

Elements for a revision and notes on bionomy of the Cumacea (Crustacea: Peracarida) of the Weddell Sea (Antarctica).

Material collected by the Expedition ANTARKTIS-VIII/5 of R.V. "Polarstern" 1989/90

I. Petrescu & K.J. Wittmann

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Iorgu Petrescu, c/o "Grigore Antipa" National Museum of Natural History, Dept. of Aquatic Fauna, Kiseleff 1, RO-79744 Bucharest, Romania (e-mail: iorgup@antipa.ro).

Karl J. Wittmann, c/o Laboratorium für Ökophysiologie und Ökotoxikologie, Institut für Medizinische Biologie, Universität Wien, Währinger Strasse 10, A-1090 Vienna, Austria (e-mail: karl.wittmann@univie.ac.at.).

Key words: Crustacea; Cumacea; taxonomy; new species; morphology; bionomy; Antarctic; marine benthos.

Among 26 species of Antarctic Cumacea sampled during the southern summer 1989/90 from benthic habitats in the Weddell Sea, four are described as new to science: *Campylaspis ledoyeri* spec. nov., *Hemilamprops bacescui* spec. nov., *Paralamprops racovitzai* spec. nov., and *Leptostylis weddelli* spec. nov. Detailed descriptions are given for the previously unknown or undescribed sex in seven species: *Cyclaspis gigas* Zimmer, 1907, *Procampylaspis compressa* Zimmer, 1907, *Paralamprops asper* Zimmer, 1907, *P. mawsoni* (Hale, 1937), *Diastylis anderssoni armata* Ledoyer, 1993, *D. mawsoni* Calman, 1918, and *Leptostylis antipus* Zimmer, 1907. Previous descriptions are supplemented by additional morphological data on 14 species: *Cyclaspis gigas*, *Vaunthompsonia inermis* Zimmer, 1909, *Eudorella gracilior* Zimmer, 1907, *Campylaspis excavata* Ledoyer, 1993, *Procampylaspis compressa*, *Paralamprops mawsoni*, *Diastylis anderssoni armata*, *D. corniculata* Hale, 1937, *D. enigmatica* Ledoyer, 1993, *D. helleri* Zimmer, 1907, *D. mawsoni*, *Diastylopsis goekei* Roccatagliata & Heard, 1992, *Leptostylis antipus*, and *Makrokyllindrus inscriptus* Jones, 1971.

Egg sizes measured in six species were above or partly in the upper range of previous findings in sub-polar to polar climates, while numbers of eggs per female were well within this range. Body sizes measured in nine species were mostly in the upper range. Incubating females were frequent (*Diastylopsis goekei*), less frequent (*Diastylis mawsoni*), infrequent (*Cyclaspis gigas*, *Diastylis anderssoni armata*, *D. corniculata*), or absent (*Vaunthompsonia inermis*, *Paralamprops mawsoni*, *Leptostylis antipus*) in the summer samples, thus pointing to the possibility of various breeding strategies in high Antarctic waters.

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1. Introduction

Sars (1887) presented the first data on Subantarctic cumaceans, collected by the "Challenger Expedition" from the Kerguelen Islands. The first systematic collections of Antarctic cumaceans were made in 1897-1899 by E.G. Racovitza as a member of the "Belgica Expedition", whereby the results were published by Hansen in 1908. Zimmer published a series of papers (1900, 1907a, 1907b, 1909, 1913) on cumaceans collected by German and Swedish expeditions mainly from Subantarctic waters around South Georgia. Calman (1917, 1918) reported Antarctic cumaceans collected by several British and French expeditions. Hale (1937) described cumaceans from the southern extremity of Australia, with several species also present in Subantarctic waters. Further important contributions on Antarctic and Subantarctic cumaceans were provided by Lomakina (1968), Ledoyer (1969, 1993), Jones (1971), Muradian (1976, 1980), Gamô (1987), Petrescu (1991), Roccatagliata & Heard (1992), Mühlenhardt-Siegel (1994), Blazewicz &

Jazdzewsky (1995), Blazewicz & Heard (1999) and Corbera (2000). To date, 70 cumacean taxa (69 species and one subspecies) have been recorded from Antarctic and Subantarctic waters.

The first contribution on cumaceans of the Weddell Sea was made by Ledoyer (1993) on material collected by expedition "EPOS" 3 of R.V. "Polarstern", whereby nine out of 29 taxa were new to science. The second contribution was published by Mühlenhardt-Siegel (1994), including a description of a new species, *Leucon parasiphonatus*.

A literature survey on Antarctic Cumacea yielded complete descriptions with a large number of drawings almost only in Sars' papers (1887, 1900); Zimmer (1900, 1907a, 1907b, 1909, 1913) and Calman (1917, 1918) made almost complete descriptions, yet only for a few species; Muradian (1976, 1980) made complete descriptions only for certain species of the genus *Campylaspis*; Roccatagliata & Heard (1992) published only one new species, with some missing pieces, especially mouth parts; Ledoyer (1969, 1993) provided short descriptions, with few and not very detailed drawings. Published materials often contained only one of both sexes, or parts of animals, particularly certain legs, were missing. In summary, insufficient knowledge of the Antarctic cumaceans, together with partly poor availability of types, became a major hindrance for routine determinations and especially for descriptions of new species.

Based on extensive material, many of these problems could be solved by the present study. This holds true especially for the completion of insufficient or incomplete descriptions, for descriptions of previously missing sexes, as well as for descriptions of new species. The very large number of new, detailed drawings will promote future revisions of species and genera as well as phylogenetic studies, particularly cladistic ones with a great demand for morphological characters.

In contrast to Subarctic and Arctic cumaceans (Granger et al., 1979; Corey, 1981), very little is known about bionomy of the high Antarctic species. Harsh climate and seclusion of the continent severely hinder obtaining sufficient winter data for population studies with reasonable efforts. The summer data on frequency of stages, body size, egg size and fecundity, presented below, will help deepen our knowledge on latitudinal relations of size and reproduction and to formulate or modify questions about possible life cycles under high Antarctic conditions.

2. Material and methods

The material consists of 3,397 specimens of Cumacea collected by K.J. Wittmann from the Weddell Sea during the Expedition ANTARKTIS-VIII/5 of R.V. "Polarstern" during the southern summer from 29 Dec. 1989 to 27 Feb. 1990. Sampling was conducted on the sea floor with an Agassiz trawl (abbreviated as 'AGT' in the cruise log, in Miller & Oerter, 1991, and in Emschermann et al., 1991), epibenthic sledge (KGS; Wittmann, 1995), or grab sampler (GKG). Cumaceans were identified in 31 samples (table 1) belonging to 24 "Polarstern" stations (fig. 1). Sea-water temperatures were generally in the range of -2 to 0°C (max. 1°C). Further details regarding the cruise, sampling stations, sampling methods and additional materials are available in Emschermann et al. (1991), Miller & Oerter (1991), and Wittmann (1991, 1996).

Ship-board close-up photography of living specimens was made within a few hours after sampling according to Svoboda (1992). All specimens in figs. 2-9 were in

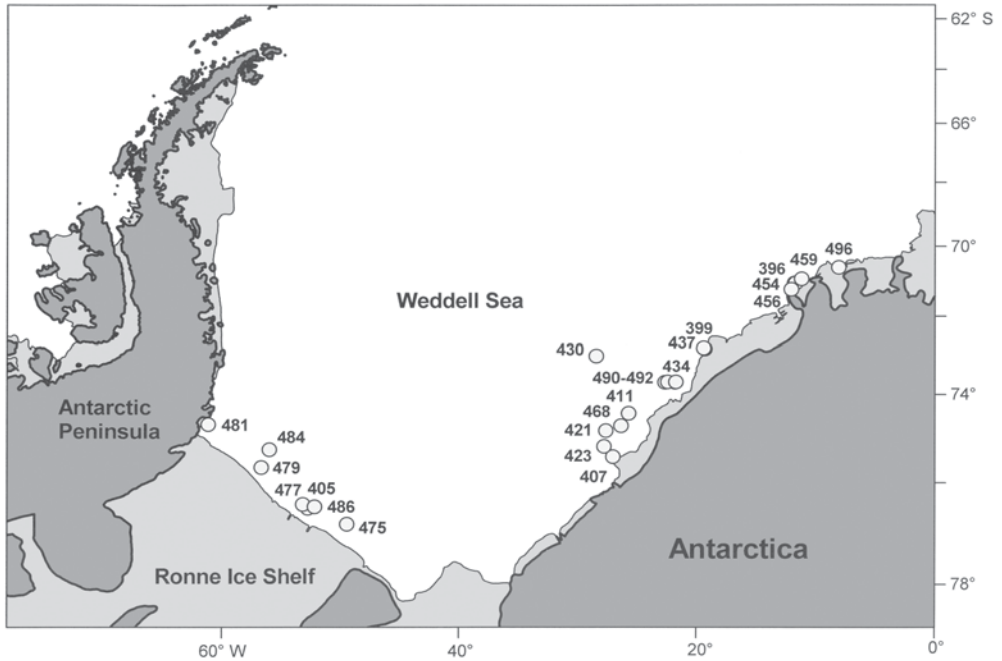


Fig. 1. Collecting stations of cumaceans in the Weddell Sea, material taken by the Expedition ANTARKTIS-VIII/5 with R.V. "Polarstern" during the southern summer 1989/90. Station numbers are given in short form (c.f. table 1). Shelf ice is in light grey. The map is in Mercator projection.

lethargic or moribund condition upon photography, in part due to heat effects at 2-4°C (compared with more active individuals kept in aquaria at lower temperature). No coloured photos of cumaceans have ever been published prior to the present contribution (previous authors provided only coloured drawings). Textual descriptions of body colour were derived from ship-board photographs of living specimens.

Material was fixed in a solution of 4% formalin in sea-water and preserved in a solution of ethanol (60%) and diethylene-glycol (10%) in distilled water. Dissections were made in ethanol-glycol under a Nikon SMZ-U low-power stereomicroscope. The dissected parts were generally put in micro vials or alternatively mounted in Swan medium on micro slides. Identifications and drawings were made using a Nikon Optiphot-2 phase-contrast microscope with camera lucida, or in the case of larger specimens with the SMZ-U microscope.

Terminology of appendages and of cuticle structures is according to Watling (1989) and Watling & McCann (1997). Marsupial and post-marsupial stages are according to Băcescu (1951). Body length was measured from tip of carapace to end of pleonite (excluding telson). Egg diameters were measured as geometric mean of apparent length and width (if not spherical).

Types and reference material were deposited at the following institutions:

- GAM "Grigore Antipa" National Museum of Natural History, Bucharest, Romania
- NHMW Naturhistorisches Museum, Wien, Austria
- RMNH Nationaal Natuurhistorisch Museum, Leiden, The Netherlands

Table 1. Cumacean samples taken in the Weddell Sea during the southern summer 1989/90.

Sample no.	Station no.	Samp. gear	Depth (m)	Substratum and associated fauna (taken with sample)	Cumacean material (no. specimens and taxa)
H 1	16-396	AGT	360-320	large stones, sponges, bryozoans	12 <i>Cyclaspis gigas</i>
H 2	16-399	AGT	380-390	large stones, sponge needles, sponges	2 <i>Cyclaspis gigas</i>
H 4-6	16-405	AGT	380-390	mud, ascidians, (sponges, bryozoans)	1 <i>Vaunthompsonia inermis</i>
H 7	16-407	KGS	240	sponge needles, sponges	86 <i>Cyclaspis gigas</i> , 2 <i>Vaunthompsonia inermis</i> , 1 <i>Leucon assimilis</i> , 2 <i>Campylaspis antarctica</i> , 13 <i>C. excavata</i> , 2 <i>Diastylis corniculata</i> , 4 <i>D. enigmatica</i> , 25 <i>D. helleri</i> , 7 <i>Diastylopsis goekei</i> , 1 <i>Leptostylis antipus</i> , 2 <i>Paralamprops racovitzai</i>
H 8	16-407	AGT	250	sponge needles, sponges	39 <i>Cyclaspis gigas</i> , 1 <i>Vaunthompsonia inermis</i> , 1 <i>Campylaspis excavata</i> , 10 <i>Diastylis helleri</i> , 1 <i>Leptostylis antipus</i>
H 9	16-411	KGS	520	mud, decapod shrimps	25 <i>Cyclaspis gigas</i> , 189 <i>Vaunthompsonia inermis</i> , 1 <i>Eudorella gracilior</i> , 1 <i>Leucon assimilis</i> , 1 <i>Campylaspis quadridentata</i> , 3 <i>Diastylis anderssoni armata</i> , 8 <i>D. corniculata</i> , 20 <i>D. mawsoni</i> , 14 <i>Diastylopsis goekei</i> , 4 <i>Makrokylindrus inscriptus</i> , 1 <i>Hemilamprops bacescui</i> , 5 <i>Paralamprops mawsoni</i> , 2 <i>P. racovitzai</i>
H 11	16-421	KGS	430-420	mud, sea urchins, decapod shrimps	10 <i>Cyclaspis gigas</i> , 2 <i>Vaunthompsonia inermis</i> , 61 <i>Diastylis anderssoni armata</i> , 1 <i>Diastylopsis goekei</i> , 5 <i>Leptostylis antipus</i>
H 14	16-423	KGS	470	mud, sponges, amphipods, decapod shrimps	136 <i>Cyclaspis gigas</i> , 115 <i>Vaunthompsonia inermis</i> , 4 <i>Eudorella gracilior</i> , 12 <i>Diastylis anderssoni armata</i> , 61 <i>D. corniculata</i> , 17 <i>D. mawsoni</i> , 102 <i>Diastylopsis goekei</i> , 29 <i>Leptostylis antipus</i> , 1 <i>Makrokylindrus inscriptus</i> , 2 <i>Paralamprops mawsoni</i> , 1 <i>P. racovitzai</i>
S 11	16-430	GKG	3674	fine mud	1 <i>Paralamprops serratocostatus</i>
H 15	16-434	KGS	260	biogenic gravel, bryozoans, sea urchins, decapod shrimps	1 <i>Cyclaspis gigas</i> , 2 <i>Vaunthompsonia inermis</i> , 3 <i>Diastylis anderssoni armata</i> , 1 <i>D. corniculata</i> , 1 <i>D. enigmatica</i> , 1 <i>Makrokylindrus inscriptus</i>
H 16	16-434	AGT	260-270	mud, bryozoans, fish	1 <i>Campylaspis excavata</i>
H 17	16-437	KGS	390-420	bryozoans, ophiurids, amphipods	216 <i>Cyclaspis gigas</i> , 2 <i>Campylaspis antarctica</i> , 2 <i>C. johnstoni</i> , 1 <i>Procampylaspis compressa</i> , 5 <i>Diastylis mawsoni</i> , 1 <i>Hemilamprops bacescui</i>
H 18	16-454	KGS	280-240	sponges, fish	53 <i>Cyclaspis gigas</i> , 1 <i>Campylaspis excavata</i>
H 19	16-454	AGT	210	sponge needles, sponges, fish	13 <i>Cyclaspis gigas</i>
H 20	16-456	AGT	200	sponges, ascidians, fish	1 <i>Cyclaspis gigas</i> , 1 <i>Campylaspis excavata</i>
H 21	16-456	KGS	210-250	sponges, ascidians, amphipods	6 <i>Cyclaspis gigas</i> , 2 <i>Campylaspis excavata</i>

H 22	16-459	KGS	350-380	gravel, sponges, pennatulids, crinoids, amphipods	86 <i>Cyclaspis gigas</i> , 3 <i>Vaunthompsonia inermis</i> , 1 <i>Campylaspis excavata</i> , 2 <i>C. johnstoni</i> , 1 <i>C. maculata</i> , 1 <i>Procampylaspis compressa</i> , 10 <i>Diastylis corniculata</i> , 9 <i>D. mawsoni</i> , 2 <i>Diastylopsis goekei</i> , 2 <i>Leptostylis antipus</i> , 1 <i>Hemilamprops bacescui</i> , 2 <i>Paralamprops mawsoni</i> , 10 <i>P. racovitzai</i>
H 23	16-459	AGT	380-390	large stones, biogenic gravel, crinoids	1 <i>Cyclaspis gigas</i>
H 24	16-468	KGS	480-470	pennatulids, amphipods, (sponges)	26 <i>Cyclaspis gigas</i> , 879 <i>Vaunthompsonia inermis</i> , 6 <i>Eudorella gracilior</i> , 2 <i>Campylaspis quadridentata</i> , 5 <i>C. johnstoni</i> , 3 <i>C. maculata</i> , 1 <i>Procampylaspis compressa</i> , 9 <i>Diastylis anderssoni armata</i> , 23 <i>D. corniculata</i> , 3 <i>D. mawsoni</i> , 17 <i>Diastylopsis goekei</i> , 104 <i>Leptostylis antipus</i> , 1 <i>Makrokylindrus inscriptus</i> , 3 <i>Hemilamprops bacescui</i> , 1 <i>Paralamprops racovitzai</i>
H 25	16-468	AGT	460	pennatulids, fish, decapod shrimps	1 <i>Leptostylis antipus</i>
H 28	16-475	KGS	280	sponges	2 <i>Cyclaspis gigas</i> , 4 <i>Vaunthompsonia inermis</i> , 2 <i>Diastylopsis goekei</i> , 4 <i>Leptostylis antipus</i> , 1 <i>Paralamprops racovitzai</i>
H 29	16-475	AGT	280	mud, sponges, sea urchins, ascidians	1 <i>Cyclaspis gigas</i>
H 31	16-477	KGS	440-450	mud, decapod shrimps	30 <i>Cyclaspis gigas</i> , 4 <i>Vaunthompsonia inermis</i> , 4 <i>Eudorella gracilior</i> , 5 <i>Leucon assimilis</i> , 1 <i>Campylaspis maculata</i> , 1 <i>Procampylaspis compressa</i> , 14 <i>Diastylis anderssoni armata</i> , 5 <i>D. corniculata</i> , 1 <i>D. mawsoni</i> , 50 <i>Diastylopsis goekei</i> , 10 <i>Leptostylis antipus</i> , 1 <i>L. weddelli</i> , 3 <i>Hemilamprops bacescui</i> , 12 <i>Paralamprops mawsoni</i>
H 32	16-479	KGS	340	mud, sponge needles, decapod shrimps	19 <i>Cyclaspis gigas</i> , 1 <i>Eudorella gracilior</i> , 1 <i>Leucon assimilis</i> , 2 <i>Campylaspis breviramis</i> , 1 <i>Diastylis anderssoni armata</i> , 2 <i>D. corniculata</i> , 1 <i>D. mawsoni</i> , 6 <i>Diastylopsis goekei</i> , 4 <i>Leptostylis antipus</i> , 3 <i>L. weddelli</i> , 16 <i>Hemilamprops bacescui</i> , 10 <i>Paralamprops mawsoni</i>
H 35	16-481	KGS	630-620	gravel, amphipods, decapod shrimps	86 <i>Cyclaspis gigas</i> , 2 <i>Leucon assimilis</i> , 9 <i>Campylaspis ledoyeri</i> , 1 <i>Procampylaspis compressa</i> , 1 <i>Diastylopsis goekei</i> , 5 <i>Leptostylis antipus</i> , 70 <i>Paralamprops mawsoni</i>
H 36	16-484	KGS	440	mud, polychaets	40 <i>Cyclaspis gigas</i> , 7 <i>Eudorella gracilior</i> , 4 <i>Leucon assimilis</i> , 5 <i>Campylaspis breviramis</i> , 5 <i>C. ledoyeri</i> , 51 <i>Diastylis anderssoni armata</i> , 24 <i>D. corniculata</i> , 2 <i>Diastylopsis goekei</i> , 25 <i>Leptostylis antipus</i> , 19 <i>L. weddelli</i> , 10 <i>Paralamprops mawsoni</i>
H 38	16-486	KGS	340-330	biogenic gravel, sponges, bryozoans, pennatulids, ascidians	15 <i>Cyclaspis gigas</i> , 1 <i>Vaunthompsonia inermis</i> , 4 <i>Leucon assimilis</i> , 3 <i>Leptostylis antipus</i> , 2 <i>Paralamprops racovitzai</i>
H 41	16-490	KGS	630-610	(sponges, crinoids)	40 <i>Cyclaspis gigas</i> , 2 <i>Diastylis anderssoni</i>

					<i>armata</i> , 16 <i>D. corniculata</i> , 3 <i>D. helleri</i> , 34 <i>D. mawsoni</i> , 3 <i>Diastylopsis goekei</i> , 13 <i>Makrokyllindrus inscriptus</i> , 4 <i>Paralam-</i> <i>props mawsoni</i> , 4 <i>P. asper</i>
H 42	16-491	KGS	390-370	crinoids, amphipods, (sponges)	1 <i>Cyclaspis gigas</i> , 2 <i>Vaunthompsonia iner-</i> <i>mis</i> , 1 <i>Campylaspis quadridentata</i> , 1 <i>Dia-</i> <i>stylis helleri</i> , 2 <i>D. mawsoni</i> , 1 <i>Leptostylis</i> <i>antipus</i> , 1 <i>Makrokyllindrus inscriptus</i>
H 43	16-492	AGT	250	biogenic gravel, bryozoans, sponges, holothurids	1 <i>Cyclaspis gigas</i>
H 45	16-496	KGS	80	biogenic gravel, bryo- zoans, holothurids, (sponges)	66 <i>Cyclaspis gigas</i> , 1 <i>Campylaspis antarctica</i> . 19 <i>C. excavata</i> , 1 <i>C. maculata</i> , 1 <i>Diastylis</i> <i>helleri</i>

3. Systematics

3.1. Outline of the species

The 3,397 specimens of the present collection belong to 26 species, 12 genera and five families (table 1; species list in '5. Discussion'). Contributions to the taxonomy of most of these taxa are given below by the description of four new species (nos. 9, 13, 16, 25 in the species list) and of the previously unknown or undescribed sex in further seven species (nos. 1, 12, 14, 15, 18, 22, 24). For 14 species (nos. 1-3, 7, 12, 15, 18-24, 26), earlier descriptions are supplemented by drawings and by data on previously unknown or undescribed parts, especially appendages. From the 26 species sampled, a total of 16 species was already recorded from the Weddell Sea by Ledoyer (1993) and Mühlenhardt-Siegel (1994). Besides the four new species, six others (nos. 2, 19, 20, 23, 30, 31) are to be added to the faunal inventory of the Weddell Sea.

3.2. Bodotriidae T. Scott, 1901

3.2.1. *Cyclaspis gigas* Zimmer, 1907 (figs. 2, 10-41)

Material.— The most common species, 1014 specimens from 27 samples (table 1).

Description of adult female (figs. 10-31).— Additions to descriptions of Zimmer (1907a, 1913), Hansen (1908) and Ledoyer (1993) concern antennae, labium, mandible, maxillae, maxillipeds 1, 2, pereopods 2-5, and colour.

Cephalic appendages: Antenna 1 (fig. 13); peduncle with short segments; minute accessory flagellum. Antenna 2 (fig. 14) non-articulated, with two strong, plumose, apical setae. Labium (fig. 15) acute, with three robust, spatula-like, apical setae. Mandible (fig. 16); pars incisiva with four teeth; lacinia mobilis with three teeth; 18 plumose robust setae between lacinia and robust pars molaris. Maxilla 1 (figs. 17, 18); inner endite with five plumose setae, outer one with 12 microserrated robust setae; long palp with four terminal filaments, mostly backward directed setae in central portions on filaments. Maxilla 2 (figs. 19, 20) with microserrated setae on

Figs. 2-9. Ship-board close-up photographs of living (lethargic or moribund) cumaceans from the Weddell Sea (lateral views, only fig. 5 in dorsal view; background cleaned with digital tools). 2, *Cyclaspis gigas* Zimmer, 1907, subadult female; 3, *Vaunthompsonia inermis* Zimmer, 1909, adult male; 4, *Campylaspis excavata* Ledoyer, 1993, subadult female; 5, *Campylaspis ledoyeri* spec. nov., subadult female; 6, *Paralamprops mawsoni* (Hale, 1937), subadult female; 7, *Paralamprops racovitzai* spec. nov., subadult female (pleon damaged); 8, *Diastylis corniculata* Hale, 1937, adult female; 9, *Diastylis mawsoni* Calman, 1918, subadult male.

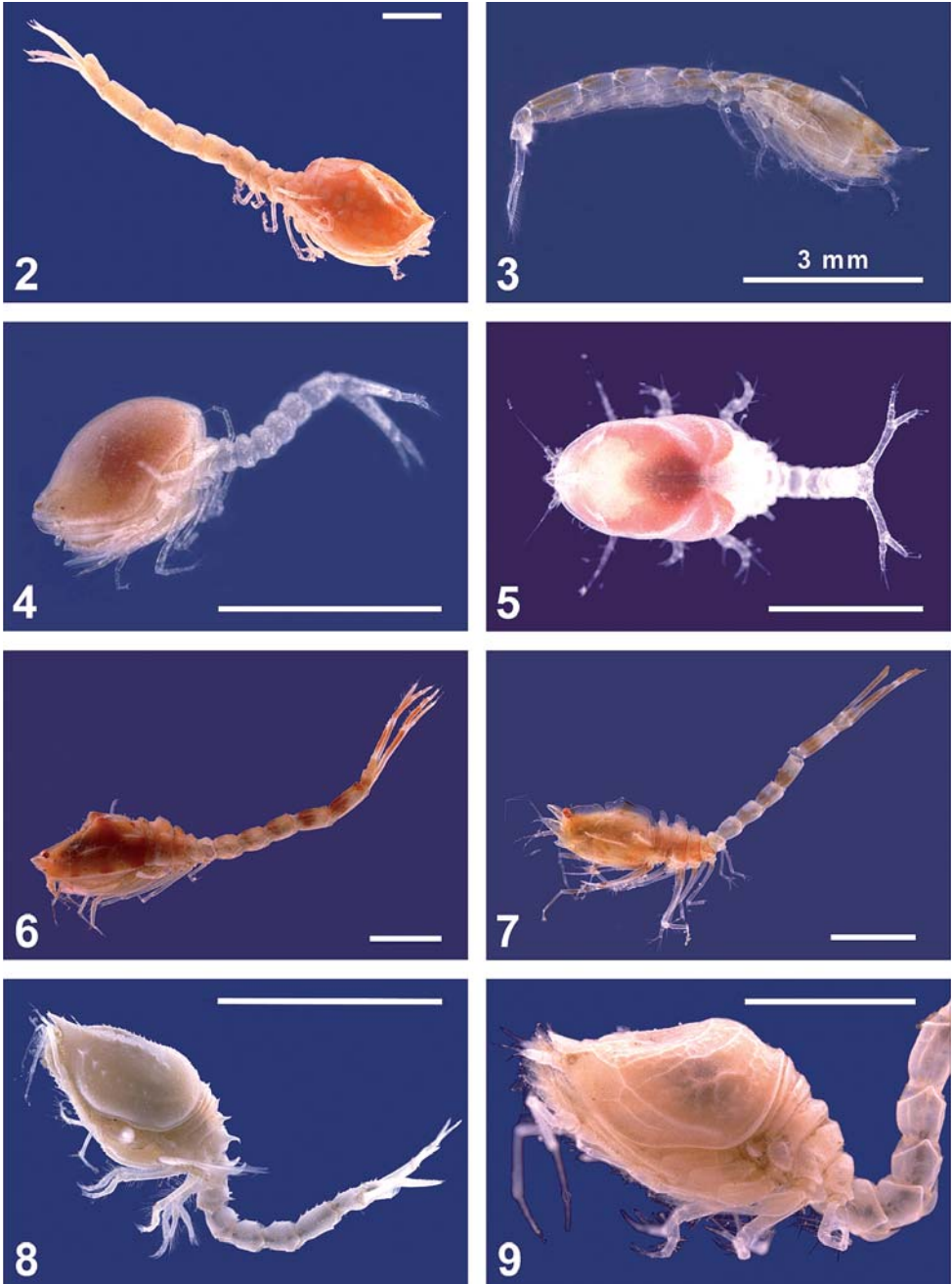
endites; row of simple setae on inner margin of protopod.

Thoracic appendages: Maxilliped 1 (figs. 21-23) with hand-like, flattened, robust setae on endite of basis (fig. 23) and on inner margin of carpus (fig. 22); propodus with two long simple setae on inner margin; small dactylus. Anterior part of siphon ends with indurate lamella armed with four setae, lamella encircled by very thin and pellucid border (fig. 21). Maxilliped 2 (fig. 24); basis with numerous plumose setae on distal half of outer margin and with short plumose seta on inner distal corner; carpus with numerous short plumose setae on inner margin; propodus with two plumose setae on inner margin. Pereiopod 2 (fig. 27) with basis shorter than half its length; carpus with two robust inner setae, one of them two times as long as propodus; dactylus three times as long as propodus, with stout, simple, terminal seta. Pereiopods 3-5 (figs. 28-30) with progressively shorter basis and longer carpus; dactylus with short terminal seta.

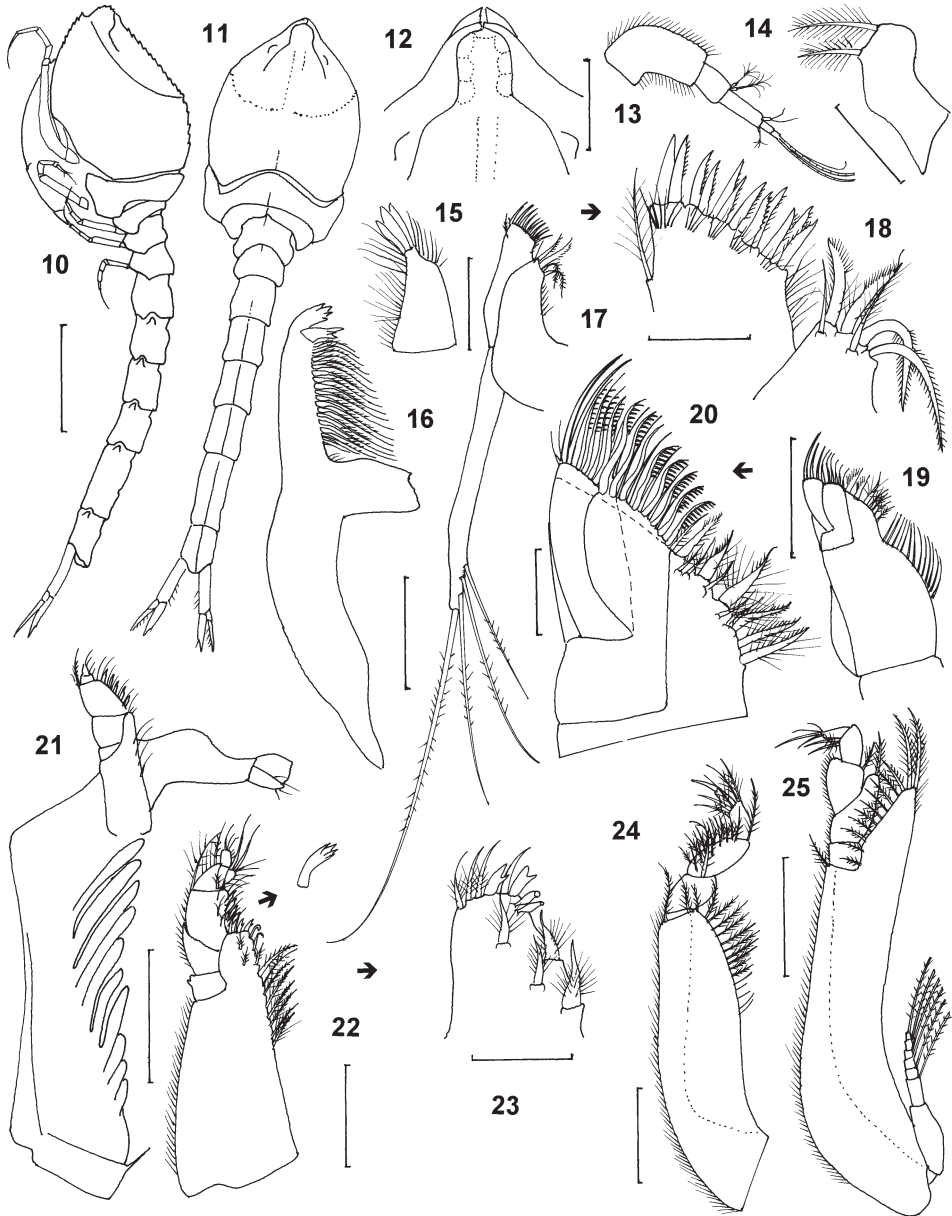
Colour (fig. 2): Living subadult females with yellowish orange body; carapace reddish orange with large yellowish-white spots; eye-spots dark orange-grey; legs whitish transparent. Oviparous females show almost yellowish, dirty white body; carapace with weak tinge of yellow-orange and with large white spots; marsupium white.

Description of previously unknown adult male (figs. 32-41).— Body (fig. 32) with glabrous integument. Length of dissected specimen 16.62 mm. Antenna 2 (fig. 33); last two segments of peduncle with groups of short setae. Maxilliped 3 (fig. 34); basis produced into outer process with short plumose setae. Pereiopod 1 (fig. 35) with basis exceeding half its length; carpus subequal to propodus; dactylus shorter than propodus. Pereiopods 2-5 (figs. 36-39) like in female. Pleopods (fig. 40) with plumose setae on peduncle; two-segmented inner ramus longer than non-articulated outer one. Uropod (fig. 41) longer than in female; peduncle 1.4 times as long as last pleonite, with large number of plumose setae, peduncle 1.2 times as long as endopod; exopod little shorter than endopod, with smooth terminal seta and few plumose setae on inner margin; endopod acuminate, without terminal seta, with about 16 short plumose setae on proximal half and six short stout setae on distal half.

