104.

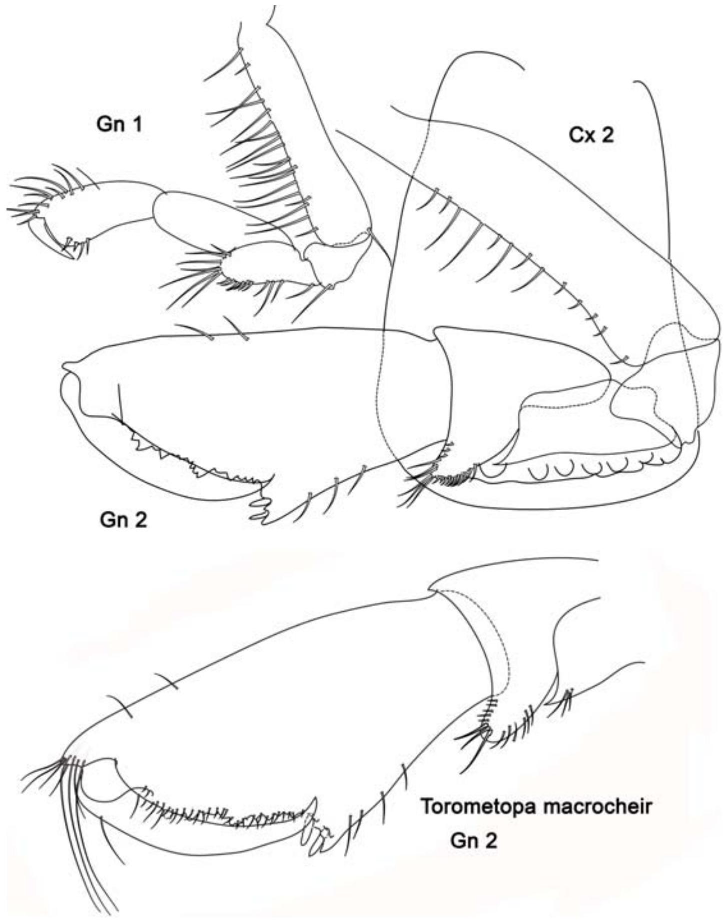

Fig. 3. *Metopoides clavata* (body length 7 mm, South Georgia), slide NHMUK 2011.80X1; ?*Torometopa macrocheir* (body length 4 mm, Admiralty Bay).

Material. — 1 ad. 7 mm (slide NHMUK 2011.80X1), 2 ad. 5 mm, 2 juv. 3 mm. SG-EBS-3-E, South Georgia, 53.60°S 37.90°W, depth 478–502 m, 05 April 2006; 1 ad. 4.6 mm (slide NHMUK 2011.80X2), SG-EBS-4-E, South Georgia, 53.61°S 37.89°W, depth 220–222 m, 05 April 2006.

Remarks. — This species can be confused with *Torometopa macrocheir*, as Gn2 propodus in both species is extremely similar (see also Schellenberg 1931: 105, where he refers to it, being author of both species). Differences can be found in the length of the antennae, the shape of the distally widened propodus of Gn1 with nearly right-angled palmar corner (*vs.* distally obliquely rounded in *T. macrocheir*), the dense setation on basis of Gn1, Gn2 (*vs*. few setae in *T. m.*), the rounded Cx 2 (*vs.* posterodistal corner with tooth in *T. m.*), the lack of posterodistal lobe on the basis of P5 (*vs.* well developed lobe in *T. m.*) and the somewhat angular posterior margin on the basis of P7 (*vs.* regularly rounded in *T. m.*).

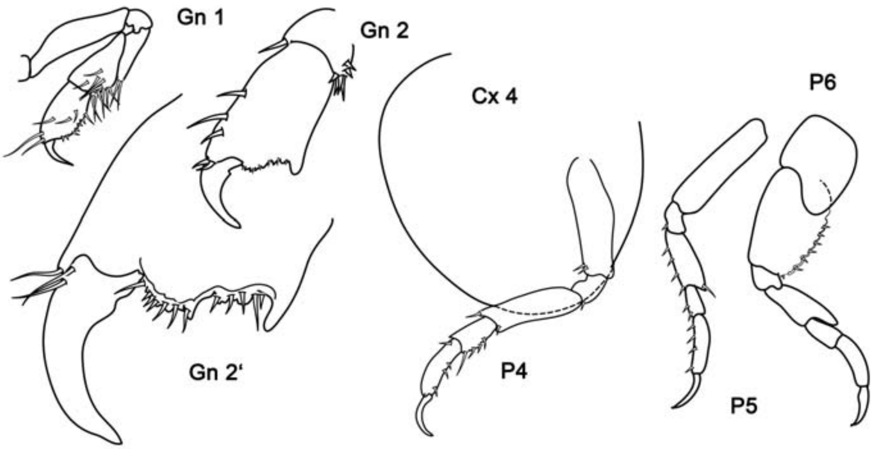

Fig. 4. *Metopoides* cf. *crassa* (body length 3 mm, Admiralty Bay), slide ULCA 0002.

Metopoides cf. *crassa* Schellenberg, 1931
(Fig. 4)

Metopoides crassa Schellenberg, 1931: 99, fig. 53.

Material. — 1 ind. 3 mm (slide ULCA 0001), OC-483, Admiralty Bay, central basin, 62.1513°S 58.44847°W, depth 258 m, 23 July 1985; 1 ♀ 5 mm (slide ULCA 0002), 1 juv. 3 mm, OC-453, Admiralty Bay, central basin, 62.15612°S 58.45452°W, depth 38 m, 15 March 1985.

Remarks.— We have found probably immature specimens which could belong to *M. crassa*. However, the merus of P5–6 is much shorter and narrower, and Cx 4 inferior margin is not "slightly concave" as described by Schellenberg (1931), but absolutely regularly convex. Also basis P6 is much narrower when compared to the original drawings, but it seems quite probable that the Schellenberg's illustration (fig. 53d) shows P7 and not P6, as written. As far as we know, there is no other illustration of this species except the original one.

In Krapp-Schickel (2009b, 2011a) this species was erroneously not included in the discussion and key to *Metopoides* species.

Metopoides elliptica Schellenberg, 1931

Metopoides elliptica Schellenberg, 1931: 196, fig. 57.
Metopoides ellipticus; Krapp-Schickel 2009b: 104–106, fig. 7.

Material. — 1 ind. 3 mm OC-522, Admiralty Bay, central basin, 62.15482°S 58.4538°W, depth 50 m, 3 November 1985; 1 ind. 3 mm OC-528, Admiralty Bay, central basin, 62.15453°S 58.45323°W, depth 53 m, 8 November 1985.

Metopoides heterostylis Schellenberg, 1926
(Fig. 5)

Metopoides heterostylis Schellenberg, 1926: 320–321, fig. 30; Nicholls 1938: 48–49, fig. 25; Krapp-Schickel 2009b: 104–109, figs 8, 9.

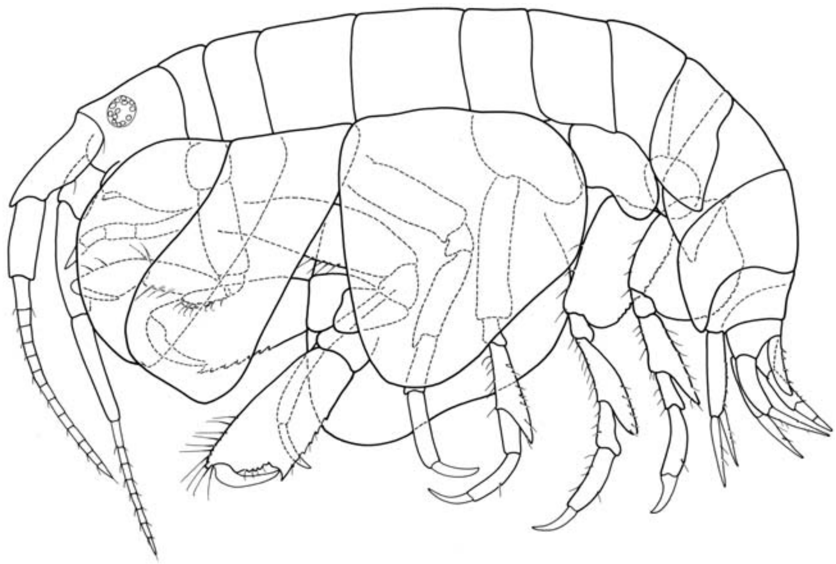

Fig. 5. *Metopoides heterostylis* habitus (male, body length 3 mm, Shag Rocks).

Material. — 6 ind. OC-500, Admiralty Bay, central basin, 62.1545°S 58.45068°W, depth 156 m, 11 September 1985; 1 ind. OC-485, Admiralty Bay, central basin, 62.15168°S 58.44897°W, depth 232 m, 10 August 1985; 1 ind. OC-547, Admiralty Bay, central basin, 62.°S 58.44523°W, depth 330m, 8 January 1985; 1 ind. OC-520, Admiralty Bay, central basin, 62.15128°S 58.4449°W, depth 335 m, 3 November 1985; 1 ♀ ovig. 3 mm, 1 ♂ 3 mm, 2 juv. (2 slides NHMUK 2011.80X4, 5) SR-EBS-5-E, Shag Rocks, 53.32132°S 42.22679°W, depth 500 m, 12 April 1985; 1 juv. (slide NHMUK 2011.80X6) PB-EBS-3-H, Powell Basin, South Orkney Islands, 60.99°S 46.83°W, depth 502–511 m, 18 March 2006.

Remarks. — As indicated in the key in Krapp-Schickel (2009b), there are two *Metopoides* species with "distinctly concave Cx 4": *M. heterostylis* and *M. lata.* For the latter Rauschert (1990) mentioned this fact only in the text, there is no illustration, while he stressed the same character state also for *M. lanceolata* (1990), where (confusingly) his fig. 6 shows a clearly straight inferior margin instead of excavate as normally. Again a slightly excavate Cx 4 were reported for *M. curvipes* and for *M. bellansantiniae*. It is the first record of this species from the West Antarctic.

Metopoides lata Rauschert, 1990

Metopoides latus Rauschert, 1990: 22–26, fig. 6; 1991: 38.

Material. — 1 ind. OC-527, Admiralty Bay, central basin, 62.1551°S 58.45238°W, depth 72 m, 8 November 1985; 2 ind. OC-487, Admiralty Bay, central basin, 62.154°S 58.45°W, depth 162 m, 4 September 1985; 2 ind. OC-506, Admiralty Bay, central basin, 62.15312°S 58.44863°W, depth 178 m, 27 September 1985; 3 ind. OC-517, Admiralty Bay, central basin, 62.15248°S 58.44878°W, depth 212 m, 30 October 1985; 1 ind. OC-477, Admiralty Bay, central basin, 62.15265°S 58.44762°W, depth 221 m, 11 May 1985; 4 ind. OC-479, Admiralty Bay, central basin, 62.15292°S 58.44575°W, depth 240 m, 11 May 1985; 2 ind. OC-484, Admiralty Bay, central basin, 62.15192°S 58.4466°W, depth 278 m, 23 July 1985; 1 ind. OC-530, Admiralty Bay, central basin, 62.15192°S 58.44455°W, depth 280 m, 8 November 1985; 3 ind. OC-548, Admiralty Bay, central basin, 62.15177°S 58.44608°W, depth 296 m, 8 January 1985; 1 ind. B-III-3, Admiralty Bay, 62.159117°S 58.500217°W, depth 116 m, 28 March 2007.

