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Hystrignathus dearmasi sp. n. (Oxyurida, Hystrignathidae), first record of a nematode parasitizing a Panamanian Passalidae (Insecta, Coleoptera)

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Abstract

Hystrignathus dearmasi sp. n. (Oxyurida: Hystrignathidae) is described from an unidentified passalid beetle (Coleoptera: Passalidae) from Panama. It resembles *H. cobbi* Travassos & Kloss, 1957 from Brazil, by having a similar form of the cephalic end, extension of cervical spines and absence of lateral alae. It differs from the latter species by having the body shorter, the oesophagus and tail comparatively larger, the vulva situated more posterior and the eggs ridged. This species constitutes the first record of a nematode parasitizing a Panamanian passalid.

Keywords

Nematoda, Hystrignathidae, *Hystrignathus*, Passalidae, *Passalus*, Panama

Introduction

The family Hystrignathidae includes a large number of monoxenous nematodes from passalid beetles. At present, more than 100 species have been described from North America, Mexico, Cuba, Lesser Antilles, Brazil, Africa, Madagascar and Australasia.

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The type genus of the family, *Hystrignathus* Leidy, 1850, is characterized by having a single cephalic annule, the cervical cuticle armed with opposite rows of spines, procorpus clavate and genital tract didelphic-amphidelphic (Adamson and Van Waerebeke 1992). At present, 21 species are described, 11 of which are from Brazil, where the group have received major attention (Travassos and Kloss 1957a, b, 1958). The rest of the nominal species are known from North America, Cuba, Trinidad, Venezuela, Ivory Coast and Madagascar (Leidy 1850, Van Waerebeke 1973, Guerrero 1980, Hunt 1982, Van Waerebeke and Remillet 1982, García et al. 2009).

The family Passalidae in Panama comprises about 60 species belonging to 16 genera (de Armas, pers. comm.). Despite such diversity there are no records of parasitic nematodes from Panamanian passalid beetles. In general, parasitological surveys of passalids are scarce in Central America. The few studies that have been carried out are restricted to the area of the Yucatan peninsula, Mexico (Coy and García 1995, García and Coy 1997).

In this paper a new species of *Hystrignathus* from Panama is described. It constitutes the first record of a parasitic nematode from passalid beetles for this country.

Material and methods

Two specimens of an unidentified small, blackish passalid beetle were collected by hand on rotting logs from the Summit National Park, Panama Province, Panama.

Hosts were killed by decapitation and the last abdominal segments were removed in order to extract the guts that were fixed and conserved in 70% ethanol. Intestines were dissected as soon as possible in Petri dishes with 70% ethanol under a stereomicroscope. The nematodes found were removed and fixed in 70% ethanol.

Nematodes were transferred and cleared in glycerine via slow evaporation method and mounted in the same medium. The edges of the coverslips were sealed using nail polish. Measurements were taken as in Morffe et al. (2009) and are expressed in millimetres, except where indicated. De Man's ratios a, b, c and V% were calculated. Each variable is shown as the range followed by the mean plus standard deviation in parentheses, the number of measurements is also given. Micrographs were obtained with the aid of an AxioCam digital camera attached to a Carl Zeiss AxioScop 2 Plus compound microscope. Line drawings were made with the softwares CorelDRAW X3 and Adobe Photoshop CS2 using the micrographs as templates. Scale bars of all plates are given in millimetres.

The type-material is deposited in the Colección Helmintológica de las Colecciones Zoológicas (CZACC) from the Instituto de Ecología y Sistemática, Havana, Cuba and the Coleçao Helmintologica do Instituto Oswaldo Cruz (CHIOC), Rio de Janeiro, Brazil.

Systematics

Genus *Hystrignathus* Leidy, 1850

***Hystrignathus dearmasi* sp. n.**
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Fig. 1 A–H, Fig. 2 A–E

Type material. ♀ holotype, Panama, Panama Province, Summit National Park; in unidentified short, blackish Passalidae; 25.IX.2009; L. F. de Armas coll.; CZACC 11.4604. Paratypes: 6 ♀♀, same data as holotype, CZACC 11.4605–11.4610; 2 ♀♀, CHIOC, same data as holotype.

Measurements. Holotype (female) a = 8.62, b = 4.89, c = 7.24, V% = 57.46, total length = 1.810, maximum body width = 0.210, first cephalic annule (length×width) = 0.013×0.055, stoma length = 0.045, procorpus length = 0.295, isthmus length = 0.025, diameter of basal bulb = 0.090, total length of oesophagus = 0.370, nerve ring to anterior end = 0.213, excretory pore to anterior end = 0.480, vulva to posterior end = 0.770, anus to posterior end = 0.250, eggs = 0.095–0.110×0.043–0.048 (0.099 ± 0.007×0.046 ± 0.002 n = 4).

Paratypes (females) (n = 8): a = 7.81–9.37 (8.61 ± 0.58 n = 8), b = 4.17–5.35 (4.84 ± 0.51 n = 6), c = 6.19–8.16 (7.14 ± 0.59 n = 8), V% = 54.27–60.00 (56.69 ± 2.05 n = 7), total length = 1.300–1.780 (1.549 ± 0.179 n = 8), maximum body width = 0.158–0.210 (0.180 ± 0.019 n = 8), first cephalic annule (length×width) = 0.010–0.015×0.048–0.055 (0.013 ± 0.001×0.052 ± 0.003 n = 7), stoma length = 0.038–0.045 (0.041 ± 0.004 n = 8), procorpus length = 0.230–0.273 (0.248 ± 0.016 n = 8), isthmus length = 0.020 (n = 1), diameter of basal bulb = 0.070–0.085 (0.077 ± 0.005 n = 8), total length of oesophagus = 0.300–0.350 (0.325 ± 0.019 n = 6), nerve ring to anterior end = 0.175–0.190 (0.184 ± 0.007 n = 4), excretory pore to anterior end = 0.420–0.450 (0.433 ± 0.015 n = 4), vulva to posterior end = 0.590–0.770 (0.686 ± 0.073 n = 7), anus to posterior end = 0.190–0.250 (0.218 ± 0.023 n = 8), eggs = 0.088–0.103×0.038–0.055 (0.097 ± 0.005×0.046 ± 0.004 n = 16).