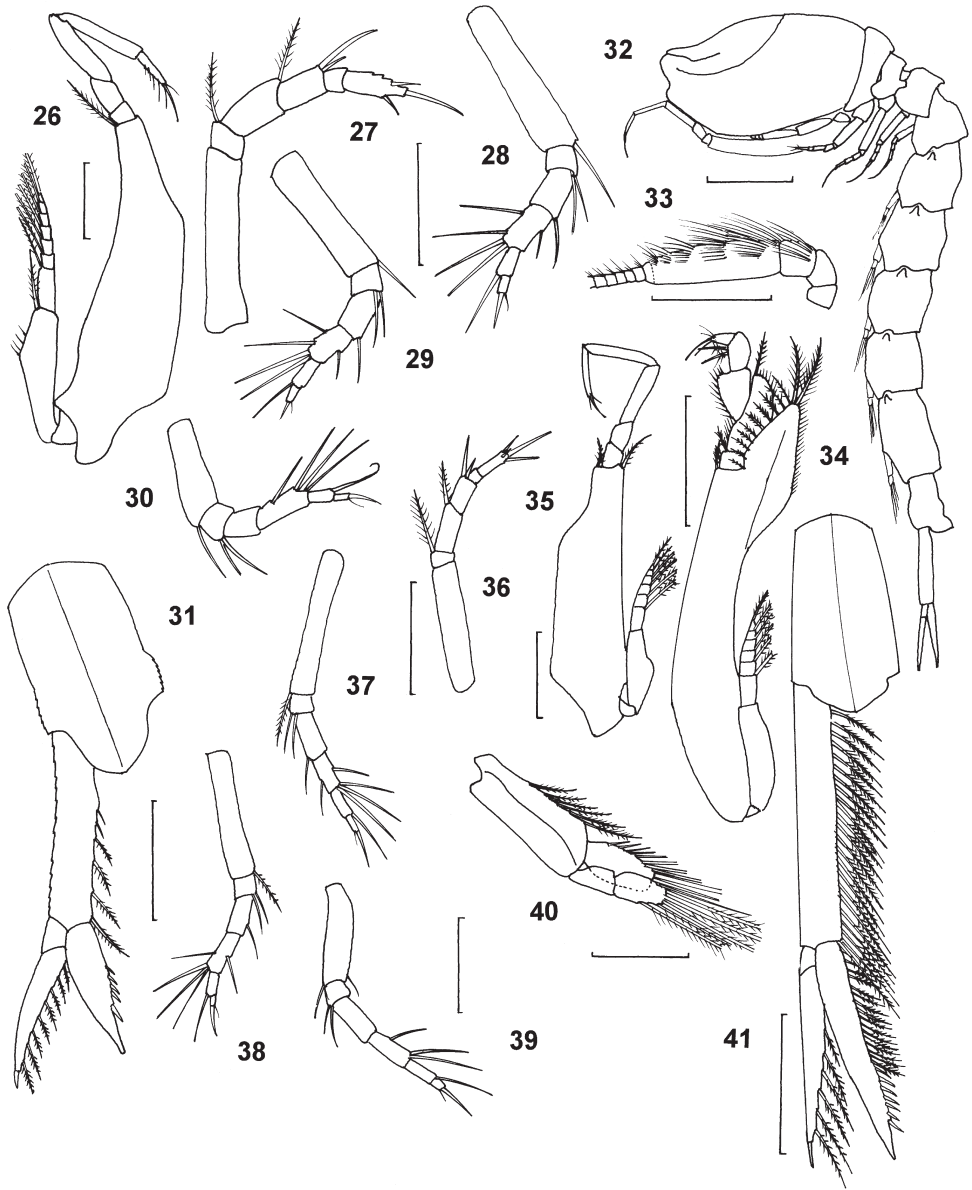
Remarks.— Carapace, pereion and pleon are like in Zimmer (1913) and Hansen (1908); the pleon has well marked carina. The eye-lobe has indistinct lenses. The siphon of the branchial apparatus is like in *C. australis* Sars, 1887. Maxilliped 3 and pereiopod 1 of the female are like in Hansen (Zimmer, 1913, and Ledoyer, 1993, described only body and uropod). The uropodal peduncle is longer than the last pleonite, the peduncle and its rami are like in Ledoyer (1993), the exopod is somewhat longer than the endopod (subequal in Zimmer and in Hansen). The endopod has five small, stout setae (most apical one being longest), on the inner margin (eight in Hansen's, 1908, description and again more numerous in Zimmer, 1913). Within its genus, *Cyclaspis gigas* belongs to the group of species without apical phanera on uropodal endopod, like in *C.*



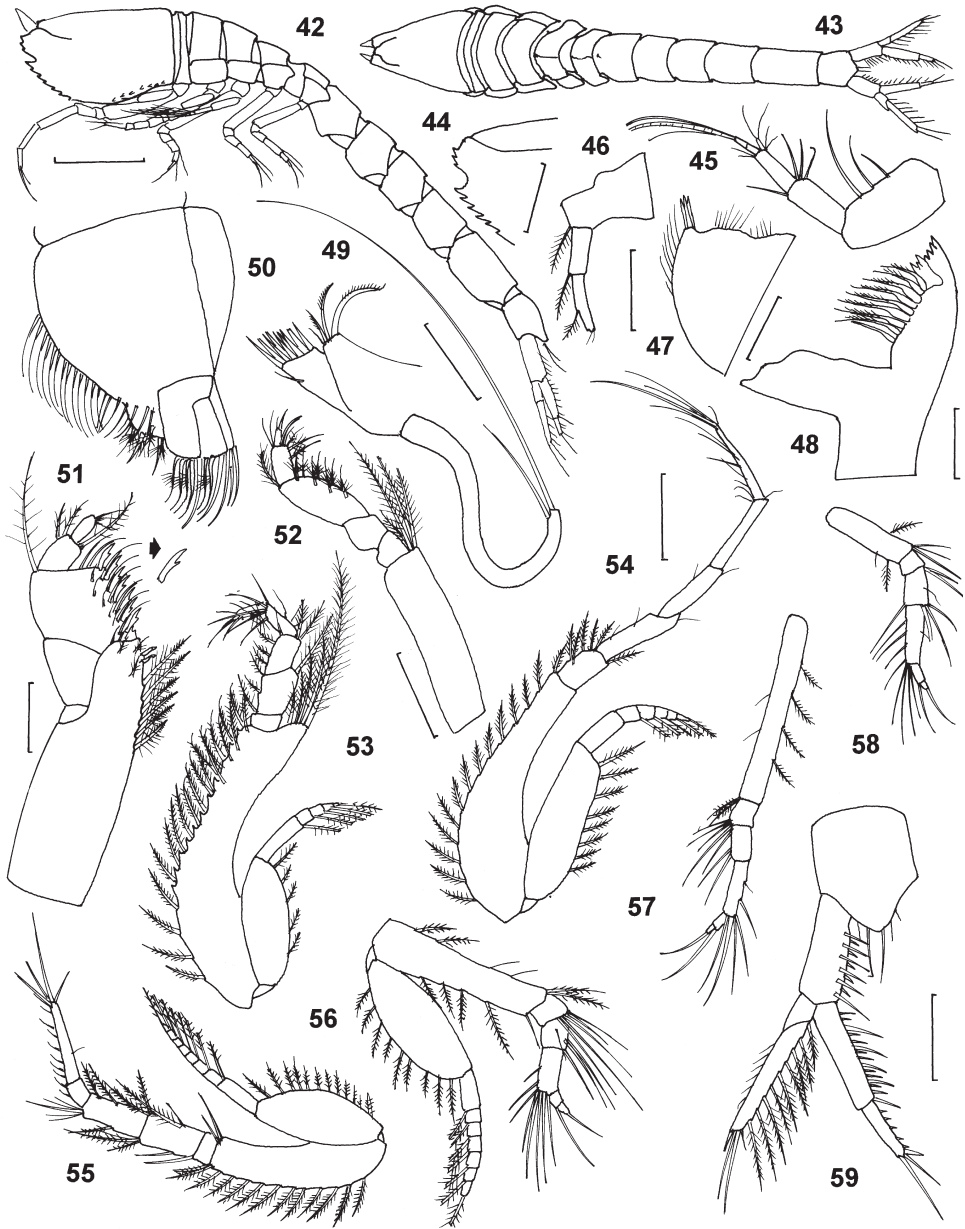
australis, *C. marisrubri* Băcescu & Muradian (1975), *C. longicaudata* Sars (1900), *C. varians* Calman, 1912 and like almost all species from the Indian and western Pacific Oceans. Among these species, *C. australis* appears to be most closely related to *C. gigas*.



Figs. 10-25. *Cyclops gigas* Zimmer, 1907, adult female. 10, body, lateral view; 11, body, dorsal view; 12, frontal part of carapace; 13, first antenna; 14, second antenna; 15, labium; 16, mandible; 17, first maxilla; 18, tip of its endites, magnified; 19, second maxilla; 20, detail showing tip of second maxilla; 21, first maxilliped with branchial apparatus; 22, first maxilliped; 23, endite of its basis, magnified; 24, second maxilliped; 25, third maxilliped. Scales: 10,11: 8 mm; 12: 1; 13, 14: 0.5; 15: 0.2; 16, 17: 0.5; 18: 0.1; 19: 0.5; 20: 0.1; 21: 1; 22: 0.5; 23: 0.1; 24: 0.5; 25: 1.



Figs. 26-41. *Cyclops gigas* Zimmer, 1907, subadult female (26-31) and adult male (32-41). 26, first pereiopod; 27, second pereiopod; 28, third pereiopod; 29, fourth pereiopod; 30, fifth pereiopod; 31, uropod; 32, body, lateral view; 33, second antenna; 34, third maxilliped; 35, first pereiopod; 36, second pereiopod; 37, third pereiopod; 38, fourth pereiopod; 39, fifth pereiopod; 40, pleopod; 41, uropod. Scales: 26: 0.5 mm; 27-30: 0.5; 31: 1; 32: 2; 33: 1; 34: 1; 35: 1; 36: 1; 37-39: 0.5; 40: 0.5; 41: 1.



Figs. 42-59. *Vaunthompsonia inermis* Zimmer, 1909, subadult female. 42, body, lateral view; 43, body, dorsal view; 44, frontal part of carapace; 45, first antenna; 46, second antenna; 47, labium; 48, mandible; 49, first maxilla; 50, second maxilla; 51, first maxilliped; 52, second maxilliped; 53, third maxilliped; 54, first pereopod; 55, second pereopod; 56, third pereopod; 57, fourth pereopod; 58, fifth pereopod; 59, uropod. Scales: 42, 43: 1 mm; 44: 0.5; 45, 46: 0.2; 47: 0.1; 48: 0.2; 49, 50: 0.1; 51: 0.1; 52: 0.2; 53-58: 0.5; 59: 0.5.

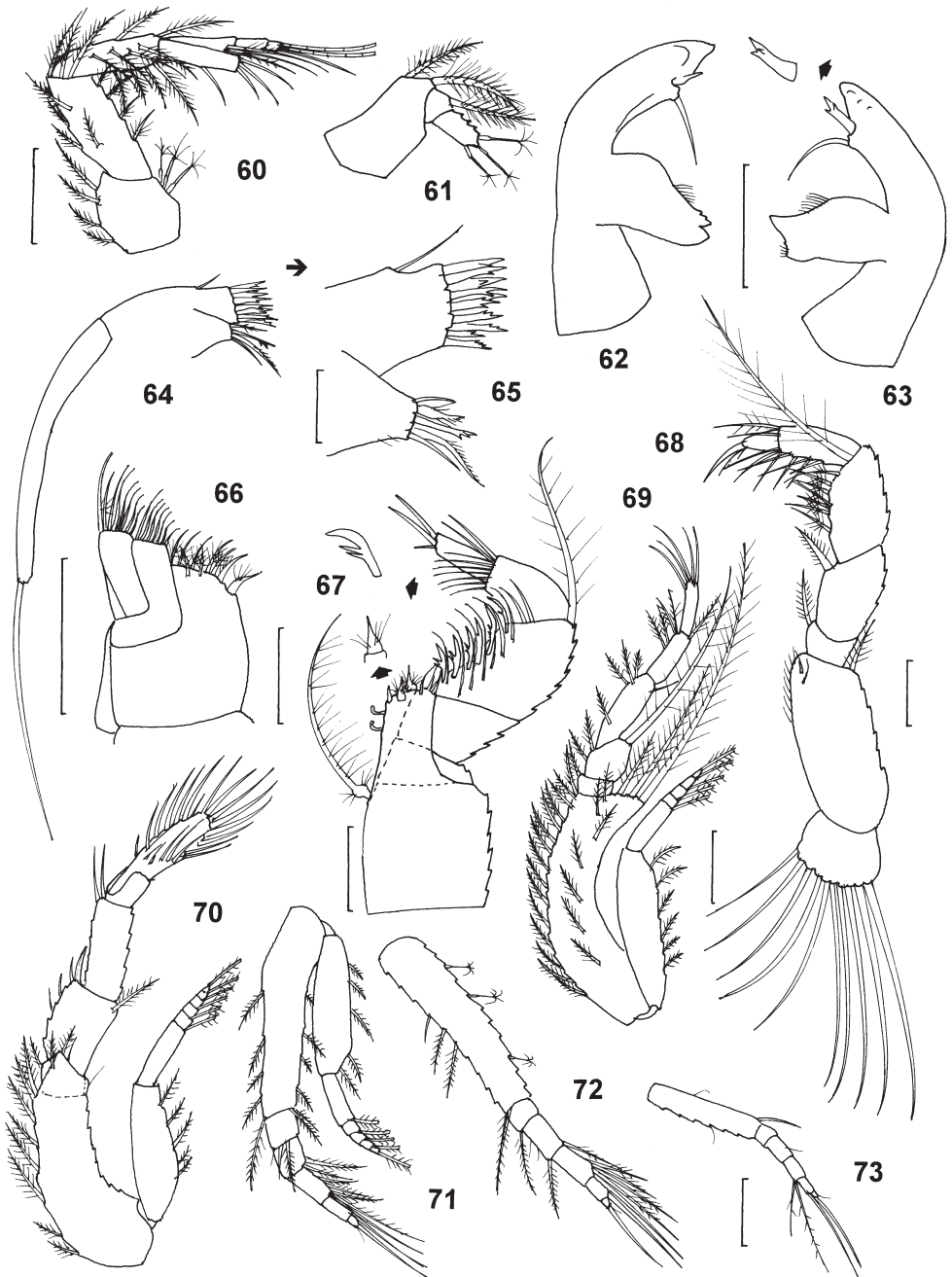
3.2.2. *Vaunthompsonia inermis* Zimmer, 1909
(figs. 3, 42-59)

Material.— 1205 specimens from 13 samples (table 1).

Description of subadult female.— Additions to description by Zimmer (1909) concern labium, maxillae, pereopods 3-5, and colour. Labium (fig. 47) large, with three stout apical setae. Maxilla 1 (fig. 49) with three plumose setae on inner endite, nine robust setae on outer one; palp with two unequal glabrous filaments. Maxilla 2 (fig. 50); protopod with row of simple setae along inner margin up to basis of inner endite. Pereiopod 3 (fig. 56) with basis longer than remaining segments combined; carpus three times as long as propodus; dactylus with thin apical seta; exopod well developed. Pereiopod 4 (fig. 57) with basis about as long as in pereiopod 3, but carpus longer. Pereiopod 5 (fig. 58) with basis shorter and with carpus longer than in pereiopods 3 and 4.

Colour (fig. 3): Living specimens mostly transparent with internal organs visible through body wall; essentially yellow pigment spots, with tinge of orange or brown, in dorsal portions of carapace, thoracomeres and pleomeres, and in antero-ventral portions of carapace. Brown band visible in fig. 3 between mouth parts and first pleomere from content of intestinal tract.

Remarks.— Body (figs. 42, 43) and uropods (fig. 59) are as described by Zimmer (1909). The anterior margin of the pseudorostral lobes (fig. 44) has a small serration like in Zimmer (1909). The antennae (figs. 45, 46), maxillipeds 1-3, and pereopods 1, 2 (figs. 51-55), fit the description of *V. laevifrons* given by Ledoyer (1993). Gamô (1987) described this species from waters off Princess Ragnhild Coast (Antarctica) based only on a damaged holotype by considering "it also differs from *V. inermis*, in that the carapace is as long as the first four free thoracic segments combined", whereby this statement fits well only with Zimmer's (1909) figures but only marginally with Zimmer's text [transl.]: "the carapace is slightly longer than the first four thoracic segments combined". In all specimens of the present material, the carapace is as long as the free thoracic segments. Gamô's (1987) only specimen was strongly damaged, with maxilliped 3 and the first two pairs of pereopods and uropods broken. Based on a single character – length ratio between carapace and free thoracic segments – it appears difficult to judge whether *V. laevifrons* may be a synonym of *V. inermis*. Without consulting the original description, Ledoyer (1993) presumed from the study of Weddell Sea material that *V. laevifrons* may differ from *V. inermis* also by a toothed pseudorostrum. This assumption is not compatible with Zimmer's (1909) statement [transl.]: "there is a distinct subrostral incision. Above this, the anterior margin of the carapace is toothed in its anterior portion". Corbera (2000) mentioned "Ledoyer attributes the Weddell Sea material to *V. laevifrons* on the basis of the denticulate upper margin of antennal notch. However, the structure of this margin is not mentioned in the short description of *V. inermis* and it is very difficult to discern in the small figure of Zimmer (1909)". The present specimens fit essentially with Zimmer's (1909) description, but show a slightly shorter carapace and the thoracic appendages are as in *V. meridionalis* Sars, 1887.



Figs. 60-73. *Eudorella gracilior* Zimmer, 1907, subadult female. 60, first antenna; 61, second antenna; 62, right mandible; 63, left mandible; 64, first maxilla; 65, tip of its endites, magnified; 66, second maxilla; 67, first maxilliped; 68, second maxilliped; 69, third maxilliped; 70, second pereopod; 71, third pereopod; 72, fourth pereopod; 73, fifth pereopod. Scales: 60,61: 0.2 mm; 62, 63: 0.2; 64: 0.2; 65: 0.05; 66: 0.1; 67: 0.1; 68: 0.1; 69: 0.2; 70-73: 0.4.

3.3. Leuconidae Sars, 1878

3.3.1. *Eudorella gracilior* Zimmer, 1907 (figs. 60-73)

Material.— 23 specimens from six samples (table 1).

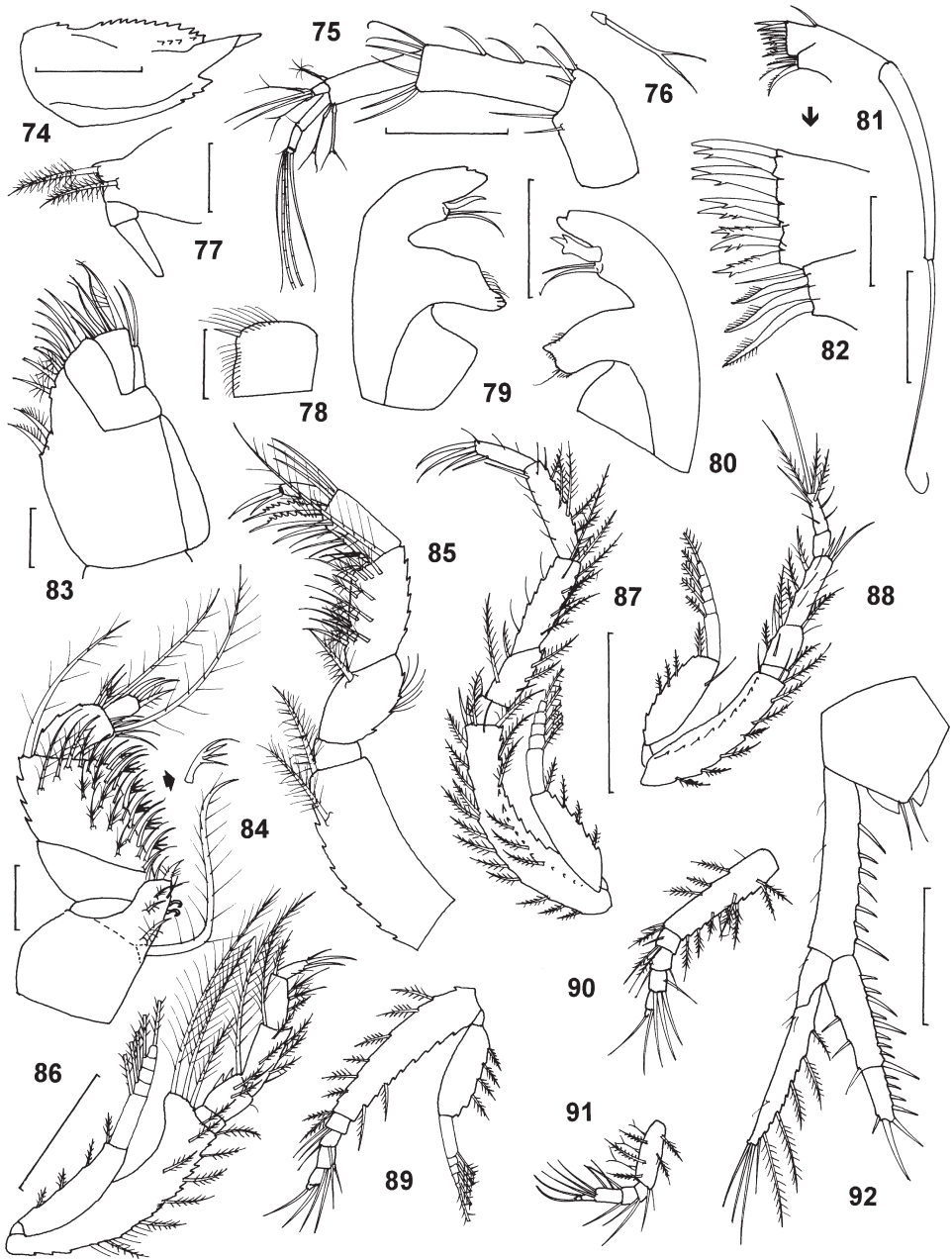
Description of subadult female.— Additions to descriptions of Zimmer (1907b, 1909), Ledoyer (1993), and Mühlenhardt-Siegel (1994) concern antennae, labium, mandible, maxillae, maxillipeds 1 and 2. Antenna 1 (fig. 60); peduncle with numerous plumose setae; non-articulated accessory flagellum about as long as first segment of main flagellum; three-segmented main flagellum longer than distal segment of peduncle. Antenna 2 (fig. 61) with three segments; apical segment with long stiff setae, two times as long as median segment. Left mandible (fig. 63) with only allusively developed teeth on strong pars incisiva; three small teeth on thin lacinia mobilis; large simple seta between lacinia and robust pars molaris. Right mandible (fig. 62) with similar pars incisiva bearing large tooth; lacinia mobilis represented only by small spine; as on left mandible one large simple seta between lacinia and pars molaris; right pars molaris similar to left one but with different inner margin (fig. 62). Maxilla 1 (figs. 64, 65); outer endite with ten microserrated robust setae; long palp with only one glabrous filament. Maxilla 2 (fig. 66) with protopod almost squared, setae only on apical margin. Maxilliped 1 (fig. 67) with long plumose seta on inner margin of ischium, partially covered by endite of basis; flattened robust setae on inner margin of carpus; propodus somewhat longer than dactylus; propodus with simple setae; dactylus long and narrow. Maxilliped 2 (fig. 68) with basis representing third of its length; one plumose seta on outer distal corner of basis; plumose setae on inner margins of ischium, merus, and carpus; long plumose seta on outer margin of carpus; numerous simple setae on inner margin of propodus.

Remarks.— The body and remaining appendages are as described by previous authors. Maxilliped 3 (fig. 69) has an indistinct process on the outer margin of the basis; with a thin carpus, propodus, and dactylus; the carpus is longer than the propodus; the propodus is as long as the dactylus. Pereiopod 2 (fig. 70) has the distal margin of the basis as usual in this genus, the basis partially covers the ischium; the propodus is also characteristic for the genus, with an excavation on inner margin; the dactylus is very characteristic for the genus, two times as long as the propodus, with an elliptical arrangement of simple setae, forming a kind of brush. Pereiopod 3 (fig. 71) has the basis exceeding half its length; the carpus is somewhat longer than the propodus; the dactylus has a long, simple, apical seta. Exopods are present on maxilliped 3 and pereiopods 1-3. Pereiopod 4 (fig. 72) has fewer plumose setae and has the basis of equal size compared to pereiopod 3, the carpus is much longer than the propodus. Pereiopod 5 (fig. 73) has very few setae and a much shorter basis than in pereiopods 3 and 4. Mouthparts are essentially as figured by Sars (1900) for *E. emarginata*.

3.3.2. *Leucon (Leucon) assimilis* Sars, 1887 (figs. 74-92)

Material.— 14 specimens from six samples (table 1).

Description of adult female.— Additions to previous descriptions of Sars (1887:



Figs. 74-92. *Leucon assimilis* Sars, 1887, adult female. 74, carapace, lateral view; 75, first antenna; 76, stiff seta from first antenna, magnified; 77, second antenna; 78, labium; 79, right mandible; 80, left mandible; 81, first maxilla; 82, tip of its endites, magnified; 83, second maxilla; 84, first maxilliped; 85, second maxilliped; 86, third maxilliped; 87, first pereopod; 88, second pereopod; 89, third pereopod; 90, fourth pereopod; 91, fifth pereopod; 92, uropod. Scales: 74: 1 mm; 75: 0.2; 76, 82: 0.05; 77: 0.2; 78: 0.2; 79, 80, 83, 85: 0.2; 81: 0.2; 84: 0.1; 86: 0.2; 87-91: 0.6; 92: 0.2.

only immature male completely described) and Ledoyer (1993: only carapace, antenna 1 and uropod of female) concern antenna 2, mouth parts, maxillipeds, and pereopods.

Cephalic appendages: Antenna 2 (fig. 77) three-segmented; two plumose setae only on basal segment; apical segment more than two times as long as median one. Labium (fig. 78) almost squared, with small stout seta on inner distal corner and numerous fine setae. Left mandible (fig. 80); robust pars incisiva with two teeth; lacinia mobilis with three teeth; two simple long setae between lacinia and truncated pars molaris. Right mandible (fig. 79) also with robust pars incisiva, with three teeth (most apical one much stronger); stout seta and two simple longer setae between pars incisiva and pars molaris; right pars molaris less rectangular than left one. Maxilla 1 (figs. 81, 82); outer endite with microserrated robust setae; palp with one glabrous filament. Maxilla 2 (fig. 83) with protopod narrowed towards tip, protopod with setae only on terminal margin.

Thoracic appendages: Maxilliped 1 (fig. 84); long plumose seta at level of joint between basis and ischium; carpus with flattened, hand-like, robust setae and numerous short plumose setae; propodus two times as long as dactylus, with two very long plumose setae. Maxilliped 2 (fig. 85); basis with two pappose setae on inner margin; carpus with numerous plumose setae on inner margin; propodus with two denticulate robust setae on inner distal corner. Maxilliped 3 (fig. 86); basis without outer process; propodus longer than dactylus. Pereiopod 1 (fig. 87) with basis shorter than half its length; plumose and stout setae on inner margin of basis; numerous plumose setae on outer margins of merus, carpus, and propodus; carpus as long as propodus; propodus longer than dactylus. Pereiopod 2 (fig. 88) with basis shorter than half its length; dactylus two times as long as propodus, with subapical plumose setae and one long, simple, apical seta. Third to fifth pereopods (figs. 89-91) with progressively shorter bases and longer carpi, with long, simple, apical setae. Exopods present on maxilliped 3 and pereopods 1-3.

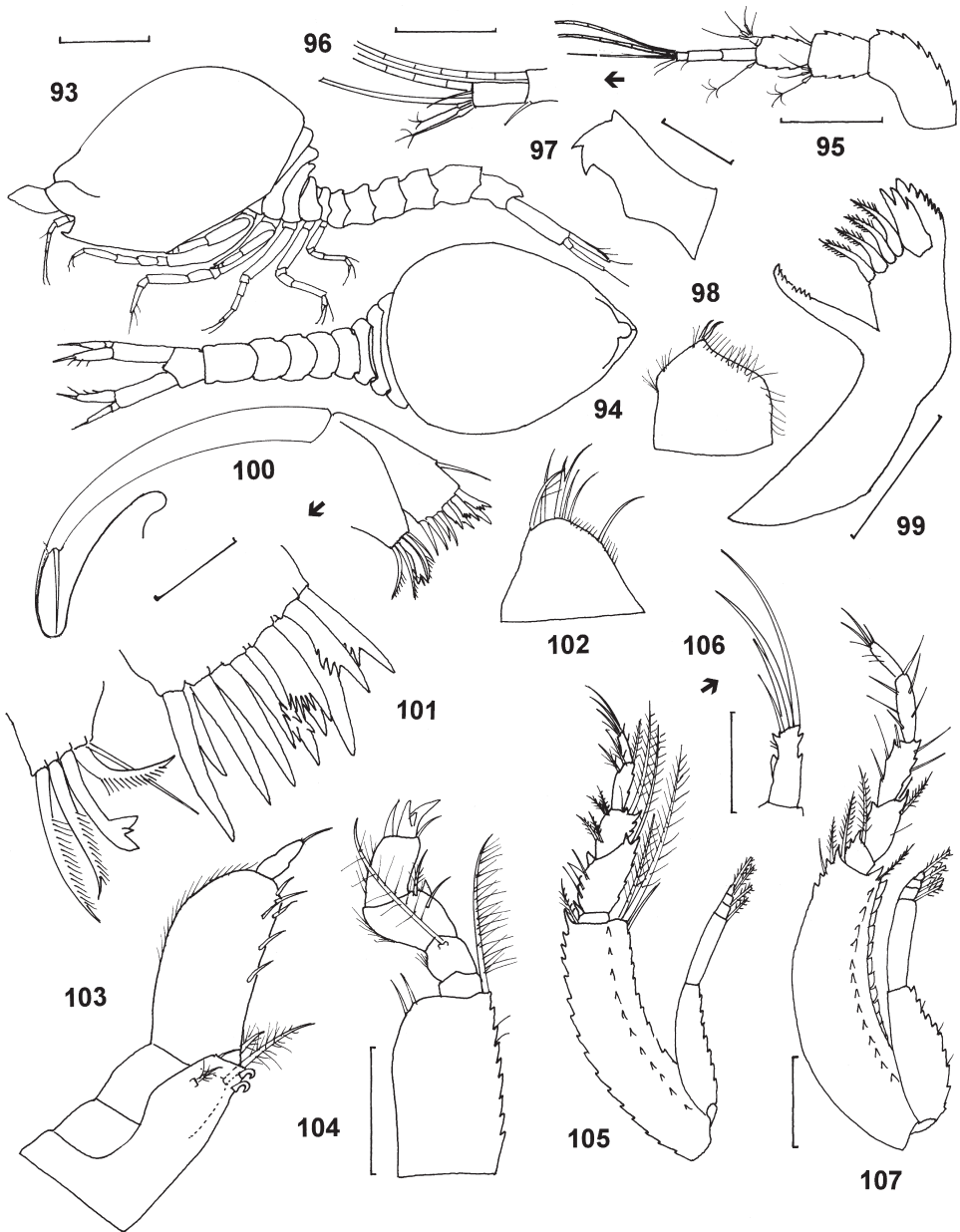
Remarks.— The carapace (fig. 74) is like in the immature male of Sars (1887), with three denticles on each side of the eye-lobe (not mentioned by Ledoyer, 1993). Antenna 1 (figs. 75, 76) is also like in Sars (1887), with characteristic stiff setae and with the apical segment of the main flagellum smaller than in Ledoyer (1993). Mouthparts are like in the immature male of Sars. The mandibles are similar to those of *Eudorella*, but there are small yet distinct differences: stronger teeth on pars incisiva, stronger lacinia mobilis, and more evident stout seta on inner margin of right mandible (fig. 79). The long plumose seta on the basis of maxilliped 1 (fig. 84) inserts below the endite and not right on the endite as figured by Sars (1887) for an immature male. Maxilliped 1 shows little differences from *Eudorella*: in *Leucon* there is a long plumose seta on the propodus; this seta is much longer than the dactylus. Uropods (fig. 92) like in female of Ledoyer (1993) and immature male of Sars (1887).

3.4. Nannastacidae S. Bate, 1865

3.4.1. *Campylaspis antarctica* (Calman, 1907)

Material.— Five specimens from three samples (table 1).

Remarks.— The present specimens are similar to those completely described by Petrescu & Heard (2000) based on material of the Smithsonian Institution (USA).



Figs. 93-107. *Campylaspis excavata* Ledoyer, 1993, subadult female. 93, body, lateral view; 94, body, dorsal view; 95, first antenna; 96, tip of its main flagellum; 97, second antenna. 98, labium; 99, mandible; 100, first maxilla; 101, tip of its endites, magnified; 102, second maxilla; 103, first maxilliped; 104, second maxilliped; 105, third maxilliped; 106, its dactylus, magnified; 107, first pereopod. Scales: 93, 94: 1 mm; 95: 0.1; 96: 0.05; 97: 0.2; 98-100, 103: 0.1; 101, 104: 0.2; 102: 0.05; 105, 107: 0.3; 106: 0.1.

3.4.2. *Campylaspis breviramis* Ledoyer, 1993

Material.— Seven specimens from two samples (table 1).

Remarks as given above for *C. antarctica*.

3.4.3. *Campylaspis excavata* Ledoyer, 1993
(figs. 4, 93-122)

Material.— 39 specimens from eight samples (table 1).

Description of subadult female (figs. 93-113).— Following characteristics added to description of Ledoyer (1993): Antenna 2 (fig. 97) as usual for genus. Labium (fig. 98) large, with two stout apical setae. Mandible (fig. 99) as usual for genus. Maxilla 1 (figs. 100, 101); outer endite with microserrated setae and simple, robust setae; palp with two short, glabrous filaments. Maxilla 2 (fig. 102) broad, without endites. Maxilliped 1 (fig. 103) with long apical segment. Third to fifth pereopods (figs. 110-112) with progressively shorter bases and longer carpi; each of these legs with simple apical seta. Colour of living specimens (fig. 4): Carapace reddish orange; cephalothorax light orange; eye-spots dark orange-red; pereopods transparent; pleon and uropods white-transparent.