Remarks . —This species is quite similar to *M. heterostylis.* Rauschert (1990) gave a detailed comparison of the two species, the main difference being the shape of Gn2 propodus. This material seems to be the only one after Rauschert's description. Both come from the same island (King George Island) in South Shetland Islands archipelago.

Metopoides magellanica (Stebbing, 1888)

(Figs 6, 7)

Metopa magellanica Stebbing, 1888: 756–759, t. XCI.

Metopoides magellanica; Stebbing 1906: 185; Schellenberg 1931: 96.

Metopoides magellanicus; Krapp-Schickel 2009b: 110–112, fig. 13.

Material. — 4 ind. partly damaged, 2–2.2 mm: OC-522, Admiralty Bay, central basin, 62.15482°S 58.4538°W, depth 50 m, 3 November 1985; OC-444 (slides ULCA 0003a–c), Admiralty Bay, central basin, 62.15353°S 58.44863°W, depth 175 m, 21 February 1985; OC-479, Admiralty Bay, central basin, 62.15292°S 58.44575°W, depth 240 m, 11 May 1985; OC-547, Admiralty Bay, central basin, 62.15048°S 58.44523°W, depth 330 m, 8 January 1986.

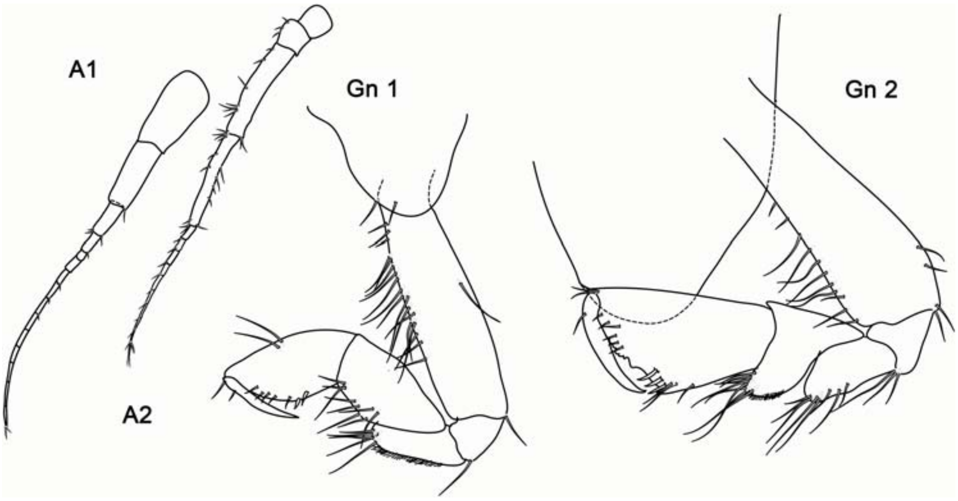

Fig. 6. *Metopoides magellanica* (body length 2 mm, Admiralty Bay), slides ULCA 0003a–c.

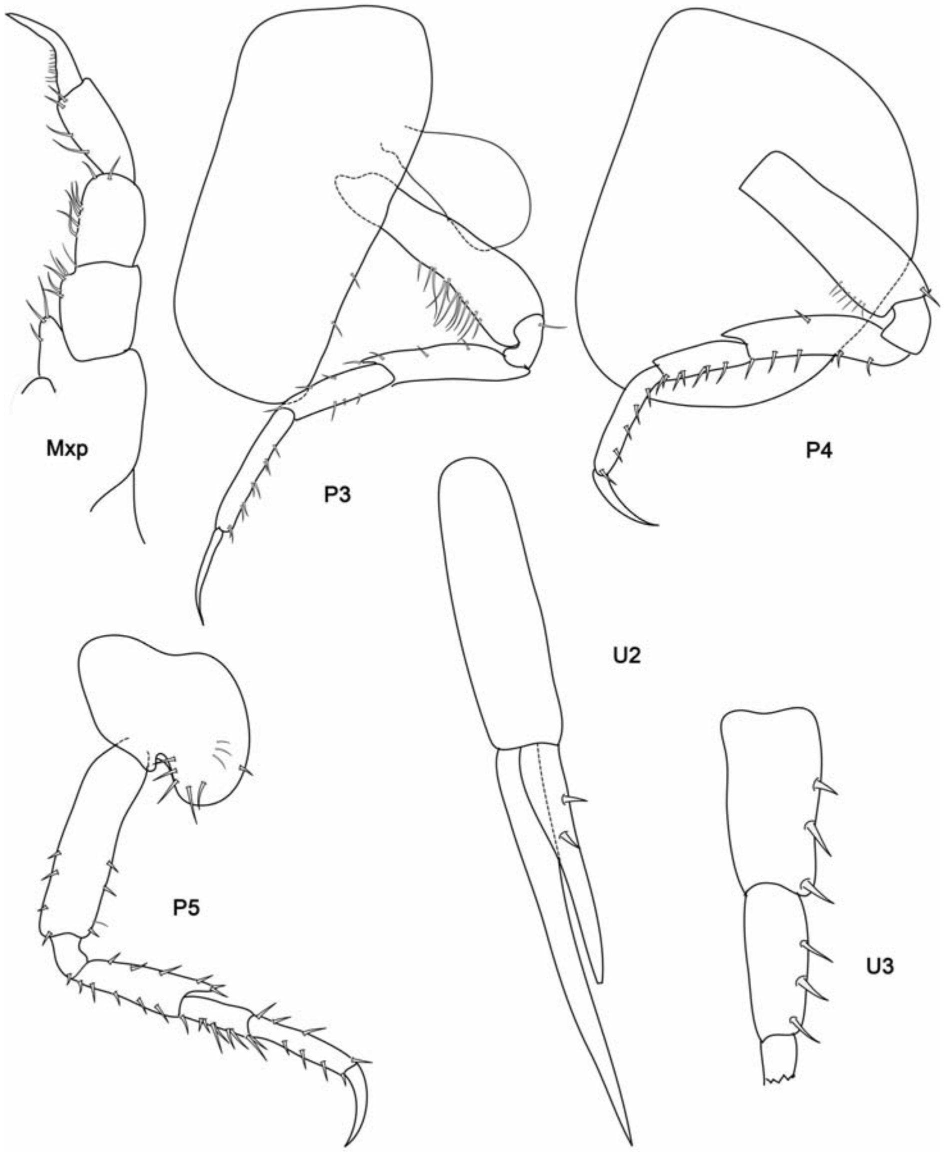

Fig. 7. *Metopoides magellanica* (body length 2 mm, Admiralty Bay), slides ULCA 0003a–c.

Remarks. — The present material agrees well with Stebbing's description. However, the narrow P3, 4 with long and thin dactylus would match also *M. curvipes* Schellenberg, 1926, which was described after one single young female of 2 mm. The few sketches do not show any important morphological character states besides the name-giving character of the insertion with a sharp angle of Gn1 basis on the inner side of Cx 1 with a sharp angle; such a character occurs in various stenothoids (see the drawing of *Torometopa crenatipalmata* Gn1, Fig. 10).

A conspicuous character in *M. magellanica* are the dense setae on the posterior margin of the basis of Gn1–2, P3–4.

Metopoides typica (Walker, 1906)

Proboliella typica Walker, 1906: 14; 1907: 20–21, fig. 10.

Proboloides typica; Schellenberg 1926: 323–324, fig. 41; K.H. Barnard 1932: 109; De Broyer *et al.* 2007: 213.

Metopoides typicus; Krapp-Schickel 2011: 20–24, figs 3, 4.

Material. — 1 ind. OC-487, Admiralty Bay, central basin, 62.154°S 58.45°W, depth 162 m, 4 September 1985; 1 ind. OC-517, Admiralty Bay, central basin, 62.15248°S 58.44878°W, depth 212 m, 30 October 1985; 1 ind. B-III-3, Admiralty Bay, 62.159117°S 58.500217°W, depth 116 m, 28 March 2007.

Genus *Scaphodactylus* Rauschert *et* Andres, 1993

Scaphodactylus Rauschert *et* Andres, 1993: 348.

Diagnostic characters (see also new definition by Krapp-Schickel in press). — Coxae small, short. A1 > A2, lacking nasiform process. Md palp with 3 articles. Mx1 palp with 2 articles. Mx1, Mxp ordinary. Gn1, 2 subchelate, different in size and shape. Gn1 very small and narrow, weak, carpus > propodus; propodus with oblique and short palm. Gn2 propodus large, carpus < propodus. P5 basis rectolinear, with posterodistal lobe. P6, 7 basis rounded, widened. Peraeon and pleon segments ordinary, T flappable, flat.

Species included. — See Krapp-Schickel (in press).

Scaphodactylus carinatus (Schellenberg, 1931)
(Figs 8, 9)

Metopoides carinata Schellenberg, 1931: 101–103, fig. 54.

Proboloides perlata K.H. Barnard, 1930 partim: 339–341, only fig. 15d.

Proboloides carinata; K.H. Barnard 1932: 109–110, fig. 59; Ren and Huang 1991: 281, fig. 58.

Torometopa pseudoperlata Andres, 1993: 216–225, figs 4–6.

Material. — 1 ind. OC-479, Admiralty Bay, central basin, 62.15292°S 58.44575°W, depth 240 m, 11 May 1985; 1 ind. OC-486, Admiralty Bay, central basin, 62.15112°S 58.44662°W, depth 270 m, 10 August 1985; 1 ind. OC-548, Admiralty Bay, central basin, 62.15177°S 58.44608°W, depth 296 m, 8 January 1985; 1 ♂ 13 mm, 4 ad.: 10 mm, 7 mm, 6.5 mm, 5.5 mm; 4 juv.: 5.2 mm, 5 mm, 4 mm, 3.5 mm; JR-144 EI-EBS-4 supra, Elephant Island, 61.38542°S 55.20366°W, depth 204 m, 12 March 2006.