Description. Female body robust, slightly fusiform. Cuticle strongly annulated in spiny region (annule c.5 μm width) and less in rest of body. Cervical cuticle armed with spines from some distance beyond stoma (distance about length of stoma) almost to end of procorpus. Spines arranged initially in c. 16 apposite rows that do not seem to increase consistently where they terminate. Anterior spines short and wide, scale-like, becoming sharply pointed but still short toward end of rows. Sub-cuticular longitudinal striae present. Lateral alae absent. Head bearing 8 paired papillae, set-off from body by single groove. First cephalic annule cone-like and truncated, not inflated, c.1.5 head lengths long. Stoma short, wide, about 4 first annule lengths long, surrounded by oesophageal collar. Oesophagus consists of muscular procorpus whose diameter increases slightly and gradually, well set-off

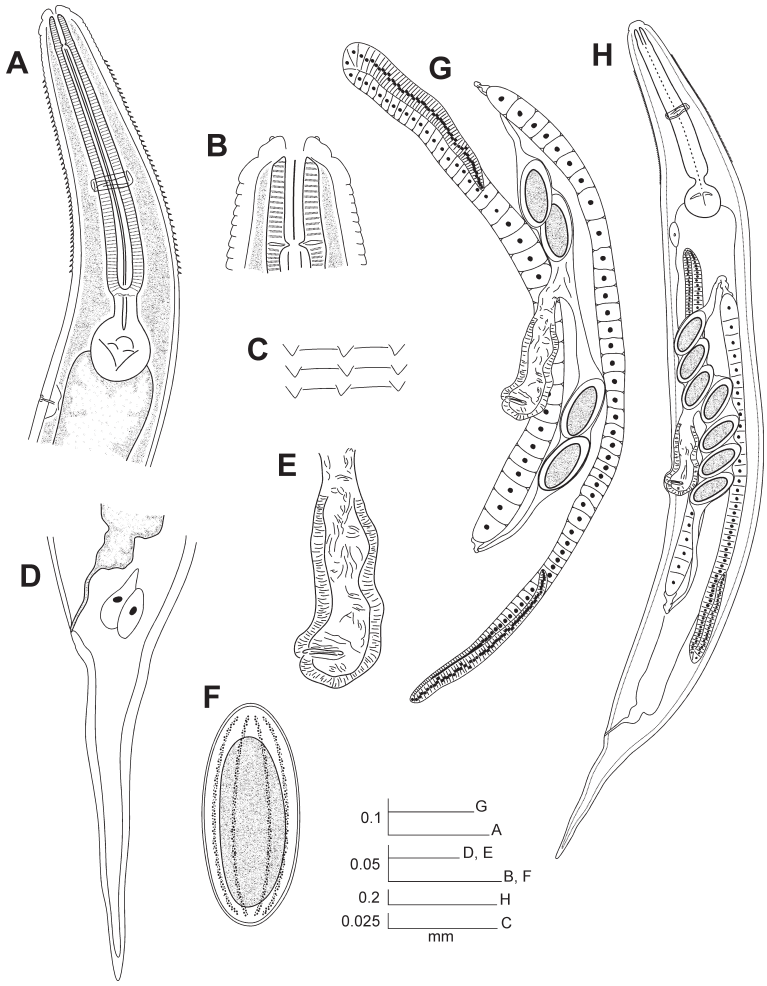

Figure 1. *Hystrignathus dearmasi* sp. n. female. **A** Esophageal region, lateral view **B** Cephalic region and stoma **C** Cervical spines **D** Tail, lateral view **E** Vulva, ventro-lateral view **F** Egg **G** Genital tracts **H** Entire nematode.

from short isthmus. Intestine simple, sub-rectilinear, its fore region inflated. Rectum short, anus not prominent. At least with 2, large, ovoid, rectal glands with central nuclei at level of rectum. Nerve ring encircles procorpus at about its midpoint. Excretory pore located at about half of body width posterior to basal bulb. Vulva a median transverse slit slightly displaced towards posterior half of body, lips very prominent. Vagina muscular, forwardly directed. Genital tract didelphic-amphidelphic. Ovaries reflexed. Anterior ovary shorter, reflexed just posterior excretory pore, posterior ovary reflexed at slightly more than body width before anus. Both flexures about 2 body-widths long. Eggs ovoid, numerous, bearing 8 longitudinal, slightly prominent ridges on shell. Tail comparatively short, conical, attenuated, sharply pointed. Male unknown.

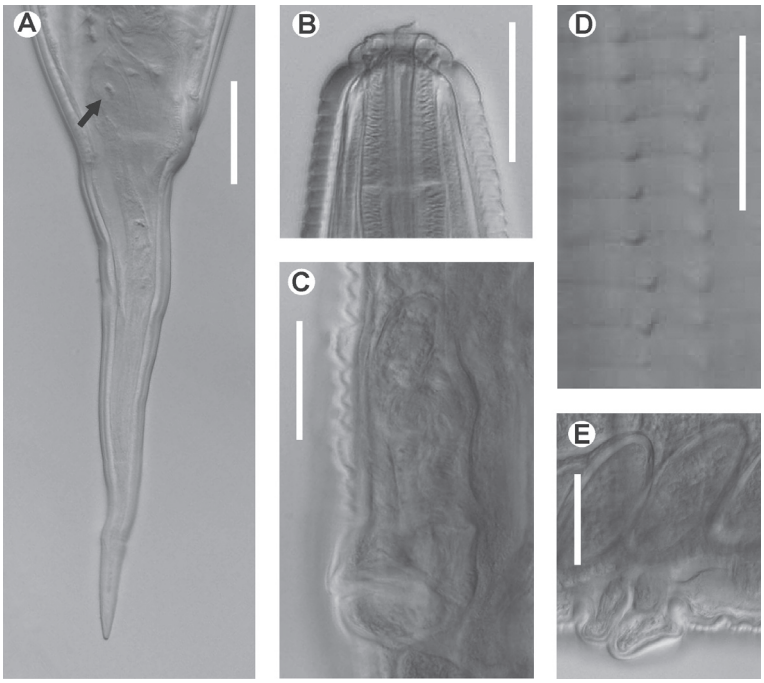

Figure 2. *Hystrignathus dearmasi* sp. n. female. **A** Tail, lateral view (arrow shows therectal glands) **B** Cephalic region and stoma **C** Vulva, ventro-lateral view **D** Cervical spines **E** Prominent lips of the vulva, lateral view. Scale bars: A, B, C, E. 0.05 mm; D. 0.025 mm.

Differential diagnosis. *H. dearmasi* sp. n. is similar to *H. cobbi* Travassos & Kloss, 1957 from Brazil, since both have a similar form of the cephalic end, spines commencing posterior to the stoma (feature unique in the genus) and the apparent absence of lateral alae (Travassos and Kloss 1957b). From the latter, *H. dearmasi* sp. n. differs by having the body consistently shorter (1.300–1.81 *vs.* 2.432–2.79), but the tail (c = 6.19–8.16 *vs.* 14.48–16.61) and oesophagus (b = 4.17–5.35 *vs.* 5.68–6.30) comparatively longer. The vulva is located further forward in *H. dearmasi* sp. n. (V%: 54.27–60.00 *vs.* 62.25–64.37). The eggs of *H. cobbi* have smooth shells instead of the ridged eggs of *H. dearmasi* sp. n.

H. heliae Travassos & Kloss, 1957, from Brazil, has a similar cephalic end, but can be differentiated by the length of the stoma, which hardly surpasses the base of the first cephalic annule, and spines starting at the end of the cephalic annule. In *H. dearmasi* sp. n. the stoma is notably longer and the spines commence at some distance posterior to it.

Type host. Unidentified, short, blackish passalid beetle (Coleoptera: Passalidae).

Site. Gut caeca.

Type locality. Summit National Park, Panama Province, Panama.

Etymology. The specific epithet honours Dr. Luis F. de Armas Chaviano, an eminent Cuban aracnologist and the collector of the type-host.

Key to the species of the genus *Hystrignathus*

Note: In the following key we omit two species of Cuban hystrignathids formerly placed in the genus *Hystrignathus*, because they will be published in the future as new combinations.