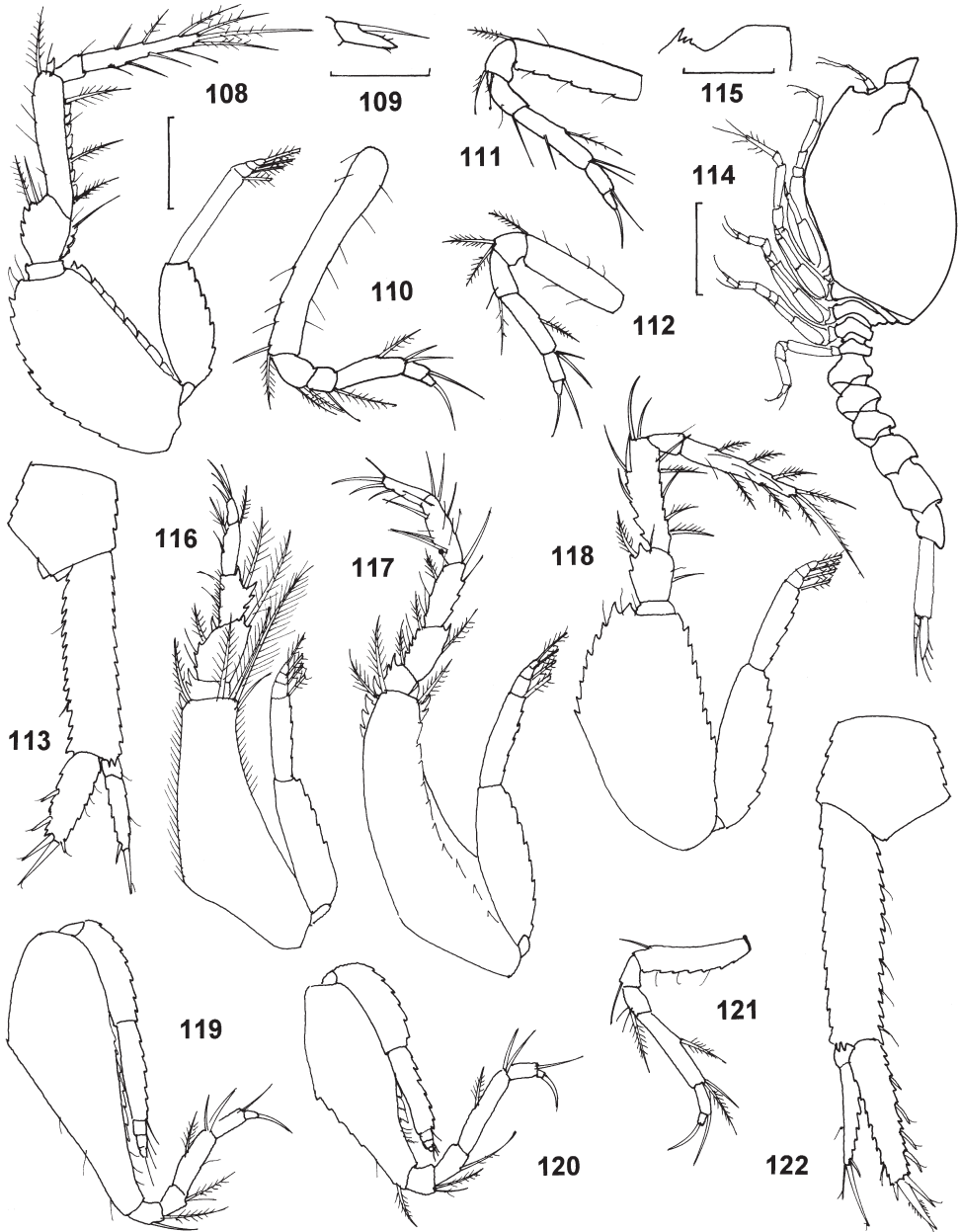
Description of subadult male (figs. 114-122).— So far, only the anterior margin of the carapace has been figured by Ledoyer (1993). Therefore a complete description is given in the following: Body (fig. 114) with glabrous integument. Length of dissected male 5.76 mm. Carapace (figs. 114, 115) with anterior margin like in female. Maxilliped 3 (fig. 116) with basis exceeding half its length; basis without outer process; carpus as long as propodus. Pereiopod 1 (fig. 117) with basis exceeding half its length; basis with serrated median ridge; serration also visible on inner margin of basis, ischium and merus and on outer margin of carpus; carpus as long as propodus. Pereiopod 2 (fig. 118) with basis shorter than half its length; carpus with simple setae on inner distal corner; dactylus four times as long as propodus, with plumose setae. Pereiopods 3-5 (figs. 119-121) essentially as in female, but with larger bases in pereiopods 3 and 4. Exopods present on maxilliped 3 and pereiopods 1-4. Uropods (fig. 122); robust peduncle two times as long as last pleonite, margins serrated; peduncle 1.7 times as long as endopod; exopod somewhat shorter than endopod, with serrated inner margin and with stout apical seta; endopod with serrated margins, four short setae on inner margin, two subapical setae and one robust, microserrated, apical seta.

Remarks.— Body (figs. 93, 94), antenna 1 (figs. 95, 96), maxillipeds 2 and 3 (figs. 104-106), pereiopods 1 and 2 (figs. 107-109) and uropod (fig. 113) of the female are similar to the original description. Robust setae on outer endite of maxilla 1 are like in almost all Antarctic species of *Campylaspis*; maxilla 2 is very characteristic of the subgenus *Sarsia* Muradian (1979).

3.4.4. *Campylaspis johnstoni* Hale, 1937

Material.— Nine specimens from three samples (table 1).

Colour of subadult female.— Carapace of living specimens is red, cephalothorax light yellowish-orange, pereiopods transparent, pleon and uropods white-transparent.



Figs. 108-122. *Campylaspis excavata* Ledoyer, 1993, subadult female (108-113) and subadult male (114-122). 108, second pereiopod; 109, seta from its carpus, magnified; 110, third pereiopod; 111, fourth pereiopod; 112, fifth pereiopod; 113, uropod; 114, body, lateral view; 115, frontal part of carapace; 116, third maxilliped; 117, first pereiopod; 118, second pereiopod; 119, third pereiopod; 120, fourth pereiopod; 121, fifth pereiopod; 122, uropod. Scales: 108, 110-113, 116-122: 0.3 mm; 109: 0.05; 114: 1; 115: 0.05.

Remarks.— This species was carefully redescribed by Muradian (1976). Therefore no further morphological details are necessary here.

3.4.5. *Campylaspis ledoyeri* spec. nov.
(figs. 5, 123-151)

Material.— 14 specimens from two samples (table 1: sta. 16-481, 16-484). Types from sta. 16-481: holotype, subad. fem. 7.4 mm, NHMW coll. no. 19658; paratypes: 3 subad. fem. (no. 265), 1 dissected subad. fem. (no. 266), and 1 dissected subad. male (no. 267), GAM Cum 265-267; 3 subad. fem. RMNH N 283. Paratypes from sta. 16-484: 2 subad. fem. NHMW 19683; 2 subad. fem., 1 juv. RMNH N 284.

Type locality.— Antarctic, Weddell Sea, "Polarstern" station 16-481 (fig. 1, table 1), coord. 74°43'S, 61°09'W.

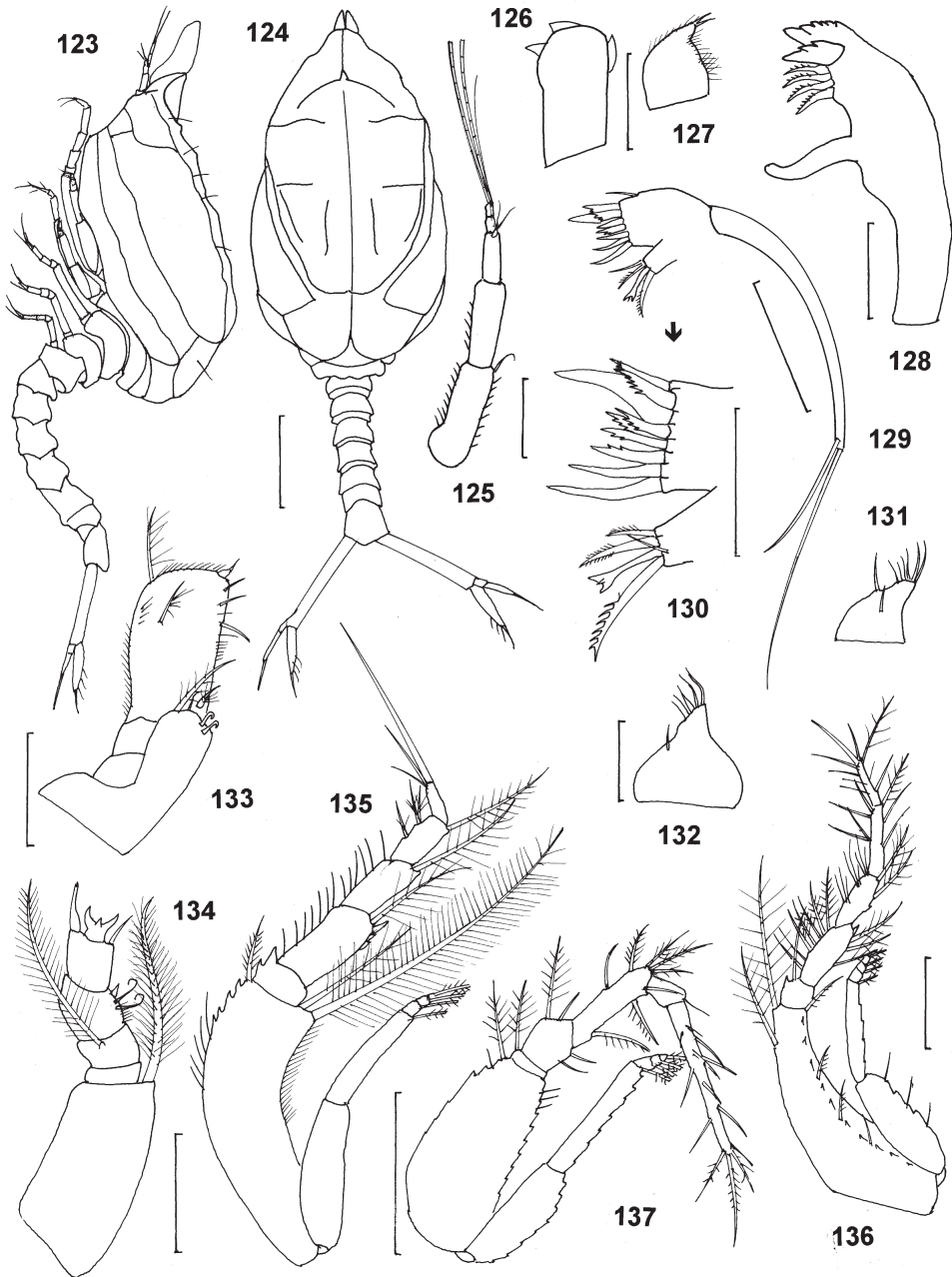
Etymology.— Dedicated to Michel Ledoyer in acknowledgement of his important contributions to the knowledge of Antarctic Cumacea. He already noted that certain Weddell Sea specimens, now described as new species, were different from *C. johnstoni* Hale.

Description of subadult female (figs. 123-141).— Body (figs. 123, 124) with glabrous integument. Length of dissected specimen 7.06 mm.

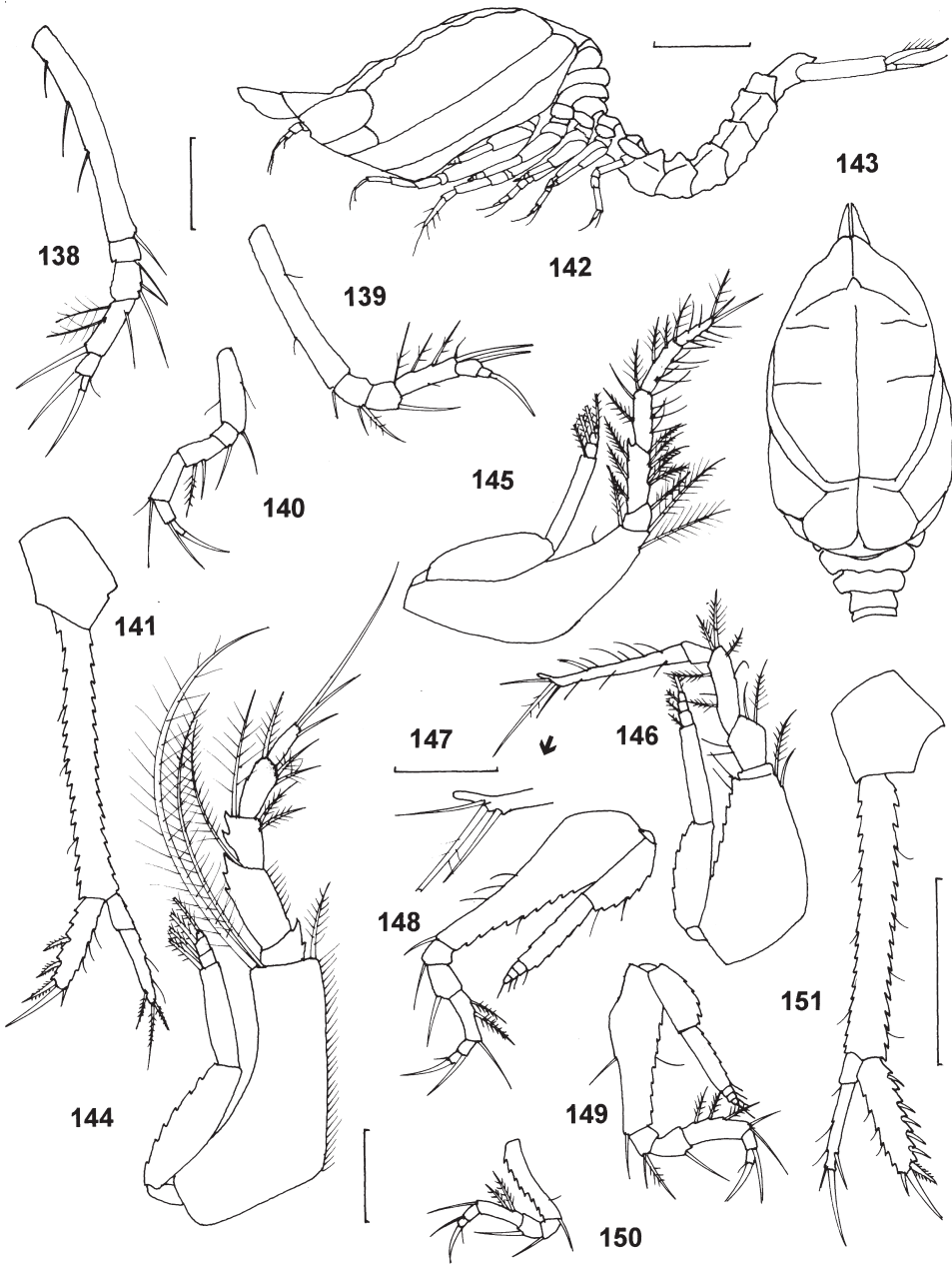
Carapace (figs. 123, 124): represents half of entire body; length/height = 2.5, flattened in its anterior 2/3 and inclining to eye-lobe. On each side, three prominent carinae run obliquely upwards from antero-lateral border, only middle and inner carinae join before reaching mid-line of carapace, upper carina connected with its symmetrical counterpart. Short lateral carina connects uppermost carina and anterior margin below pseudorostrum; short transverse carina connects this lateral carina and middle lateral carina; further transverse carina connects innermost lateral carina with ventral margin of carapace. Mid-dorsal carina runs up to tip of eye-lobe; two pairs of transverse carinae do not reach mid-dorsal carina in antero-dorsal part of carapace. In addition, one pair of ridges parallel with uppermost carinae and one pair of ridges parallel with middle carina in postero-dorsal part of carapace.

Cephalic appendages: Antenna 1 (fig. 125) with thin segments. Antenna 2 (fig. 126) as usual in genus. Labium (fig. 127) with two short apical setae. Mandibles (fig. 128) as usual for genus; pars incisiva with six teeth; lacinia mobilis with three teeth; four microserrated setae between lacinia and pars molaris. Maxilla 1 (figs. 129, 130) with outer endite showing six microserrated robust setae; long palp with two glabrous filaments. Maxilla 2 (figs. 131, 132) acuminate.

Thoracic appendages: Maxilliped 1 (fig. 133); mero-carpus with two plumose setae; apical segment minute. Maxilliped 2 (fig. 134) as usual for genus; basis with pappose seta; carpus with spine and two curved simple setae; dactylus with three teeth. Maxilliped 3 (fig. 135) with basis shorter than half its length, basis without outer process; merus longer than carpus; carpus longer than propodus; dactylus with very long, simple, apical seta. Pereiopod 1 (fig. 136) with slender segments; basis shorter than half of pereiopod; carpus somewhat shorter than propodus. Pereiopod 2 (fig. 137) with basis shorter than half its length; carpus with plumose setae on inner distal corner; dactylus four times as long as propodus, with three plumose terminal setae. Pereiopod 3 (fig. 138) with longer basis than in pereiopod 4. Pereiopod 4 (fig. 139)



Figs. 123-137. *Campylaspis ledoyeri* spec. nov., paratype, subadult female. 123, body, lateral view; 124, body, dorsal view; 125, first antenna; 126, second antenna; 127, labium; 128, mandible; 129, first maxilla; 130, tip of its endites, magnified; 131, right second maxilla; 132, left second maxilla; 133, first maxilliped; 134, second maxilliped; 135, third maxilliped; 136, first pereopod; 137, second pereopod. Scales: 123, 124: 1 mm; 125, 127: 0.2; 126: 0.1; 128: 0.1; 129: 0.4; 130: 0.1; 131, 132: 0.3; 133: 0.3; 134: 0.4; 135: 0.6; 136, 137: 0.2.



Figs. 138-151. *Campylaspis ledoyeri* spec. nov., paratypes, subadult female (138-141) and subadult male (142-151). 138, third pereiopod; 139, fourth pereiopod; 140, fifth pereiopod. 141, uropod; 142, body, lateral view; 143, carapace and pereion, dorsal view; 144, third maxilliped; 145, first pereiopod; 146, second pereiopod; 147, tip of its dactylus, magnified; 148, third pereiopod; 149, fourth pereiopod; 150, fifth pereiopod; 151, uropod. Scales: 138-141: 0.2 mm; 142, 143: 1; 144-146, 148-150: 0.05; 147: 0.1; 151: 0.4.

with basis as well as carpus longer than in pereopod 5 (fig. 140). Pereiopods 3-5 (figs. 138-140) with stout, simple, apical setae. Exopods present on maxilliped 3 and pereiopods 1-2.

Uropods (fig. 141): Peduncle 2.5 times as long as last pleonite and as exopod; peduncle with serrated margins; exopod little longer than endopod, with three plumose apical setae; endopod with three short, microserrated, stout setae on inner serrated margin, robust seta at tip.

Colour (fig. 5): Carapace of living specimens with red and yellow-orange portions as in fig. 5; cephalothorax light yellowish-orange; eye-spots (light) orange; pereiopods transparent; pleon and uropods white-transparent.

Description of subadult male (figs. 142-151).— Body (fig. 142) like in female. Length of dissected specimen 7.08 mm. Carapace (fig. 143); short lateral carina connecting uppermost carina and anterior margin below pseudorostrum; short transverse carina connects this lateral carina and middle lateral carina as in female, but these connections between lateral carinae more distant from anterior margin than in female. Carapace and pereion (fig. 143) without longitudinal dorsal ridges.

Thoracic appendages: Maxilliped 3 (fig. 144) with ischium serrated on inner margin; merus and carpus serrated on outer margin; dactylus with very long, simple, apical seta. Pereiopod 1 (fig. 145) with slender segments; carpus as long as propodus. Pereiopod 2 (fig. 146) with basis more robust than in pereiopod 1; dactylus five times as long as propodus, with finger-like apical prolongation (fig. 147). Pereiopod 3 (fig. 148) with basis longer than in pereiopods 4 and 5. Pereiopod 4 (fig. 149) with carpus longer than in pereiopods 3 and 5 (fig. 150). Pereiopods 3-5 with robust apical setae; inner margin of bases serrated. Exopods present on maxilliped 3 and pereiopods 1-4.

Uropod (fig. 151): Peduncle 2.7 times as long as last pleonite, margins serrated, peduncle 2.4 times as long as rami; exopod as long as endopod, exopod with simple, robust, apical seta; endopod with serrated inner margin and six short stout setae plus simple robust seta at tip.

Remarks.— The new species is closely related to *C. johnstoni* Hale, but differs by a supplementary lateral carina, transversal carinae on anterior part of carapace, male with two dorsal ridges on carapace instead of only one, female with dorsal ridges instead of tubercles (Ledoyer, 1993), uropodal endopod of female with three instead of four stout setae on inner margin, uropodal peduncle longer than in specimens of Hale (1937) and Muradian (1980). The female of the new species is more like Ledoyer's (1993) "female B", showing same type of lateral carinae, two dorsal ridges on carapace, but different numbers of setae on inner margin of uropodal endopod.

3.4.6. *Campylaspis maculata* Zimmer, 1907

Material.— Six specimens from four samples (table 1).

Remarks as given above for *C. antarctica*.

3.4.7. *Campylaspis quadridentata* Ledoyer, 1993

Material.— Four specimens from three samples (table 1).

Remarks as given above for *C. antarctica*.

3.4.8. *Procampylaspis compressa* Zimmer, 1907
(figs. 152-181)

Material.— Five specimens from five samples (table 1).

Description of subadult female (figs. 152-172).— Additions to descriptions of Zimmer (1913) and Ledoyer (1993) concern antennae, mouth parts, maxilliped 1, and pereopods 3-5.

Cephalic appendages: Antenna 1 (figs. 155, 156) with robust peduncle; accessory flagellum with three segments and stiff setae, characteristic of genus. Antenna 2 (fig. 157) non-articulated, serrated terminal margin with two plumose setae. Labium (fig. 158) acute, with fine setae. Mandible (fig. 159); pars incisiva with four small teeth; lacinia mobilis with three teeth; four microserrated robust setae between lacinia and acute pars molaris. Maxilla 1 (figs. 160, 161) with microserrated robust setae on outer endite; palp somewhat longer than protopod, with one glabrous filament.

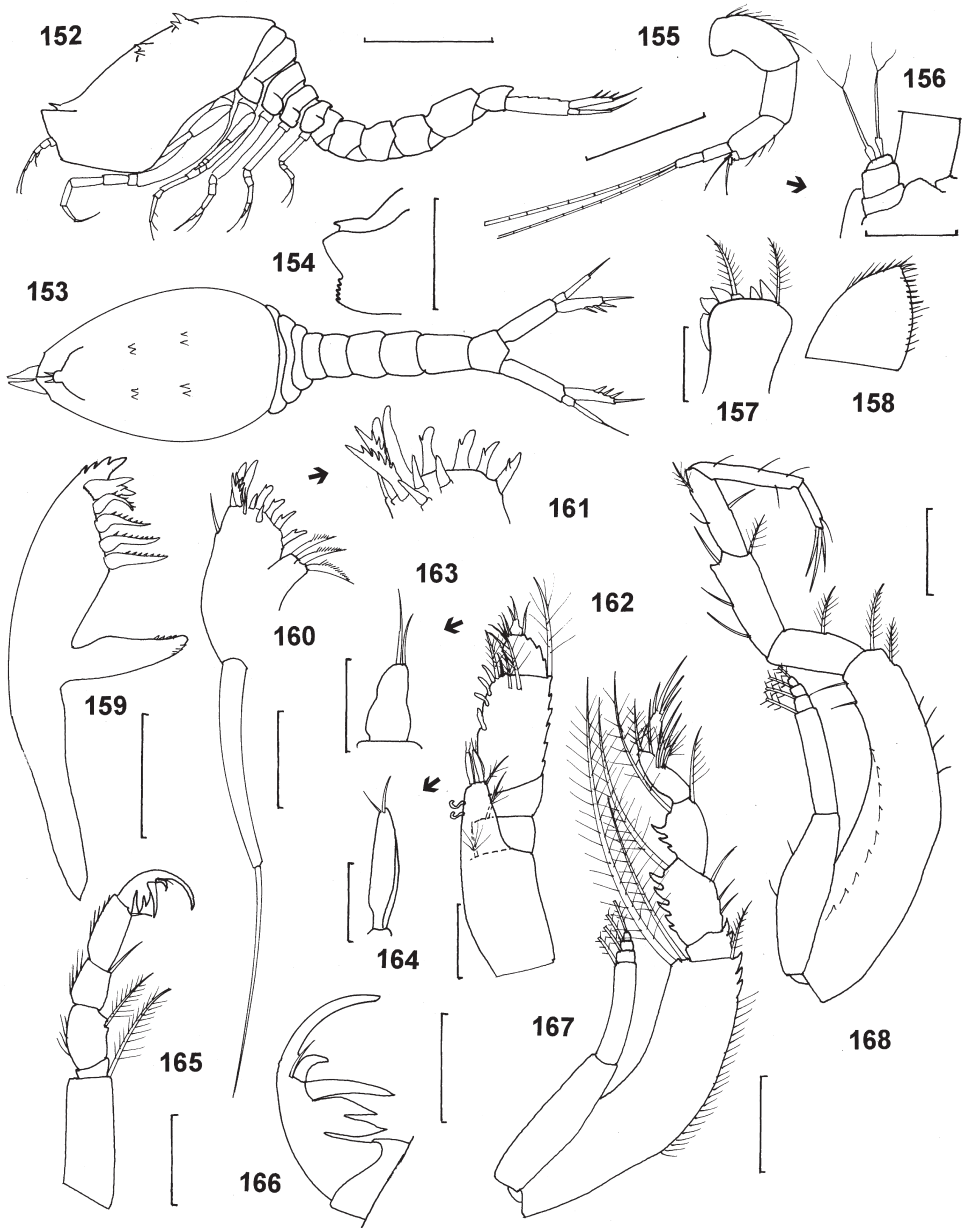
Thoracic appendages: Maxilliped 1 (fig. 162); basis (fig. 164) with two spoon-like setae on endite; carpus with few short, blunt setae and plumose ones on inner margin and long plumose seta on outer distal corner; dactylus (fig. 163) pear-shaped. Pereiopod 3 (fig. 170) with basis exceeding half its length; dactylus with simple apical seta. Pereiopod 5 (fig. 171) with basis shorter and with fewer plumose setae than in pereiopod 3.

Description of previously unknown adult male (figs. 173-181).— Body (fig. 173) slender, with glabrous integument. Length of dissected specimen 5.09 mm. Carapace (fig. 174) less stout than in female, nonetheless with same number and disposition of dorsal spines as in female; two short apical spines on eye-lobe, eye-lobe not reaching tip of pseudorostrum; carapace with serrated antero-ventral corner (fig. 173).

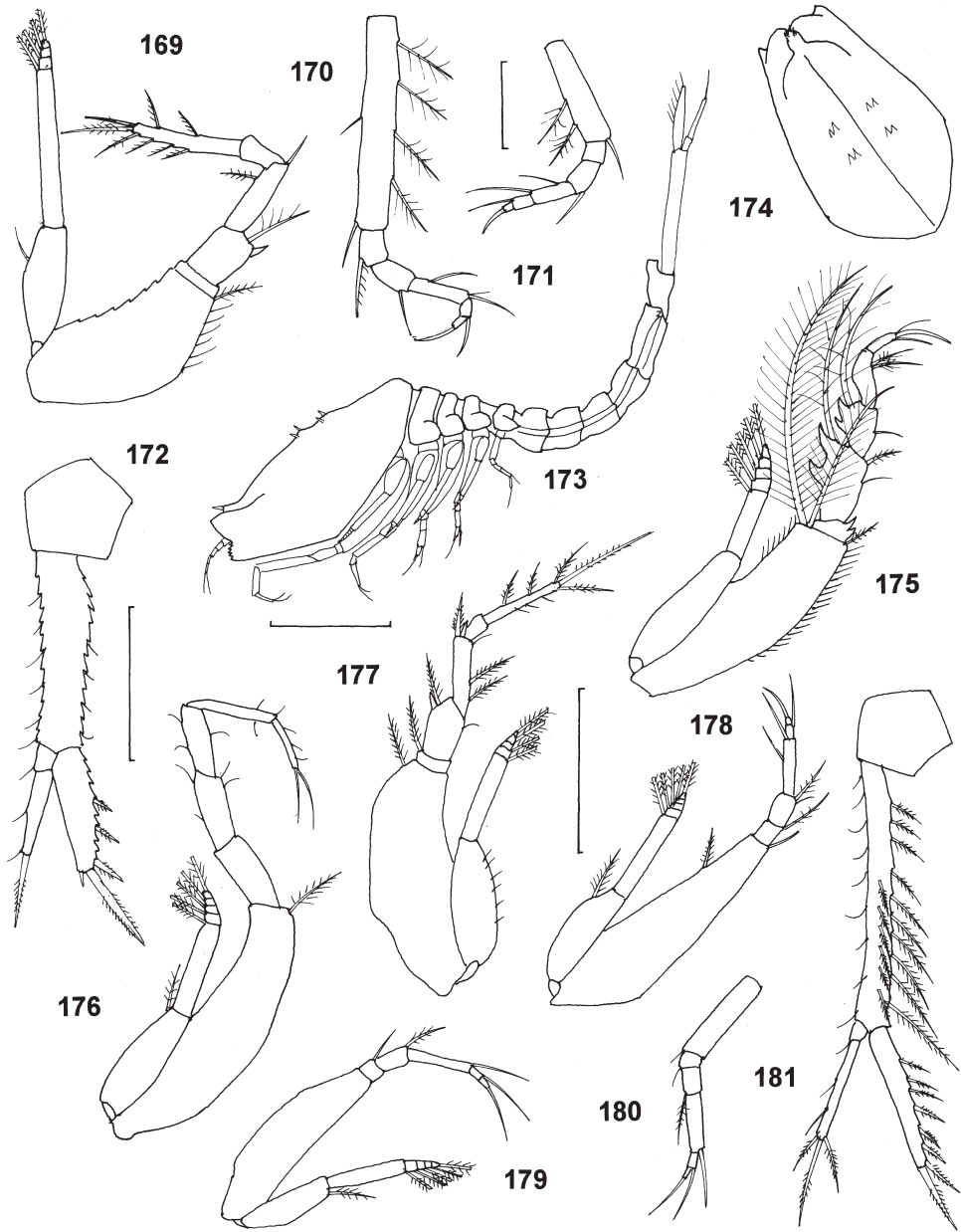
Thoracic appendages: Maxilliped 3 (fig. 175) without outer process on basis; ischium with two short teeth on inner margin; merus and carpus each with two strong teeth on outer margin. Pereiopod 1 (fig. 176) with basis exceeding half its length; ischium as long as merus; propodus longest among distal five segments; dactylus with two simple apical setae. Pereiopod 2 (fig. 177); basis subequal to remainder of pereiopod; carpus with two microserrated stout setae (one longer than propodus); dactylus three times as long as propodus. Pereiopod 3 (fig. 178) with basis strongly exceeding half its length; carpus two times as long as merus; minute dactylus with simple apical seta. Pereiopods 4 and 5 (figs. 179, 180) with bases progressively shorter and carpi longer than in pereiopod 3; dactyli with long, simple, apical setae. Fully developed exopods present on maxilliped 3 and pereiopods 1-4.

Uropod (fig. 181): Peduncle 3.3 times as long as last pleonite, with numerous plumose setae on inner margin, almost two times as long as endopod; exopod shorter than endopod, with three apical, plumose setae; endopod with seven microserrated short setae on inner margin and one longer apical seta.

Remarks.— Body (fig. 152), carapace (figs. 153, 154), maxilliped 2 (figs. 165, 166), pereiopods 1 and 2 (figs. 168, 169), and uropod (fig. 172) are like in previous descriptions. Antenna 2 with only one segment, not two as in Băcescu & Muradian (1972) and in Gamô (1977). The characteristic spoon-like setae (fig. 164) on the endite of maxilliped 1 were never mentioned in other species of the genus. Maxilliped 3 (fig. 167) with more segments showing serrated margins as compared to Ledoyer (1993). The



Figs. 152-168. *Procampylaspis compressa* Zimmer, 1907, subadult female. 152, body, lateral view; 153, body, dorsal view; 154, frontal part of carapace; 155, first antenna; 156, its accessory flagellum, magnified; 157, second antenna; 158, labium; 159, mandible; 160, first maxilla; 161, tip of its outer endite, magnified; 162, first maxilliped; 163, its dactylus, magnified; 164, special seta from endite of basis, magnified; 165, second maxilliped; 166, its dactylus, magnified; 167, third maxilliped. Scales: 152, 153: 1 mm; 154: 0.5; 155: 0.2; 156: 0.05; 157: 0.1; 158, 160, 163: 0.1; 159: 0.1; 161: 0.05; 162: 0.1; 164: 0.05; 165: 0.1; 166: 0.1; 167: 0.2; 168: 0.2.



Figs. 169-181. *Procampylaspis compressa* Zimmer, 1907, subadult female (169-172) and adult male (173-181). 169, second pereiopod; 170, third pereiopod; 171, fifth pereiopod; 172, uropod; 173, body, lateral view; 174, carapace, dorsal view; 175, third maxilliped; 176, first pereiopod; 177, second pereiopod; 178, third pereiopod; 179, fourth pereiopod; 180, fifth pereiopod; 181, uropod. Scales: 169-171: 0.2 mm; 172: 0.4; 173, 174: 1; 175-181: 0.6.

present females have three setae on inner margin of uropodal endopod as in Zimmer (1913) and not four like in Ledoyer (1993).

3.5. Lampropidae Sars, 1878

3.5.1. *Hemilamprops bacescui* spec. nov. (figs. 182-199)

Material.— 25 specimens from six samples (table 1: sta. 16-411, 16-437, 16-459, 16-468, 16-477, 16-479). Types from sta. 16-479: holotype, subad. fem. 6.1 mm, NHMW coll. no. 19654; paratypes: 2 subad. fem., 3 subad. males, NHMW 19655; 4 subad. fem. (no. 268), 1 dissected subad. fem. (no. 269), 2 subad. males and 3 ad. males (no. 270), GAM Cum 268-270. Paratypes from further stations: 1 subad. male, sta. 16-411, NHMW 19657; 1 subad. male, sta. 16-437, RMNH N 285; 1 subad. fem., sta. 16-459, RMNH N 286; 2 subad. fem., 1 subad. male, sta. 16-468, RMNH N 287; 2 subad. fem., 1 subad. male, sta. 16-477, NHMW 19656.