Remarks. — The present material matches well the detailed description by Ren and Huang (1991: fig. 58) for *Proboloides carinata* female of 11.4 mm. Different from the description by Andres (1993: figs 4–6) for *Torometopa pseudoperlata* (one female of 10 mm) is the shape of propodus Gn2 and propodus Gn1 which are distally wider. This difference exists also in the description of *Metopoides carinata* (male 8

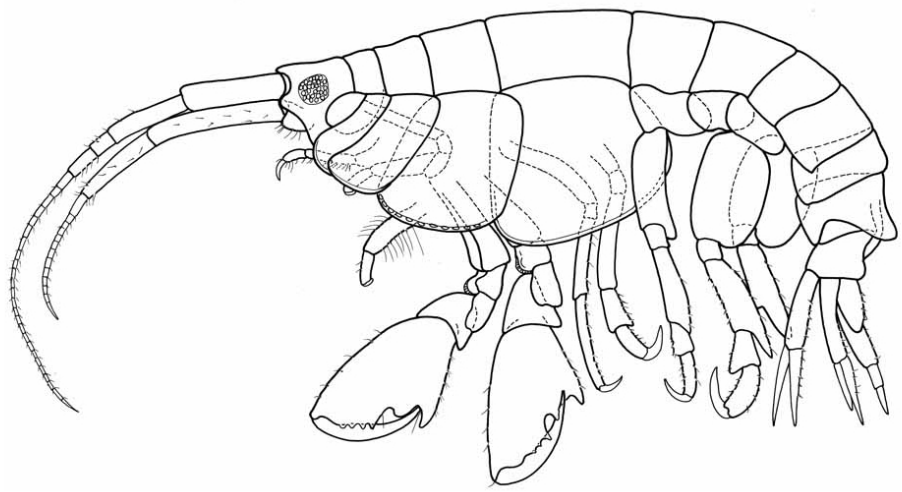

Fig. 8. *Scaphodactylus carinatus*, habitus (male, body length 13 mm, Elephant Island).

mm) by K.H. Barnard (1932: fig. 59), and to a lesser extent in the description of Schellenberg (1931: fig. 54) for a male of 10 mm.

Andres (1993: 221), in the discussion on *T. pseudoperlata*, stressed its difference from the genus *Scaphodactylus* due to the showel-shaped dactylus in Gn1; then he mentioned the carinate last pleon-segment as well as "long and slender P3" as distinctive characters from *Torometopa carinata* (Schellenberg 1931). However, Gn1 is very small and the dactylus nearly always closed, the carina on the pleon seemingly not very well developed in females (see the small hump in Ren and Huang 1991: fig. 58) and P3 in *Torometopa pseudoperlata* was not illustrated and verbally described as "slender" by Andres (1993).

As the present collection contains in the same sample males of 6.5–13 mm and juveniles from 3.5 to 5.5 mm, the allometry of Gn2 is shown and the habitus of a male of 13 mm is given (Figs 8, 9). It seems justified to synonymize the species mentioned above. With growing body length the relation between the propodi of Gn2: Gn1 becomes bigger, the "thumb" on the palmar corner of propodus Gn2 changes position from the half propodus length to 2/3, and becomes finally worn off, and the relation of rami U2 changes from 2:1 to 3:4 in larger specimens. It seems worth stressing that Barnard (1932) and Schellenberg (1931) found only males, Ren and Huang (1991), and Andres (1993) found only females, and in our material there are only adult males and no females. The hump on pleon segment 3 starts in specimens of 4–5 mm as very small swelling, while the juvenile of 3.5 mm has no bulge at all.

Therefore *Torometopa pseudoperlata* Andres, 1993 is here synonymized with *Scaphodactylus carinatus* (Schellenberg, 1931). Until now the species was recorded from the West Antarctic region, including South Georgia district. The present records confirm this distribution. However, as *Torometopa pseudoperlata* (de-

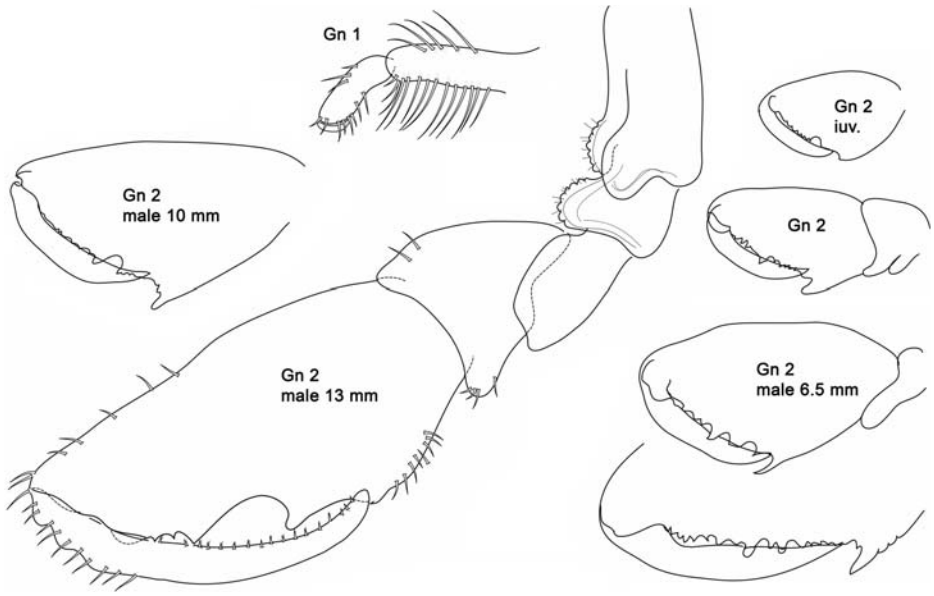

Fig. 9. *Scaphodactylus carinatus* (Elephant Island), Gn1, 2 gnathopods of individuals of different ages.

scribed from the Ross Sea) is here synonymized, the distribution of this species should be enlarged also to the East Antarctic province.

Scaphodactylus dentimanus (Nicholls, 1938)

Proboloides dentimanus Nicholls, 1938: 51, fig. 27; Bellan-Santini 1972a: 232, fig. 37, 1972b: 699; Ren and Huang 1991: 282 fig. 59.

Proboloides laevis Ren, 1991 in Ren and Huang 1991: 284–285, 317–318, fig. 60.

Material. — 1 ind. OC-454 (slides ULCA 0004a–c), Admiralty Bay, central basin, 62.15433°S 58.45308°W, depth 59 m, 17 March 1985; 14 ind. OC-464, Admiralty Bay, central basin, 62.15522°S 58.44855°W, depth 104 m, 22 March 1985; 1 ind. OC-419, Admiralty Bay, central basin, 62.15032°S 58.44183°W, depth 380 m, 18 January 1985; 1 ad. 5 mm: JR-144 EI-EBS-2-epi-net, Elephant Island, 61.57415°S 55.24883°W, depth 996–1000 m, 12 March 2006; juv. incomplete + 3 ind. 4 mm, JR-144 EI-EBS-3, Elephant Island, 61.38675°S 55.20109°W, depth 0 m, 12 March 2006; 6 ad. 3–3.5 mm PB-EBS-4-E, Powell Basin, South Orkney Islands, 60,82°S 46,82°W, depth 210–215 m, 18 March 2006; 5 ad. 3–6 mm, PB-EBS-3-E, Powell Basin, South Orkney Islands, 60,99°S 46.83°W, depth 502–506 m, 18 March 2006; 1 juv. 2 mm, PB-EBS-3H, Powell Basin, South Orkney Islands, 60.99°S 46.83°W; depth 502–506 m, 18 March 2006; 1 ad. 5 mm, 4 juv., SR-EBS-4-E, Shag Rocks, 53.62°S 40.91°W, depth 201–203 m, 11 April 2006.

Remarks. — *Proboloides laevis* Ren, 1991 is here synonymized with *Scaphodactylus dentimanus* (Nicholls). Nicholls described females of 5–8 mm; the drawings of the urosome of *Proboloides dentimanus* by Ren and Huang (fig. 59/2, sex?, length?) start with a much larger last pleonite compared to the width of the urosome, but the illustration is very sketchy; the drawings of *Proboloides laevis* (fig. 60) based on material of 3.5–4.7 mm length show a Md palp with only 2 articles (the first is not illustrated but certainly not missing), lacking an accessory flagellum, 3 instead of 4 telson spines and a more regularly dentate palm on Gn2, but otherwise there is no reason for establishing a new species. The specimen illustrated in Bellan-Santini (1972a) is 6 mm long, again without determined sex.

Genus *Torometopa* Barnard *et* Karaman, 1987

Torometopa Barnard *et* Karaman, 1987: 870.

Species included. — See Krapp-Schickel (in press).

Torometopa cf. *antarctica* (Walker, 1906)

Proboloides antarcticus Walker, 1906: 13, 1907: 18, pl. 5, fig. 9; K.H. Barnard 1932: 109–110, fig. 58.

Torometopa antarctica; Krapp-Schickel 1996: fig. 4a.

Material. — 1 ind. OC-434, Admiralty Bay, central basin, 62.15527°S 58.45035°W, depth 88 m, 8 February 1985; 2 ind. OC-487, Admiralty Bay, central

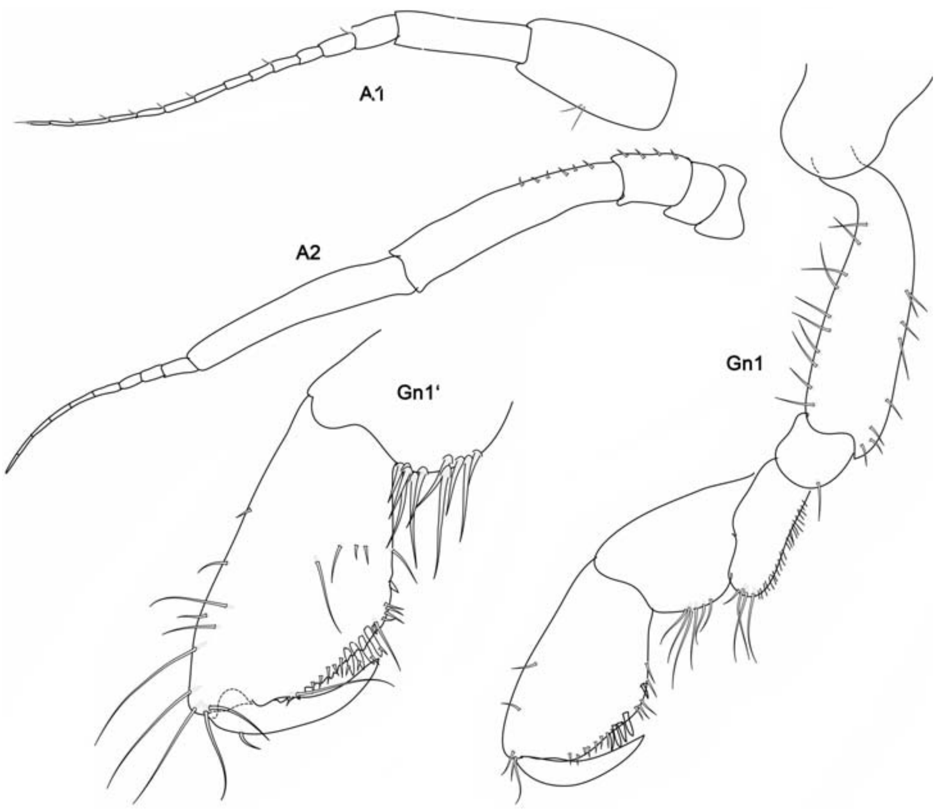

Fig. 10. *Torometopa* cf. *crenatipalmata* (body length 5 mm, Admiralty Bay), slides ULCA 0005a–b.