1. Rows of spines commencing to some distance posterior to the stoma **2**
– Rows of spines commencing just after the end of the first cephalic annule ... **3**
2. Tail very short (c = 14.48–16.61); eggs with smooth shell..... ..... ***H. cobbi*** **Travassos & Kloss, 1957**
– Tail longer (c = 6.19–8.16); eggs with less prominent ridges on the shell ....***H. dearmasi*** **Morffe & García, sp. n.**
3. One ovary atrophied..... ***H. inegalis*** **Van Waerebeke & Remillet, 1982**
– Both ovaries well developed **4**
4. First cephalic annule long and notably inflated **5**
– First cephalic annule shorter and less inflated..... **7**
5. Eggs with smooth shell **6**
– Eggs with ridged shell ..... ***H. splendidus*** **Morffe & García, 2010**
6. Oesophagus longer than the tail..... ***H. tarda*** **(Artigas, 1928)**
– Oesophagus as longer as the tail.....***H. inflatus*** **Travassos & Kloss, 1957**
7. Stoma not extending further than end of the first cephalic annule **8**
– Stoma extending further than end of the first cephalic annule..... **9**
8. Spines ending at the level of the excretory pore; tail longer (c =8.63) .... ***H. paulistanus*** **Cordeira, 1981**
– Spines ending at the end of the basal bulb; tail shorter (c = 9.61)..... .....***H. papillophorus*** **Cordeira, 1981**
9. Eggs with a ridged shell..... **10**
– Eggs with a smooth shell..... **15**
10. First cephalic annule very short, much less than half the stoma length **11**
– First cephalic annule longer, about half the stoma length .... ***H. metropolitanus*** **Cordeira, 1981**
11. Lateral alae surpass the level of the vulva..... **12**
– Lateral alae do not surpass the level of the vulva..... **13**
12. Tail markedly attenuate and comparatively short (c = 6.0–7.6) ....***H. egalis*** **Van Waerebeke & Remillet, 1982**
– Tail markedly subulate and comparatively large (c = 3.64–4.81) ....***H. rescens*** **Travassos & Kloss, 1958**
13. Spines terminate at a short distance (less than a body-width) posterior to basal bulb **14**
– SSpines terminate at a longer distance (about a body-width) posterior to basal bulb .....***H. ferox*** **Hunt, 1982**

14. Lateral alae end at the level of the vulva; tail comparatively larger (c = 3.38–3.98) ..... ***H. rosario*** **García, Ventosa & Morffe, 2009**
– Lateral alae end before the level of the vulva; tail comparatively shorter (c = 5.71–6.86) ..... ***H. rugosus*** **Travassos & Kloss, 1958**
15. Spines terminate before the basal bulb **16**
– Spines terminate after the basal bulb **19**
16. Lateral alae present **17**
– Lateral alae not present ..... ***H. popiliophagus*** **Guerrero, 1980**
17. Spines cease at the end of the bulb; tail very short (c = 7.88–10.66) ..... ***H. heliae*** **Travassos & Kloss, 1957**
– Spines cease before the end of the bulb; tail longer (c < 7) **18**
18. Lateral alae end just before the anus ..... ***H. insularis*** **Van Waerebeke, 1973**
– Lateral alae end at certain distance before the anus ..... ***H. meridensis*** **Guerrero, 1980**
19. Spines terminate at the level of the excretory pore **20**
– Spines terminate slightly anterior to the excretory pore ..... ***H. rigidus*** **Leidy, 1850**
20. Stoma very short, hardly surpassing the end of the first cephalic annule ..... ***H. pearsoni*** **Travassos & Kloss, 1958**
– Stoma longer, clearly surpassing the end of the first cephalic annule ..... ***H. spinosus*** **Travassos & Kloss, 1957**

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RESEARCH ARTICLE

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Descriptions of two new species in the genus *Macrostylis* Sars, 1864 (Isopoda, Asellota, Macrostylidae) from the Weddell Sea (Southern Ocean), with a synonymisation of the genus *Desmostylis* Brandt, 1992 with *Macrostylis*

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Abstract

Descriptions of *Macrostylis antennamagna* **sp. n.** and *M. uniformis* **sp. n.** are presented with notes on intraspecific variability and sexual dimorphism. *M. uniformis* **sp. n.** showes differences to *M. antennamagna* **sp. n.** in the length of the antenna 2, the shape of the pleotelson and length of uropods.

The genus *Desmostylis* Brandt, 1992 (formerly including the two species *D. obscurus* Brandt, 1992 and *D. gerdesi* Brandt, 2002) is synonymised with the genus *Macrostylis*. Based on type material additional remarks and additions to the original descriptions are provided for both species. Results lead to following nomenclatorial changes: *M. obscurus* (Brandt, 1992), **comb. n.** and *M. gerdesi* (Brandt, 2002), **comb. n.** A setal nomenclature is proposed and the diagnosis for the family is revised.

Keywords

Antarctic, deep sea, *Macrostylis uniformis* sp. n., *Macrostylis antennamagna* sp. n., ANDEEP, Janiroidea, taxonomy, macrobenthos

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Introduction

During recent ANDEEP I–III cruises (ANtarctic benthic DEEP-sea biodiversity: colonization history and recent community patterns (Brandt et al. 2004a)), isopods have been found to be an important component of the Southern-Ocean deep sea (in terms of both richness and abundance). Most of the collected isopods belonged to the suborder Asellota Latreille, 1802 (Brandt et al. 2004b, Brandt et al. 2007a). Among these, the family Macrostylidae Hansen, 1916 showed a remarkable species richness (Brandt et al. 2004, 2007, Kaiser et al. 2007).

Macrostylidae have been suggested to be a specialized endobenthic component of deep-sea macrofauna (Harrison 1989, Hessler and Strömberg 1989). They have been regularly reported from deep-sea samples (e.g. Menzies 1962, Wolff 1962, Menzies and George 1972, Brandt 2002, Wilson 2008, Vey and Brix 2009).

This taxon consists of two genera: *Macrostylis* Sars, 1864 and *Desmostylis* Brandt, 1992. Species of *Desmostylis* have been reported from the Antarctic shelf (*D. gerdesi* Brandt, 2002; 238 m) and deep sea (*D. obscurus* Brandt, 1992; 4335 m). Species of *Macrostylis* have been reported from all major marine realms, from near-shore and deeper sublittoral habitats (e.g. *M. spinifera* Sars, 1864 from 27–1761 m) to hadal regions (e.g. *M. mariana* Mezhov, 1993; 10223–10730 m, e.g. deepest isopod record), and thus Macrostylidae has the widest depth range amongst all isopod families (Tab. 2).

To date, 78 valid macrostylid species are known worldwide of which ten occur in the Southern Ocean (Tab. 2). During the ANDEEP cruises at least 33 species of Macrostylidae have been collected, of which 23 where unlike any previously described species (Vey and Brix 2009). In the current paper, two of these previously unknown species, *M. unifomis* sp. n. and *M. antennamagna* sp. n. are described. Based on type material, additions to the original description of *D. obscurus* is presented and close examination of characters led to a rejection of the genus *Desmostylis*. It has been found synonymous with *Macrostylis*.

Material and methods

Specimens used for species descriptions were collected at four stations in the northern and south-eastern Weddell Sea during the ANDEEP II–III expeditions with RV Polarstern. These cruises took part in Austral summer 2001/2002 and 2004/2005. An epibenthic sledge was used for sampling (Brenke 2005 and references therein). On board samples were immediately transferred into 96% pre-cooled ethanol and stored at -20° for at least 48 h. Samples were sorted into major groups on board. Sorting of isopods to family level has been continued in the laboratories of the Zoological Museum, Hamburg.