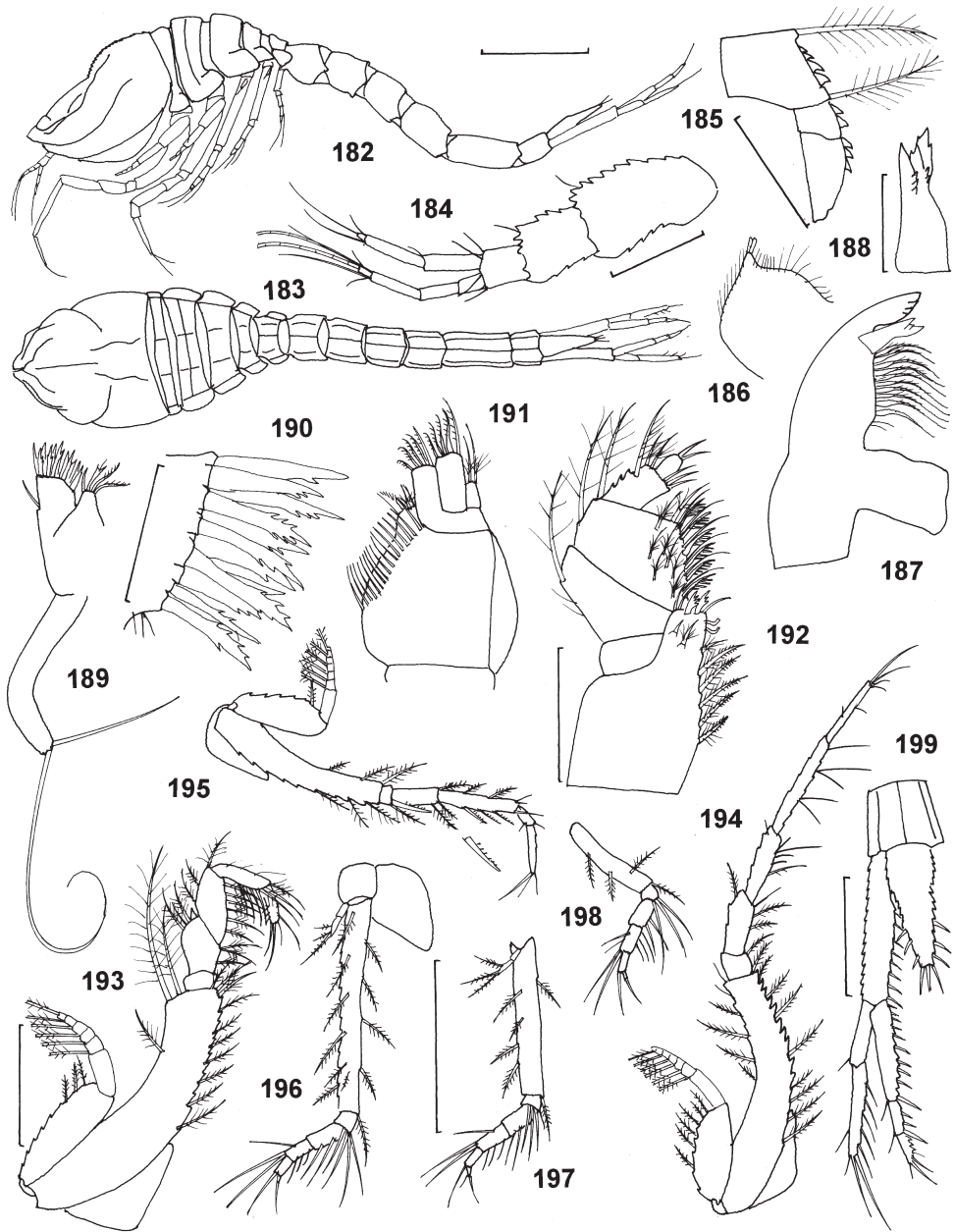
Type locality.— Antarctic, Weddell Sea, "Polarstern" station 16-479 (fig. 1, table 1), coord. 75°40'S, 56°40'W.

Etymology.— Dedicated in memory of the famous Romanian crustaceologist Mihai C. Băcescu (1908-1999), world specialist in Cumacea, Mysidacea and Tanaidacea.

Description of subadult female.— Body (figs. 182, 183) with glabrous integument. Length of dissected specimen 6.10 mm. Carapace length less than third of body; carapace with numerous carinae and ridges. Pair of carinae rises on pseudorostrum, obliquely directed to dorsal pair of serrated carinae from posterior half; pair of lateral carinae running almost parallel with previous ones; pair of innermost carinae shortest. Pair of dorsal ridges parallel with eye-lobe.

Cephalic appendages: Antenna 1 (fig. 184) with very robust peduncle, its first two segments with serrated margins; main flagellum with four segments; accessory flagellum with three segments, subequal to main one. Antenna 2 (fig. 185) with three segments showing serrated inner margins; basal segment with two plumose setae; robust apical segment two times as long as median one. Labium (fig. 186) terminally pointed, with two stout apical setae. Mandible (fig. 187); pars incisiva with four teeth; lacinia mobilis with three serrated teeth (fig. 188); ten plumose stout setae between lacinia and robust pars molaris. Maxilla 1 (figs. 189, 190) with 12 microserrated robust setae on outer endite; short and strong palp with two glabrous filaments. Protopod of maxilla 2 (fig. 191) with row of setae on inner margin extending up to inner endite.

Thoracic appendages: Maxilliped 1 (fig. 192) with flattened, hand-like, robust setae on endite of basis and on inner margin of carpus; propodus two times as long as dactylus. Maxilliped 3 (fig. 193) with numerous plumose setae along inner margin; basis without outer process; carpus longest among distal five segments. Pereiopod 1 (fig. 194) with basis shorter than half its length; basis with serrated inner margins and plumose setae on both margins; carpus about as long as dactylus; propodus longest among distal five segments. Pereiopod 2 (fig. 195) with basis shorter than half its length; ischium with microserrated robust seta on inner distal corner; carpus with three microserrated setae on inner margin and three plumose ones on outer margin; dactylus two times as long as propodus, with short, simple, apical setae. Pereiopod 3



Figs. 182-199. *Hemilamprops bacescui* spec. nov., paratype, subadult female. 182, body, lateral view; 183, body, dorsal view; 184, first antenna; 185, second antenna; 186, labium; 187, mandible; 188, its lacinia mobilis, magnified; 189, first maxilla; 190, tip of its outer endite, magnified; 191, second maxilla; 192, first maxilliped; 193, third maxilliped; 194, first pereopod; 195, second pereopod; 196, third pereopod; 197, fourth pereopod; 198, fifth pereopod; 199, uropod and telson. Scales: 182, 183: 1 mm; 184: 0.2; 185: 0.1; 186, 187, 189, 191, 192: 0.2; 188: 0.05; 190: 0.05; 193: 0.4; 194-198: 0.4; 199: 0.5.

(fig. 196) with basis greatly exceeding half its length; basis with numerous plumose setae, terminal five segments with numerous simple long setae; carpus slightly longer than propodus. Pereiopods 3-5 (figs. 196-198) with progressively shorter bases. Pereiopods 3 and 4 with very short, two-segmented exopods, terminal segment with plumose apical setae.

Pleon: Telson (fig. 199) shorter than uropodal peduncle, with three stout setae on each lateral margin and further three on tip. Uropod (fig. 199); peduncle two times as long as last pleonite, peduncle with serrated margins and eight simple setae on inner margin, peduncle as long as exopod and somewhat shorter than endopod; exopod with long proximal segment and even longer distal one, latter with two long simple setae on tip and numerous shorter ones along inner margin; endopod with three segments, nine stout short setae on inner margin of basal segment, three on middle one and two on distal one.

Subadult males with reduced pleopods similar to those of females.

Remarks.— The new species is most closely related to *H. ultimaespei*, judging from the description given by Zimmer (1921). The latter species was reported by Ledoyer (1993) for the Weddell Sea, but was not found in the present material. The new species is distinguished mainly by the presence of two lateral carinae on the carapace. The lacinia mobilis has a greater number of small teeth compared to the most closely related genus *Paralamprops*. Antennae, vestigial exopods on pereiopods 3 and 4, telson, and uropod are characteristic of the genus *Hemilamprops*.

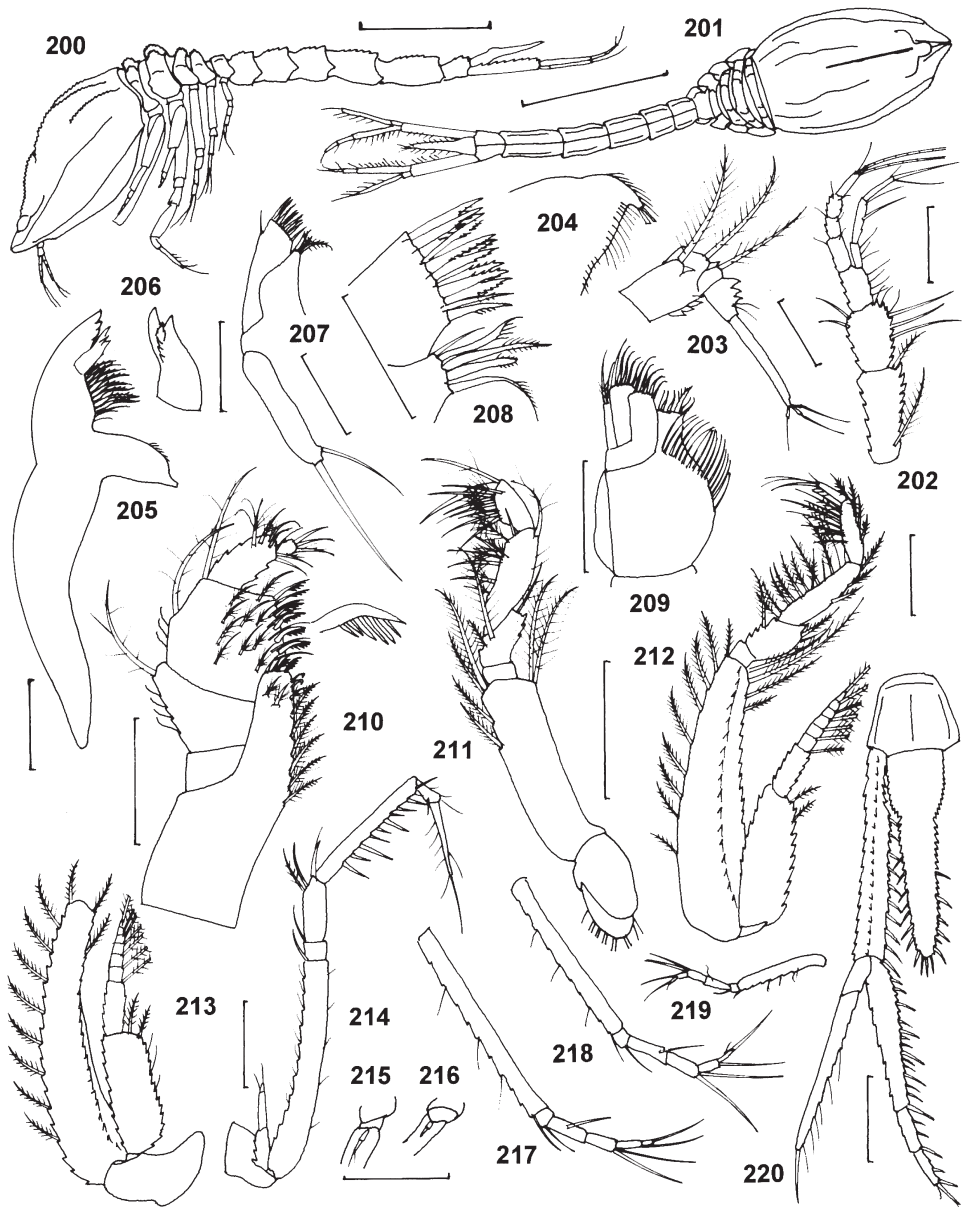
3.5.2. *Paralamprops asper* Zimmer, 1907 (figs. 200-220)

Material.— 4 subad. females, "Polarstern" station 16-490 (fig. 1, table 1).

Description of subadult female.— Additions to descriptions by Zimmer (1913) and Corbera (2000) concern antenna, mouth parts, maxillipeds, pereiopods, and uropod (Zimmer, 1907a and 1913, based his descriptions on immature males).

Cephalic appendages: Antenna 2 (fig. 203) with three segments; apical one thin, three times as long as second segment, with stiff terminal setae. Labium (fig. 204) acuminate, with short, stout, apical setae. Mandible (figs. 205, 206); pars incisiva with four teeth; lacinia mobilis with three teeth and row of short spines on its body, middle tooth serrated (fig. 206); numerous plumose robust setae between lacinia and robust pars molaris. Maxilla 1 (figs. 207, 208); outer endite with microserrated robust setae; palp as long as protopod, palp with two glabrous filaments. Protopod of maxilla 2 (fig. 209) with row of simple setae along inner margin up to basis of inner endite; endites with simple setae.

Thoracic appendages: Maxilliped 1 (fig. 210); endite with two flattened, hand-like, robust setae as also present on inner margin of carpus; propodus more than three times as long as dactylus. Maxilliped 2 (fig. 211) with four plumose setae on inner and two on outer margin of basis; propodus with numerous forked setae on inner margin. Maxilliped 3 (fig. 212) with thin segments, numerous plumose setae on both margins of these segments; basis half as long as maxilliped, bases with serrated median ridge; carpus longest among distal five segments. Pereiopod 1 (fig. 213) broken in present material; basis with numerous plumose setae on inner margin, with serrated median



Figs. 200-220. *Paralamprops asper* Zimmer, 1907, subadult female. 200, body, lateral view; 201, body, dorsal view; 202, first antenna; 203, second antenna; 204, labium; 205, mandible; 206, its lacinia mobilis, magnified; 207, first maxilla; 208, tip of its endites, magnified; 209, second maxilla; 210, first maxilliped; 211, second maxilliped; 212, third maxilliped; 213, first pereopod, broken; 214, second pereopod; 215, exopod of third pereopod; 216, exopod of fourth pereopod; 217, third pereopod; 218, fourth pereopod; 219, fifth pereopod; 220, uropod and telson. Scales: 200: 2 mm; 201: 2; 202: 0.3; 203: 0.2; 204, 205, 207: 0.2; 206: 0.1; 208: 0.1; 209: 0.2; 210: 0.2; 211: 0.4; 212: 0.2; 213, 214, 217-219: 0.5; 215, 216: 0.5; 220: 0.5.

ridge. First segments of exopods of pereiopods 1 and 2 with serrated margins. Pereiopod 2 (fig. 214) with basis somewhat shorter than half its length; merus with robust seta on outer distal corner; carpus two times as long as merus, with robust setae on inner margin; dactylus 2.5 times as long as propodus. Pereiopod 2 with reduced, three-segmented exopod (fig. 214). Exopod of pereiopod 3 (fig. 215) minute. Exopod of pereiopod 4 (fig. 216) shorter than in preceding leg. Pereiopods 3-5 (figs. 217-219) with progressively shorter bases, bases serrated on inner margins; distal portions of pereiopods with long, simple, apical setae.

Pleon: Telson (fig. 220) as long as uropodal peduncle, tip with three stout setae, serrated lateral margins each with eight short, stout setae. Uropodal peduncle (fig. 220) 2.8 times as long as last pleonite, with serrated median ridge, stout setae on inner margin, peduncle subequal to exopod and somewhat shorter than endopod; two-segmented exopod with simple setae; three-segmented endopod with 16 short robust setae on basal segment and three on each of two distal segments.

Remarks.— The body (fig. 200) and antenna 1 (fig. 202) in the present females are similar to the subadult males described by Zimmer (1913). The carapace is like in Corbera (2000).

3.5.3. *Paralamprops mawsoni* (Hale, 1937) (figs. 6, 221-254)

Material.— 115 specimens from eight samples (table 1).

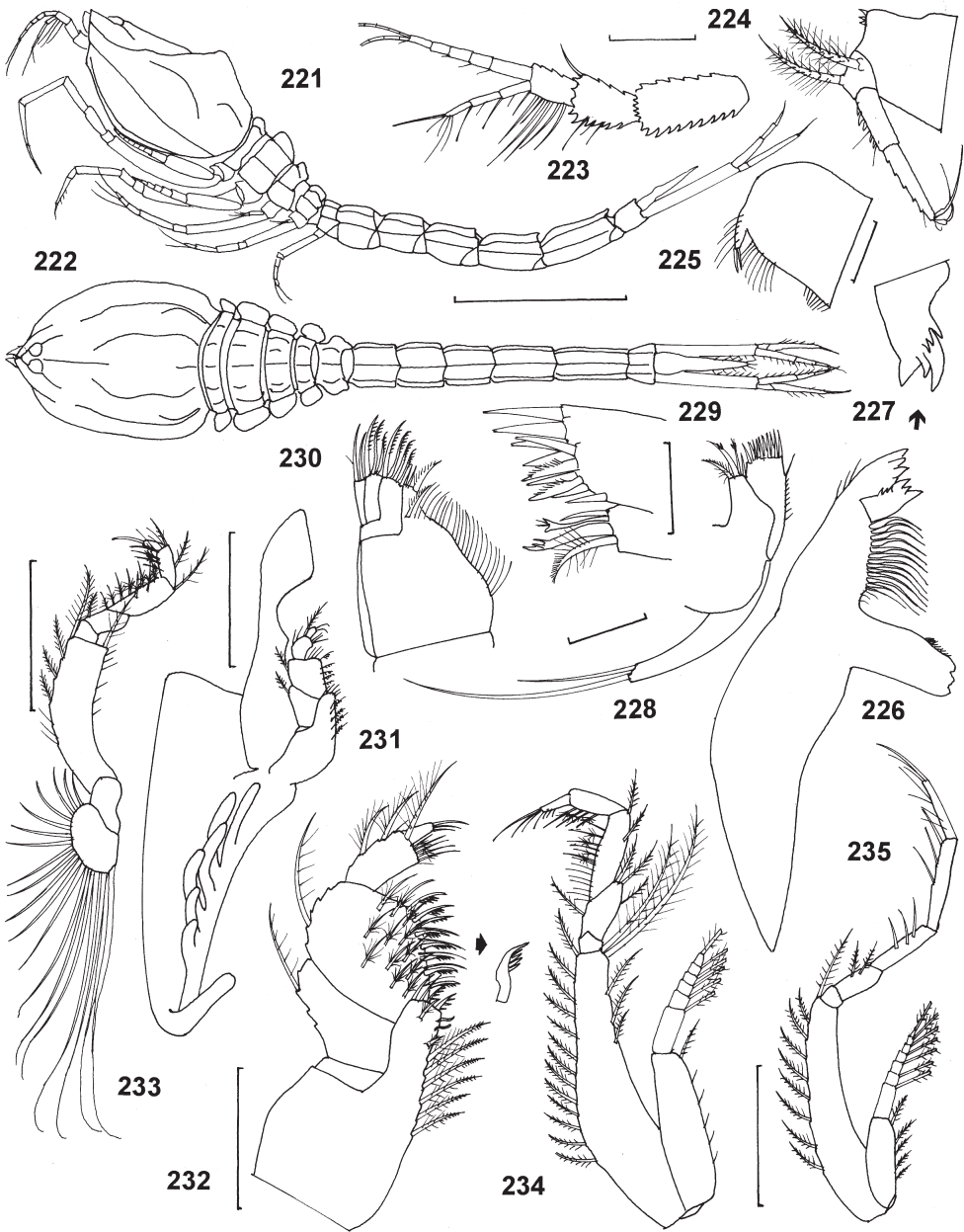
Description of subadult female.— Additions to descriptions of Hale (1937) and Corbera (2000) concern colour and following appendages: Labium (fig. 225) with apical process bearing two stout setae. Mandible (figs. 226, 227); pars incisiva with three teeth; lacinia mobilis with three teeth and short serrated part; 13 setae between lacinia and robust pars molaris. Pereiopod 3 (fig. 237) with basis strongly exceeding half its length; basis with plumose setae on outer margin; dactylus with simple seta; very tiny two-segmented exopod (fig. 239). Pereiopod 4 (fig. 238) with shorter basis and also with tiny exopod (fig. 240).

Colour (fig. 6): Living specimens orange-brown with large orange-red spots on carapace, thoracomeres and pleomeres; eye-spots striking, dark red; appendages mostly transparent, except for orange-brown spots on antennae, mouth parts, maxillipeds, first thoracopod, uropod, and telson.

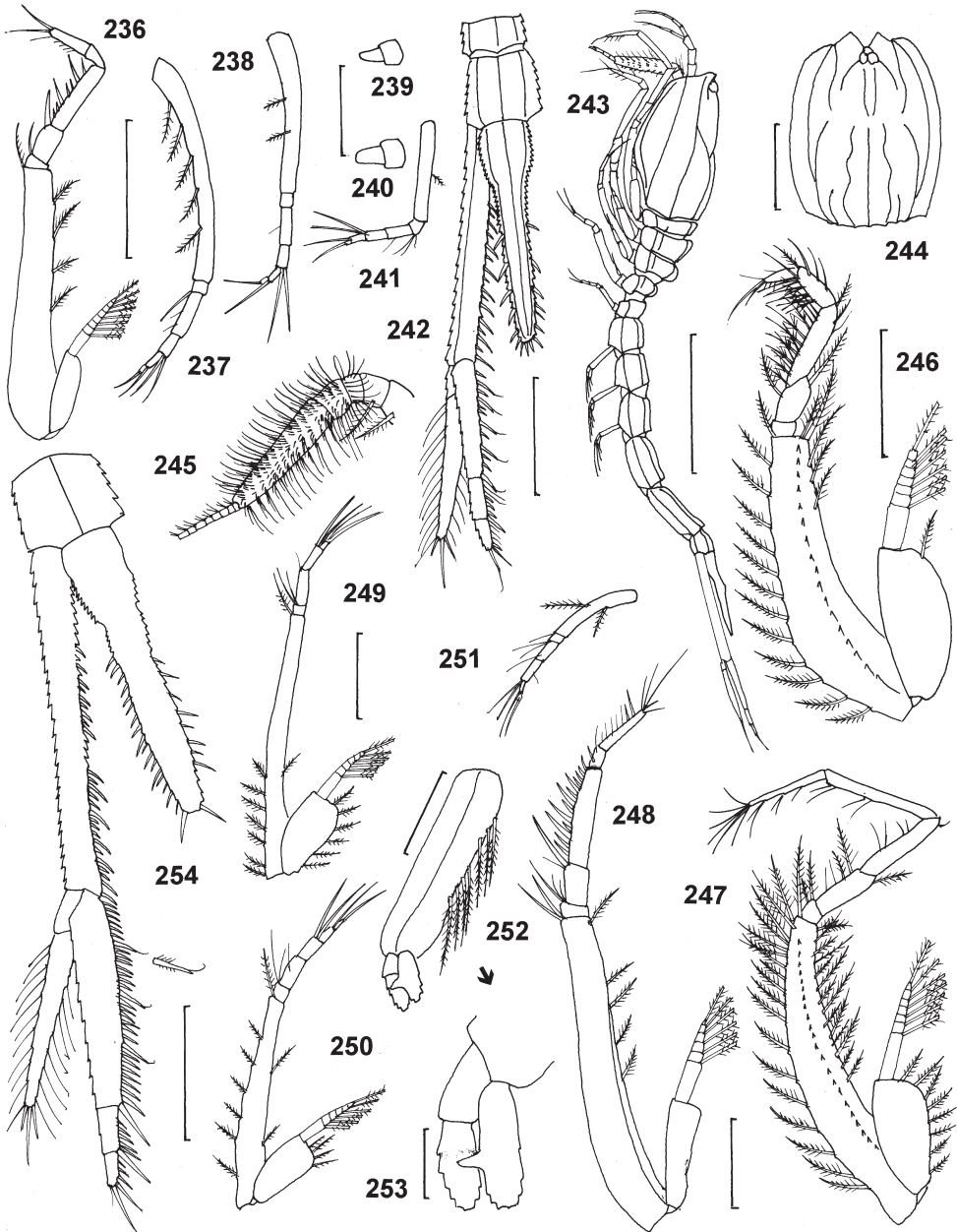
Description of previously undescribed adult male (figs. 243-254).— Body (fig. 243) with two lateral ridges running from carapace up to last pleonite. Length of dissected male 16.8 mm. Carapace (fig. 244) with three lateral ridges instead of only two as in female, ridges in posterior portions less produced compared to female; male with double ridges on eye-lobe and with more dorsal ridges than in female. Eye-lobe with pair of oval tumidities appearing lens-like as in female.

Cephalic appendages: Antenna 2 (fig. 245); last two segments of peduncle with numerous groups of setae; main flagellum with short segments. Maxilliped 3 (fig. 246) with basis strongly exceeding half its length; basis with median ridge, without outer process; carpus longest among distal five segments; all segments with numerous plumose setae on inner margin and fewer on outer one.

Thoracic appendages: Pereiopod 1 (fig. 247) with basis exceeding half its length;



Figs. 221-235. *Paralamprops mawsoni* (Hale, 1937), subadult female. 221, body, lateral view; 222, body, dorsal view; 223, first antenna; 224, second antenna; 225, labium; 226, mandible; 227, its lacinia mobilis, magnified; 228, first maxilla; 229, tip of its endites, magnified; 230, second maxilla; 231, first maxilliped with branchial apparatus; 232, first maxilliped; 233, second maxilliped; 234, third maxilliped; 235, first pereopod. Scales: 221, 222: 4 mm; 223: 0.5; 224, 228: 0.3; 225: 0.4; 226, 230, 232: 0.4; 227, 229: 0.1; 231, 234: 1; 233: 1; 235: 2.



Figs. 236-254. *Paralamprops mawsoni* (Hale, 1937), subadult female (236-242) and adult male (243-254). 236, second pereiopod; 237, third pereiopod; 238, fourth pereiopod; 239, exopod of third pereiopod, magnified; 240, exopod of fourth pereiopod, magnified; 241, fifth pereiopod; 242, uropod and telson; 243, body, lateral view; 244, carapace, dorsal view; 245, second antenna; 246, third maxilliped; 247, first pereiopod; 248, second pereiopod; 249, third pereiopod; 250, fourth pereiopod; 251, fifth pereiopod; 252, pleopod; 253, its rami, magnified; 254, uropod and telson. Scales: 236-238, 241, 245, 248-250: 2 mm; 239, 240: 0.025; 242: 1; 243, 244: 2; 246: 1; 247: 1; 251: 0.2; 252: 0.2; 253: 0.2; 254: 1.

basis with serrated median ridge and numerous plumose setae on both margins; carpus somewhat longer than dactylus but shorter than propodus. Pereiopod 2 (fig. 248) with basis strongly exceeding half its length; basis with median ridge; carpus with numerous robust setae on inner margin; dactylus 2.5 times as long as propodus, dactylus with simple setae; exopod with narrow basis. Pereiopods progressively shorter from third to fifth pair (figs. 249-251), with slender bases. Exopods present on maxilliped 3 and pereiopods 1-4.

Pleon: First pair of pleopods similar to other ones (figs. 252, 253); non-articulated inner ramus with pointed apophysis; apophysis shorter than width of distal segment of two-segmented outer ramus. Telson (fig. 254) is 0.86 as long as uropodal peduncle, both margins serrated and with numerous short stout setae; apical setae broken in fig. 254. Uropodal peduncle (fig. 254) with serrated outer margin and numerous short stout setae on inner margin; peduncle four times as long as last pleonite or 1.2 times as long as endopod; exopod as long as proximal segment of endopod, with numerous simple setae; endopod with 30 short stout setae on proximal segment, six setae on middle segment, four setae on distal segment, plus one longer stout seta on tip.

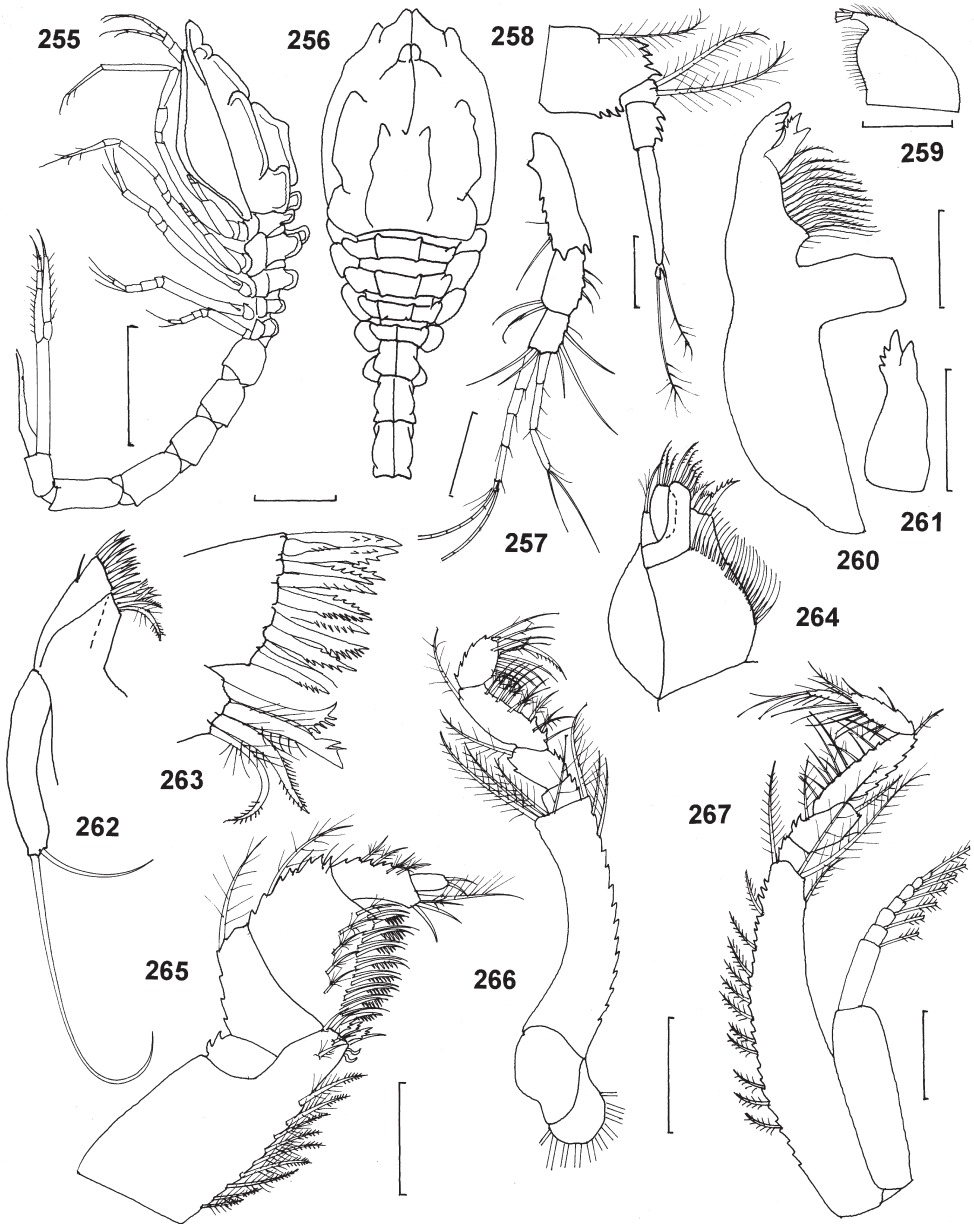
Remarks.— The carapace is essentially like in the descriptions of Hale (1937) and Corbera (2000). However, the form of the carapace is more similar to that of *P. rossi* Jones, 1971 (this species was found by Ledoyer, 1993, in the Weddell Sea and is absent in the present material). Other similarities with the descriptions of Hale (1937) and Corbera (2000) include the body of the subadult female (figs. 221, 222), antenna 1 (fig. 223; peduncle with serrated margins), antenna 2 (fig. 224), maxilla 1 (figs. 228, 229; outer endite with two microserrated robust setae), maxilla 2 (fig. 230), maxilliped 1 (figs. 231, 232; flattened, hand-like, robust setae on endite of basis and on inner margin of carpus; one plumose seta on distal outer corner of merus and carpus; propodus two times the length of dactylus), maxillipeds 2 and 3 (figs. 233, 234), and pereiopods 1-5 (figs. 235-241). Pereiopods 3 and 4 of the female show vestigial exopods, which often are broken off and were not found by previous authors (Hale, 1937; Ledoyer, 1993; Corbera, 2000).

3.5.4. *Paralamprops racovitzai* spec. nov. (figs. 7, 255-284)

Material.— 19 specimens from seven samples (table 1: sta. 16-407, 16-411, 16-423, 16-459, 16-468, 16-475, 16-486). Types from station 16-459: holotype, subad. fem. 12.5 mm, NHMW coll. no. 19661; paratypes: 5 subad. fem. (no. 271) and 1 dissected subad. fem. (no. 272), GAM Cum 271, 272; 3 subad. fem., RMNH N 288. Paratypes from further stations: 1 subad. fem. (no. 273) and 1 dissected subad. male (no. 274), sta. 16-407, GAM Cum 273, 274; 1 subad. fem., 1 subad. male, sta. 16-411, NHMW 19664; 1 subad. fem., sta. 16-423, NHMW 19662; 1 subad. male, sta. 16-468, NHMW 19663; 1 subad. fem., sta. 16-475, RMNH N 289; 2 subad. fem., sta. 16-486, RMNH N 290.

Type locality.— Antarctic, Weddell Sea, "Polarstern" station 16-459 (fig. 1, table 1), coord. 70°58'S, 11°11'W.

Etymology.— Dedicated in the memory of the famous Romanian marine biologist and founder of biospeleology, Emile G. Racovitz, the first scientist who made systematic collections of cumaceans in Antarctic waters, during the "Belgica Expedition" (1897-1899; material published by Hansen in 1908).