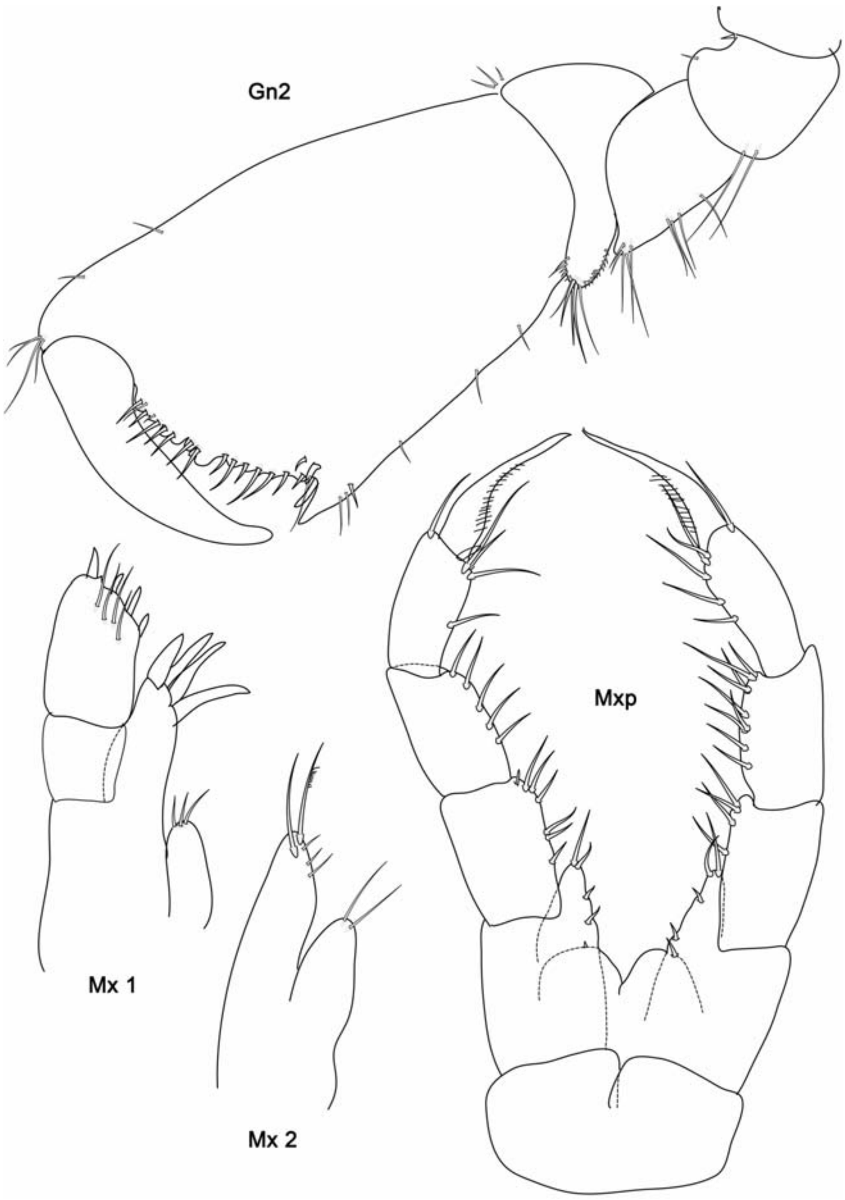

Fig. 11. *Torometopa* cf. *crenatipalmata* (body length 5 mm, Admiralty Bay), slides ULCA 0005a–b.

basin, 62.154°S 58.45°W, depth 162 m, 4 September 1985, 1 ind. OC-472, Admiralty Bay, central basin, 62.15167°S 58.44898°W, depth 245 m, 27 April 1985; 2 ind. OC-525, Admiralty Bay, Ezcurra Inlet; 62.169433°S 58.577667°W, depth 45 m, 6 November 1985; 1 ind. OC-524, Admiralty Bay, Ezcurra Inlet; 62.169667°S 58.580417°W, depth 48 m, 6 November 1985, 1 ind. B-III-3, Admiralty Bay, 62.159117°S 58.500217°W, depth 116 m, 28 March 2007.

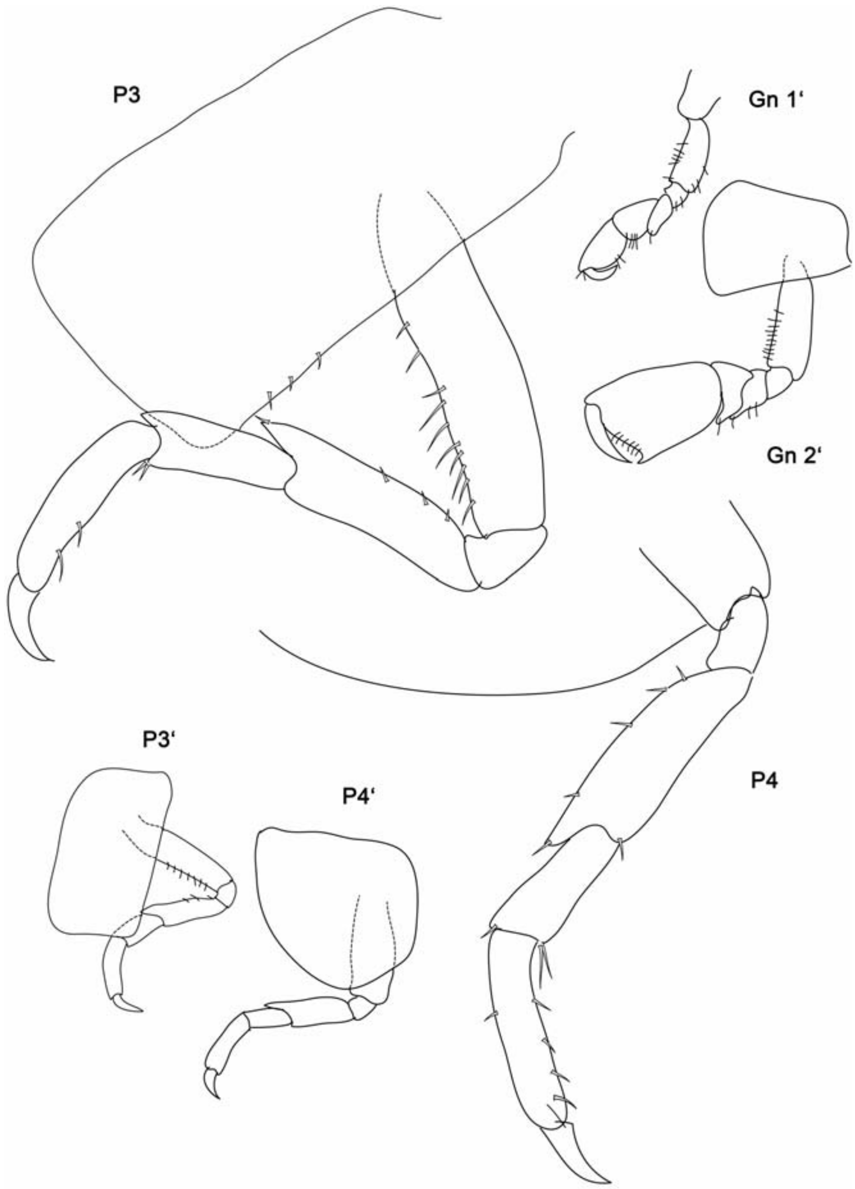

Fig. 12. *Torometopa* cf. *crenatipalmata* (body length 5 mm, Admiralty Bay), slides ULCA 0005a–b.

Torometopa cf. *crenatipalmata* (Stebbing, 1888)
(Figs 10–15)

Metopa crenatipalmata Stebbing, 1888: 759–762, t. XLII.
Proboloides crenatipalmatus; Stebbing 1906: 188.
?*Proboloides* cf. *crenatipalmatus*; Bellan-Santini 1972a: 231–232.
non *Proboloides crenatipalmatus*; K.H. Barnard 1932: 111, fig. 60.

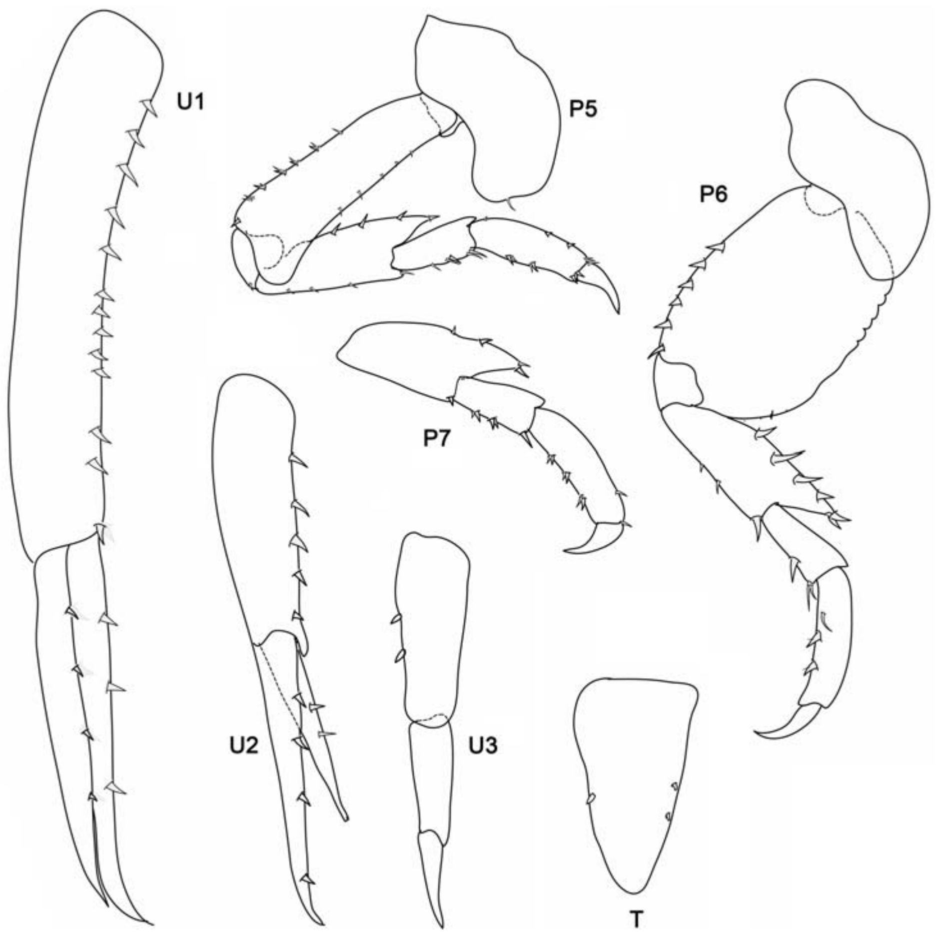

Fig. 13. *Torometopa* cf. *crenatipalmata* (body length 5 mm, Admiralty Bay), slides ULCA 0005a–b.