For habitus drawings and dissections of limbs, specimens were transferred into glycerine. Habitus were photographed in deionized water or glycerine. For identifications and pencil habitus sketches a Leica MZ12.5 with a camera lucida was used (max. 100 ×). Specimens were stained in high-concentration water solution of

methylene green or stained glycerine (glycerol with methylene green). Limbs and habitus of small specimens were drawn using a Leica DM 2500 with camera lucida (max. 800 × with phase contrast). For digital photographs a Keyence VHX-500FD digital microscope with two lenses (VH Z20R & VH Z100R) was applied. Limbs were fixed on temporal or permanent slides. Temporal slides were made using stained glycerine. Permanent slides were made using Hydro-Matrix. Pencil drawings were scanned as grayscale PDF. Line drawings were made from pencil drawings and stack photos using Adobe Illustrator and WACOM Intuos digitizer boards following Coleman (2003, 2009).

Ratios were calculated from measurements made from the line drawings. Measurements were made following the method of Hessler (1970). They were taken using the distance measurement and cumulative distance measurement tools imbedded in Adobe Acrobat Professional. All appendages´ article-length ratios are given in proximal to distal order, excluding setae. Body lengths are given in anterior-posterior order excluding appendages. Ratios were rounded to first position after decimal point. Only one or two specimens were precisely measured for each description. Thus, a certain number provided here guarantees only to be within an unknown range of variation.

Terminology is based on Hessler (1970), Wilson (1989) and Larsen (2003) with several additions and modifications. Setal nomenclature follows Hessler (1970) and is updated after Larsen (2003) and Garm (2004). See also Figs 1–2. Type material examined is listed in Table 1.

Abbreviations. AMNH - American Museum of Natural History, New York City; **NHM**- Natural History Museum, London, UK; **NMNH** - National Museum of Natural History, Washington, D.C.; **ZMB** - Museum für Naturkunde, Berlin, Germany; **ZMH** - Zoological Museum Hamburg, University of Hamburg, Germany; **ZMUC** - Zoologisk Museum, University of Copenhagen, Denmark

Taxonomy

Asellota Latreille, 1802
Macrostylidae Hansen, 1916

Desmosomidae Sars, 1899

Macrostylini Hansen, 1916, p. 74; Wolff, 1956, p. 99
Macrostylinae Birstein, 1973
Macrostylidae Gurjanova, 1933, p. 411; Menzies 1962a, p. 28; 1962b, p. 127; Wolff 1962, Menzies and George 1972, p. 79–81; Wägele 1989, Brandt 1992; 2002; 2004; Birstein 1970, Kussakin 1999, p. 336, Mezhov 1988, p. 983–994; 1992, p. 69

Composition. *Macrostylis* Sars, 1864
Type genus. *Macrostylis* Sars, 1864

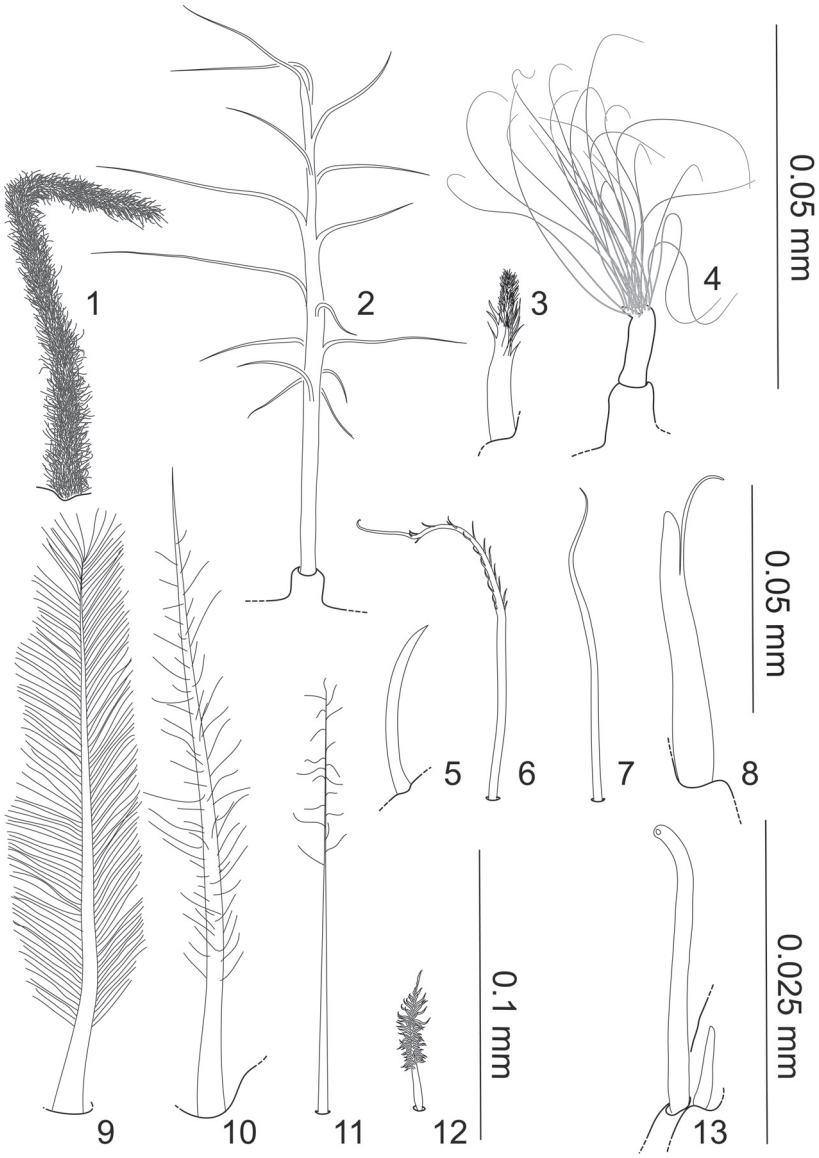

Figure 1. 1–13 Specialized setae, all articulating infracuticularly, except when mentioned otherwise; **1** Sensilla, pappose seta, shaft densely covered with fringe-like appearing setules; on pereopod 1–3 dactyli **2** broom seta, pedestal pappose seta **3** sensilla, distally pappose seta, densely covered with fringe-like appearing setules, showing a gradual transition from denticles to setules; on distal margins of maxilliped palp and on pereopods **4** tuft seta, a pedestal pappose seta, setule bases closely together, continuous transition to shaft cuticle; only known from distal articulation margin of 5. article in antenna 2 **5, 7** simple setae, short **5** on general cuticle and pereopodal basis **6–8, 12** different setal types, on lateral margin of pleopod cavity and operculum **6** plumose seta with few short setules on distal half **8** spine-like unequally bifid seta **12** small pappose seta, with short setules **9** "feather-like" plumose seta like at pleopod 3 apex **10–11** pappose setae, on operculum distal apex and pleopod 2 distal apex **13** simple tubular seta with big apical pore and associated small simple seta, on antenna 1 articles and antenna 2 flagellar articles.