Figs. 255-267. *Paralamprops racovitzai* spec. nov., paratype, subadult female. 255, body, lateral view; 256, carapace and pereion, dorsal view; 257, first antenna; 258, second antenna; 259, labium; 260, mandible; 261, its lacinia mobilis, magnified; 262, first maxilla; 263, tip of its endites, magnified; 264, second maxilla; 265, first maxilliped; 266, second maxilliped; 267, third maxilliped. Scales: 255, 256: 2 mm; 257: 0.2; 258: 0.2; 259: 0.2; 260, 262, 264: 0.2; 261: 0.1; 263: 0.05; 265: 0.2; 266: 0.4; 267: 0.2.

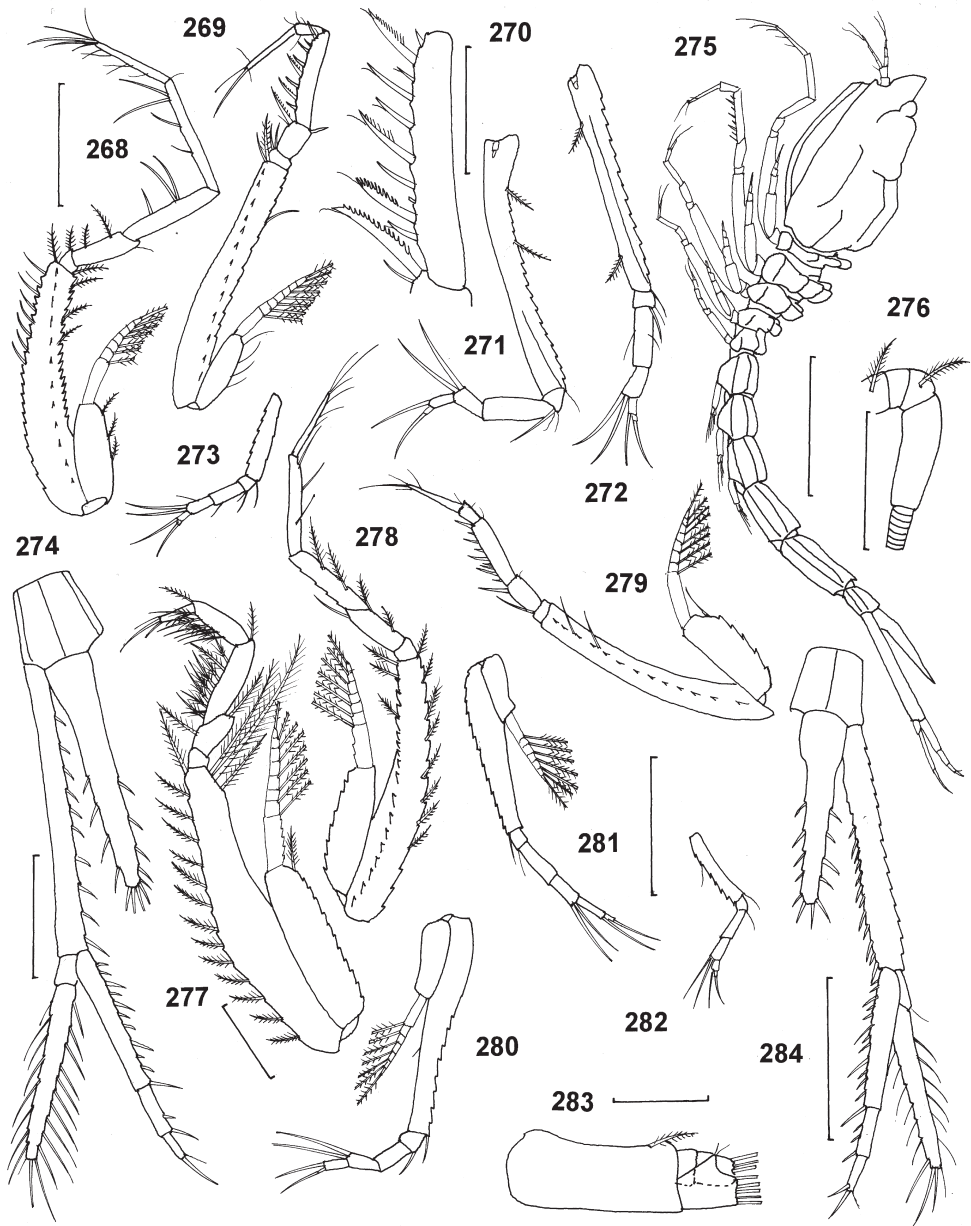
Description of subadult female.— Body (fig. 255) with smooth integument. Length of dissected specimen 13.63 mm. Carapace (fig. 256) less than third of entire body, with numerous crests: median, antero-dorsal crest (ending at half of carapace), pair of dorsal submedian crests with irregular margins (posterior half), on outside flanked by two pairs of dorsolateral crests also with irregular margins. Two lateral carinae, one mediolateral crest starting on pseudorostrum and lower one, parallel to ventral margin of carapace; pair of short, oblique carinae between antero-ventral corner and medio-lateral carinae. Eye-lobe with pair of tumidities having lens-like appearance. Anterior four segments of pereion with two pairs of dorsal crests, fifth segment with only one pair and one median carina (fig. 256).

Cephalic appendages: Antenna 1 (fig. 257); peduncle with robust segments; main flagellum with five segments; accessory flagellum with three long segments. Antenna 2 (fig. 258) with four segments; apical one almost three times as long as penultimate one, with two stiff terminal setae. Labium (fig. 259) with inner distal process showing three flattened, robust, short setae at tip. Mandible (figs. 260, 261); pars incisiva with four teeth; lacinia mobilis with two teeth and series of denticles along margin of terminal tooth (fig. 261); numerous plumose setae between lacinia and robust pars molaris. Maxilla 1 (figs. 262, 263), outer endite with 12 microserrated robust setae, simple seta between innermost two robust ones; short palp with two glabrous filaments. Maxilla 2 (fig. 264); protopod with row of simple setae along inner margin up to basis of inner endite; endites with microserrated setae.

Thoracic appendages: Maxilliped 1 (fig. 265) with three flattened, hand-like, robust setae on endite of basis; pectinate robust setae on inner margin of carpus; propodus two times as long as dactylus. Maxilliped 2 (fig. 266) with plumose setae on inner and outer, distal corners of basis; numerous forked and simple setae on carpus and propodus. Maxilliped 3 (fig. 267) with basis exceeding half its length; basis without outer process; merus as long as propodus. Pereiopod 1 (fig. 268) with basis shorter than half its length; basis with serrated median carina; carpus shorter than propodus and longer than dactylus. Pereiopod 2 (fig. 269) with basis exceeding half its length; basis with median carina; carpus with nine robust setae (fig. 270; microserrated setae longer than simple ones) on inner margin; dactylus two times as long as propodus. Exopods of maxilliped 3 and of pereiopods 1 and 2 are progressively smaller. Pereiopods 3 and 4 (figs. 271, 272) with basis exceeding half the total length; merus two times as long as carpus; minute dactylus with long simple seta; exopods vestigial. Pereiopod 5 (fig. 273) with very short basis, only about third length of fourth one (fig. 272).

Pleon: Dorsal carina present. Telson (fig. 274) 0.81 times as long as uropodal peduncle, with four stout setae on each lateral margin plus four on tip. Uropodal peduncle (fig. 274) 2.9 times as long as last pleonite, peduncle longer than endopod, with ten stout setae on inner margin; exopod somewhat shorter than endopod, with numerous simple setae on both margins; endopod with 11 short stout setae on inner margin of proximal segment, two on middle one, and one thin plus one stout seta on tip.

Colour (fig. 7): Living specimens with carapace and most of cephalothorax (except last thoracomere) orange-brown; appendages and lobes on carapace and on cephalothorax essentially transparent with few orange-brown spots; eye-spots intensely red-orange. Last thoracomere, pleon, uropod, and telson white-transparent with orange-



Figs. 268-284. *Paralamprops racovitzai* spec. nov., paratypes, subadult female (268-274) and subadult male (275-284). 268, first pereiopod; 269, second pereiopod; 270, its carpus, magnified; 271, third pereiopod; 272, fourth pereiopod; 273, fifth pereiopod; 274, uropod and telson; 275, body, lateral view; 276, second antenna; 277, third maxilliped; 278, first pereiopod; 279, second pereiopod; 280, third pereiopod; 281, fourth pereiopod; 282, fifth pereiopod; 283, pleopod; 284, uropod and telson. Scales: 268, 269, 271-273, 276, 278-282: 1 mm; 270: 0.4; 274: 1; 275: 2; 277: 0.2; 283: 0.2; 284: 1.

brown tinge. Part of colour in fig. 7 from content of intestine visible through transparent pleomeres.

Description of subadult male (figs. 275-284).— Body (fig. 275) and carinae as in female. Length of dissected specimen 10.46 mm.

Cephalothorax: Antenna 2 (fig. 276) as usual for subadult male; last segment of peduncle glabrous. Maxilliped 3 (fig. 277) with basis greatly exceeding half its length; basis without outer process; merus shorter than propodus. Pereiopod 2 (fig. 279) with basis exceeding half its length, as in female. Pereiopod 3 (fig. 280) with slender basis; merus somewhat longer than carpus; endopod like in female (fig. 271); exopod well developed (unlike female). Pereiopod 4 (fig. 281) shorter than pereiopod 3. Basis of pereiopod 5 (fig. 282) only half length of that of pereiopod 4.

Pleon: First pair of pleopods, similar to other ones (fig. 283); acuminate apophysis of inner non-articulated ramus extends up to outer margin of two-segmented outer ramus. Telson (fig. 284) almost as long as in female, 0.78 times as long as uropodal peduncle, with four stout setae on each lateral margin plus four on tip. Uropodal peduncle (fig. 284) 3.8 times as long as last pleonite and somewhat longer than endopod, peduncle with serrated outer margin and numerous stout setae on inner one; exopod somewhat shorter than endopod, with numerous simple setae on both margins; endopod with 11 short stout setae along inner margin of proximal segment, three on middle segment, and two on distal segment.

Remarks.— The colour is essentially like in *P. mawsoni*, but less dark (c.f. figs. 6, 7). The new species is most closely related to *P. rossi* described by Jones (1971) from the Ross Sea. It differs from *P. mawsoni* and *P. rossi* by the more enlarged crests on the carapace and the pereion, the crests have undulated, hyaline margins (figs. 255, 256, 275 versus 221, 222, 243, 244).

3.5.5. *Paralamprops serratocostatus* Sars, 1887

Material.— 1 subad. female, "Polarstern" station 16-430 (fig. 1, table 1).

Remarks.— No further details are necessary, because of Sars' (1887) very complete description of this deep-water form.

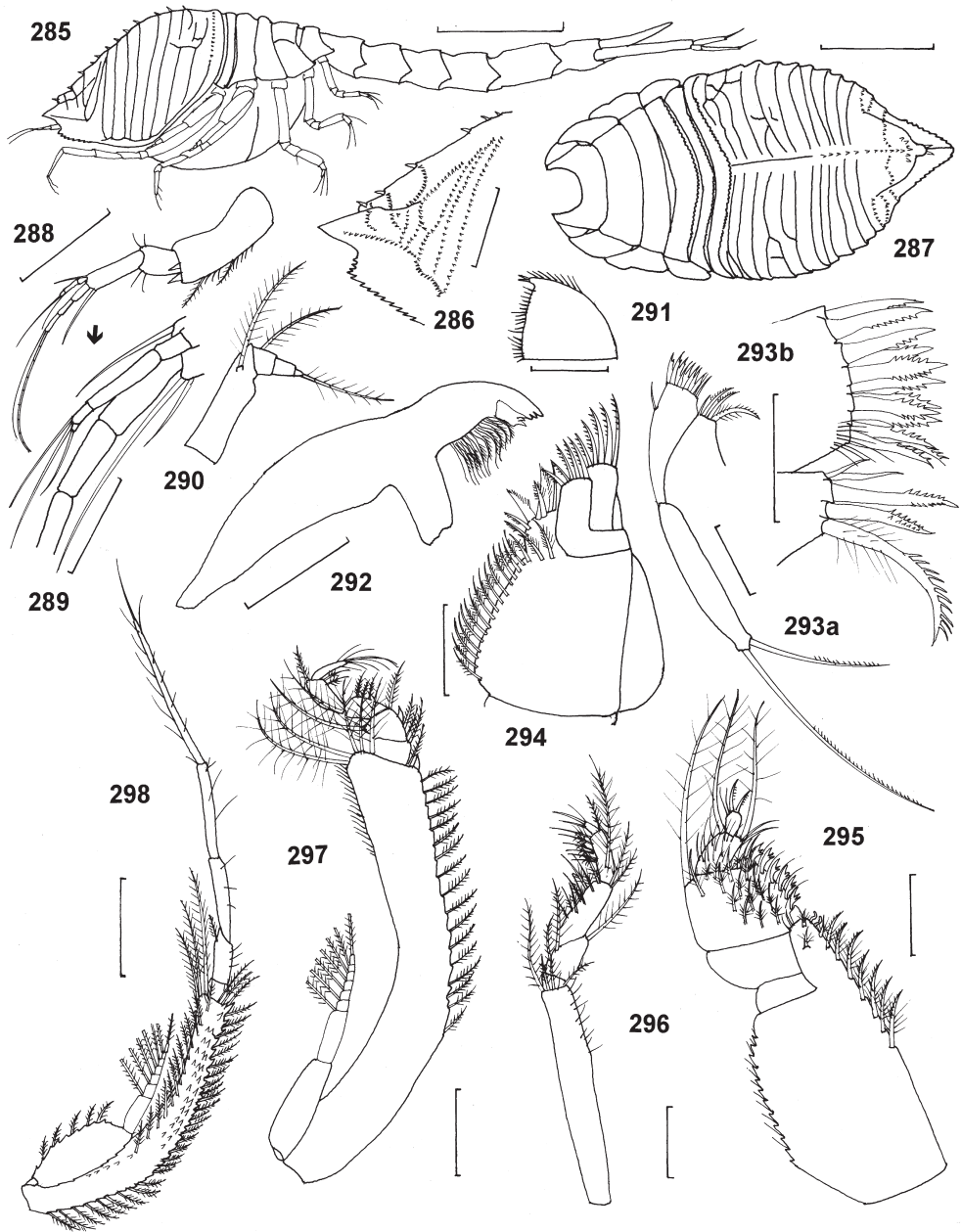
3.6. Diastylidae S. Bate, 1856

3.6.1. *Diastylis anderssoni armata* Ledoyer, 1993 (figs. 285-317)

Material.— 156 specimens from nine samples (table 1).

Description of adult female (figs. 285-303).— Following characteristics added to Ledoyer's (1993) description of female:

Cephalic appendages: Antenna 1 (fig. 288); main flagellum with three segments; accessory flagellum (fig. 289) with four segments, second segment longest; accessory flagellum never extending beyond half of second segment of main flagellum. Antenna 2 (fig. 290) with four segments; third segment somewhat longer than second segment; apical segment minute, with plumose seta. Labium (fig. 291) with two short stout setae on tip of short, inner, distal process. Mandible (fig. 292); pars incisiva and lacinia



Figs. 285-298. *Diastylis anderssoni armata* Ledoyer, 1993, adult female. 285, body, lateral view; 286, anterior part of carapace; 287, carapace and pereon, dorsal view; 288, first antenna; 289, detail of its flagella; 290, second antenna; 291, labium; 292, mandible; 293a, first maxilla; 293b, tip of its endites, magnified; 294, second maxilla; 295, first maxilliped; 296, second maxilliped; 297, third maxilliped; 298, first pereiopod. Scales: 285: 3 mm; 286: 1; 287: 2; 288, 290: 0.2; 289: 0.1; 291: 0.3; 292: 0.4; 293a: 0.2; 293b: 0.1; 294: 0.2; 295: 0.2; 296: 0.5; 297: 0.5; 298: 1.

mobilis each with three teeth; lacinia mobilis with 'knee' below teeth; 11 plumose setae between lacinia and truncated pars molaris. Maxilla 1 (figs. 293a, 293b); outer endite with 12 microserrated robust setae; short and strong palp with two filaments showing one-sided, backward directed, fine setae on distal half. Maxilla 2 (fig. 294); protopod with row of short plumose setae along inner margin up to basis of inner endite.

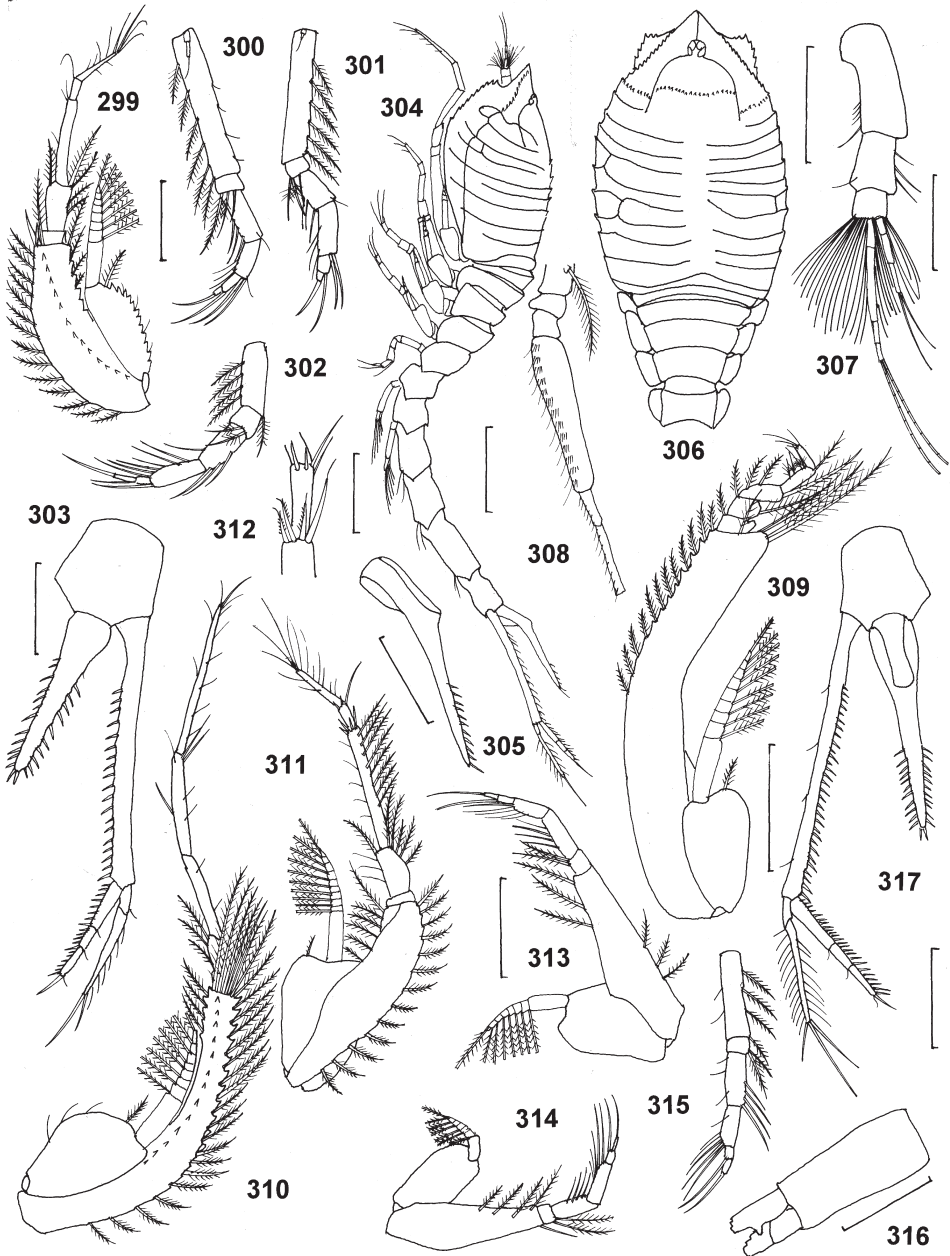
Thoracic appendages: Maxilliped 1 (fig. 295); endite of basis with tooth-like, robust seta; flattened, hand-like setae on inner margin of carpus; propodus two times as long as dactylus. Maxilliped 2 (fig. 296) with slender segments; basis distally with plumose setae; number of plumose setae on outer margin of merus, carpus, and propodus; forked setae on inner margin of propodus. Pereiopod 3 (fig. 300) with basis exceeding half its length, merus longer than carpus; dactylus with long, simple, apical seta. Pereiopod 4 (fig. 301) with basis shorter than in pereiopod 3; carpus longer than merus. Vestigial exopods present on pereiopods 3 and 4. Pereiopod 5 (fig. 302) with basis shorter than in preceding legs; merus as long as carpus.

Pleon: Telson (fig. 303) 0.62 times as long as uropodal peduncle, with 12 short stout setae on each lateral margin plus two stout setae on tip. Uropodal peduncle 2.7 times as long as last pleonite, with numerous short stout setae on inner margin; peduncle more than 2.5 times as long as its rami; rami subequal; exopod with simple setae on outer margin and one long seta on tip; endopod with eight short stout setae on proximal segment, five setae on middle segment, six on distal segment, plus one longer stout seta on tip.

Description of previously undescribed subadult male (figs. 304-317).— Body (fig. 304) like in female. Length of dissected specimen 17.33 mm. Telson (figs. 305, 317) longer than in female. Carapace (fig. 306) without dorsal spines and without dorsal carinae, with fewer rows of denticles on pseudorostrum and fewer transversal ridges compared to female; eye-lobe without spines, only with row of denticles.

Cephalic appendages: Antenna 1 (fig. 307) as usual in this genus; peduncle terminally with large tuft of setae; main flagellum with four thin segments; accessory flagellum with three segments, not extending beyond the second segment of the main flagellum. Antenna 2 (fig. 308); last segment of peduncle with groups of short setae; flagellum with long segments.

Thoracic appendages: Maxilliped 3 (fig. 309) with basis contributing two-thirds its length; basis with indistinct outer process, inner margin with short plumose setae on distal half; ischium with small outer process (present in all *Diastylis* species of present study); carpus subequal to propodus. Pereiopod 1 (fig. 310) with basis somewhat shorter than half its length, basis with serrated median ridge and with numerous plumose setae on inner margin and on terminal margin; carpus little shorter than propodus; dactylus 1.5 times as long as propodus. Pereiopod 2 (figs. 311, 312) with basis shorter than half its length; basis with numerous plumose setae on both margins, carpus 2.5 times as long as merus, carpus with numerous plumose setae on inner margin and several microserrated robust setae on terminal margin; dactylus two times as long as propodus, dactylus with simple setae. Pereiopod 3 (fig. 313) with basis exceeding half its length; merus little longer than carpus; dactylus with long, simple, apical seta. Pereiopods 4 and 5 (figs. 314, 315) with bases shorter than in pereiopod 3. Exopods with widened basis (figs. 310, 311) on maxilliped 3 and pereiopods 1-4.



Figs. 299-317. *Diastylis anderssoni armata* Ledoyer, 1993, adult female (299-303) and subadult male (304-317). 299, second pereiopod; 300, third pereiopod; 301, fourth pereiopod; 302, fifth pereiopod; 303, uropod and telson; 304, body, lateral view; 305, telson, lateral view; 306, carapace and pereion, dorsal view; 307, first antenna; 308, second antenna; 309, third maxilliped; 310, first pereiopod; 311, second pereiopod; 312, its propodus, magnified; 313, third pereiopod; 314, fourth pereiopod; 315, fifth pereiopod; 316, pleopod; 317, uropod and telson. Scales: 299-302: 0.5 mm; 303: 1; 304: 2; 305: 1; 306: 4; 307: 0.5; 308, 310, 311, 313-315: 1; 309: 1; 312: 0.3; 316: 0.3; 317: 1.

Pleon: First pair of pleopods similar to remaining ones (fig. 316); non-articulated inner ramus with short apophysis which never reaches outer margin of two-segmented outer ramus. Uropod (fig. 317) with slender peduncle 3.2 times as long as last pleonite; peduncle with numerous short stout setae on inner margin, peduncle 2.3 times as long as its subequal rami; exopod with simple setae; endopod with 12 short stout setae on proximal segment, four on middle segment, and six on distal segment.

Remarks.— The body (fig. 285), carapace (figs. 286, 287), maxilliped 3 (fig. 297), pereopods 1 and 2 (figs. 298, 299) are essentially like in Ledoyer (1993); however, pereopod 1 has more numerous spines and a row of plumose setae on its basis, pereopod 2 has more numerous plumose setae on its basis. Females in the present material show the medio-dorsal small spines on the carapace, characteristic of the subspecies *armata* Ledoyer, 1993, while this feature is absent in the nominate form of *D. anderssoni* according to Zimmer's (1909) description. In the present material, all studied specimens of the genus *Diastylis* show the characteristic 'knee' on the lacinia mobilis, a feature not mentioned by previous authors.

3.6.2. *Diastylis corniculata* Hale, 1937 (figs. 8, 318-347)

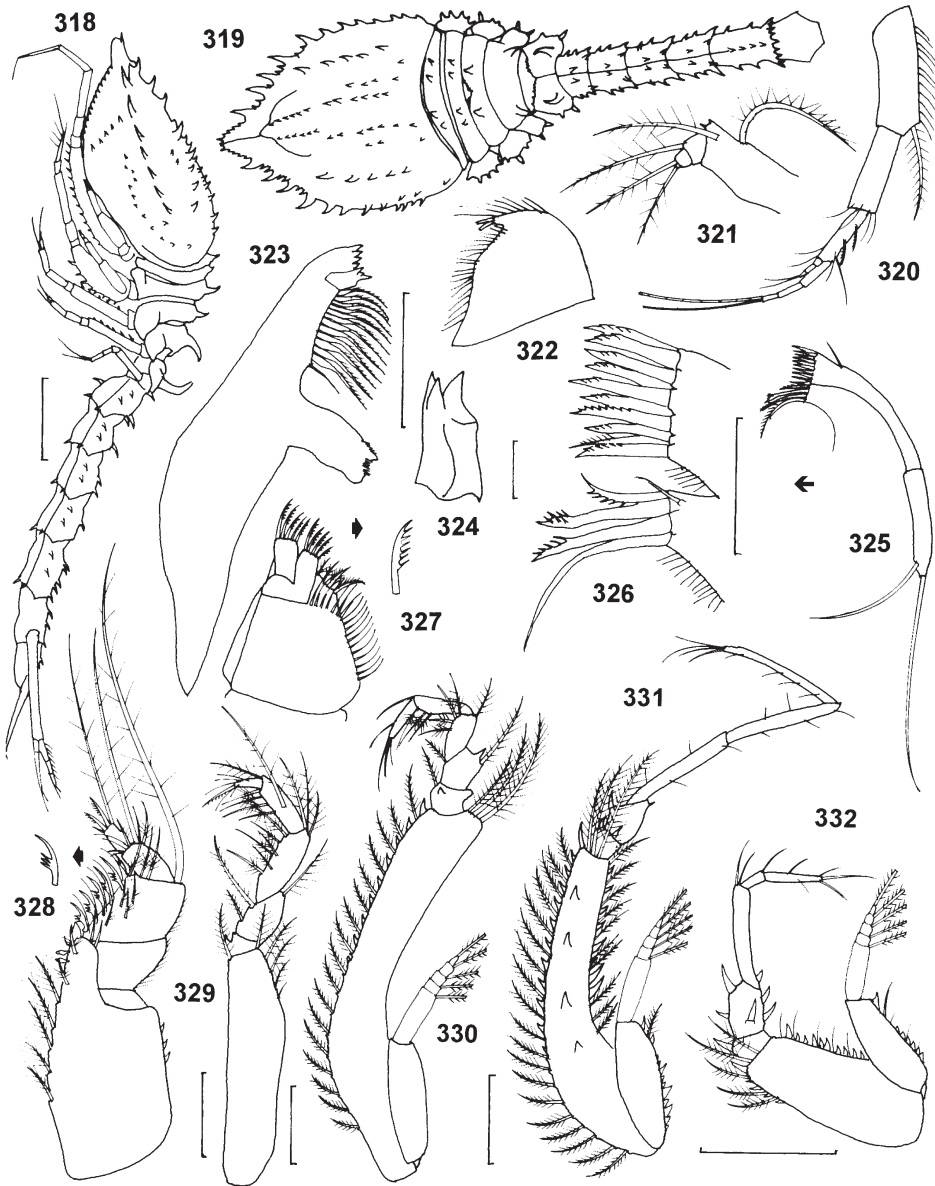
Material.— 152 specimens from ten samples (table 1).

Description of subadult female (figs. 318-336).— Additions to Gamo's (1959) description of adult female:

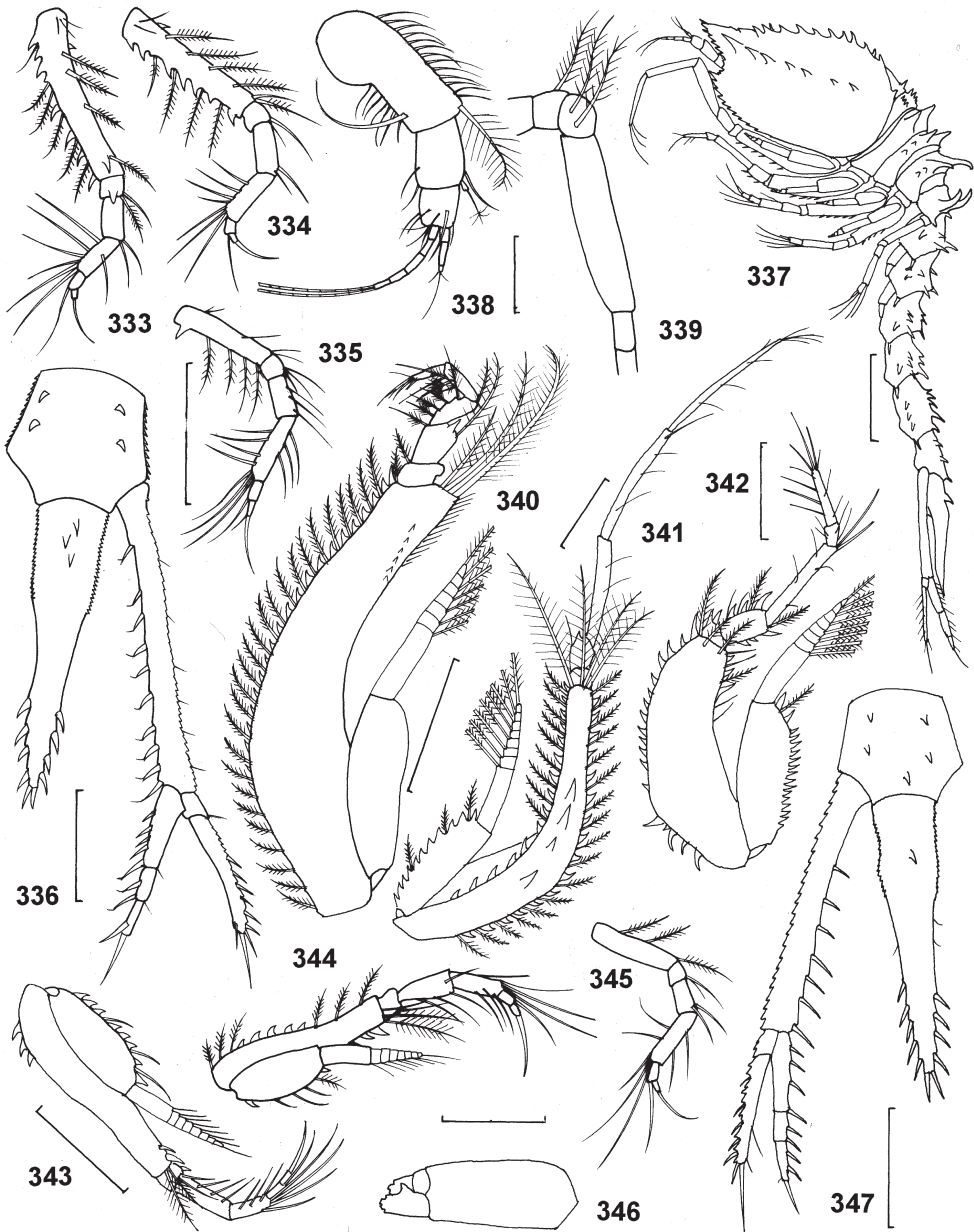
Cephalic appendages: Antenna 1 (fig. 320); three-segmented accessory flagellum nearly as long as basal segment of three-segmented main flagellum. Antenna 2 (fig. 321) with four segments, third shorter than second segment; apical segment minute, with long plumose seta. Labium (fig. 322); distinct apical process with two stout short setae. Mandible (figs. 323, 324); pars incisiva with four teeth; lacinia mobilis with 'knee' and three teeth; 13 plumose setae between lacinia and truncated pars molaris. Maxilla 1 (figs. 325, 326); outer endite with microserrated robust setae; palp shorter than protopod, palp with two unequally sized, glabrous filaments. Maxilla 2 (fig. 327); protopod with row of fine setae along inner margin extending up to basis of inner endite; endites with microserrated setae.

Thoracic appendages: Maxilliped 1 (fig. 328); endite of basis with robust tooth-like seta; carpus with flattened, hand-like setae on inner margin; propodus two times as long as dactylus; very long plumose setae on outer distal corner of terminal three segments. Maxilliped 2 (fig. 329); propodus with forked setae on inner margin; dactylus with microserrated apical seta. Maxilliped 3 (fig. 330) with basis representing two-thirds of its length; basis with plumose setae on serrated inner margin and three short plumose setae on outer distal corner, basis without outer process; ischium and merus each with spine; propodus somewhat longer than carpus. Pereiopod 1 (fig. 331) with basis shorter than half its length; basis with four strong median spines and plumose setae on serrated inner margin; carpus longer than propodus, about as long as dactylus. Pereiopods 3 and 4 (figs. 333, 334) with vestigial exopods.

Colour (fig. 8) of living animals whitish with slight yellowish or orange tinge; eyespots small, appearing dark grey with reddish tinge. Internal organs and especially dark content of intestine visible through semi-transparent body.