Material. — 1 ind. 5 mm, OC-547 (slides ULCA 0005a-b), Admiralty Bay, central basin, 62.15048°S 58.44523°W, depth 330 m, 8 January 1986; 1 ♂ 9 mm (slide NHMUK 2011.80X3), PB-EBS-4-E, Powell Basin, South Orkney Islands, 60.82°S 46.82°W, depth 210–215 m, 18 March 2006.

Remarks. — This taxon is the type of what Barnard and Karaman (1987) called *Torometopa*, and at the moment it seems that the common synapomorphy, the posterodistal lobe on the P5 basis, could have evolved more than once and this genus would then contain not naturally related species. Thus every increase of knowledge on the morphology is very welcome.

From the Admiralty Bay we got one specimen of 5 mm in length, from South Orkney Island another one of 9 mm. The first mentioned matches well the original drawings (which after our knowledge are the only illustrations until now), the second one has a more sculptured Gn2 palm, which could well depend on allometry.

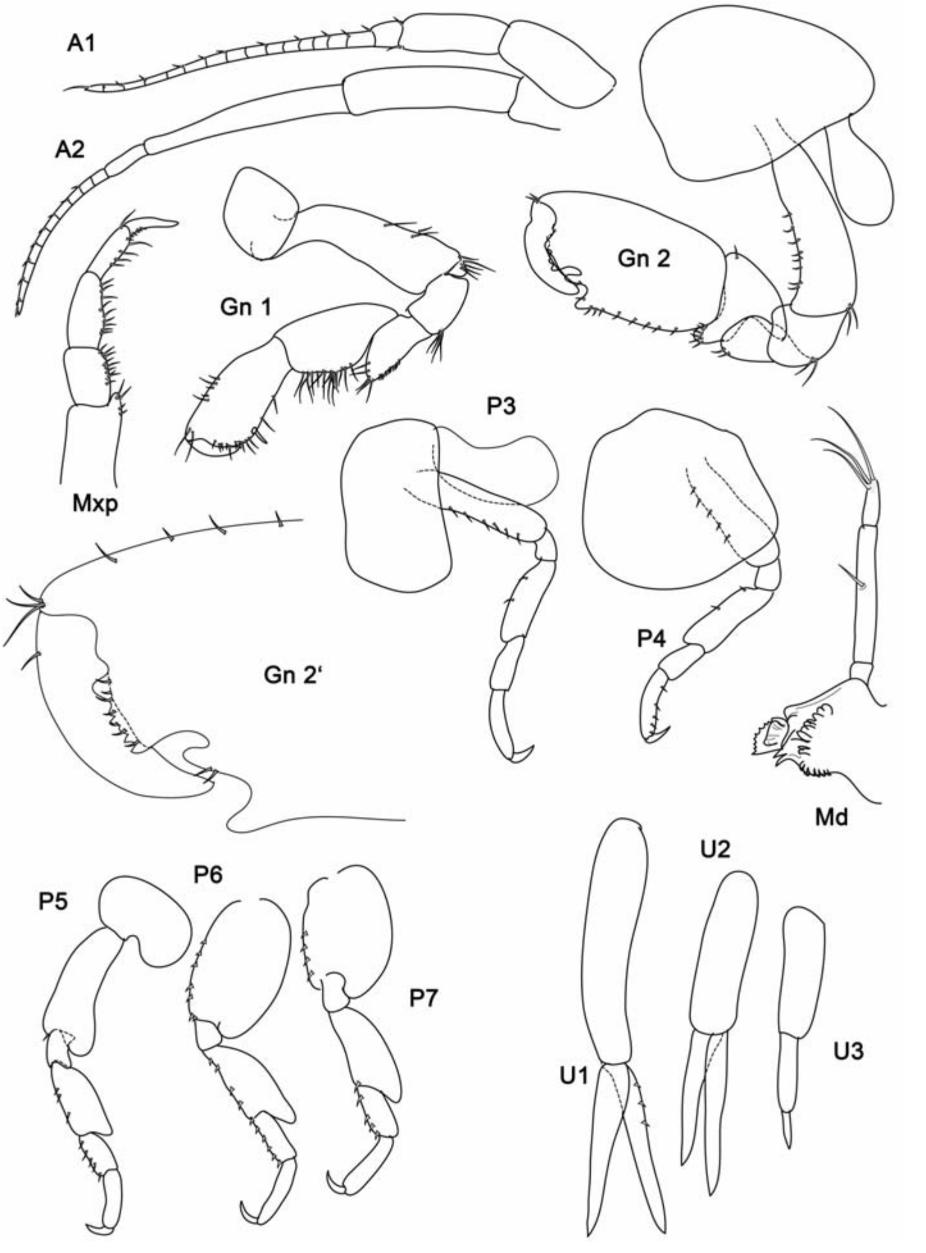

Fig. 14. *Torometopa* cf. *crenatipalmata* (male, body length 9 mm, South Orkney Islands), slide NHMUK 2011.80X3.

For the time being both specimens are identified as this species with question mark. The type specimen comes from the Magellan Area, the present individuals from the West Antarctic region. Other citations are scattered all over the Antarctic, but their determination should be confirmed.

Fig. 15 *Torometopa* cf. *crenatipalmata* habitus (male, body length 9 mm, South Orkney Islands), slide NHMUK 2011.80X3.

?*Torometopa macrocheir* (Schellenberg, 1926)
(Figs 3, 16)

Metopoides macrocheir Schellenberg, 1926: 318, fig. 38.

Proboloides nititus Ren, 1991 in Ren and Huang 1991: 286, fig. 61.

Material. — Type material ZMB 20339 from Gauss Station, Twist 385 m; 4 ind. OC-398, Admiralty Bay, central basin, 62.1548°S 58.45145°W, depth 110 m, 17 December 1984; 1 ind. A-II-3, Admiralty Bay, Ezcurra Inlet, 62.16035°S 58.575567°W, depth 115 m, 25 March 2007.

Remarks. — As Schellenberg has described his species mainly verbally (in German), we add some illustrations of his material here. This species has many characters similar to *Scaphodactylus simus*, but see Krapp-Schickel (in press). Until now only two specimens (the types) were known plus one male and female described as *Proboloides nititus* by Ren (1991) from Bransfield Strait relatively close to King George Island and Admiralty Bay; it is here synonymized. M. Klages has also reported this species from Weddell Sea in his PhD dissertation (1991).

Torometopa macromana Rauschert, 1990

Torometopa macromana Rauschert, 1990: 7–11, fig. 2

Material. — 1 ♂, body length 4 mm, SR-EBS-4-E, Shag Rocks, 53.6267°S 40.911°W, depth 201–203 m, 11 April 2006.

Subfamily Thaumatelsoninae Gurjanova, 1938

See also Krapp-Schickel (2006).

This group probably lives in a special biotope; these amphipods reinforce the body ends by nasiform processes on the peduncle of A1 article 1 or article 2, by thickening the dorsal cuticula with double layers and pleats, by fusion of the urosomites and by enlarging the telson which becomes fleshy and vertically in-

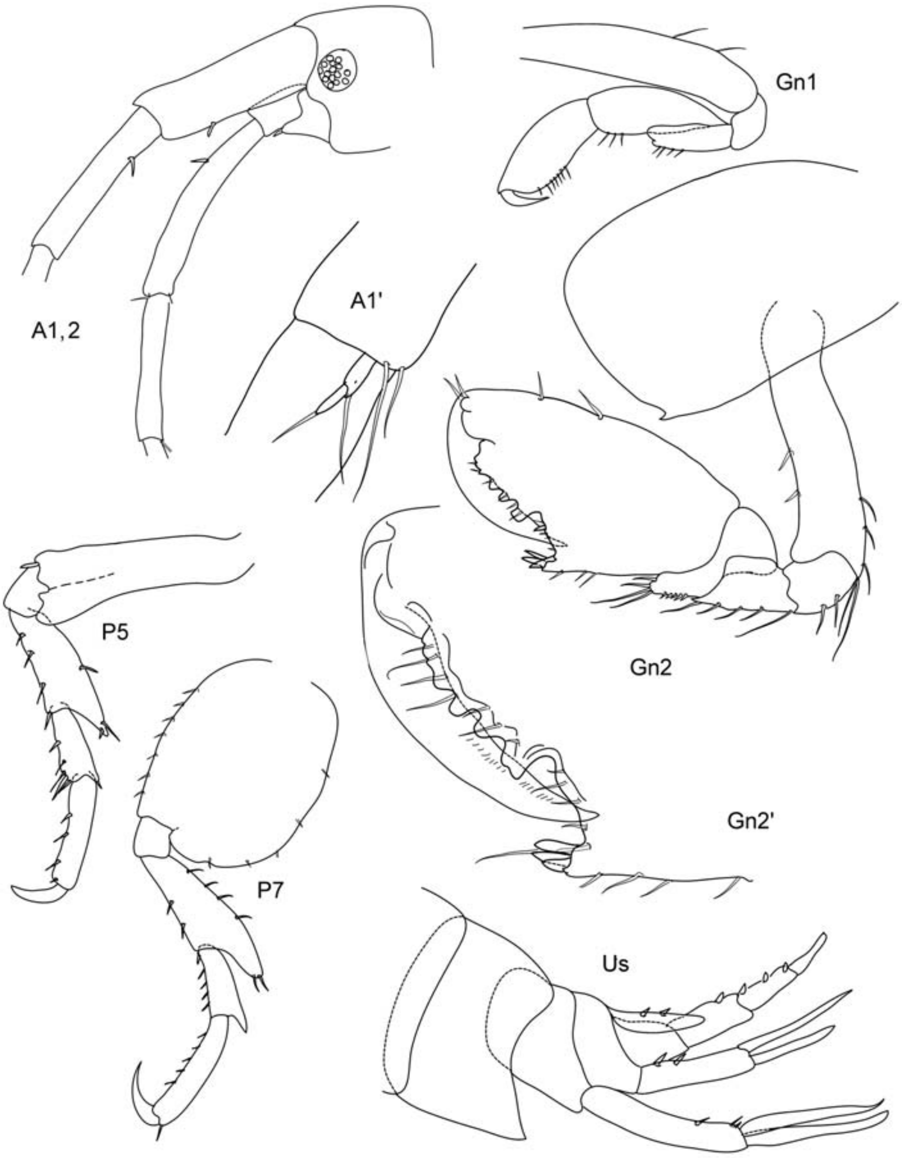

Fig. 16. ?*Torometopa macrocheir* (body length 4 mm, Admiralty Bay).

serted. This way the animals can "close" their ventral part, locking inside the tiny and weak legs, looking like bivalves. As all these character states are probably achieved independently many times, for the moment it seems impossible to establish a well defined separate family.

Genus *Antatelson* J.L.Barnard, 1972

Antatelson J.L. Barnard, 1972: 312.

Diagnostic characters. — A1 with nasiform process on article 1. Acc. flag. minute to absent. Palp of Md usually with 3 articles, third article sometimes reduced. Mx1 palp with 2 articles. Mxp IP well separated. Gn1, 2 subchelate, scarcely different in size and shape. Gn1 palm scarcely oblique, palm shorter or equal to posterior margin. Gn2 propodus subrectangular, longer than wide, palmar corner nearly rightangled. P5–7 basis rectolinear. Peraeonite 4 much wider than peraeonites 3 or 5 (Barnard and Karaman 1991: 688, wrote that peraeonites 4–6 are coalesced, but this is not always the case). Body dorsally smooth or with protuberances. Telson huge, vertically inserted, laterally compressed, fleshy.