Diagnosis. Cephalothorax free, about as broad as long. Body elongated. Eyes absent. Antenna 1 small, number of articles variable (1–9). Antenna 2 short or only moderately long, with articles 1–3 together about as long as articles 4 and 5 respectively, squama absent. Mandible with pars molaris reduced, subacute triangular and setiferous on apex; palp absent; lacinia mobilis ambilateral. Maxilliped with long and narrow basis; subtriangular epipod subequal in length to basis; palp articles 1–3 expanded and articles 4–5 minute.

Pereonites 1–3 constituting separate subquadrangular section with tightly articulated segments but tergite borders visible: fossosome. Pereonites 4–7 articulated moveably, constricted anteriorly. Pereopods 1–4 fossorial; pereopods 1–3 dactylus with 2 (anterior and posterior) subterminally inserting claws and posterior to both claws with elongated expansion, proximodorsally to claws with 2–3 sensillae, exceeding the distal tip in length. Pereopod 3 most robust, strongly setiferous, ischium extended dorsally, with row of long setae, with 1–2 apical setae strongly pronounced (spine-like, thickened, bent), merus distally extended; orientation of propodus twisted 180° along proximo-distal axis compared to pereopods 1–2, hence, propodus and dactylus bent in dorsal direction instead of ventral. Pereopod 4 shortest, bent laterally at mero-carpal articulation, directed in lateral or laterodorsal position. Posterior pereopod articles elongate subcylindrical. Pereopodal coxae inserted lateroventrally.

Coxae 1–3 inserted at anteriolateral margins of pereonites, coxae 4 inserted medially, coxae 5–7 inserted under posterolateral protrusions.

Sternite of pleonite 1 distinguishable; pleopodal articulations merged together at anterior margin of branchial cavity; anus subterminally, separated from branchial cavity in longitudinal ventrocaudal excavation stretching from branchial cavity to pleotelson apex. Female operculum oblong, distally with long pappose setae covering anal chamber. Uropods with 1-, 2- or many articles, elongated, terminally articulated, uniramous. Pleotelson with a pair of statocysts.

Genus *Macrostylis* G.O. Sars, 1864

Macrostylis Sars, 1864, p.13; 1899, p. 120; Beddard 1886b, p. 173; Hansen 1916, p. 75; Barnard 1920, p. 411; Wolff 1956, p. 99–106, 1962, p. 91–93; Menzies 1962, p. 127–133; Birstein 1963a, p. 95–106; Mezhov 1988, p. 60–69; Brandt 1992, p. 74–78; Vey and Brix 2009, p. 358
Vana Meinert 1890, p. 195
Desmostylis Brandt 1992, p.70, Figs 11–13

Composition. See Table 2.

Type species. *Macrostylis spinifera* Sars, 1864

Diagnosis. As of the family.

Remarks. Some characters are absent or poorly illustrated in original descriptions and could not be analysed thoroughly during this study. Therefore these have not been

Table 1. Type material examined for comparison. *Macrostylis longiremis* (Meinert, 1890) is labelled as *Vana longiremis* Meinert, 1890. *M. obscurus* (Brandt, 1992) and *M. gerdesi* (Brandt, 2002) are labelled as the genus *Desmostylis*.

Scientific Name	Museum no	Type status
Macrostylis abyssalis Brandt, 2004	ZMH K-40284	Holotype
Macrostylis abyssalis Brandt, 2004	ZMH K-40285	Paratype
Macrostylis abyssicola Hansen, 1916	ZMUC CRU-5037	Syntypes
Macrostylis abyssicola Hansen, 1916	ZMUC CRU-5038	Syntypes
Macrostylis abyssicola Hansen, 1916	ZMUC CRU-5046	Syntypes
Macrostylis angolensis Brandt, 2004	ZMH K-40280	Holotype
Macrostylis angolensis Brandt, 2004	ZMH K-40281	Paratype
Macrostylis bifurcatus Menzies, 1962	AMNH 12126	Holotype
Macrostylis bifurcatus Menzies, 1962	AMNH 12268	Paratype
Macrostylis bipunctatus Menzies, 1962	AMNH 12056	Holotype
Macrostylis bipunctatus Menzies, 1962	AMNH 12057	Allotype
Macrostylis bipunctatus Menzies, 1962	AMNH 12262	Paratype
Macrostylis bipunctatus Menzies, 1962	AMNH 12277	Paratype
Macrostylis bipunctatus Menzies, 1962	AMNH 12265	Paratype
Macrostylis caribbicus Menzies, 1962	AMNH 12072	Holotype
Macrostylis cerritus Vey & Brix, 2009	ZMH K-41431	Holotype
Macrostylis cerritus Vey & Brix, 2009	ZMH K-41432	Paratype
Macrostylis cerritus Vey & Brix, 2009	ZMH K-41433	Paratype
Macrostylis cerritus Vey & Brix, 2009	ZMH K-41434	Paratype
Macrostylis dellacrocei Aydogan, Wägele & Park 2001	ZMB 27338	Holo- and Paratypes
Macrostylis elongata Hansen, 1916	ZMUC CRU6348	Holotype
Macrostylis galatheae Wolff, 1956	ZMUC CRU6509	Syntypes
Macrostylis gerdesi (Brandt, 2002), comb. n.	ZMH K-39915	Holotype
Macrostylis gerdesi (Brandt, 2002), comb. n.	ZMH K-39916	Paratype
Macrostylis hadalis Wolff, 1956	ZMUC CRU-6647	Holotype
Macrostylis hadalis Wolff, 1956	ZMUC CRU-6648	Allotype
Macroistylis hirsuticaudis Menzies, 1962	AMNH 12122	Holotype
Macroistylis hirsuticaudis Menzies, 1962	AMNH 12122A	Allotype
Macroistylis hirsuticaudis Menzies, 1962	AMNH 12123	Paratypes
Macrostylis longifera George & Menzies, 1972	USNM 121743	Non-type
Macrostylis longifera George & Menzies, 1972	USNM 121746	Allotype
Macrostylis longifera George & Menzies, 1972	USNM 121745	Holotype
Macrostylis longifera George & Menzies, 1972	USNM 121747	Paratype
Macrostylis longipedis Brandt, 2004	ZMH K-40278	Holotype
Macrostylis longipedis Brandt, 2004	ZMH K-40279	Paratype
Macrostylis longipes Hansen, 1916	ZMUC CRU-7126	Holotype
Macrostylis longispinis Brandt, 2004	ZMH K-40286	Holotype
Macrostylis longiremis (Meinert, 1890)	ZMUC CRU-7131	Syntype
Macrostylis longiremis (Meinert, 1890)	ZMUC CRU-9596	Syntype
Macrostylis magnifica Wolff, 1962	ZMUC CRU-7189	Holotype