Figs. 318-332. *Diastylis corniculata* Hale, 1937, subadult female. 318, body, lateral view; 319, body (without uropods), dorsal view; 320, first antenna; 321, second antenna; 322, labium; 323, mandible; 324, its lacinia mobilis, magnified; 325, first maxilla; 326, tip of its endites, magnified; 327, second maxilla; 328, first maxilliped; 329, second maxilliped; 330, third maxilliped; 331, first pereopod; 332, second pereopod. Scales: 318, 319: 2 mm; 320, 329: 0.3; 321-323, 325, 327: 0.4; 324: 0.1; 326: 0.1; 328: 0.2; 330: 0.5; 331, 332: 1.



Figs. 333-347. *Diastylis corniculata* Hale, 1937, subadult female (333-336) and subadult male (337-347). 333, third pereiopod; 334, fourth pereiopod; 335, fifth pereiopod; 336, uropod and telson; 337, body, lateral view; 338, first antenna; 339, second antenna; 340, third maxilliped; 341, first pereiopod; 342, second pereiopod; 343, third pereiopod; 344, fourth pereiopod; 345, fifth pereiopod; 346, pleopod; 347, uropod and telson. Scales: 333-335: 1 mm; 336: 1; 337: 2; 338: 0.5; 339, 340: 1; 341: 1; 342: 1; 343-345: 1; 346: 0.2; 347: 1.

Description of subadult male (figs. 337-347).— Additions to Hale's (1937) description of immature male: Antenna 2 (fig. 339); last segment of peduncle glabrous; flagellum with strong segments. Pleopods (fig. 346); non-articulated inner ramus longer than two-segmented outer ramus; apophysis on inner ramus shorter than width of outer ramus.

Remarks.— Compared with Gamô's (1959) description of the female, the body (figs. 318, 319) and the pereopods (figs. 332-335) are similar (exopods on third and fourth pereopods not noticed by Gamô), the antenna 1 is without a strong spine on the basal segment of the peduncle, maxilliped 3 is without a strong spine on the basis, the telson (fig. 336) has three small spines near the basis (only one spine in Gamô), the proximal third of the telson has serrated margins, the telson has four short strong setae on the distal third of each lateral margin and two strong setae on the tip, it has a much longer uropodal peduncle with a greater number of robust setae on the inner margin, the exopod has a greater number of short stout setae on its outer margin, the endopod has a greater number of short stout setae on its inner margin (nine versus five). Compared with Hale's (1937) description of the male, the body (fig. 337) is very similar; the peduncle of antenna 1 (fig. 338) has shorter and stronger segments; the three-segmented accessory flagellum is somewhat longer than the two basal segments of the five-segmented main flagellum, versus Hale's description of the accessory flagellum being somewhat longer than only the basal segment of a four-segmented main flagellum. Maxilliped 3 (fig. 340) and the pereopods (figs. 341-345) are essentially as in Hale (1937: exopods of pereopods 3-5 not fully developed); the male telson (fig. 347) exceeds the uropodal peduncle in length, has only one spine on its basis, and serrated proximal margins; the uropodal peduncle is 2.5 times as long as the last pleonite, the exopod is somewhat shorter than the endopod, and has a serrated outer margin.

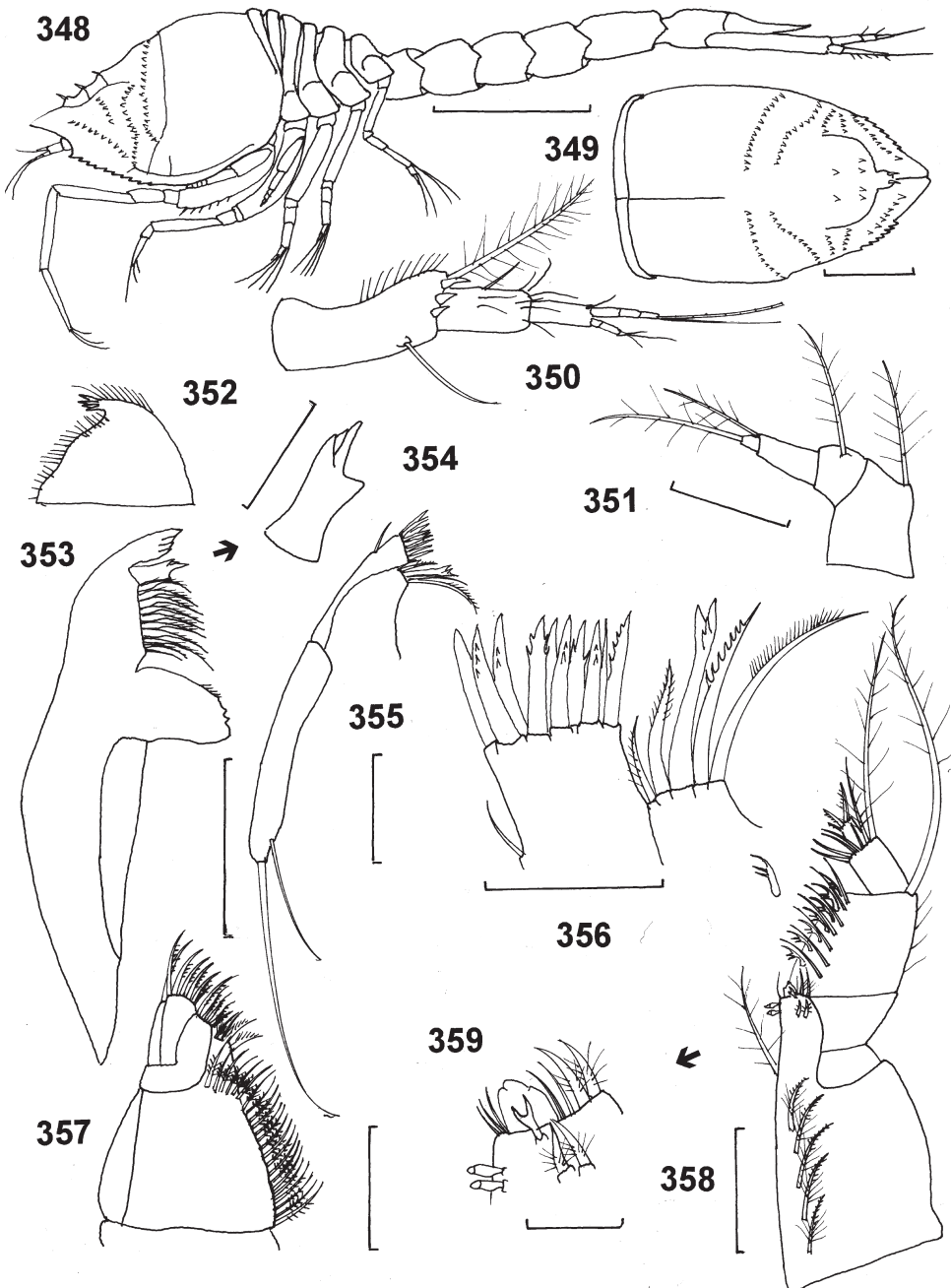
3.6.3. *Diastylis enigmatica* Ledoyer, 1993 (figs. 348-368)

Material.— Five specimens from two samples (table 1: sta. 16-407, 16-434).

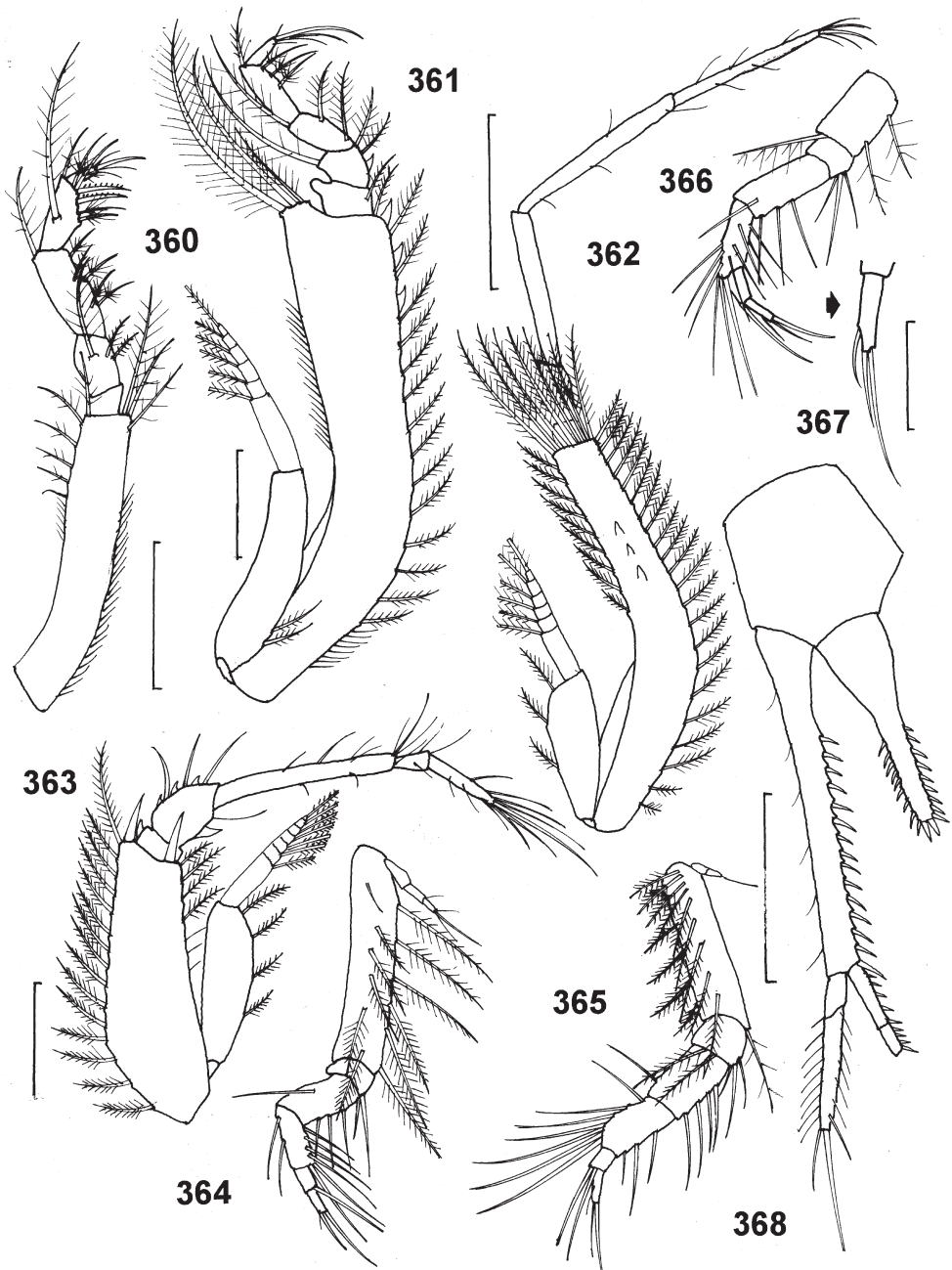
Description of subadult female.— Following appendages added to Ledoyer's (1993) description of subadult female:

Cephalic appendages: Antenna 1 (fig. 350); basal segment of peduncle with pappose seta; three-segmented accessory flagellum extending slightly beyond basal segment of three-segmented main flagellum. Antenna 2 (fig. 351) with four segments, apical segment minute, third one 1.3 times as long as second segment; all these segments with long plumose setae. Labium (fig. 352) with four short stout setae on tip of inner apical process. Mandible (figs. 353, 354); pars incisiva with four teeth; lacinia mobilis with three teeth opposite to 'knee', pars molaris truncated. Maxilla 1 (figs. 355, 356); outer endite with nine microserrated robust setae and simple seta; palp longer than protopod, palp with two unequally sized, glabrous filaments. Protopod of maxilla 2 (fig. 357) with row of plumose setae along inner margin up to basis of inner endite.

Thoracic appendages: Maxilliped 1 (figs. 358, 359); endite of basis with flattened, three-toothed, apophysis-like, robust seta, with forked setae and fork-like robust seta; flattened hand-like setae on inner margin of carpus; propodus two times as long as



Figs. 348-359. *Diastylis enigmatica* Ledoyer, 1993, subadult female. 348, body, lateral view; 349, carapace, dorsal view; 350, first antenna; 351, second antenna; 352, labium; 353, mandible; 354, its lacinia mobilis, magnified; 355, first maxilla; 356, tip of its endites, magnified; 357, second maxilla; 358, first maxilliped; 359, first maxilliped, tip of endite of basis, detail. Scales: 348: 2 mm; 349: 1; 350, 352, 353: 0.4; 351: 0.2; 354: 0.1; 355: 0.2; 356: 0.05; 357: 0.1; 358: 0.2; 359: 0.1.



Figs. 360-368. *Diastylis enigmatica* Ledoyer, 1993, subadult female. 360, second maxilliped; 361, third maxilliped; 362, first pereopod; 363, second pereopod; 364, third pereopod; 365, fourth pereopod; 366, fifth pereopod; 367, its dactylus, magnified; 368, uropod and telson. Scales: 360: 0.4 mm; 361: 0.2; 362: 1; 363-366: 0.5; 367: 0.2; 368: 1.

dactylus. Maxilliped 2 (fig. 360) with basis half its length; basis with plumose setae on distal corners; propodus with two microserrated, robust setae on inner margin. Maxilliped 3 (fig. 361) with basis amounting to two-thirds of its length; basis with short outer process, inner margin distally serrated, subbasally to distally with numerous plumose setae; ischium with characteristic outer process. Pereiopod 4 (fig. 365); basis with numerous plumose setae; merus as long as carpus; carpus with numerous simple setae; dactylus with two unequally sized, simple, apical setae; very short two-segmented exopod. Pereiopod 5 (figs. 366, 367); short basis with very few plumose setae; merus longer than carpus; dactylus with two unequally sized apical setae.

Remarks.— The body (fig. 348) is like in Ledoyer's (1993) description. The carapace (fig. 349) has six denticles on the basis of the eye-lobe and two apical spines (Ledoyer only presumed that there could be a pair of spines), the pseudorostrum has two supplementary, denticulate, transversal ridges. Pereiopods 1-3 (figs. 362-364) are like in Ledoyer. The basis of the second pereiopod (fig. 363) has two strong robust setae; the short exopod of the third pereiopod (fig. 364) has three segments versus only two in Ledoyer (1993). The telson (fig. 368) has the pre-anal part shorter than the post-anal part (longer in Ledoyer), the telson length is 0.63 times as long as the uropodal peduncle, the telson has two stout apical setae. The present specimens have almost complete uropods (damaged in Ledoyer's single female), the peduncle is 2.2 times as long as the last pleonite, with numerous stout setae on its inner margin, the peduncle is 2.3 times as long as the exopod; the exopod has simple setae on both margins; the endopod is broken in half, the proximal segment has five stout setae.

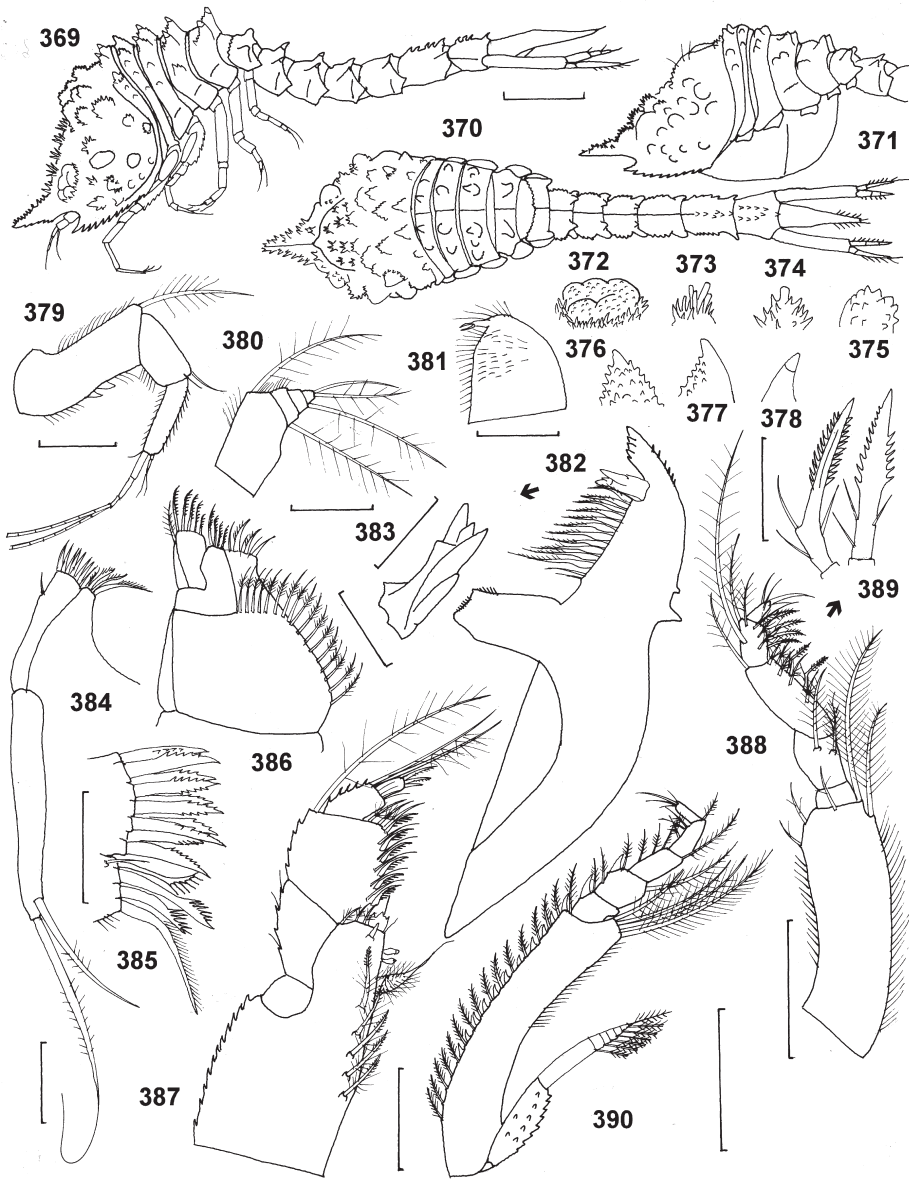
3.6.4. *Diastylis helleri* Zimmer, 1907 (figs. 369-407)

Material.— 40 specimens from five samples (table 1).

Description of subadult female.— Additions to descriptions by Zimmer (1909), Stebbing (1912), and Calman (1918):

Cephalic appendages: Antenna 1 (fig. 379); three-segmented main flagellum shorter than last segment of peduncle; three-segmented accessory flagellum shorter than basal segment of main flagellum. Antenna 2 (fig. 380) with long plumose setae on each of its four segments; last three segments about equal in length. Labium (fig. 381) with two stout setae and numerous fine setae on inner apical process. Mandible (figs. 382, 383) navicular; pars incisiva with five teeth and with microserrated outer margin; lacinia mobilis with three teeth opposite to 'knee'; numerous plumose setae between lacinia and truncated pars molaris; two small tubercles on outer margin, at height of plumose setae on inner margin. Maxilla 1 (figs. 384, 385); outer endite with ten microserrated robust setae; two unequally sized filaments on palp, median portions of filaments with backward-directed fine setae on both sides. Protopod of maxilla 2 (fig. 386) with row of plumose setae along inner margin up to basis of inner endite.

Thoracic appendages: Pereiopod 3 (fig. 393); basis with serrated inner margin and with plumose setae; carpus longer than merus; propodus short and broad; carpus and propodus with simple, long, apical setae. Pereiopods 4 and 5 (figs. 394, 395) essentially like pereiopod 3, but with shorter bases and fewer plumose setae. Pereiopods 3 and 4 without visible exopods.



Figs. 369-390. *Diastylis helleri* Zimmer, 1907, subadult female (except 371). 369, body, lateral view. 370, body, dorsal view; 371, carapace and pereopod of an adult female; 372, groups of special tubercles from carapace; 373, spiny tubercle from carapace (eye-lobe); 374, spiny tubercle from carapace; 375, rounded tubercle from carapace; 376, acute tubercle from posterior part of carapace; 377, tubercle from pereopod; 378, tubercle from pleon; 379, first antenna; 380, second antenna; 381, labium; 382, mandible; 383, its lacinia mobilis, magnified; 384, first maxilla; 385, tip of its outer endite, magnified; 386, second maxilla; 387, first maxilliped; 388, second maxilliped; 389, plumodenticulate setae from second maxilliped; 390, third maxilliped. Scales: 369-371: 2 mm; 379: 0.3; 380: 0.2; 381: 0.2; 382, 384: 0.2; 383: 0.1; 385: 0.1; 386: 0.2; 387: 0.2; 388: 0.4; 389: 0.05; 390: 0.2. Not on scale: 372-378.

Colour: Body of living specimens essentially white and semi-transparent; carapace and cephalothorax with yellowish tinge; thoracopods whitish transparent.

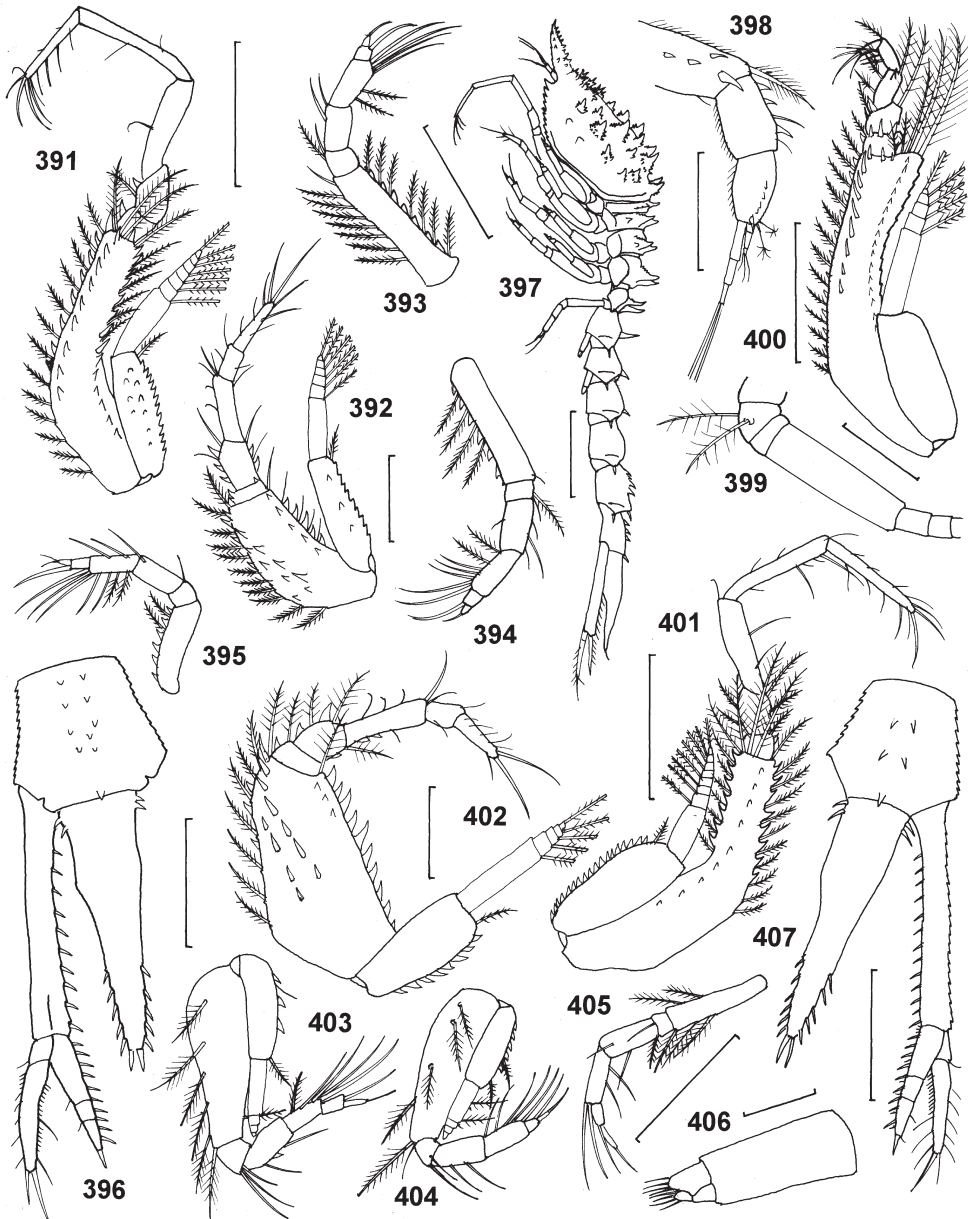
Description of previously unknown (immature) male (figs. 397-407).— Body (fig. 397) essentially like in female; with strong spines on carapace, pereion and first pleonite; spines generally more acute than in female. Length of dissected specimen 14.75 mm.

Cephalic appendages: Antenna 1 (fig. 398) with stronger, more robust peduncle than in female; distal segment without tuft of setae; three-segmented main flagellum longer than last segment of peduncle; three-segmented accessory flagellum shorter than basal segment of main flagellum. Antenna 2 (fig. 399); last segment of peduncle glabrous; flagellum with segments of diverse size. Maxilliped 3 (fig. 400); basis with serrated margins and with serrated ridge close to outer margin, plus row of stout setae near inner margin, basis with indistinct outer process; ischium with short outer process.

Thoracic appendages: Pereiopod 1 (fig. 401) with basis half its length, basis with both margins serrated and with serrated median ridge; carpus somewhat shorter than propodus; propodus about as long as dactylus. Pereiopod 2 (fig. 402) with basis somewhat shorter than half its length; basis with serrated outer margin and two longitudinal rows of stout setae; dactylus 1.4 times as long as propodus. Pereiopod 3 (fig. 403) with basis about half its length; merus longer than carpus; propodus and dactylus longer than in female. Pereiopods 3 and 4 with incompletely developed exopods. Pereiopod 4 (fig. 404) with shorter basis than in preceding pereiopods; merus as long as carpus. Pereiopod 5 (fig. 405) with even shorter basis; merus as long as carpus; relatively long propodus and dactylus; tip with long simple seta.

Pleon: Pleopods (fig. 406); inner ramus with apophysis not exceeding width of two-segmented outer ramus; both rami with short apical setae. Telson (fig. 407) somewhat longer than uropodal peduncle (appears much longer because of more terminal articulation with last pleonite); pre-anal part shorter than post-anal one; lateral margins each with pair of stout setae near basis and with five short stout setae in subterminal portions; tip of telson with two longer stout setae. Uropodal peduncle 1.8 times as long as last pleonite, or 1.9 times as long as exopod; peduncle with numerous short stout setae on inner margin; exopod somewhat longer than endopod, with stout apical seta; endopod three-segmented, five stout setae on inner margin of proximal segment, two stout setae on median and also on distal segment, plus short stout seta on tip.

Remarks.— The body (figs. 369, 370) is like in previous descriptions; the carapace (fig. 371) has a large variety of spines and tubercles (figs. 372-378) showing considerable variation within populations: some females show acute spines like in Zimmer (1909), while others show blunt spines and tubercles like in Calman (1918). The lacinia mobilis is of different shape compared with the other *Diastylis* species. Also, the serration and tubercles on the outer margin of the mandible are very characteristic. The maxillipeds (figs. 387-390; maxilliped 2 with two stout plumodenticulate setae on inner margin of propodus), and pereiopods 1 and 2 (figs. 391, 392) are mostly like in Zimmer's description (propodus of pereiopod 2 is shorter in the present material). The female pereiopods 3 and 4 lack exopods (not even vestigial ones like in *D. corniculata*). The lateral margins of the telson is not serrated, but each margin has a pair of spines in basal position. The uropod (fig. 396) essentially like in Zimmer (1909) and Stebbing (1912), but the endopod consists of three segments separated by poorly visible articulations. Previous authors did not notice these articulations and, based on the



Figs. 391-407. *Diastylis helleri* Zimmer, 1907, subadult female (391-396) and subadult male (397-407). 391, first pereiopod; 392, second pereiopod; 393, third pereiopod; 394, fourth pereiopod; 395, fifth pereiopod; 396, uropod and telson; 397, body, lateral view; 398, first antenna; 399, second antenna; 400, third maxilliped; 401, first pereiopod; 402, second pereiopod; 403, third pereiopod; 404, fourth pereiopod; 405, fifth pereiopod; 406, pleopod; 407, uropod and telson. Scales: 391: 1 mm; 392: 0.5; 393-395: 1; 396: 1; 397: 2; 398: 0.4; 399: 0.5; 400: 0.4; 401: 1; 402: 0.5; 403-405: 1; 406: 0.2; 407: 1.

(virtual) absence of articulations, Stebbing (1912) described a new genus, *Holostylis*, and even a new family, Holostylidae.

3.6.5. *Diastylis mawsoni* Calman, 1918
(figs. 9, 408-438)

Material.— 94 specimens from nine samples (table 1).

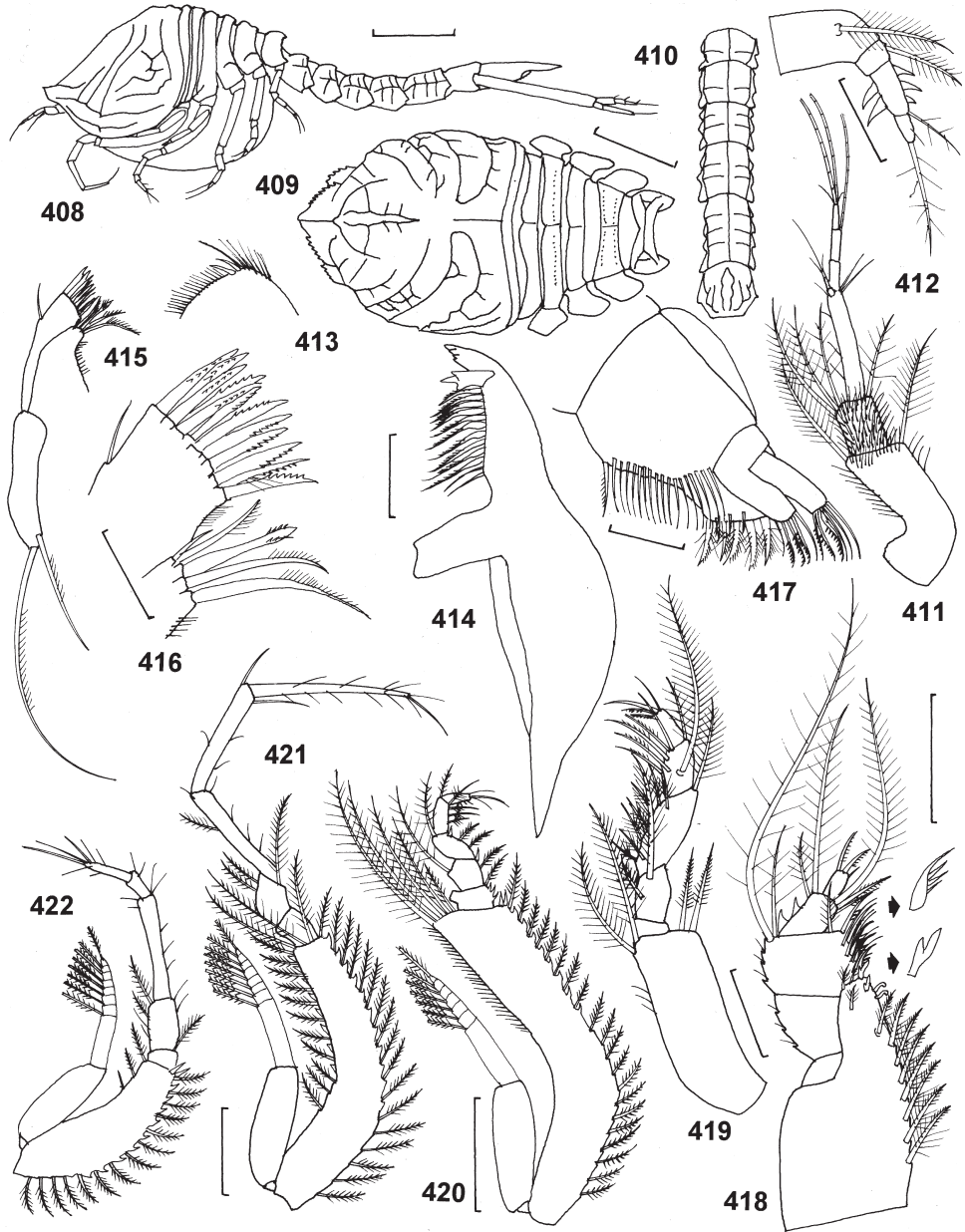
Description of adult female.— Additions to descriptions by Calman (1918) and Ledoyer (1993):

Cephalic appendages: Antenna 1 (fig. 411); median segment of three-segmented peduncle with dense cover of small setae plus four long plumose setae; apical segment narrower than the two proximal ones, two times as long as second segment; three-segmented accessory flagellum not longer than basal segment of three-segmented main flagellum. Antenna 2 (fig. 412) with four segments, each with long plumose setae; third segment two times as long as second segment, with strongly serrated lateral margins; apical segment 0.6 times as long as third segment. Labium (fig. 413) with two stout apical setae; without apical process. Mandible (fig. 414) navicular; pars incisiva with four teeth; lacinia mobilis with two teeth and 'knee'; pars molaris truncated. Maxilla 1 (figs. 415, 416) with 12 microserrated robust setae on outer endite; palp as long as protopod, palp with two filaments showing backward-directed, fine setae on only one side. Protopod of maxilla 2 (fig. 417) with row of simple setae along inner margin up to basis of inner endite.