Seven species included. — *A. antennatum* Bellan-Santini *et* Ledoyer, 1974; *A. claudei* Krapp-Schickel, 2011; *A. cultricauda* (K.H. Barnard, 1932); *A. cuneatum* Krapp-Schickel, 2006; *A. rostratum* Bellan-Santini *et* Ledoyer, 1974; *A. tuberculatum* Andres, 1989; *A. walkeri* (Chilton, 1912).

Antatelson antennatum Bellan-Santini *et* Ledoyer, 1974

Antatelson antennatum Bellan-Santini *et* Ledoyer, 1974: 701, fig. 39.

Material. — 3 ind., OC-458, Admiralty Bay, central basin, 62.15567°S 58.45472°W, depth 46 m, 17 March 1985.

Antatelson walkeri (Chilton, 1912)

Thaumatelson walkeri Chilton, 1912: 199–200.

Material. — 2 ind. OC-522, Admiralty Bay, central basin, 62.15482°S 58.4538°W, depth 50 m, 3 November 1985; 1 ind. OC-528, Admiralty Bay, central basin, 62.15453°S 58.45323°W, depth 53 m, 8 November 1985; 1 ind. B-II-4, Admiralty Bay, 62.160717°S 58.503033°W, depth 112 m, 27 March 2007; 1 ind. B-IV-3, Admiralty Bay, 62.157633°S 58.49575°W, depth 110 m, 28 March 2007; 1 ind. B-V-5, Admiralty Bay, 62.154583°S 58.491383°W, depth 117 m, 29 March 2007; 1 ad 2 mm (slide NHMUK 2011.80X7), SR-EBS-4 E, Shag Rocks, 53.62°S, 40.91°W, depth 201–205 m, 11 April 2006.

Genus *Probolisca* Gurjanova, 1938

Probolisca Gurjanova, 1938: 279.

Diagnostic characters. — A1 with or without nasiform process on article 1. Acc. flag. with 1 article. Md palp with 2–3 articles. Mx1 palp with 2 articles. Mx2 ordinary. Mxp ordinary. Gn1, 2 subchelate, scarcely different in size and shape. Gn1 propodus palm weakly oblique; Gn2 propodus palm almost transverse. P5–7 with rectolinear basis. Peraeonite 4–6 partly coalesced, pleonite 3 lacking dorsal process. T ordinary, flat.

Three species included. — *P. elliptica* (Schellenberg, 1931); *P. nasutigenes* (Stebbing, 1888); *P. ovata* (Stebbing, 1888).

Probolisca ovata (Stebbing, 1888)

Metopa ovata Stebbing, 1888: 764, pl. 44.

Probolisca ovata; Krapp-Schickel 2009b: 14–18.

For extensive literature citation see De Broyer *et al.* (2007: 213).

Material. — 2 ind. OC-453, Admiralty Bay, central basin, 62.15612°S 58.45452°W, depth 38 m, 15 March 1985; 1 ind. OC-456, Admiralty Bay, central basin, 62.15467°S 58.45308°W, depth 60 m, 17 March 1985.

Genus *Prometopa* Schellenberg, 1926

Prometopa Schellenberg, 1926: 310.

Diagnostic characters. — With various dorsal processes. A1 article 1 with or without nasiform process. A1 acc. flag. vestigial. Md palp with 3 articles. Mx1 palp with 1 or 2 articles. Gn1, 2 different in size and shape. Gn1 small, simple. Gn2 enlarged, palm weakly oblique. P5 basis rectolinear, P6–7 expanded and lobate. Peraeonite 4 slightly elongate and tumid. T ordinary, flat.

Four species included. — *P. cedrici* Krapp-Schickel 2011; *P. dorsoundata* Bushueva, 1988; *P. edentata* Rauschert, 1990; *P. tuberculata* Schellenberg, 1926.

Prometopa tuberculata Schellenberg, 1926

Prometopa tuberculata Schellenberg, 1926: 310, fig. 35; Krapp-Schickel 2009a: 18–20, figs 8, 9; in press.

Material. — 1 ind. OC-424, Admiralty Bay, central basin; 62.15225°S 58.44677°W, depth 246 m, 30 January 1985, 1 ind. OC-547, Admiralty Bay, central basin, 62.15048°S 58.44523°W, depth 330 m, 8 January 1986; 1 ind. OC-520, Admiralty Bay, central basin, 62.15128°S 58.4449°W, depth 335 m, 3 November 1985.

Remarks. — De Broyer *et al.* (2007) cited only the type material (as did Krapp-Schickel 2009a and 2011b). Thus the present material is the first sampled after 1926, and the first collected in the West Antarctic; it is already mentioned by Jażdżewska (2011).

Genus *Prothaumatelson* Schellenberg, 1931

Prothaumatelson Schellenberg, 1931: 113.

Diagnostic characters. — A1 article 1 with nasiform process. Acc. flag. lacking. Md palp without visible articulation. Gn1, 2 different in size and shape, Gn1 small, subchelate, palm transverse; Gn2 enlarged, chelate. P5–7 linear, with rectolinear basis. Peraeonite 4 elongate and tumid, weakly extended posterodistally. Pleonites 5–6 coalesced, pleon without dorsal processes. Telson huge, vertically elevated, fleshy.

Species included. — Monotypic.

Prothaumatelson nasutum (Chevreux, 1912)

Thaumatelson nasutum Chevreux, 1912: 5, 1913: 109, figs 16–18; Chilton 1912: 483 pl. I, figs 16–17 (sub *inermis*, questioned by Schellenberg 1931); K.H. Barnard 1932: 112–113.

Prothaumatelson nasutum; Schellenberg 1931: 113; Thurston 1974: 25–26.

Table 1

Distribution of stenothoids found in our material. SSI – South Shetland Islands

Species name	Present records	Literature data on distribution	References
Metopoides clavata Schellenberg, 1931	South Georgia	Shag Rocks, South Georgia (type loc.)	Schellenberg 1931; K.H. Barnard 1932; De Broyer *et al.* 2007
Metopoides cf. *crassa* Schellenberg, 1931	Admiralty Bay (SSI)	Falkland Islands (type loc.), South Shetland Islands	Schellenberg 1931; Rauschert 1991; De Broyer *et al.* 2007
Metopoides elliptica Schellenberg, 1931	Admiralty Bay (SSI)	South Georgia (type loc.), Tierra del Fuego, Iles Kerguelen	Schellenberg 1931; De Broyer *et al.* 2007; Krapp-Schickel 2009b
Metopoides heterostylis Schellenberg, 1926	Shag Rocks, South Orkney Islands, Admiralty Bay (SSI)	Gauss Station (Davis Sea – type loc.), Adélie Coast	Schellenberg 1926; Nicholls 1938; Bellan-Santini 1972a; De Broyer *et al.* 2007
Metopoides lata Rauschert, 1990	Admiralty Bay (SSI)	King George Island (South Shetland Islands – type loc.)	Rauschert 1990, 1991; De Broyer *et al.* 2007
Metopoides magellanica (Stebbing, 1888)	Admiralty Bay (SSI)	Magellan area (type loc.), South Georgia, Ross Sea	Stebbing 1888; Schellenberg 1931; Gonzalez 1991; De Broyer and Rauschert 1999; De Broyer *et al.* 2007; Krapp-Schickel 2009b
Metopoides typica (Walker, 1906)	Admiralty Bay (SSI)	Ross Sea (type loc.), Davis Sea, Shag Rocks, South Georgia, eastern Weddell Sea	Walker 1906, Schellenberg 1926; K.H. Barnard 1930, 1932; Klages 1991; De Broyer *et al.* 2007; Krapp-Schickel 2011a
Scaphodactylus carinatus (Schellenberg, 1931)	Admiralty Bay, Elephant Island (SSI)	South Georgia (type loc.), South Shetland Islands, Ross Sea	Schellenberg 1931; K.H. Barnard 1930, 1932; Ren and Huang 1991; Andres 1993; De Broyer *et al.* 2007
Scaphodactylus dentimanus (Nicholls, 1938)	Admiralty Bay (SSI), Shag Rocks, South Orkney Islands	Commonwealth Bay (Adélie Coast – type loc.), South Shetland Islands, eastern Weddell Sea	Nicholls 1938; Bellan-Santini 1972a, b; Klages 1991; Ren and Huang 1991; De Broyer *et al.* 2007
Torometopa cf. *antarctica* (Walker, 1906)	Admiralty Bay (SSI)	Ross Sea (type loc.), South Shetland Islands, eastern Weddell Sea	Walker 1906; K.H. Barnard 1932; Rauschert 1991; De Broyer *et al.* 1999, 2007
Torometopa cf. *crenatipalmata* (Stebbing, 1888)	Admiralty Bay (SSI), South Orkney Islands	Magellan area (type loc.), South Georgia, Adélie Coast, Iles Kerguelen, Tristan da Cunha	Stebbing 1888; K.H. Barnard 1932; Truchot 1974; Gonzalez 1991; De Broyer *et al.* 2007
?*Torometopa macrocheir* (Schellenberg, 1926)	Admiralty Bay (SSI)	Gauss Station (Davis Sea – type loc.), eastern Weddell Sea, South Shetland Islands	Schellenberg 1926; Klages 1991; Ren and Huang 1991; De Broyer *et al.* 2007
Torometopa macromana Rauschert, 1990	Shag Rocks	King George Island (South Shetland Islands – type loc.)	Rauschert 1990, 1991; De Broyer *et al.* 2007
Antatelson antennatum Bellan-Santini *et* Ledoyer, 1974	Admiralty Bay (SSI)	Iles Kerguelen (type loc.), South Shetland Islands	Bellan-Santini and Ledoyer 1974; Wakabara *et al.* 1990; Rauschert 1991; De Broyer *et al.* 2007

Species name	Present records	Literature data on distribution	References
Antatelson walkeri (Chilton, 1912)	Admiralty Bay (SSI), Shag Rocks	South Orkney Islands (type loc.), Bransfield Strait, Palmer Archipelago, Shag Rocks, South Georgia, South Shetland Islands, Trinity Peninsula, eastern Weddell Sea	Chilton 1912; Schellenberg 1931; Thurston 1974a, b; Wakabara *et al.* 1990; Rauschert 1991; De Broyer *et al.* 1999, 2007
Probolisca ovata (Stebbing, 1888)	Admiralty Bay (SSI)	widely distributed in East and West Antarctic as well as in Subantarctic	For extensive distribution citation see De Broyer *et al.* 2007; Krapp-Schickel 2009a
Prometopa tuberculata Schellenberg, 1926	Admiralty Bay (SSI)	Gauss Station (Davis Sea – type loc.)	Schellenberg 1926; De Broyer *et al.* 2007; Jażdżewska 2011
Prothaumatelson nasutum (Chevreux, 1912)	Admiralty Bay (SSI)	Wilhelm Archipelago (type loc.), Palmer Archipelago, South Georgia, South Orkney Islands, South Shetland Islands	Chevreux 1912; Chilton 1912; Schellenberg 1931; K.H. Barnard 1932; Thurston 1974a, b; Arnaud *et al.* 1986; Rauschert 1991; De Broyer *et al.* 2007
Thaumatelson herdmani Walker, 1906	Admiralty Bay (SSI)	widely distributed in East and West Antarctic as well as in Subantarctic	For extensive distribution citation see De Broyer *et al.* 2007
Thaumatelsonella kingelepha Rauschert *et* Andres, 1991	Admiralty Bay (SSI)	South Shetland Islands (type loc.)	Rauschert and Andres 1991; De Broyer *et al.* 2007

Material. — 2 ind. OC-453, Admiralty Bay, central basin, 62.15612°S 58.45452°W, depth 38 m, 15 March 1985; 4 ind. OC-528, Admiralty Bay, central basin, 62.15453°S 58.45323°W, depth 53 m, 8 November 1985.