Scientific Name	**Museum no**	**Type status**
Macrostylis meteorae Brandt, 2004	ZMH K-40282	Holotype
Macrostylis meteorae Brandt, 2004	ZMH K-40283	Paratype
Macrostylis minutus Menzies, 1962	AMNH 12059	Holotype
Macrostylis minutus Menzies, 1962	AMNH 12060	paratype
Macrostylis minutus Menzies, 1962	AMNH 12203	Paratypes
Macrostylis minutus Menzies, 1962	AMNH 12202	Paratypes
Macrostylis obscurus Brandt, 1992, comb. n.	BM (NH) 1990:39:1	Holotype
Macrostylis robusta Brandt, 2004	ZMH K-40277	Paratype
Macrostylis robusta Brandt, 2004	ZMH K-40695	Paratype
Macrostylis robusta Brandt, 2004	ZMH K-40696	Paratype
Macrostylis robusta Brandt, 2004	ZMH K-40697	Paratype
Macrostylis sarsi Brandt, 1992	BM (NH) 1990:40:1	Holotype
Macrostylis setifer Menzies, 1962	AMNH 12058	Holotype
Macrostylis subinermis Hansen 1916	ZMUC CRU-8301	Syntype
Macrostylis subinermis Hansen 1916	ZMUC CRU-8302	Syntype
Macrostylis subinermis Hansen 1916	ZMUC CRU-8303	Syntypes
Macrostylis subinermis Hansen 1916	ZMUC CRU-8304	Syntypes
Macrostylis subinermis Hansen 1916	ZMUC CRU-8305	Syntypes
Macrostylis subinermis Hansen 1916	ZMUC CRU-8306	Syntype
Macrostylis trucatex Menzies, 1962	AMNH 12065	Holotype
Macrostylis vemae Menzies, 1962	AMNH 12074	Holotype
Macrostylis vemae Menzies, 1962	AMNH 12075	Allotype
Macrostylis vemae Menzies, 1962	AMNH 12076	Paratypes
Macrostylis vemae Menzies, 1962	AMNH 12204	Paratypes

included in the family diagnosis (e.g. presence of exopod of pleopod 5, setation patterns and setal substructures).

Following the original description (Brandt 1992), *Desmostylis* can be separated from *Macrostylis* by the following characters: absence of dorsal triangular expansion on the pereopod 3 ischium, lack of dactylus on pereopod 4 and of claws on pereopods 5–7. However, after comparisons of different species of *Macrostylis*, and re-examination of the holotype of *Desmostylis obscurus* Brandt, 1992 these characters have been found not to be delimitating *Desmostylis* from *Macrostylis*. Shape and extension of pereopod 3 ischium varies greatly between species of *Macrostylis*. For example *M. galatheae* Wolff, 1956 (p. 101, Fig. 17) has a strong and acute extension and no extension is present in *M. abyssalis* Brandt, 2004 (p. 28, Fig. 15), very similar to *D. obscurus*. However, another described species of *Desmostylis*, *D. gerdesi* Brandt, 2002 shows a strongly fossorial pereopod 3 bearing a prominent dorsal extension on the ischium. Thus, the condition of this character in *Desmostylis* lies within the interspecific range of variation in *Macrostylis*. Therefore, this character is not usable to maintain the genus *Desmostylis*.

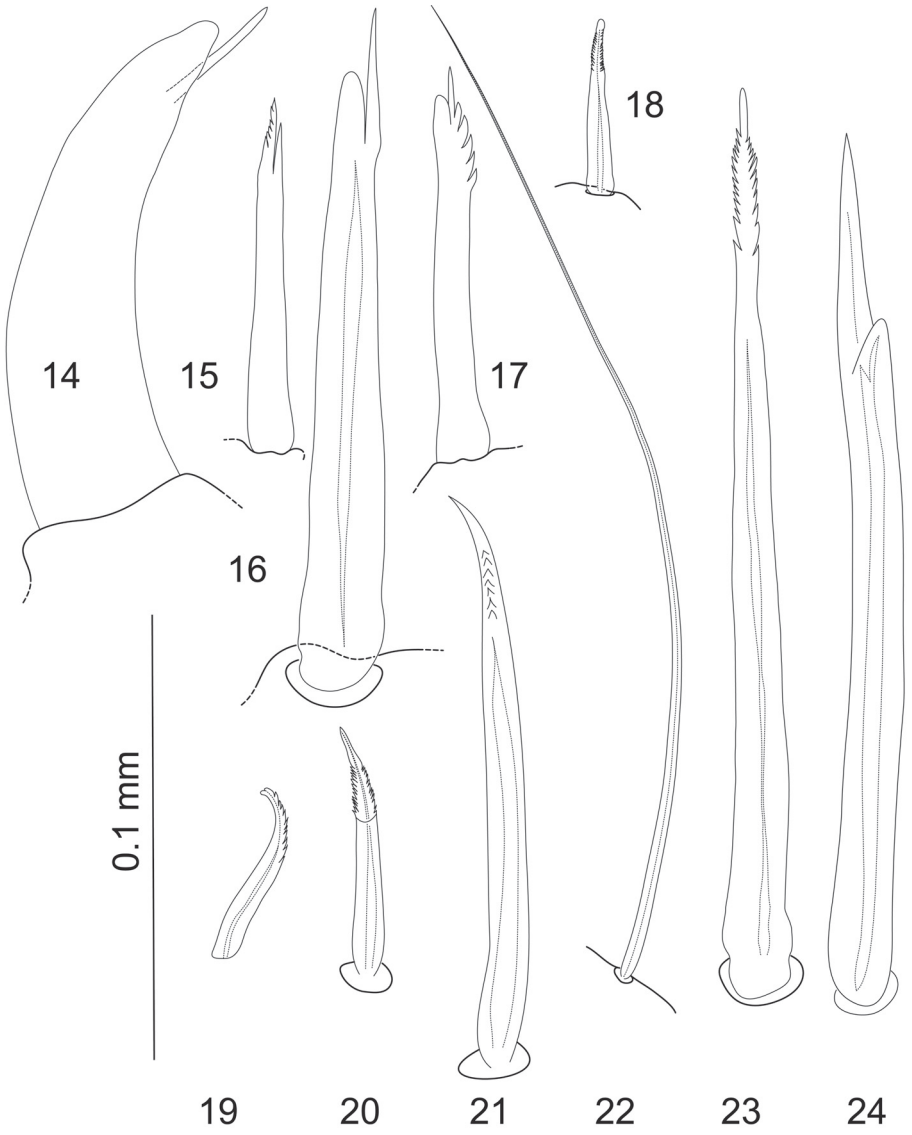

Figure 2. 14–24 Most common pereopodal setae, occurring e.g. on dorsal and ventral margins of all pereopodal articles; **14–16** unequally bifid setae **15, 17, 18–21, 23** serrate setae **22** simple seta, very long and slender **24** bifurcate seta. Lumen indicated by dotted lines where visible in light microscopy. Scale bar = 0.1 mm.

The absence of a pereopod 4 dactylus was another generic character of *Desmostylis*. However, the dactyli in *D. obscurus* are not absent but have been overseen in the original description and they were distorted in the pereopod illustrated of the holotype. The value of differences in setal counts or occurrence of types of setae on pereopod 3 ischium for discriminating between two genera is not known. The genus *Desmostylis*

Table 2. Composition and distribution of Macrostylidae Hansen, 1916.