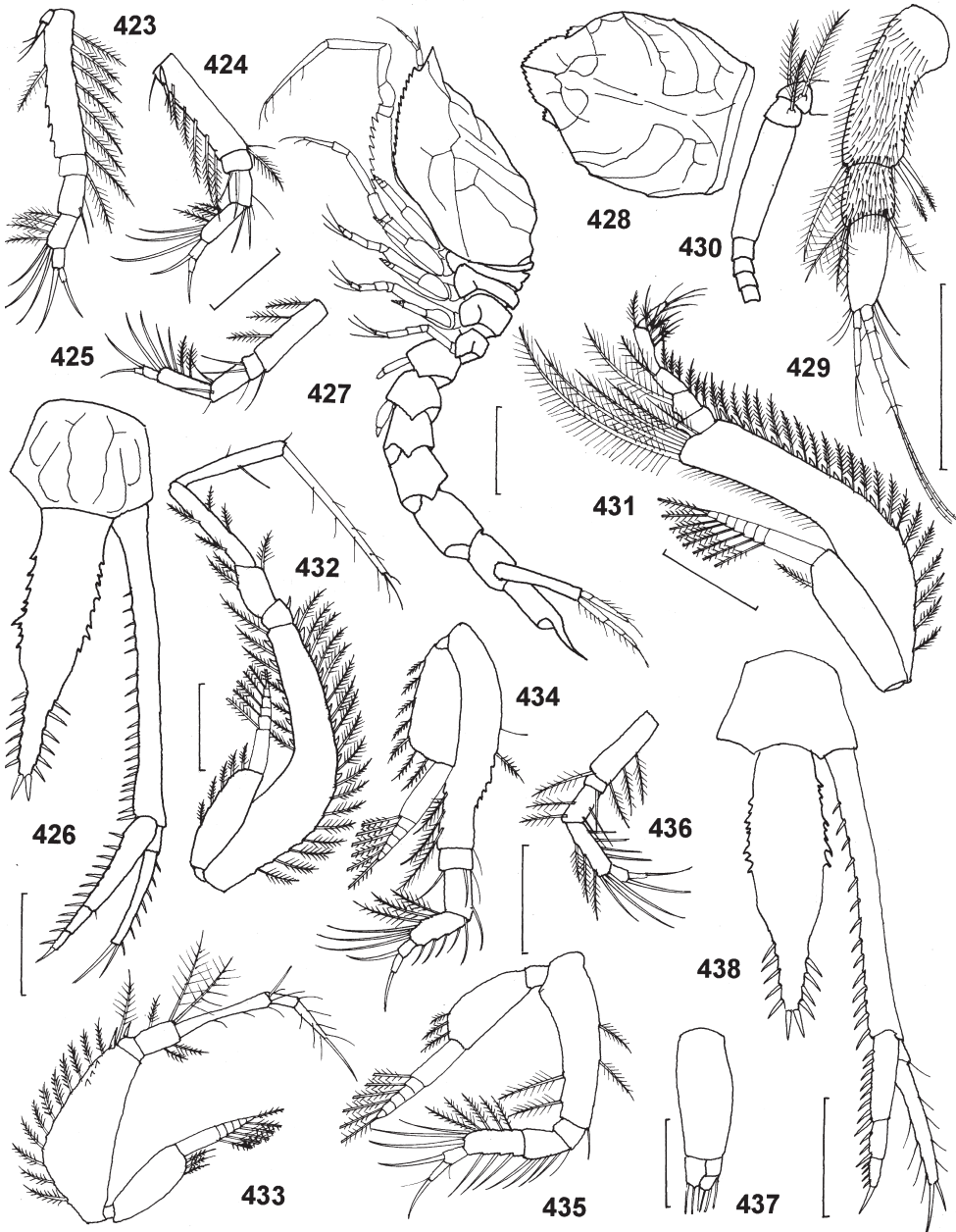
Thoracic appendages: Maxilliped 1 (fig. 418); endite of basis with two flattened, hand-like, robust setae, different from that on inner margin of carpus; carpus and propodus with long plumose setae on outer corners. Maxilliped 2 (fig. 419) with basis shorter than half its length; basis with two plumodenticulate setae on outer distal corner, plus two plumose setae on inner corner; propodus with four microserrated setae on inner margin. Maxilliped 3 (fig. 420) with basis two-thirds of its length; basis with serrated inner margin and very reduced outer process; ischium with small outer process; carpus as long as propodus. Pereiopod 1 (fig. 421) with basis shorter than half its length; basis with serrated inner margin, numerous plumose setae on both margins; carpus as long as propodus but shorter than dactylus. Pereiopod 2 (fig. 422) with basis shorter than half its length; basis with serrated inner margin, numerous plumose setae on this margin; carpus two times the length of merus; dactylus two times as long as propodus. Pereiopod 3 (fig. 423) with basis exceeding half its length, with numerous plumose setae; carpus shorter than merus; dactylus with long, simple, apical seta. Pereiopod 4 (fig. 424) with basis shorter than in pereiopod 3; carpus longer than merus. Pereiopods 3 and 4 with reduced exopods. Pereiopod 5 (fig. 425) with shorter basis than in pereiopod 4; basis with fewer plumose setae; carpus longer than merus.

Description of subadult male (figs. 427-438).— Additions to descriptions by Calman (1918) and Ledoyer (1993): Body (fig. 427) essentially like in female. Length of dissected specimen 15.87 mm. Carapace (fig. 428) less high compared to female; antero-ventral margin serrated.

Cephalic appendages: Antenna 1 (fig. 429); first two segments of peduncle densely setose, third segment shorter and thicker than in female; main flagellum with six segments, long plumose setae on distal end of second segment (like in female; fig. 412);



Figs. 408-422. *Diastylis mawsoni* Calman, 1918, adult female. 408, body, lateral view; 409, carapace and pereon; 410, pleon; 411, first antenna; 412, second antenna; 413, labium; 414, mandible; 415, first maxilla; 416, tip of its endites, magnified; 417, second maxilla; 418, first maxilliped; 419, second maxilliped; 420, third maxilliped; 421, first pereopod; 422, second pereopod. Scales: 408: 3 mm; 409, 410: 2; 411, 412: 1; 413-415: 0.3; 416: 0.1; 417: 0.2; 418: 0.4; 419: 0.5; 420: 1; 421, 422: 1.



Figs. 423-438. *Diastylis mawsoni* Calman, 1918, adult female (423-426) and subadult male (427-438). 423, third pereiopod; 424, fourth pereiopod; 425, fifth pereiopod; 426, uropod and telson; 427, body, lateral view; 428, carapace; 429, first antenna; 430, second antenna; 431, third maxilliped; 432, first pereiopod; 433, second pereiopod; 434, third pereiopod; 435, fourth pereiopod; 436, fifth pereiopod; 437, pleopod; 438, uropod and telson. Scales: 423-425: 1 mm; 426: 1; 427, 428: 2; 429: 1; 430, 434-436: 1; 431: 1; 432, 433: 1; 437: 0.2; 438: 1.

accessory flagellum with three segments, median segment longest, this flagellum not extending beyond fourth segment of main flagellum. Peduncle of antenna 2 (fig. 430) with terminal segment glabrous; flagellum with short and broad segments.

Thoracic appendages: Maxilliped 3, pereopods 1, 2 and 5 (figs. 431-433, 436) like in female. Pereiopod 3 (fig. 434) with carpus subequal to merus. Pereiopod 4 (fig. 435) with carpus longer than merus. Pereiopods 3 and 4 with large, fully developed exopods.

Pleon: Inner ramus of pleopods (fig. 437) non-articulated, with small apophysis directed towards two-segmented outer ramus. Telson (fig. 438) shorter than uropodal peduncle; pre-anal part longer than post-anal one; telson with partly serrated lateral margins, like in female; distal portion of telson with five stout setae on each lateral margin, plus two stout setae on tip. Uropodal peduncle more than three times as long as last pleonite, with numerous stout setae along inner margin, peduncle more than 1.8 times as long as its rami; exopod as long as endopod, with simple setae and with longer stout seta on tip; endopod with three segments, proximal segment with eight short stout setae on inner margin, median segment with three, and distal segment with four stout setae plus one longer apical seta.

Colour (fig. 9): Living specimens semi-transparent; body white with tinge of yellow (slightly orange); thoracopods white-transparent. Darker spots in fig. 9 mainly from content of intestine.

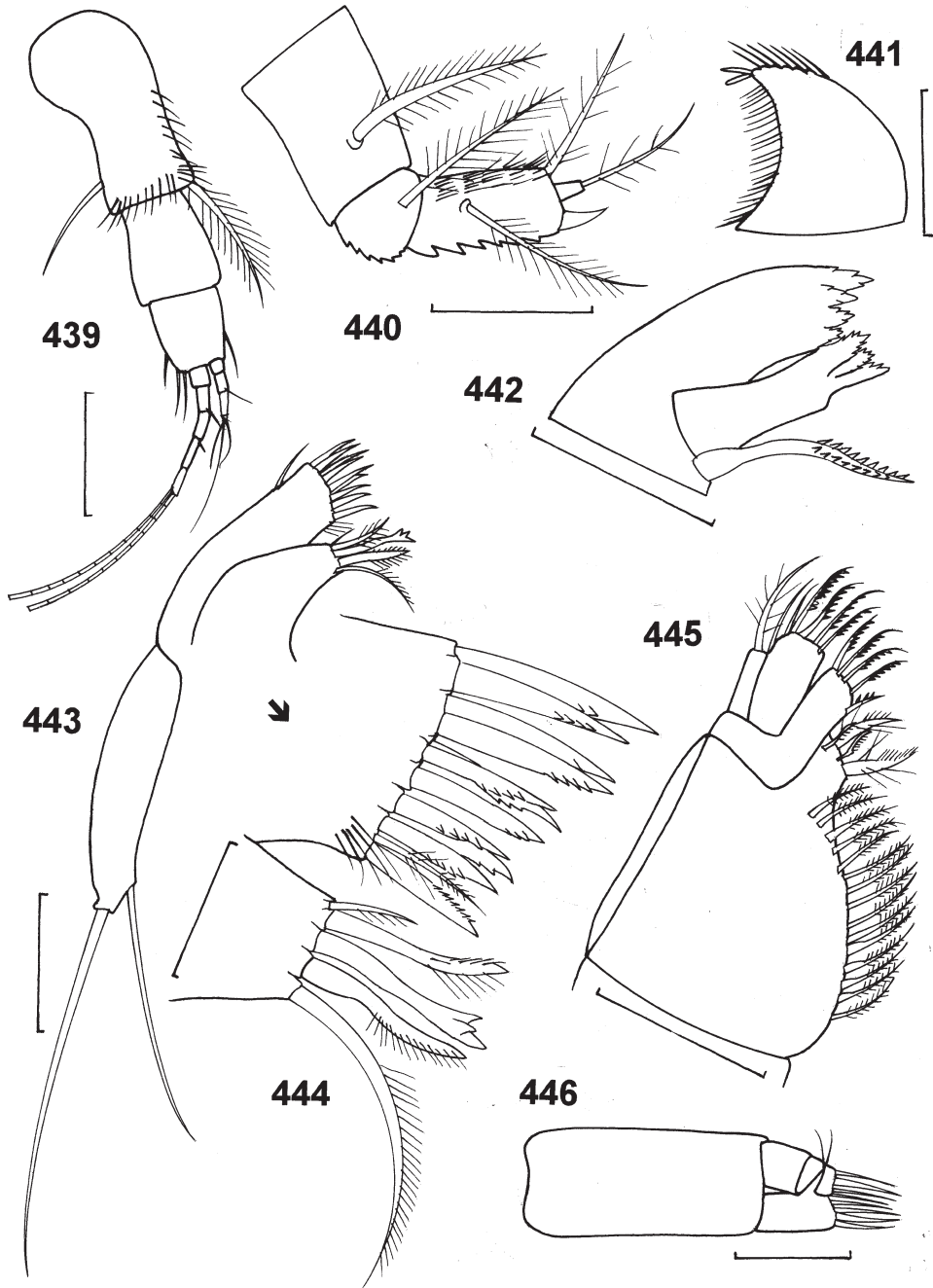
Remarks.— The body (fig. 408), carapace (fig. 409), and pleon (fig. 410) of the female are as described by Calman (1918). The pre-anal portion of the telson (fig. 426) has more strongly serrated margins. The female has the uropodal endopod somewhat longer than the exopod, with 8 + 3 + 2 stout setae along its inner margin (fig. 426).

3.6.6. *Diastylopsis goekei* Roccatagliata & Heard, 1992 (figs. 439-446)

Material.— 207 specimens from 12 samples (table 1).

Supplementary description.— Following appendages added to original description: antenna 1 of male, antenna 2 of female, mouth parts and pleopods. Antenna 1 of immature male (fig. 439); peduncle with enlarged distal segment, main flagellum with five narrow segments; four-segmented accessory flagellum extending beyond second segment of main flagellum. Antenna 2 of immature female (fig. 440) with four segments, each with long plumose setae; second and third segments with serrated inner margins; third segment more than three times as long as second segment, inner distal corner with robust seta, longer than strongly reduced apical segment. Labium (fig. 441) with inner margin concave, tip with two short stout setae. Mandible (fig. 442); pars incisiva with four serrated teeth; lacinia mobilis with three serrated teeth and 'knee' less evident compared to *Diastylis* species. Maxilla 1 (figs. 443, 444); outer endite with serrated robust setae as in *Diastylis*; palp with two glabrous filaments. Protopod of maxilla 2 (fig. 445) with row of short plumose setae along inner margin, this row not reaching up to basis of inner endite. Pleopods (fig. 446) with outer ramus two-segmented; non-articulated inner ramus with characteristic, long and thin apophysis (also like in *Diastylis*).

Remarks.— The remaining characters are as described by Roccatagliata & Heard



Figs. 439-446. *Diastylopsis goekei* Roccatagliata & Heard, 1992, immature male (439, 441-446) and immature female (440). 439, first antenna; 440, second antenna; 441, labium; 442, tip of mandible; 443, first maxilla; 444, tip of its endites, magnified; 445, second maxilla; 446, pleopod. Scales: 439: 0.3 mm; 440: 0.2; 441: 0.1; 442: 0.1; 443: 0.2; 444: 0.05; 445: 0.2; 446: 0.2.

(1992). The genus *Diastylopsis* appears to be morphologically closer to *Diastylis* than to *Makrokylindrus*. This was confirmed by the present, more detailed data on the mouth-parts.

3.6.7. *Leptostylis antipus* Zimmer, 1907
(figs. 447-477)

Material.— 195 specimens from 14 samples (table 1).

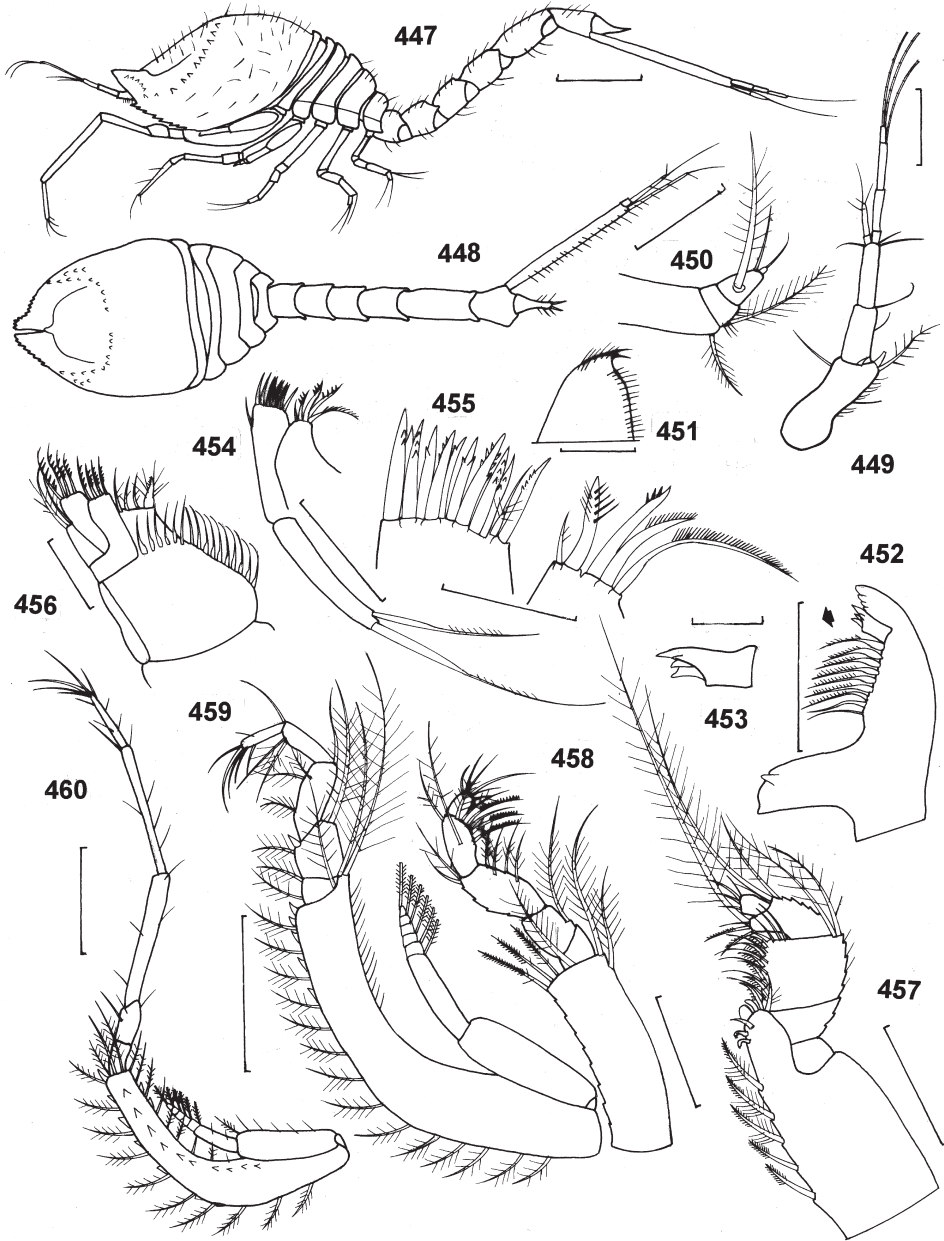
Description of subadult female (figs. 447-465).— Some appendages need to be added to Zimmer's (1907b, 1909) description of the female: Antenna 2 (fig. 450) with third segment two times as long as second one; almost vestigial apical segment. Labium (fig. 451) with two short, stout, apical setae. Protopod of maxilla 2 (fig. 456) with row of simple setae along inner margin up to basis of inner endite. Pereiopod 4 (fig. 463) with basis shorter than in pereiopod 3 (fig. 462); carpus longer than merus; dactylus with simple apical seta; two-segmented exopod very reduced. Pereiopod 5 (fig. 464) with basis shorter and carpus longer than in pereiopod 4.

Description of previously undescribed (immature) male (figs. 466-477).— Body (fig. 466) and carapace (fig. 467) like in female, but with fewer setae. Length of dissected specimen 9.09 mm. Antenna 1 (fig. 468) with enlarged segments; main flagellum (fig. 469) with six segments; accessory flagellum extending somewhat beyond the third segment of main flagellum.

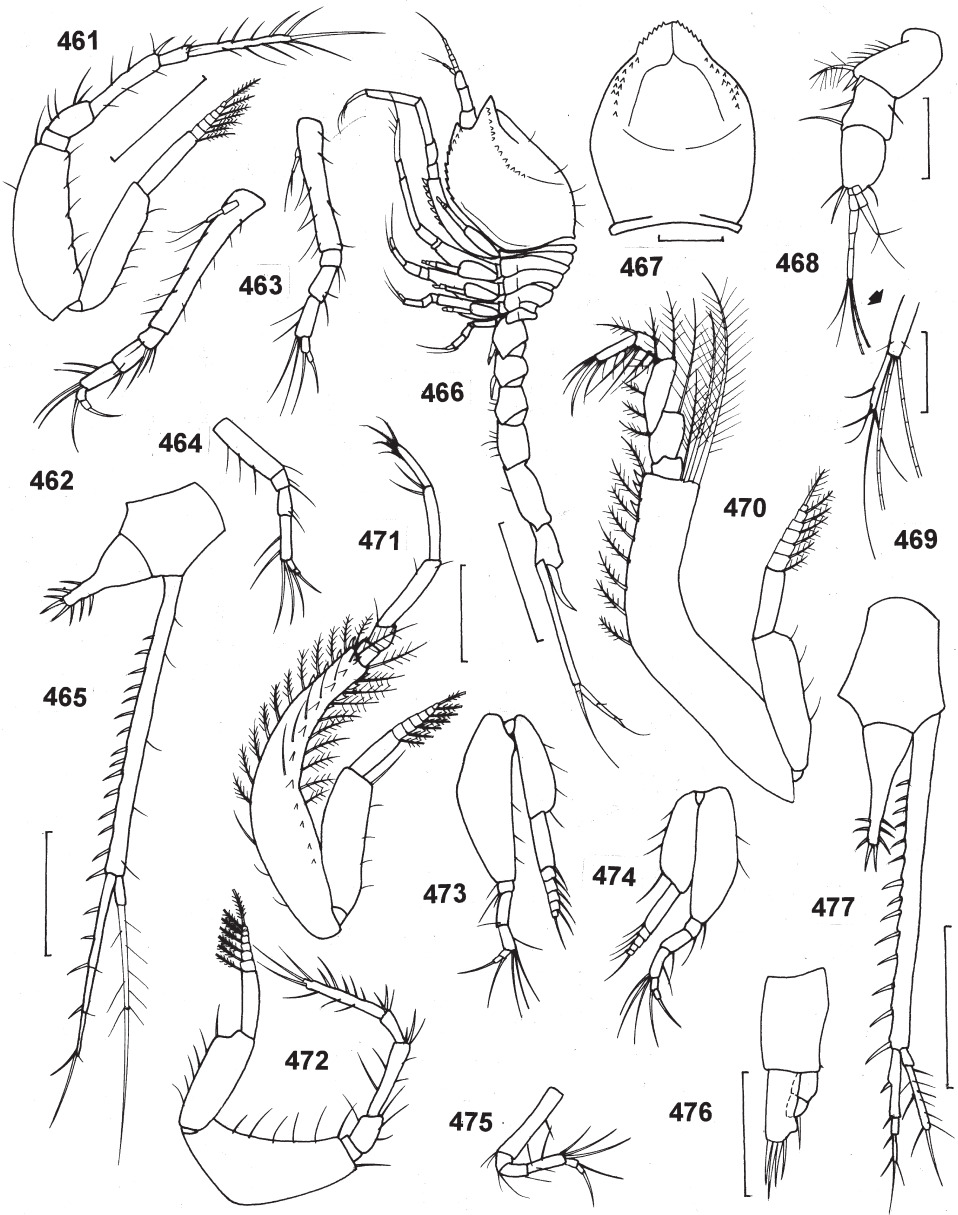
Thoracic appendages: Maxilliped 3 (fig. 470) with basis greatly exceeding half its length, basis without outer process. Pereiopod 1 (fig. 471) with basis contributing to about half its length, basis with serrated median ridge; carpus somewhat longer than propodus; propodus somewhat longer than dactylus. Pereiopod 2 (fig. 472) with basis shorter than half its length; dactylus slightly less than three times as long as propodus, dactylus with simple setae. Pereiopod 3 (fig. 473) with basis exceeding half its length; merus longer than carpus; dactylus with simple, long, apical seta. Pereiopod 4 (fig. 474) with basis half its length; carpus longer than merus. Exopods present on maxilliped 3 and pereiopods 1-4. Pereiopod 5 (fig. 475) with basis shorter and carpus longer than in pereiopod 4.

Pleon: Inner ramus of pleopods (fig. 476) non-articulated, with small apophysis extending beyond extremity of two-segmented outer ramus. Telson (fig. 477) about as long as last pleonite or one third of uropodal peduncle; about equal pre-anal and post-anal portions; distal portions of telson with three stout setae on each lateral margin plus two stout setae on tip. Uropods (fig. 477) slender; peduncle with numerous stout setae on inner margin, peduncle 1.6 times as long as endopod; exopod 0.7 times as long as endopod and with one long stout seta (longer than exopod) on tip; endopod with three segments, proximal segment with three stout setae, median with only one, and distal segment with two stout setae plus one long seta (shorter than in exopod) on tip.

Remarks.— The body (figs. 447, 448) is like in Zimmer (1909). Antenna 1 (fig. 449); the accessory flagellum has three segments, this flagellum is not extending beyond the first two segments of the four-segmented main flagellum (only three-segmented in Zimmer). Mandible (figs. 452, 453); the lacinia mobilis has a 'knee' as in *Diastylis* and *Diastylopsis*, which is not mentioned by Zimmer (1909). Maxilla 1 (figs. 454, 455); the



Figs. 447-460. *Leptostylis antipus* Zimmer, 1907, subadult female. 447, body, lateral view; 448, body, dorsal view; 449, first antenna; 450, second antenna; 451, labium; 452, mandible; 453, its lacinia mobilis, magnified; 454, first maxilla; 455, tip of its endites, magnified; 456, second maxilla; 457, first maxilliped; 458, second maxilliped; 459, third maxilliped; 460, first pereopod. Scales: 447, 448: 1 mm; 449: 0.2; 450: 0.5; 451: 0.1; 452: 0.2; 453: 0.05; 454: 0.2; 455: 0.05; 456: 0.2; 457: 0.2; 458: 0.2; 459: 0.4; 460: 0.5.



Figs. 461-477. *Leptostylis antipus* Zimmer, 1907, subadult female (461-465) and immature male (466-477). 461, second pereiopod; 462, third pereiopod; 463, fourth pereiopod; 464, fifth pereiopod; 465, uropod and telson; 466, body, lateral view; 467, carapace, dorsal view; 468, first antenna; 469, tip of its main flagellum, magnified; 470, third maxilliped; 471, first pereiopod; 472, second pereiopod; 473, third pereiopod; 474, fourth pereiopod; 475, fifth pereiopod; 476, pleopod; 477, uropod and telson. Scales: 461-464: 0.5 mm; 465: 0.5; 466: 2; 467: 1; 468, 470: 0.3; 469: 0.1; 471-475: 0.5; 476: 0.2; 477: 1.

outer endite has ten serrated robust setae and one forked seta; the palp is longer than the protopod, and has two unequally sized filaments showing fine, backward-directed setae on only one side of the distal half (equally sized glabrous filaments in Zimmer). Maxilliped 1 (fig. 457) has the endite of the basis reaching the extremity of the merus (shorter in Zimmer, who figured only the merus but not the ischium); the carpus has hand-like, flattened, robust setae; the propodus is three times as long as the dactylus (slightly longer than the dactylus in Zimmer), with two very long plumose setae, longer than those of the carpus (shorter in Zimmer). Maxilliped 2 (fig. 458) is almost like in Zimmer (1909); the basis has three microserrated, robust setae on the outer distal corner; the propodus has one-sided microserrated setae. Maxilliped 3 (fig. 459) has the basis exceeding half its length, with a (sub)terminally serrated inner margin and with a short outer process. Pereiopod 1 (fig. 460) is almost as in Zimmer (1909) except for few small differences: the basis has a serrated median ridge, and the carpus is about as long as the propodus (shorter in Zimmer). Pereiopods 2 and 3, telson, and uropod of the female (figs. 461, 462, 465) are as in Zimmer.

3.6.8. *Leptostylis weddelli* spec. nov.
(figs. 478-505)

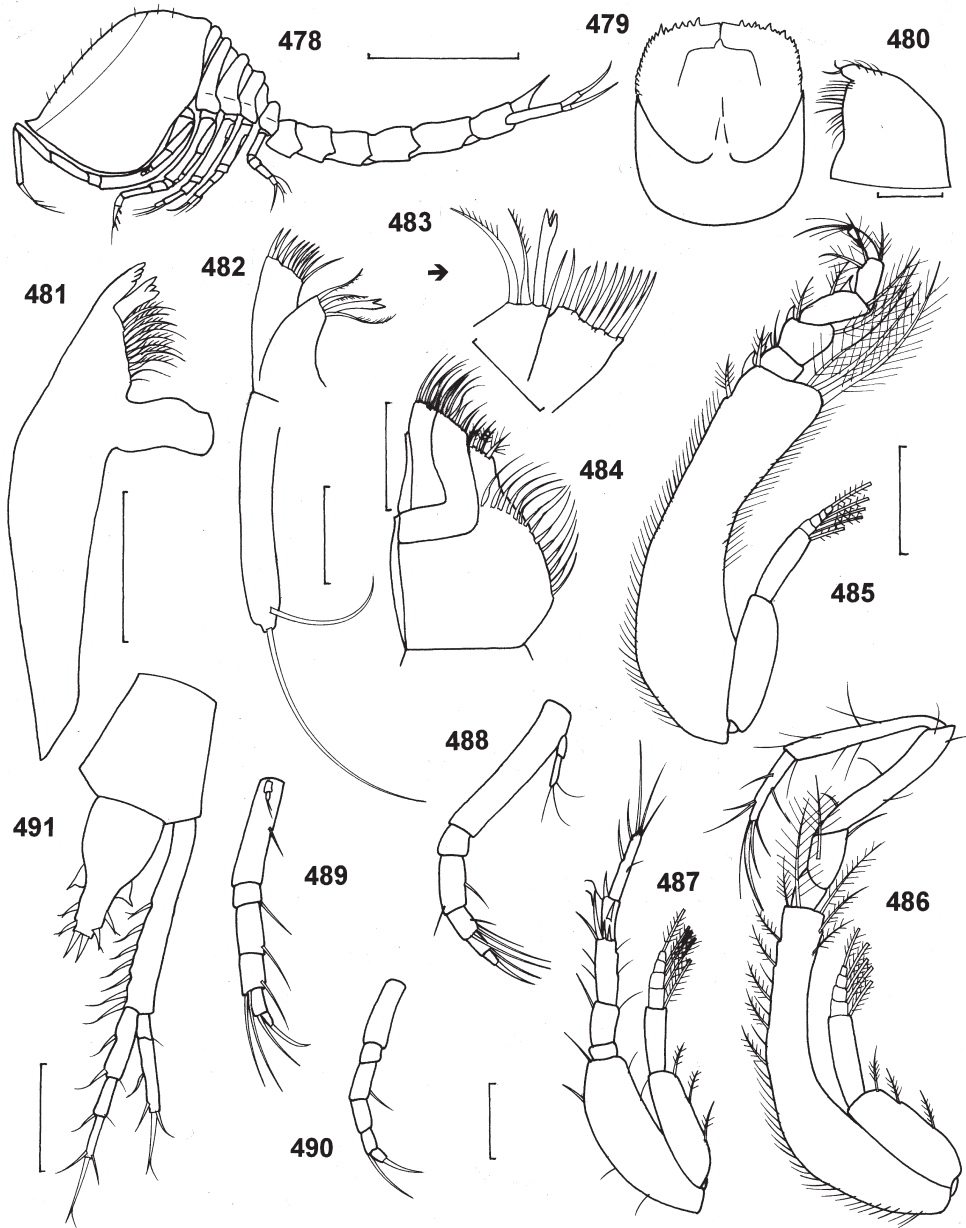
Material.— 23 specimens in three samples (table 1: sta. 16-477, 16-479, 16-484). Types from sta. 16-484: holotype, subad. fem. 3.3 mm, NHMW coll. no. 19659; paratypes: 7 subad. fem., 2 subad. males (no. 275), 1 dissected subad. fem. (no. 276), 1 subad. male (no. 277), and 1 dissected subad. male (no. 278), GAM Cum 275-278; 5 subad. fem., 1 subad. male, RMNH N 291. Paratypes from further stations: 1 subad. fem., sta. 16-477, NHMW 19660; 2 subad. fem., 1 subad. male, sta. 16-479, NHMW 19725.

Type locality.— Antarctic, Weddell Sea, "Polarstern" station 16-484 (fig. 1, table 1), coord. 75°17'S, 55°59'W.

Description of subadult female (figs. 478-491).— Body (fig. 478) with glabrous integument except for carapace. Length of dissected specimen 3.82 mm. Carapace (fig. 479) almost squared with rounded corners in dorsal view, amounting to almost third of entire body; oblique ridge from pseudorostrum towards postero-dorsal part of carapace, this ridge serrated in its anterior half; minute eye-lobe without any visual elements, no evident notch.

Cephalic appendages: Labium (fig. 480) with fine setae on inner, apical process. Mandible (fig. 481) navicular; pars incisiva with four teeth; lacinia mobilis with three teeth and without evident 'knee'; microserrated robust setae between lacinia and truncated pars molaris. Maxilla 1 (figs. 482, 483); outer endite with ten simple robust setae; palp longer than protopod, palp with two unequally sized glabrous filaments. Protopod of maxilla 2 (fig. 484) with row of long simple setae along inner margin up to inner endite.

Thoracic appendages: Maxilliped 3 (fig. 485) with strong, tooth-like, robust seta on each distal inner corner of all segments except dactylus; basis greatly exceeding half length of maxilliped, basis without distinct outer process. Pereiopod 1 (fig. 486) with basis shorter than half its length; carpus somewhat longer than propodus; propodus two times as long as dactylus. Pereiopod 2 (fig. 487) with basis shorter than half its length; carpus with four stout setae on inner portion of distal margin; dactylus about



Figs. 478-491. *Leptostylis weddelli* spec. nov., paratype, subadult female. 478, body, lateral view; 479, carapace, dorsal view; 480, labium; 481, mandible; 482, first maxilla; 483, tip of its endites, magnified; 484, second maxilla; 485, third maxilliped; 486, first pereopod; 487, second pereopod; 488, third pereopod; 489, fourth pereopod; 490, fifth pereopod; 491, uropod and telson. Scales: 478, 479: 1 mm; 480: 0.1; 481: 0.2; 482: 0.1; 483: 0.05; 484: 0.1; 485: 0.2; 486-490: 0.2; 491: 0.2.

two times as long as propodus, dactylus with simple setae. Pereiopod 3 (fig. 488) with robust segments; basis slightly exceeding half length of pereiopod; merus longer than carpus; dactylus with robust, simple, apical seta. Pereiopod 4 (fig. 489) with basis shorter than in pereiopod 3, merus longer than carpus. Pereiopods 3 and 4 with reduced two-segmented exopods, fourth segment shorter than third. Pereiopod 5 (fig. 490) with shorter basis and fewer setae compared to pereiopod 4; merus longer than carpus.

Pleon: Telson (fig. 491) as long as last pleonite, 0.67 times as long as uropodal peduncle; pre-anal part as long as post-anal one; two stout setae on each lateral margin plus two on tip. Uropodal peduncle 1.5 times as long as last pleonite or 1.2 times as long as its endopod, with seven robust setae on inner margin; exopod 0.6 times as long as endopod, with few simple setae on both margins plus robust seta on tip; three-segmented endopod, proximal segment with two stout setae on inner margin, median segment with one seta, distal segment with two subterminal and one longer, stout, terminal seta.