Genus *Thaumatelson* Walker, 1906

Thaumatelson Walker, 1906: 16.

Species included. — Monotypic.

Thaumatelson herdmani Walker, 1906

Thaumatelson herdmani Walker, 1906: 16, 1907: 21, pl. 7, fig. 11; Chilton 1912: 484.
Thaumatotelson herdmani; Schellenberg 1926: 323; 1931: 112; Thurston 1974a: 25.

Material. — 1 ind. OC-500, Admiralty Bay, central basin, 62.1545°S, 58.45068°W, depth 156 m, 11 Sep 1985; 3 ind. B-I-5, Admiralty Bay, 62.161717°S, 58.504167°W, depth 107 m, 27 Mar 2007; 1 ind. B-II-1, Admiralty Bay, 62.16065°S, 58.502417°W, depth 108 m; 27 Mar 2007; 1 ind. B-II-3, Admiralty Bay, 62.160617°S, 58.502933°W, depth 113 m, 27 Mar 2007; 1 ind. B-III-4, Admiralty Bay, 62.15835°S, 58.500717°W, depth 145 m, 28 Mar 2007; 1 ind. B-III-5, Admiralty Bay, 62.15865°S, 58.499867°W, depth 132 m, 28 Mar 2007; 2 ind. B-IV-3, Admiralty Bay, 62.157633°S, 58.49575°W, depth 110 m, 28 Mar 2007.

Genus *Thaumatelsonella* Rauschert *et* Andres, 1991

Thaumatelsonella Rauschert *et* Andres, 1991: 230.

Two species included. — *T. cyproides* (Nicholls, 1938), *T. kingelepha* Rauschert *et* Andres, 1991.

Thaumatelsonella kingelepha Rauschert *et* Andres, 1991

Thaumatelsonella kingelepha Rauschert *et* Andres, 1991: 230–235, figs 1j–k, 2, 3.

Material. — 1 ind. OC-478, Admiralty Bay, central basin, 62.15177°S 58.44797°W, depth 252 m, 11 May 1985; 1 ind. B-II-1, Admiralty Bay, 62.16065°S 58.502417°W, depth 108 m, 27 March 2007; 1 ind. B-III-4, Admiralty Bay, 62.15835°S 58.500717°W, depth 145 m, 28 March 2007.

Remarks. — De Broyer et al. (2007) reported only the type material. Thus our specimens would be the first after the original description, also coming from the West Antarctic region.

Discussion

Out of 62 known stenothoid species from the Southern Ocean, i.e. south of the Subtropical Front, 41 have been hitherto recorded in the West Antarctic. Nine of these have been found exclusively in the South Georgia district (De Broyer *et al*. 2007; Krapp-Schickel 2009b). Our study was based on 54 samples in which 20 stenothoid species have been found, i.e. 1/3 of all Antarctic stenothoids described (Table 1). The present study resulted in the first West Antarctic records for 2 species, both hitherto known only from the East Antarctic (Schellenberg 1926; Nicholls 1938; Ruffo 1949; Bellan-Santini 1972a; Arnaud 1974). For each locality studied an increase in the number of species was noted, the most noticeably for Admiralty Bay, where the number increased from eight to 21. It is worth to note that in the neighbouring Maxwell Bay and Fildes Strait, where thorough studies on Amphipoda were conducted, as many as 18 species have been reported (Rauschert 1991; Rauschert and Andres 1991, 1994); of them nine have not been yet found in Admiralty Bay. Summarizing these numbers it appears that at one small, but well studied Antarctic island, half of all known Antarctic stenothoid species occurs. It shows also the need of more intensive studies of this group at other Antarctic localities because many of the stenothoid species have been hitherto found only once (De Broyer *et al*. 2007). Additionally it is the evidence of enormously diverse fauna of the Southern Ocean. Basing on different literature data De Broyer and Danis (2010) calculated that in the Southern Ocean the number of known benthic invertebrate species is more than 7000, whereas the expected number can reach 11000–17000 (Gutt *et al*. 2004).

In the case of two species, *Scaphodactylus dentimanus* and *Torometopa macromana*, their range is now extended to the North (for the first time found in the South Georgia district). On the other hand the distribution of *Metopoides ellipticus* is extended to the South.

The West Antarctic region seems to be very rich in stenothoid species; 2/3 of all Antarctic and Sub-Antarctic species are reported from there. This region has been already recognized as very species rich, also in the case of all Amphipoda, as well as in the case of other benthic invertebrate groups: Isopoda, Mollusca, Ophiuroidea or Hexacorallia (Brandt *et al*. 1999; Barnes *et al*. 2009a, b; Griffiths *et al*. 2009). Some authors suggest that in the West Antarctic (and more precisely in South Georgia) exists an invertebrate diversity "hot-spot" (Hogg *et al*. 2011). The results of the present study confirm that suggestion, however, this region was definitely more thoroughly studied then the East Antarctic region.

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References

ANDRES H.G. 1990. Amphipoda (Flohkrebse). *In*: J. Sieg and J.W. Wägele (eds), *Fauna der Antarktis*. Paul Parey, Berlin: 133–143.

ANDRES H.G. 1993. Anmerkung zur Typusserie von *Torometopa perlata* (Barnard, 1930) (Crustacea: Amphipoda: Gammaridea). *Mitteilungen aus dem Hamburgischen Zoologischen Museum und Institut* 90: 209–226.

ANDRES H.G. 1995. Notes on *Proboloides typica* (Walker), – K.H. Barnard, with a description of *Metopoides typicamimus* sp. n. (Crustacea, Amphipoda, Gammaridea). *Mitteilungen aus dem Hamburgischen Zoologischen Museum und Institut* 92: 355–364.

ARNAUD P.M. 1974. Contribution à la bionomie marine benthique des regions antarctiques et subantarctiques. *Téthys* 6: 467–653.

ARNAUD P.M., JAŻDŻEWSKI K., PRESLER P. and SICIŃSKI J. 1986. Preliminary survey of benthic invertebrates collected by Polish Antarctic Expeditions in Admiralty Bay (King George Island, South Shetland Islands, Antarctica). *Polish Polar Research* 7: 7–24.

ARNTZ W.E. 2005. The Magellan-Antarctic connection: links and frontiers at southern high latitudes. Summary review. *In*: W.E. Arntz, G.A. Lovrich and S. Thatje (eds), *The Magellan-Antarctic connection: links and frontiers at high southern latitudes. Scientia Marina* 69 (Suppl. 2): 359–365.

ARNTZ W.E., LOVRICH G.A. and THATJE S. (eds) 2005. The Magellan-Antarctic connection: links and frontiers at high southern latitudes. *Scientia Marina* 69 (Suppl. 2): 1–373.

BARNARD J.L. 1972. Gammaridean Amphipoda of Australia, Part I. *Smithsonian Contributions to Zoology* 103: 1–333.

BARNARD J.L. and KARAMAN G.S. 1987. Revisions in classifications of gammaridean Amphipoda (Crustacea), part 3. *Proceedings of the Biological Society of Washington* 100: 856–875.

BARNARD J.L. and KARAMAN G. 1991. The families and genera of marine gammaridean Amphipoda (Except marine gammaroids). *Records of the Australian Museum* 13: 1–866.

BARNARD K.H. 1930. Crustacea. Part XI. – Amphipoda. British Antarctic ("Terra Nova") Expedition, 1910. *Natural History Report, Zoology* 8 (4): 307–434.

BARNARD K.H. 1932. Amphipoda. *Discovery Reports* 5: 1–326.

BARNES D.K.A. 2005. Changing chain: past, present and future of the Scotia Arc's and Antarctica's shallow benthic communities. *In*: W.E. Arntz, G.A. Lovrich and S. Thatje (eds) *The Magellan-Antarctic connection: links and frontiers at high southern latitudes. Scientia Marina* 69 (Suppl. 2): 65–89.

BARNES D.K.A. 2008. A benthic richness hotspot in the Southern Ocean: slope and shelf cryptic benthos of Shag Rocks. *Antarctic Science* 20: 263–270.

BARNES D.K.A., GRIFFITHS H.J. and KAISER S. 2009a. Geographic range shift responses to climate change by Antarctic benthos: where we should look. *Marine Ecology Progress Series* 393: 13–26.

BARNES D.K.A., GRIFFITHS H.J. and KAISER S. 2009b. Geographic range shift responses to climate change by Antarctic benthos: where we should look. Supplement 1. Testing whether hotspots are real or artefacts of sampling. *Marine Ecology Progress Series* (Electronic supplement): 1–5.

BARNES D.K.A., KAISER S., GRIFFITHS H.J. and LINSE K. 2009c. Marine, intertidal, freshwater and terrestrial biodiversity of an isolated polar archipelago. *Journal of Biogeography* 36: 756–769.

BARNES D.K.A., LINSE K., WALLER C., MORELY S., ENDERLEIN P., FRASER K.P.P. and BROWN M. 2006. Shallow benthic fauna communities of South Georgia Island. *Polar Biology* 29: 223–228.

BELLAN-SANTINI D. 1972a. Invertébrés marins des XIIème et XVème Expéditions Antarctiques Françaises en Terre Adélie. 10. Amphipodes Gammariens. *Téthys* (Suppl.) 4: 157–238.

BELLAN-SANTINI D. 1972b. Amphipodes provenant des contenus stomacaux de troi espèces de poissons Nototheniidae récoltés en Terre Adélie (Antarctique). *Téthys* 4: 683–702.

BELLAN-SANTINI D. and LEDOYER M. 1974 (for 1973). Gammariens (Crustacea – Amphipoda) des Iles Kerguelen et Crozet. *Téthys* 5: 635–708.

BRANCH M.L., GRIFFITHS C.L., KENSLEY B. and SIEG J. 1991. The benthic Crustacea of subantarctic Marion and Prince Edward Islands: Illustrated keys to the species and results of the 1982–1989 University of Cape Town Surveys. *South African Journal of Antarctic research* 21: 3–44.