Taxon	Locality	Depth (m)
Macrostylis G. O. Sars, 1864		
abyssalis Brandt, 2004	S Atlantic, Angola Basin	5389
abyssicola Hansen, 1916	NW Atlantic, Davis Strait	698–3921
affinis Birstein, 1963	NW Pacific	4690–5554
amplinexa Mezhov, 1989b	Indian Ocean	2385–4221
angolensis Brandt, 2004	SE Atlantic, Angola Basin	5395
angulata Mezhov, 1999	NE Atlantic	5420–6051
antennamagna sp. n.	Southern Ocean, NW Weddell Sea	4698–4760
belyaevi Mezhov, 1989a	N Pacific	8540–8780
bifurcatus Menzies, 1962	SE Atlantic	4588–4960
bipunctatus Menzies, 1962	SW Atlantic	3954–5024
birsteini Mezhov, 1993	S Pacific	1200
capito Mezhov, 1989b	Indian Ocean	2218–4737
caribbicus Menzies, 1962	W Atlantic, Caribbean, Columbia	2875–941
carinifera carinifera Mezhov, 1988	Indian Ocean	3074–4458
carinifera dilatata Mezhov, 1988	Indian Ocean	2540
cerritus Vey & Brix, 2009	Southern Ocean, Weddell Sea	2149
compactus Birstein, 1963	W Pacific, Bougainville Trench	6920–7954
confinis Mezhov, 2003	NW Indian Ocean	3617
curticornis Birstein, 1963	NW Pacific	5680–6670
dellacrocei Aydogan, Wägele & Park, 2000	SE Pacific, Atacama Trench	7800
diatona Mezhov, 2004	E Indian Ocean	6433
elongata Hansen, 1916	N Atlantic, Iceland	1591
emarginata Mezhov, 2000	N Atlantic	5420
expolita Mezhov, 2003b	N Indian Ocean, Arabian Sea	2478–2519
foveata Mezhov, 2000	W Atlantic, Puerto Rico Trench	5060–6650
fragosa Mezhov, 2004	E Indian Ocean	5410
galatheae Wolff, 1956	W Pacific, Philippine Trench	8440–10000
gerdesi (Brandt, 2002), comb. n.	Southern Ocean, Maud Rise	238
gestuosa Mezhov, 1993	W Pacific	5526
grandis Birstein, 1970	NW Pacific, Kurile-Kamchatka Trench	7265–7295
hadalis Wolff, 1956	W Pacific, Banda Trench	7270
hirsuticaudis Menzies, 1962	SE Atlantic	2997
lacunosa Mezhov, 2003b	N Indian Ocean	4706–4737
latifrons Beddard, 1886	N Pacific	3749
latiuscula Mezhov; 2003b	Central Indian Ocean	4730–4808
longifera Menzies & George, 1972	E Pacific, Peru-Chile Trench	4823–6134
longipedis Brandt, 2004	S Atlantic, Angola Basin	5389
longipes Hansen, 1916	N Atlantic, Iceland	325–1412
longiremis (Meinert, 1890)	N Atlantic, Skagerrak	149–228
longispinis Brandt, 2004	S Atlantic, Angola Basin	5415
longissima Mezhov, 1981	N Central Pacific	6043–6051
longiuscula Mezhov, 1981	N Central Pacific	4400
longula Birstein, 1970	N Pacific	5005–5045

Taxon	Locality	Depth (m)
magnifica Wolff, 1962	NW Atlantic, Davis Strait	3521
mariana Mezhov, 1993	W Pacific	10223–10730
medioxima Mezhov, 2003b	NW Indian Ocean	4458
meteorae Brandt, 2004	S Atlantic, Angola Basin	5387–5390
minuscularia Mezhov, 2003b	NW Indian Ocean	3617
minutus Menzies, 1962	W Atlantic, Puerto Rico Trench	5163–5494
obscurus (Brandt, 1992), comb. n.	Southern Ocean, Weddell Sea	4335
ovata Birstein, 1970	NW Pacific, Kurile-Kamchatka Trench	6435–6710
pectorosa Mezhov, 2004	E Indian Ocean	2807
polaris Malyutina & Kussakin, 1996	Arctic Ocean	325–400
porrecta Mezhov, 1988	Indian Ocean	6433
profundissima Birstein, 1970	NW Pacific, Kurile-Kamchatka Trench	8185–9530
prolixa Mezhov, 2003a	NW Indian Ocean	4458
pumicosa Mezhov, 2004	E Indian Ocean	2917
quadratura Birstein, 1970	NW Pacific, Kurile-Kamchatka Trench	3175–3250
rectangulata Mezhov, 1989b	Indian Ocean	5220
reticulata Birstein, 1963	NW Pacific	5502
robusta Brandt, 2004	S Atlantic, Angola Basin	5497–5398
sarsi Brandt, 1992b	Southern Ocean, Weddell Sea	4335
sensitiva Birstein, 1970	NW Pacific, Kurile-Kamchatka Trench	5005–5100
setifer Menzies, 1962	W Atlantic, Puerto-Rico Trench	5477–5494
setulosa Mezhov, 1992	Southern Ocean, Scotia Sea	757–2705
spiniceps Barnard, 1920	S Atlantic, South Africa	1280
spinifera Sars, 1864	N Atlantic, Norwegian Sea	27–1710
squalida Mezhov, 2000	Central Atlantic, Romanche Trench	6380–6430
strigosa Mezhov, 1999	NE Atlantic	5420
subinermis Hansen, 1916	N Atlantic, Norwegian Sea	830–3474
truncatex Menzies, 1962	NW Atlantic	3950–3963
tumulosa Mezhov, 1989	W Pacific, Izu-Bonin Trench	8900
uniformis sp. n.	Southern Ocean, Weddell Sea	4651–4975
urceolata Mezhov, 1989b	Indian Ocean	2596
vemae Menzies, 1962	W Atlantic, Puerto-Rico Trench	5410–5684
vigorata Mezhov, 1999	NE Atlantic	2655–2667
vinogradovae Mezhov, 1992	Southern Ocean, Weddell Sea	2705–4335
viriosa Mezhov, 1999	NE Atlantic	4050
vitjazi Birstein, 1963	W Pacific, Bougainville Trench	6920–7954
wolffi Mezhov, 1988	Indian Ocean	2385–3717
zenkevitchi Birstein, 1963	NW Pacific	4690–6135

was erected on basis of a juvenile specimen. Using ontogenetically variable characters of a juvenile type specimen to erect a new genus is problematic.

Dactylar setae fit the definition of claws (Wilson 1989): terminal/subterminal modified setae on pereopodal dactyli with pronounced sclerotisation and a sharp tip. This definition was to the authors' knowledge not narrowed since then. Taking into

account the incomplete documentation of dactylar claws in the literature on the one hand, and insufficient knowledge about plasticity of setae and their substructures on the other, a differentiation of genera exclusively based on such characters seems problematic. Due to the above listed reasons we consider the genus *Desmostylis* synonymous with *Macrostylis*.

***Macrostylis uniformis* sp. n.**
urn:lsid:zoobank.org:act:5105DA6E-E793-42B6-A5D7-A4D9F8C5933A
Figs 3–8

Material examined. Holotype. Preparatory female, 4.6 mm long, ZMH (K-42172). South-eastern Weddell Sea southwest of Maud Rise; station ANTXXII-3 59-5 (ANDEEP III; 67°29.81' S, 000°00.23'W); 4651 m depth. Paratypes. 1 paratype, ovigerous female, damaged, ZMH (K-42173) from type locality; 1 paratype female without oostegites fixed for SEM, 3.5 mm, ZMH (K-32174) northern Weddell Sea, station 137 (ANDEEP II; 63°45.00'S, 033°47.81'W), 4975 m depth. For further material examined for comparison see: Table 1.