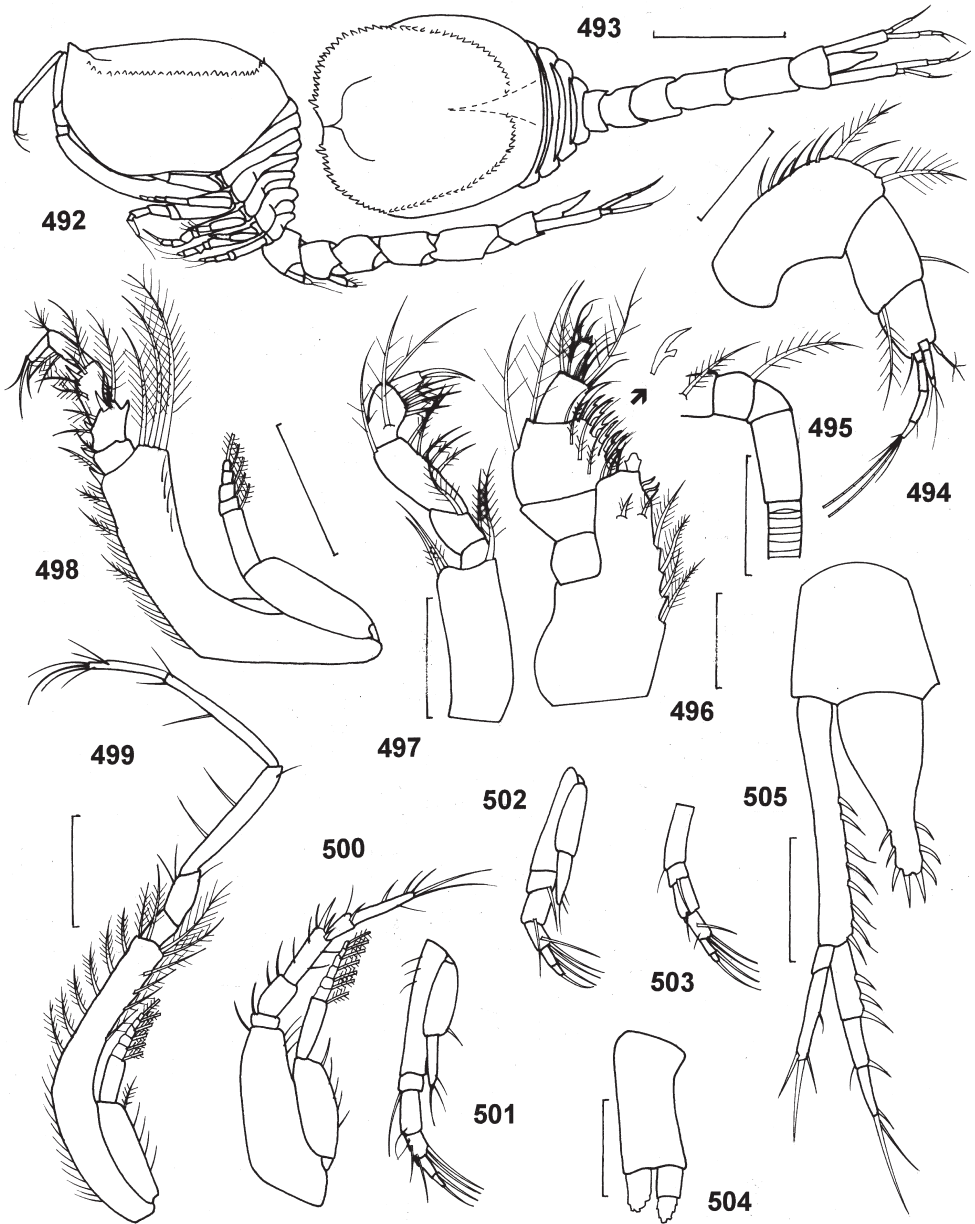
Description of immature male (figs. 492-505).— Body (figs. 492, 493) like in female, glabrous tegument. Length of dissected specimen 4.90 mm. Carapace with serrated ridge as in female.

Antennae: Antenna 1 (fig. 494) with robust segments; three-segmented accessory flagellum not extending beyond second segment of four-segmented main flagellum. Antenna 2 (fig. 495) as typical for immature male.

Thoracic appendages: Maxilliped 1 (fig. 496); endite of basis with tooth-like, robust, apical seta; carpus with flattened, hand-like setae on inner margin; carpus and propodus with short plumose setae; dactylus 0.7 times as long as propodus. Maxilliped 2 (fig. 497); basis with two forked long setae on distal outer corner; propodus with forked setae on inner margin; carpus and propodus with long plumose setae; dactylus with stout apical seta. Maxilliped 3 (fig. 498) with basis greatly exceeding half its length; basis with not clearly evident outer process, almost like in female. Pereiopods 1-5 (figs. 499-503) essentially as in female, except for larger exopods on pereiopods 3 and 4 (figs. 501, 502).

Pleon: Pleopods as in fig. 504; with two-segmented outer ramus longer than short, simple, inner ramus. Telson (fig. 505) longer than in female, 1.4 times as long as last pleonite, 0.77 times as long as uropodal peduncle; telson with three stout setae subterminally on each lateral margin plus two stout setae on tip. Uropodal peduncle (fig. 505) 1.8 times as long as last pleonite or 1.4 times as long as endopod, peduncle with eight stout setae on inner margin; exopod 0.68 times as long as endopod, not extending beyond median segment of endopod, with three stout apical setae; proximal segment of endopod with three stout setae on inner margin, median segment with one, and distal segment with three (two longer ones) stout setae.

Remarks.— This species is more closely related to *L. antipus* Zimmer, 1909, but with the toothed keel extending beyond the middle of the carapace, and the anterior margin of the carapace almost straight in dorsal view. There is no acute pseudorostrum produced in front of the eye-lobe as in *L. antipus* (figs. 447, 448) and in some *Paralamprops* species from the southern Atlantic. The uropodal peduncle of the new species is shorter than in *L. antipus*, more like in *L. crassicauda* Zimmer. The pleopods have the inner ramus shorter than the outer ramus and are without any teeth.



Figs. 492-505. *Leptostylis weddelli* spec. nov., paratype, immature male. 492, body, lateral view; 493, body, dorsal view; 494, first antenna; 495, second antenna; 496, first maxilliped; 497, second maxilliped; 498, third maxilliped; 499, first pereiopod; 500, second pereiopod; 501, third pereiopod; 502, fourth pereiopod; 503, fifth pereiopod; 504, pleopod; 505, uropod and telson. Scales: 492, 493: 1 mm; 494: 0.1; 495: 0.2; 496: 0.1; 497: 0.2; 498: 0.4; 499-503: 0.4; 504: 0.1; 505: 0.1.

3.6.9. *Makrokylindrus inscriptus* Jones, 1971
(figs. 506-535)

Material.— 21 specimens from six samples (table 1).

Supplementary description of adult female (figs. 506-525).— Following appendages added to description of Jones (1971):

Cephalic appendages: Labium (fig. 511) showing narrow apical segment with setae on its tip. Mandible (figs. 512, 513); pars incisiva and lacinia mobilis each with three teeth; pars molaris truncated. Maxilla 1 (figs. 514, 515); serrated spines on outer endite, short palp with two unequally sized filaments, distal half of filaments with backward-directed fine setae on only one side. Protopod of maxilla 2 (fig. 516) with row of setae along inner margin up to inner endite; endites with microserrated setae.

Thoracic appendages: Maxilliped 1 (fig. 517); endite of basis with one rounded, flattened, robust seta and one forked seta; carpus with hand-like, flattened setae on inner margin; dactylus half as long as propodus; merus, carpus and propodus with long plumose setae on outer margin. Maxilliped 2 (fig. 518) with basis exceeding half its length; basis (sub)terminally with four plumose setae on inner margin; propodus with plumose setae on inner margin. Pereiopods 3 and 4 (figs. 522, 523) with strong segments and numerous simple and plumose setae; merus much longer than carpus; reduced, two-segmented exopods. Pereiopod 5 (fig. 524) with merus somewhat longer than carpus.

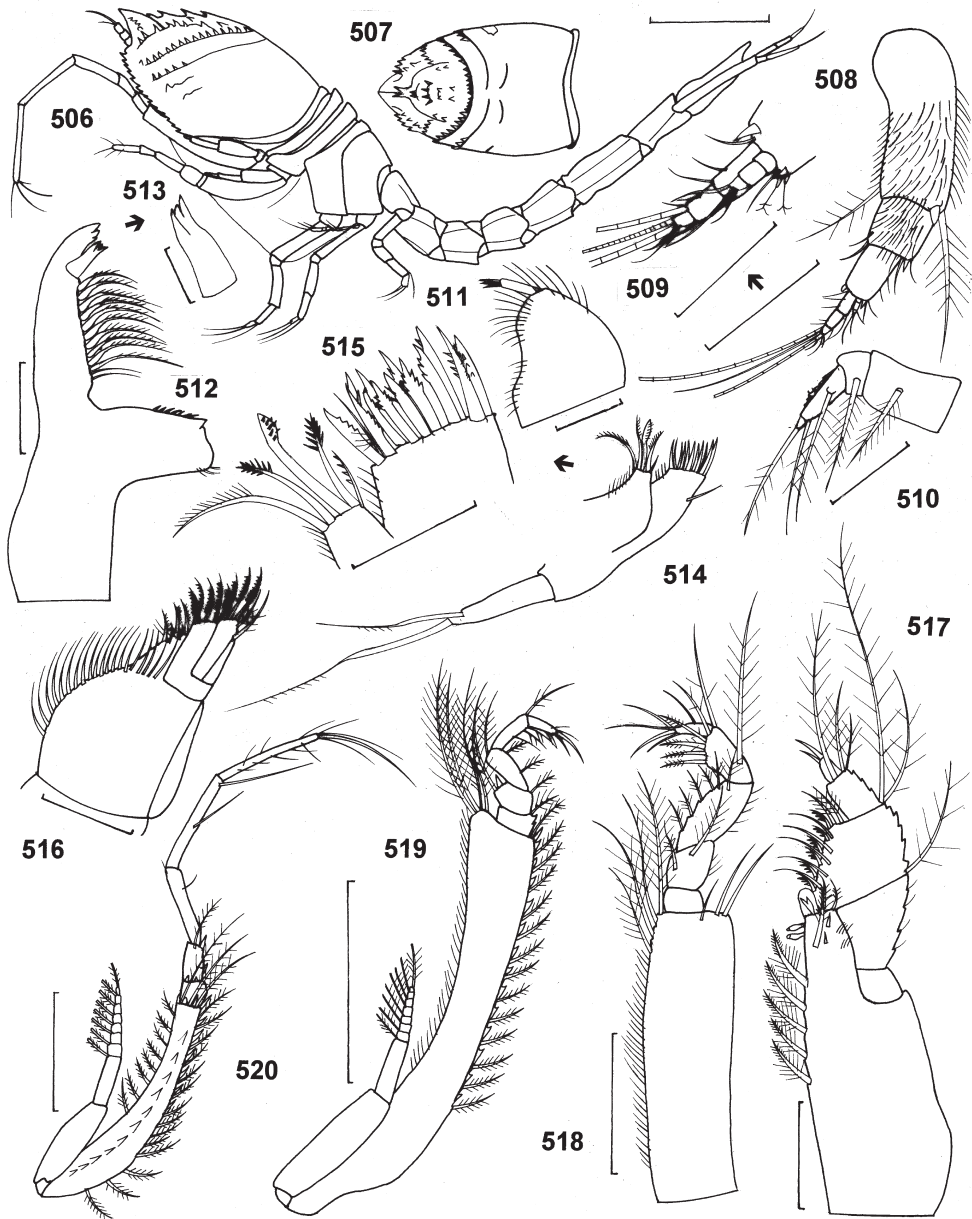
Description of adult male (figs. 526-535).— So far, males remained undescribed except for a drawing of the telson given by Ledoyer (1993). Body (fig. 526) like in female. Length of dissected specimen 13.00 mm. Compared with female, carapace with fewer denticulate rows on anterior part, with blunt dorsal spines, and with dorsal denticles also on pseudorostrum; carapace longer than high, slightly more than one third of entire body, antero-ventral margin serrated.

Cephalic appendages: Peduncle of antenna 1 (fig. 527) with numerous long setae on distal extremity of third segment. Antenna 2 (fig. 528); long peduncle with basal segment equipped with groups of short setae along inner margin; flagellum with long segments bearing fine setae.

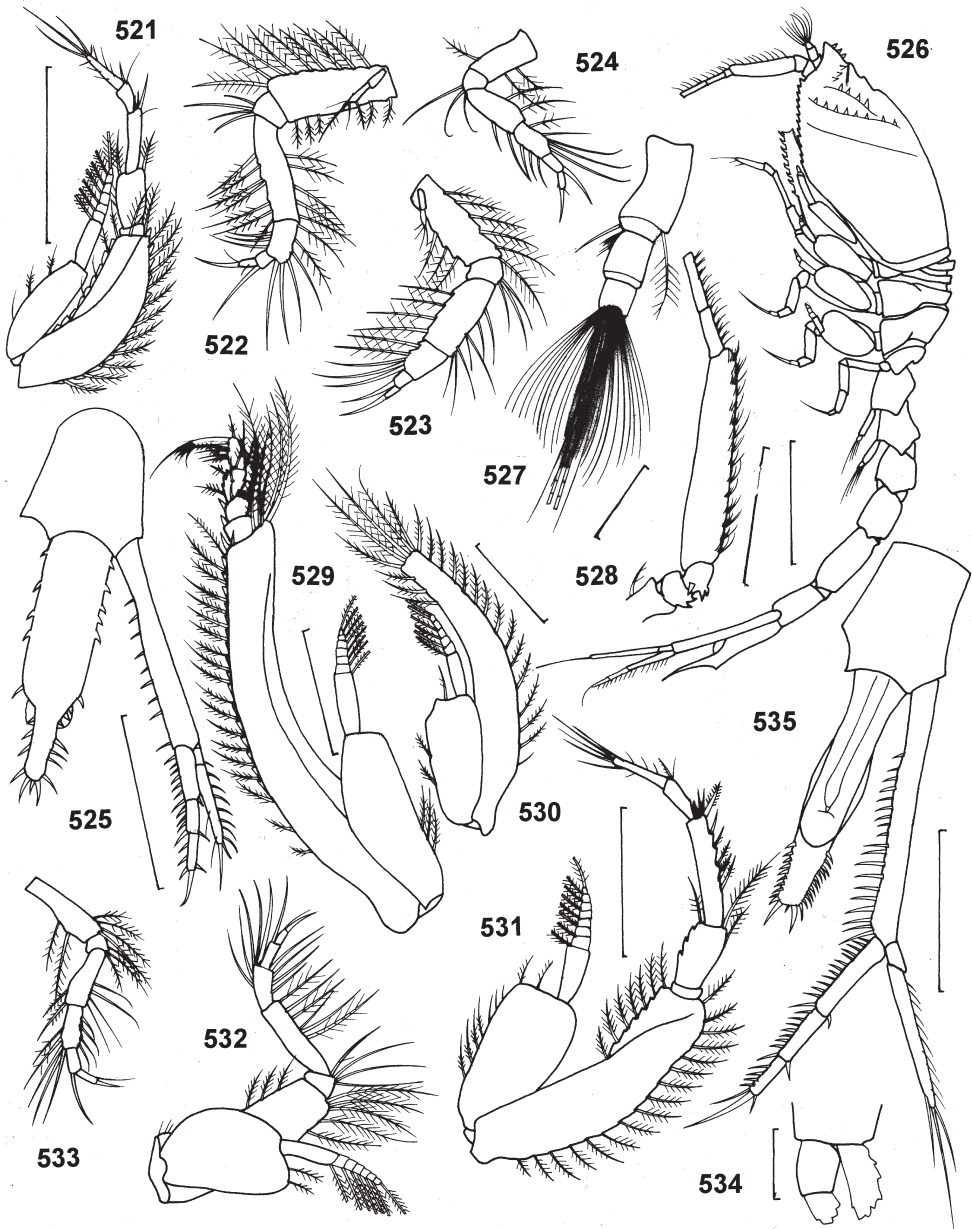
Thoracic appendages: Maxilliped 3 (fig. 529) with basis occupying most of its length; basis with indistinct outer process, basis with plumose setae on inner margin; ischium as long as merus; dactylus longer than propodus. Pereiopod 1 (fig. 530) broken in adult specimen studied, basis with numerous plumose setae. Pereiopod 2 (fig. 531) with basis contributing to about half its length; basis with numerous plumose setae on both margins; carpus with short setae on inner margin; dactylus somewhat longer than propodus and with several simple setae on tip. Pereiopod 3 (fig. 532) with numerous simple and plumose setae; merus two times as long as carpus; exopod well developed. Pereiopod 5 (fig. 533) with long plumose and simple setae; basis slightly longer than merus; merus slightly shorter than in pereiopod 3.

Pleon: Two pairs of pleopods; first pair of pleopods, similar to second pair (fig. 534), with equally sized rami, without tooth on two-segmented outer ramus. Uropodal peduncle and its rami (fig. 535) longer than in female, with more and longer setae on inner margin.

Remarks.— The body (fig. 506), carapace (fig. 507), and antenna 1 (figs. 508, 509)



Figs. 506-520. *Makrokyllindrus inscriptus* Jones, 1971, adult female. 506, body, lateral view; 507, carapace, dorsal view; 508, first antenna; 509, its flagella, magnified; 510, second antenna; 511, labium; 512, mandible; 513, its lacinia mobilis, magnified; 514, first maxilla; 515, tip of its endites, magnified; 516, second maxilla; 517, first maxilliped; 518, second maxilliped; 519, third maxilliped; 520, first pereopod. Scales: 506, 507: 2 mm; 508: 0.4; 509: 0.1; 510: 0.2; 511, 514: 0.2; 512: 0.05; 513: 0.05; 515: 0.1; 516: 0.2; 517: 0.2; 518: 0.4; 519: 1; 520: 1.



Figs. 521-535. *Makrokylindrus inscriptus* Jones, 1971, adult female (521-525) and adult male (526-535). 521, second pereopod; 522, third pereopod; 523, fourth pereopod; 524, fifth pereopod; 525, uropod and telson; 526, body, lateral view; 527, first antenna; 528, second antenna; 529, third maxilliped; 530, first pereopod, broken; 531, second pereopod; 532, third pereopod; 533, fifth pereopod; 534, tip of pleopod; 535, uropod and telson. Scales: 521-524: 1 mm; 525: 1; 526: 2; 527: 0.2; 528: 1; 529: 1; 530: 1; 531-533: 1; 534: 0.1; 535: 1.

are like in Jones (1971) and Ledoyer (1993). The sternites 2-4 of the female are without stout setae like in Ledoyer (1993). Antenna 1 has a short, three-segmented, robust flagella, unlike other species of the genus; the female has an accessory flagellum shorter than the first segment of the main flagellum. Antenna 2 (fig. 510) is almost like in Jones (1971), with four segments, of which the third segment (considered as the apical one by Jones) is thin and long; the apical segment is very short. The long apical segment of the labium is very unusual within this genus. Unlike observed in *Diastylis*, *Diastylopsis*, and *Leptostylis*, there is no 'knee' opposite to the teeth on lacinia mobilis of the mandible. Maxilliped 3 of the male (fig. 529) has the dactylus longer than the propodus, like in Ledoyer (1993) but unlike Jones (1971). Pereiopod 1 (fig. 520) has the ischium shorter than the merus. Pereiopod 2 (fig. 521) is like in Jones' specimens. Reduced exopods are present on pereiopods 3 and 4, as was already mentioned by Ledoyer (1993), whereas Jones (1971) noted: "no trace of exopods on pereiopods 3 and 4". The female telson is as in Jones and Ledoyer. The female uropod (fig. 525) is as in Ledoyer, that is with fewer setae on the inner margins than in Jones. The telson of the male has a glabrous pre-anal part and numerous short stout setae on both sides of the post-anal part; the male telson subequal to uropodal peduncle, the telson has apical setae like in the female and more numerous stout setae on the lateral margins than in Ledoyer (1993).

Ledoyer (1993) mentioned: "La présence d'exopods rudimentaires au niveau des pattes 3 et 4 de la femelle, liée au développement de l'avant dernier thoracomere (cf. genre *Diastylopsis*) pose le problème de l'appartenance générique réelle de cette espèce. Cependant la structure de la patte 1 milite en faveur de son maintien dans le genre *Makrokyllindrus*". This type of reduced exopods on pereiopods 3 and 4 also exists in females of *M. deinotelson* Day, 1980, *M. fistularis* (Calman, 1911), *M. gibraltariensis* Băcescu, 1961, *M. jubatus* Gamô, 1988, *M. mundus* Day, 1980, *M. nitens* (Gamô, 1968), *M. sandersi* Reyss, 1974, and *M. wolffi* Băcescu, 1962. A revision of all known species of *Makrokyllindrus* without exopods on pereiopods 3 and 4 of females, as Stebbing (1912) established in the diagnosis of the genus, will clarify this problem. An anteriorly produced last thoracomere is not uncommon within this genus, while an anteriorly produced third thoracomere as in Ledoyer's specimens, which is almost like in *Diastylopsis*, is not present in Jones' (1971) or in the present specimens.

Table 2. Proportion of adults and subadults in samples of Weddell Sea cumaceans.

Species	Females ¹			Males		Total	
	incubating	adult	subadult	adult	subadult	ind. ²	samples
	%	%	%	%	%	n	n
<i>Cyclaspis gigas</i>	1	3	12	1	12	985	27
<i>Vaunthompsonia inermis</i>	0	0	29	0	32	1201	13
<i>Paralamprops mawsoni</i>	0	4	52	5	22	113	8
<i>Diastylis anderssoni armata</i>	2	9	34	4	17	155	9
<i>Diastylis corniculata</i>	1	3	48	0	7	150	10
<i>Diastylis mawsoni</i>	10	16	13	0	23	94	9
<i>Diastylopsis goekei</i>	34	46	32	7	4	199	12
<i>Leptostylis antipus</i>	0	1	21	1	15	190	11

¹ adult females include the incubating ones;

² including juveniles and immatures

4. Bionomy

Frequency of adults and subadults, body size, egg size, and fecundity were measured (tables 2-4) on the most abundant species in the present material. All samples were restricted to the summer month. *Diastylopsis goekei* (both sexes), and to a much lesser extent also *Diastylis mawsoni* (females only), showed a great proportion of adults, incubating females in particular (table 2). Most incubating females of *Diastylopsis goekei* bred 'eggs' at the embryonic or nauplius stage, while the more advanced larvae at postnauplius stage were rare and the manca stage was lacking. By contrast, six out of nine *Diastylis mawsoni* bred larvae at the postnauplius stage. Six species, i.e. the majority in table 2, showed a strong predominance of juveniles, immatures and partly also subadults, while the numbers of adults were generally small (both sexes pooled: 0-13 %). In the same samples, small numbers of adults were also observed for mysids

Table 3. Body size of adult and subadult cumaceans in samples from the Weddell Sea.

Species	Sex	Size of adults (mm)			Size of subadults (mm)		
		range	mean \pm S.D.	n	range	mean \pm S.D.	n
<i>Cyclaspis gigas</i>	females	12.2 – 20.8	15.84 \pm 2.98	25	7.3 – 19.0	12.94 \pm 3.13	74
	males	14.3 – 16.5	15.48 \pm 0.83	5	11.4 – 19.4	14.43 \pm 2.44	74
<i>Vaunthompsonia inermis</i>	females	–	–	0	4.8 – 8.1	6.47 \pm 0.88	100
	males	–	–	0	5.0 – 8.5	6.60 \pm 0.60	150
<i>Campylaspis excavata</i>	females	4.8 – 6.0	5.23 \pm 0.42	9	4.8 – 5.9	5.31 \pm 0.33	23
	males	–	–	0	4.6 – 6.0	5.22 \pm 0.51	7
<i>Paralamprops mawsoni</i>	females	14.0 – 16.0	14.98 \pm 1.15	5	10.5 – 17.1	13.23 \pm 1.41	45
	males	13.0 – 15.0	14.37 \pm 0.78	6	6.0 – 14.8	12.64 \pm 1.70	25
<i>Diastylis anderssoni armata</i>	females	7.9 – 15.5	11.58 \pm 2.13	15	7.7 – 13.8	11.19 \pm 1.47	54
	males	10.5 – 16.3	14.08 \pm 1.96	6	8.3 – 13.3	11.66 \pm 1.31	28
<i>Diastylis corniculata</i>	females	11.5 – 15.4	13.54 \pm 1.74	5	6.5 – 16.4	10.80 \pm 2.51	42
	males	–	–	0	11.1 – 14.0	12.53 \pm 0.89	11
<i>Diastylis mawsoni</i>	females	13.8 – 18.2	15.57 \pm 1.25	15	8.5 – 16.5	12.06 \pm 2.04	28
	males	–	–	0	10.8 – 14.8	13.32 \pm 1.12	22
<i>Diastylopsis goekei</i>	females	6.5 – 11.4	8.83 \pm 0.99	73	6.0 – 11.6	8.49 \pm 1.14	57
	males	7.9 – 9.8	8.76 \pm 0.59	14	6.1 – 6.8	6.61 \pm 0.31	5
<i>Leptostylis antipus</i>	females	5.8 – 7.6	6.53 \pm 0.95	3	4.7 – 7.8	5.97 \pm 0.67	43
	males	5.4 – 6.1	5.75	2	4.6 – 8.7	6.51 \pm 0.93	33

Table 4. Fecundity and egg size of cumaceans in samples from the Weddell Sea.

Species	Size of incubating females (mm)			Nos. eggs or nauplii per female			Egg diameters (mm)		
	range	mean \pm S.D.	n	range	mean \pm S.D.	n	range	mean \pm S.D.	n
<i>Cyclaspis gigas</i>	12.2 – 20.8	15.00 \pm 2.76	13	45 – 92	63.6 \pm 15.7	12	0.59 – 0.65	0.618 \pm 0.022	55
<i>Campylaspis excavata</i>	4.8 – 6.0	5.23 \pm 0.42	9	11 – 35	25.0 \pm 8.8	9	0.36 – 0.47	0.425 \pm 0.023	50
<i>Diastylis anderssoni armata</i>	9.0 – 10.8	10.07 \pm 0.95	3	32 – 65	46.0 \pm 17.1	3	0.36 – 0.41	0.381 \pm 0.016	50
<i>Diastylis corniculata</i>	14.2 – 14.7	14.45	2	54 – 68	61	2	0.44 – 0.53	0.488 \pm 0.023	50
<i>Diastylis mawsoni</i>	13.8 – 18.2	15.58 \pm 1.42	9	17 – 54	35.3 \pm 18.5	3	0.67 – 0.76	0.698 \pm 0.022	50
<i>Diastylopsis goekei</i>	6.5 – 11.4	8.84 \pm 1.04	58	7 – 53	34.4 \pm 11.6	54	0.27 – 0.43	0.370 \pm 0.033	83

(Crustacea: Mysidae) by Wittmann (1996). In cumaceans of the present material, egg sizes (table 4) were larger or in the upper range reported by Corey (1981) for Subarctic to Arctic cumaceans. Body sizes (tables 3, 4) were mostly in the upper range and fecundity (table 4) was well within this range.

5. Discussion

With the present contribution, 33 species, 12 genera and five families of Cumacea are known from the Weddell Sea. Species represented in the present material are indicated by bold numbers:

Fam. Bodotriidae T. Scott, 1901

- 1 *Cyclaspis gigas* Zimmer, 1907
- 2 *Vaunthompsonia inermis* Zimmer, 1909
- 3 *Vaunthompsonia laevifrons* Gamô, 1987

Fam. Leuconidae Sars, 1878

- 4 *Eudorella gracilior* Zimmer, 1907
- 5 *Leucon assimilis* Sars, 1887
- 6 *Leucon parasiphonatus* Mühlenhardt-Siegel, 1994
- 7 *Leucon polarsterni* Ledoyer, 1993
- 8 *Leucon weddelli* Ledoyer, 1993

Fam. Nannastacidae S. Bate, 1865

- 9 *Campylaspis antarctica* (Calman, 1907)
- 10 *Campylaspis breviramis* Ledoyer, 1993
- 11 *Campylaspis excavata* Ledoyer, 1993
- 12 *Campylaspis johnstoni* Hale, 1937
- 13 *Campylaspis ledoyeri* spec. nov.
- 14 *Campylaspis maculata* Zimmer, 1907
- 15 *Campylaspis quadridentata* Ledoyer, 1993
- 16 *Procampylaspis compressa* Zimmer, 1907

Fam. Lampropidae Sars, 1878

- 17 *Hemilamprops bacescui* spec. nov.
- 18 *Hemilamprops ultimaespei* Zimmer, 1921
- 19 *Paralamprops asper* Zimmer, 1907
- 20 *Paralamprops mawsoni* (Hale, 1937)
- 21 *Paralamprops racovitzai* spec. nov.
- 22 *Paralamprops rossi* Jones, 1971
- 23 *Paralamprops serratocostatus* Sars, 1887

Fam. Diastylidae S. Bate, 1856

- 24 *Diastylis anderssoni armata* Ledoyer, 1993
- 25 *Diastylis corniculata* Hale, 1937
- 26 *Diastylis enigmatica* Ledoyer, 1993
- 27 *Diastylis galeronae* Ledoyer, 1993
- 28 *Diastylis helleri* Zimmer, 1907
- 29 *Diastylis mawsoni* Calman, 1918
- 30 *Diastylopsis goekei* Roccatagliata & Heard, 1992

31 *Leptostylis antipus* Zimmer, 1907

32 *Leptostylis weddelli* spec. nov.

33 *Makrokyllindrus inscriptus* Jones, 1971

Besides the four new species, six species from the present material are first records for the Weddell Sea: *Vaunthompsonia inermis*, *Paralamprops asper*, *P. mawsoni*, *P. serratocostatus*, *Diastylopsis goekei* and *Leptostylis antipus*. Among these species, *D. goekei* is high Antarctic and *V. inermis*, *P. asper* and *P. mawsoni* are Antarctic and Subantarctic. The remaining two species were previously known only from Subantarctic waters, around South Georgia (*L. antipus*) or Kerguelen (*P. serratocostatus*).

Ledoyer (1993) provided a first analysis of the distribution of Cumacea from the Weddell Sea. He considered four types of horizontal distribution in Antarctic and Subantarctic waters: (a) species with ample latitudinal distribution (two species, however, absent in the Weddell Sea), (b) essentially Subantarctic species (19, or 16 according to our study); (c) Antarctic and Subantarctic species (13 or 20) and (d) high Antarctic species (27, 12 of them recorded only from the Weddell Sea). Corbera (2000) added four new species to the list of Subantarctic taxa and gave a comprehensive analysis of the horizontal and vertical distribution of all known Antarctic and Subantarctic taxa.

The vertical distribution of the present material (table 5) is similar to that given by Corbera (2000). There is one major difference: *Paralamprops serratocostatus* was collected by the "Polarstern" from 3674 m depth with a grab sampler whereas it was previously

Table 5. Collecting depths of selected cumaceans from Antarctic and Subantarctic.

Species	Depth (m) (present study)	Depth (m) (Corbera, 2000)
<i>Cyclaspis gigas</i>	80–610	160–700
<i>Vaunthompsonia inermis</i>	240–520	24–650
<i>Eudorella gracilior</i>	340–520	15–752
<i>Leucon assimilis</i>	240–630	150–650
<i>Campylaspis antarctica</i>	80–420	193–522
<i>Campylaspis breviramis</i>	340–440	457–462
<i>Campylaspis excavata</i>	80–380	185–515
<i>Campylaspis johnstoni</i>	350–480	193–2018
<i>Campylaspis maculata</i>	80–480	6–250
<i>Campylaspis quadridentata</i>	390–520	406–506
<i>Procampylaspis compressa</i>	350–630	350–1223
<i>Paralamprops asper</i>	610–630	85–650
<i>Paralamprops mawsoni</i>	340–630	40–300
<i>Paralamprops serratocostatus</i>	3674	230
<i>Diastylis anderssoni armata</i>	260–630	124–810
<i>Diastylis corniculata</i>	240–630	218–650
<i>Diastylis enigmatica</i>	240–260	270–280
<i>Diastylis helleri</i>	80–610	0–70
<i>Diastylis mawsoni</i>	340–630	124–582
<i>Diastylopsis goekei</i>	240–630	2–430
<i>Leptostylis antipus</i>	240–630	12–310
<i>Makrokyllindrus inscriptus</i>	260–630	799–2012

known only from 230 m depth, collected by the "Challenger Expedition" (Sars, 1887; Corbera, 2000). Narrower range extensions of vertical distribution were noted for *P. mawsoni*, *Diastylis helleri* and *Makrokyllindrus inscriptus* (table 5).

Large egg sizes in the Weddell Sea cumaceans are above or partly in the upper range given by Corey (1981) for Subarctic and Arctic species; body sizes are mostly in the upper range and fecundity well within this range (tables 2-4). The large size of eggs in the harsh Antarctic climate, with its very long unfavourable season, is in line with findings that crustaceans (daphnids; Trubetskova & Lampert, 1995) produce smaller numbers of larger-sized eggs under unfavourable conditions, yielding more robust young (Gliwicz & Guisande, 1992) than under favourable conditions. However, it is also in line with findings that body size and egg size are positively correlated, while each is negatively correlated with ambient temperature (mysids; Wittmann, 1984).

Most species showed few or no incubating females during summer (table 2). This was previously observed in certain cumaceans (Granger et al., 1979), mysids (Mauchline, 1980; Wittmann, 1984, 1996), benthic amphipods (Thurston, 1974) and polychaetes (Curtis, 1977) in subpolar and polar regions, and was emphasized to result from timing of reproduction in order to release young during periods of high food availability. A favourable timing is mostly achieved by fecundation in autumn or winter and release of young in spring or summer. This concept fails for *Diastylopsis goekei* and possibly also for *Diastylis mawsoni*, which showed high numbers (table 2) of females carrying eggs at early (*Diastylopsis goekei*) or later (*Diastylis mawsoni*) stages of development during summer. The occurrence of summer breeders is also known from certain cumaceans (Corey, 1981) in northern polar environments and may indicate alternative strategies for the timing of reproduction.

6. Acknowledgements

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