BRANDT A., LINSE K. and MÜHLENHARDT-SIEGEL U. 1999. Biogeography of Crustacea and Mollusca of the Subantarctic and Antarctic regions. *Scientia Marina* 63 (Suppl. 1): 383–389.

BUSHUEVA I.V. 1988. Dva novykh vida antarkticheskikh bokoplavov semeistva Stenothoidae (Amphipoda, Gammaridea). *Zoologicheskij Zhurnal* 67: 511–517 [in Russian].

CHEVREUX E. 1912. Diagnoses d'amphipodes nouveaux. Deuxième expédition dans l'Antarctique, dirigée par le Dr. Charcot, 1908–1910. *Bulletin du Muséum national d'Histoire naturelle* 18: 208–218.

CHILTON C. 1912. The Amphipoda of the Scottish National Antarctic Expedition. *Transactions of the Royal Society of Edinbourgh* 48: 455–520.

CHWEDORZEWSKA K.J. and KORCZAK M. 2010. Human impact upon the environment in the vicinity of *Arctowski* Station, King George Island, Antarctica. *Polish Polar Research* 31: 45–60.

CLARKE A., MURPHY J.E., MEREDITH M.P., KING J.C., PECK L.S., BARNES D.K.A. and SMITH R.C. 2007. Climate change and the marine ecosystem of the western Antarctic Peninsula. *Philosophical Transactions of the Royal Society B: Biological Sciences* 29: 149–166.

DE BROYER C. and DANIS B. 2010. How many species in the Southern Ocean? Towards a dynamic inventory of the Antarctic marine species. *Deep-Sea Research II* 58: 5–17.

DE BROYER C., LOWRY J. K., JAŻDŻEWSKI K. and ROBERT H. 2007. Catalogue of the Gammaridean and Corophiidean Amphipoda (Crustacea) of the Southern Ocean with distribution and ecological data. *Bulletin de l'Institut royal des Sciences naturelles de Belgique, Biologie* 77 (Suppl. 1): 1–325.

DE BROYER C. and RAUSCHERT M. 1999. Faunal diversity of the benthic amphipods (Crustacea) of the Magellan region as compared to the Antarctic (Preliminary results). *Scientia Marina* 63 (Suppl. 1): 281–293.

DELLA VALLE A. 1893. Gammarini del Golfo di Napoli. *Fauna und Flora des Golfes von Neapel und der angrenzenden Meeres-Abschnitte* 20: 1–948, 61 pls.

FRENOT Y., CHOWN S.L., WHINAM J., SELKIRK P.M., CONVEY P., SKOTNICKI M. and BERGSTROM D.M. 2005. Biological invasions in the Antarctic: extent, impacts and implications. *Biological Reviews* 80: 45–72.

GONZALEZ E. 1991. Actual state of gamaridean amphipoda taxonomy and catalogue of species from Chile. *Hydrobiologia* 223: 47–68.

GRIFFITHS H.J., BARNES D.K.A. and LINSE K. 2009. Towards a generalized biogeography of the Southern Ocean benthos. *Journal of Biogeography* 36: 162–177.

GURJANOVA E. 1938. Amphipoda, Gammaroidea of Siaukhu Bay and Sudzukhe Bay (Japan Sea). *Reports of the Japan Sea Hydrobiological Expedition of the Zoological Institute of the Academy of Sciences USSR in 1934* 1: 241–404.

GUTT J., SIRENKO B.I., ARNTZ W.E., SMIRNOV I.S. and DE BROYER C. 2000. Biodiversity of the Weddell Sea: macrobenthic species (demersal fish included) sampled during the expedition ANT XIII/3 (EASIZ I) with RV "Polarstern". *Berichte zur Polarforschung* 372: 1–103.

GUTT J., SIRENKO B.I., SMIRNOV I.S. and ARNTZ W.E. 2004. How many macrozoobenthic species might inhabit the Antarctic shelf. *Antarctic Science* 16: 11–16.

HOGG O.T., BARNES D.K.A. and GRIFFITHS H.J. 2011. Highly Diverse, Poorly Studied and Uniquely Threatened by Climate Change: An Assessment of Marine Biodiversity on South Georgia's Continental Shelf. *PLoS ONE* 6 (5): e19795.

JAŻDŻEWSKA A. 2011. Soft bottom sublittoral amphipod fauna of Admiralty Bay, King George Island, Antarctic. *Oceanological and Hydrobiological Studies* 40: 1–10.

KLAGES M. 1991. *Biologische und populationsdynamische Untersuchungen an ausgewählten Gammariden (Crustacea: Amphipoda) des südöstlichen Weddellmeeres, Antarktis*. Dissertation Dr. Naturwissenschaften, Universität Bremen: 240 pp.

KRAPP-SCHICKEL T. 1996. First arctic *Torometopa*. *Bollettino del Museo civico di Storia naturale Verona* 20: 467–486.

KRAPP-SCHICKEL T. 2006. Thaumatelsonine Stenothoids (Crustacea, Amphipoda). Part 2. *Zootaxa* 1165: 1–31.

KRAPP-SCHICKEL T. 2009a. On Austral-Antarctic Stenothoidae sensu lato (Crustacea, Amphipoda) with description of *Sandrothoe eucla* sp. nov. *Mitteilungen aus dem Hamburgischen Zoologischen Museum und Institut* 106: 7–25.

KRAPP-SCHICKEL T. 2009b. On the Austral-Antarctic stenothoids *Proboloides*, *Metopoides*, *Torometopa* and *Scaphodactylus* (Crustacea, Amphipoda). Part I: genus *Metopoides*. *Zoosystematics and Evolution* 85: 93–115.

KRAPP-SCHICKEL T. 2011a. On the Austral-Antarctic stenothoids *Proboloides*, *Metopoides*, *Torometopa* and *Scaphodactylus* (Crustacea Amphipoda). Part 2: the genus *Proboloides,* with description of two new genera and the transfer of two nominal species to *Metopoides*. *ZooKeys* 86: 11–45.

KRAPP-SCHICKEL T. 2011b. New Antarctic stenothoids sensu lato (Amphipoda, Crustacea). *European Journal of Taxonomy* 2: 1–17.

KRAPP-SCHICKEL T. (in press). On Austral-Antarctic Stenothoids (Crustacea Amphipoda) part 3: *Torometopa*, *Scaphodactylus* and 3 new genera. *Crustaceana Monographs*.

MILLS E.L. 1972. T.R.R. Stebbing, the "Challenger" and knowledge of the deep-sea Amphipoda. *Proceedings of the Royal Society of Edinburgh, Section B,* 72/5: 69–87.

NICHOLLS G.E. 1938. The Amphipoda Gammaridea. *In*: T.H. Johnston (ed.) *Scientific Reports. Series C. – Zoology and Botany* 2 (4): 1–145.

OLECH M. 1996. Human impact on terrestrial ecosystems in West Antarctica. *Proceedings of the NIPR Symposium on Polar Biology* 9: 299–306.

RAUSCHERT M. 1990. Neue Stenothoidae (Crustacea, Amphipoda, Gammaridea) aus dem Sublitoral von King George (Süd-Shetland-Inseln). *Mitteilungen aus dem Zoologischen Museum in Berlin* 66: 3–39.

RAUSCHERT M. 1991. Ergebnisse der faunistischen Arbeiten im Benthal von King George Island (Südshetlandinseln, Antarktis). *Berichte zur Polarforschung* 76: 1–75.

RAUSCHERT M. and ANDRES H.G. 1991. *Thaumatelsonella kingelepha*, eine neue Gattung und Art aus der Antarktis (Crustacea: Amphipoda: Gammaridea: Stenothoidae). *Helgoländer Meersuntersuchungen* 45: 225–235.

RAUSCHERT M. and ANDRES H.G. 1993. *Scaphodactylus,* eine neue Stenothoiden-Gattung aus dem Sublittoral der Süd-Shetland-Inseln (Crustacea: Amphipoda: Gammaridea). *Mitteilungen aus dem Museum für Naturkunde in Berlin* 69: 347–358.

RAUSCHERT M. and ANDRES H.G. 1994. *Scaphodactylus simus* (Crustacea, Amphipoda, Gammaridea), ein weiterer neuer Vertreter der Stenothoiden aus dem Sublitoral der König-Georg-Insel (Südshetlandinseln). *Mitteilungen aus dem Zoologischen Museum in Berlin* 70: 321–330.

REN X. and HUANG L. 1991. Studies on Gammaridea and Caprellidea (Crustacea: Amphipoda) from the northwest waters off the Antarctic Peninsula. *Studia Marina Sinica* 32: 187–323.

RUFFO S. 1949. Amphipodes (II). *Resultats du voyage de la Belgica en 1897–99. Zoologie*. J.E. Buschmann, Anvers: 58 pp.

SCHELLENBERG A. 1926. Die Gammariden der Deutschen Südpolar-Expedition 1901–1903. *Deutsche Südpolar-Expedition 1901–1903* 18: 235–414.

SCHELLENBERG A. 1931. Gammariden und Caprelliden des Magellangebietes, Südgeorgiens und der Westantarktis. *Further Zoological Results of the Swedish Antarctic Expedition 1901–1903 under the direction of dr. Otto Nordenskjold* 2: 1–290.

STEBBING T.R.R. 1888. Amphipoda Gammarina. Report on the Scientific Results of the Voyage of H.M.S. Challenger during the years 1873–76. *Zoology* 29: 1–1737, 210 pls.

STEBBING T.R.R. 1906. Amphipoda. I. Gammaridea. *Das Tierreich* 21: 1–806.

TATIÀN M., ANTACLI J.C. and SAHADE R. 2005. Ascidians (Tunicata, Ascidiacea): species distribution along the Scotia Arc. *In*: W.E. Arntz, G.A. Lovrich and S. Thatje (eds) *The Magellan-Antarctic connection: links and frontiers at high southern latitudes. Scientia Marina* 69 (Suppl. 2): 205–214.

THURSTON M.H. 1974a (for 1972). The Crustacea Amphipoda of Signy Island, South Orkney Islands. *British Antarctic Survey Scientific Reports* 71: 1–127.

THURSTON M.H. 1974b. Crustacea Amphipoda from Graham Land and the Scotia Arc, collected by Operation Tabarin and the Falkland Islands Dependencies Survey, 1944–59. *British Antarctic Survey Scientific Reports* 85: 1–89.

TRUCHOT J.P. 1974. Invertébrés de l'infralittoral rocheux dans l'archipel de Kerguelen. Crustacés: Amphipodes. *Comité National Français des Recherches Antarctiques* 35: 19–23.

WAKABARA Y., TARARAM A.S., VALÉRIO-BERARDO M.T. and OGIHARA R.M. 1990. Records of Amphipoda collected during I and III Brazilian Antarctic Expeditions. *Relation interno do Instituto Oceanografico Universidade de Sao Paulo* 30: 1–9.

WALKER A.O. 1906. Preliminary descriptions of new species of Amphipoda from the "*Discovery*" Antarctic Expedition, 1902–1904. *Annals and Magazine of Natural History* 7 (18): 13–18.

WALKER A.O. 1907. Crustacea. III. – Amphipoda. *British Museum (Natural History)* 3: 1–38.

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