Diagnosis. Cephalothorax almost semicircular, little longer than wide with no transverse ridge on frons; antenna 1 minute, incl. aesthetascs not reaching article 4 of antenna 2; mandible with blunt pars incisiva, left lacinia mobilis spiniform, integrated into spine row; dorsal extension of ischium of pereopod 3 positioned much more distally, on apex with 2 conspicious setae, 1 bent robust and spiniform unequally bifid seta proximally, and another more straight and less robust unequally bifid seta distally; posterolateral corners of posterior pereonites rounded; pleotelson compact, not constricted anteriorly of uropod articulations; uropod endopod of half the length of protopod.

Description of holotype female. Body (Figs 3–4) elongate, 5.3 times longer than wide; maximal body width in pereonite 3 1.2 times maximal width of pleotelson; pereonites 1–5 about the same width, gradually narrowing from pereonite 6 towards pleotelson. Surface of tergites, sternites and operculum bearing comb-like structures, which can be worn off due to abrasion to a smooth surface in exposed areas (e.g. cephalothorax, pereonite 3); posterolateral setae only in pereonite 7, otherwise lacking or broken off; no sockets found in SEM (probably due to dirt on cuticle). Cephalothorax free, almost semicircular with maximal width at posterolateral margin, length 1.1 times maximal width and 0.2 times total body length; 0.9 times width of pereonite 1; no transverse ridge on frons.

Fossosome 1.1 times longer than wide, laterally slightly convex, median length: pereonite 1 about 1.4 times longer than pereonite 2, as long as pereonite 3; lateral length: pereonite 1 1.3 times as long as pereonite 2 and 0.5 times as long as pereonite 3; pereonite with prominent anteroventral spine and pereonite 3 with very small posteroventral spine. Pereonites 4–5 of same length and width, 1.6 times wider than long; pereonite 4 laterally convex, maximal width amid segment. Pereonites 5–7 posterolateral corners tapering, with tiny simple apical setae; pereonites with short posterior ventral spines. Pereonite 6 0.8 times pereonite 4 length, 1.7 times wider than long. Pereonite 7 0.7 pereonite 4 length, 1.9

Figure 3. *Macrostylis uniformis* sp. n. (Holotype ♀, ZMH (K-42172)) digital stack photograph of female holotype; **1** lateroventral view; stained with methylene green H2O solution; colours inverted, greyscale; scale bar = 0.5 mm **2** dorsal view; stained with methylene green H2O solution; colours inverted, greyscale; scale bar = 0.5 mm.

times wider than long; Pleotelson 1.5 times longer than wide, length about 0.2 times total body length, as long as fossosome and as long as pereonites 5 and 6 together; laterally convex, slightly narrowing towards uropodal articulations with no constriction; apex bluntly rounded with several long setae; compared to rest of body with strongest sculpturation of cuticle; cuticle not translucent, dorsal organ not visible; slot-like apertures in dorsal cuticle not present; pleopodal chamber maximal opening width 0.6 times maximal pleotelson width; longitudinal excavation minimal width about 0.3 times max pleotelson width.

Antenna 1 (Figs 3–5) of 5 articles, 0.25 times fossosome median length; 2,6 times longer than wide; articles gradually decreasing in size and length-width ratio towards distal end, relative length ratios: 1:0.5:0.3:0.2:0.1; article 1 length 1.4 times of width, 50% of total antenna 1 length, article 5 as long as wide, less than 0.1 times total antenna 1 length; articles 4 and 5 with 1 aesthetasc each; articles 1 and 2 with distal broom setae; simple setae on distal margins of articles 2 and 3, 1 seta on article 5.

Antenna 2 (Figs 3–5) basal five articles reaching the posterior end of cephalothorax; flagellum reaching the anterior margin of pereopod 2 basis when directed posteriorly; article 1 broadest, 1.4 times wider than long, article 2 1.2 times longer than wide and article 3 1.4 times longer than wide, article 4 little narrower than articles 1–3, 4 times longer than wide, article 5 longest 1.1 times article 4, 4.5 times longer than wide; several broom setae distally on basal articles, most on article 5; seven flagellar articles, width about 0.5 times article 5 width.

Mandible (Fig. 5) gradually narrowing towards pars incisiva; pars incisiva blunt and rounded, without teeth; left lacinia mobilis spine-like, with subtriangular basis in dorsal and medial view and 1 small spine on apex, little shorter than adjacent spine row; right lacinia mobilis tiny with several short spine-like projections; spine row of 5–7 fanned spines, more in left mandible, partially serrated at tips and along proximal

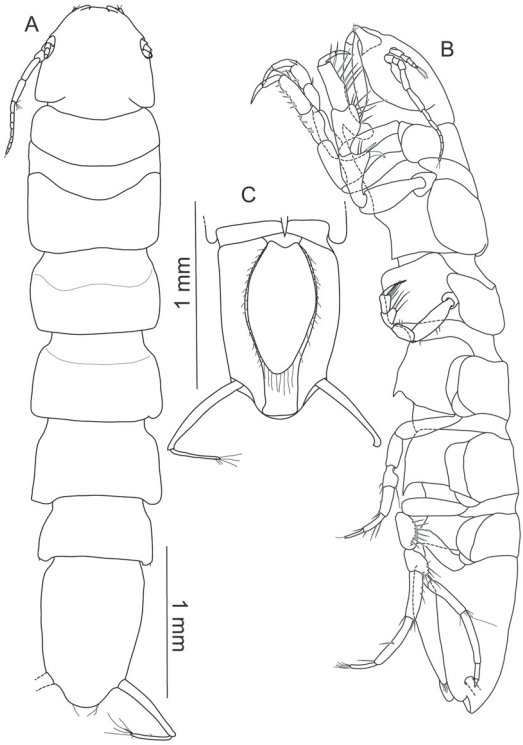

Figure 4. *Macrostylis uniformis* sp. n. (Holotype ♀, ZMH (K-42172)) **A** habitus (dorsal view, pereopods and left uropod omitted) **B** habitus (lateral view), uropods omitted **C** pleotelson (ventral view).

margin, especially more proximal ones; pars molaris shorter than adjacent spines of spine row, apex oriented proximally.

Maxilla 1 (Fig. 5) inner endite shorter and more slender than outer one, terminally spatulate; dense accumulation of simple setae around distal apex, along a dorsal ridge as well as along medial and lateral margins with setae; outer endite broad, narrowing in the most distal quarter, with numerous setae of different lengths on lateral and medial margins, numerous setae of different lengths around distomedial corner 12 robust setae, some two-sided serrate, on distal margin.

Maxilla 2 (Fig. 5) inner and outer endites of similar width, equally projecting distally; medial endite thinner and shorter; along proximedial margin of inner endite more than 15 long simple setae of less than half the length of inner endite, an accumulation of about 10 small and intermediate simple setae distolaterally, on distal margin 7 strong setae, some heavily denticulate, medial endite with few simple setae along lateral and medial margins, distally with 3 simple setae of different lengths, longest seta less than half as long as the medial endite; outer endite with simple setae around lateral margin, distally with four robust setae of different lengths the most lateral one longest and one-sided denticulate.

Maxilliped (Fig. 6) epipod 3.6 times longer than wide, distally narrowing to multiple small tips, with tiny setae or setules, laterally concave, reaching midlength of palp

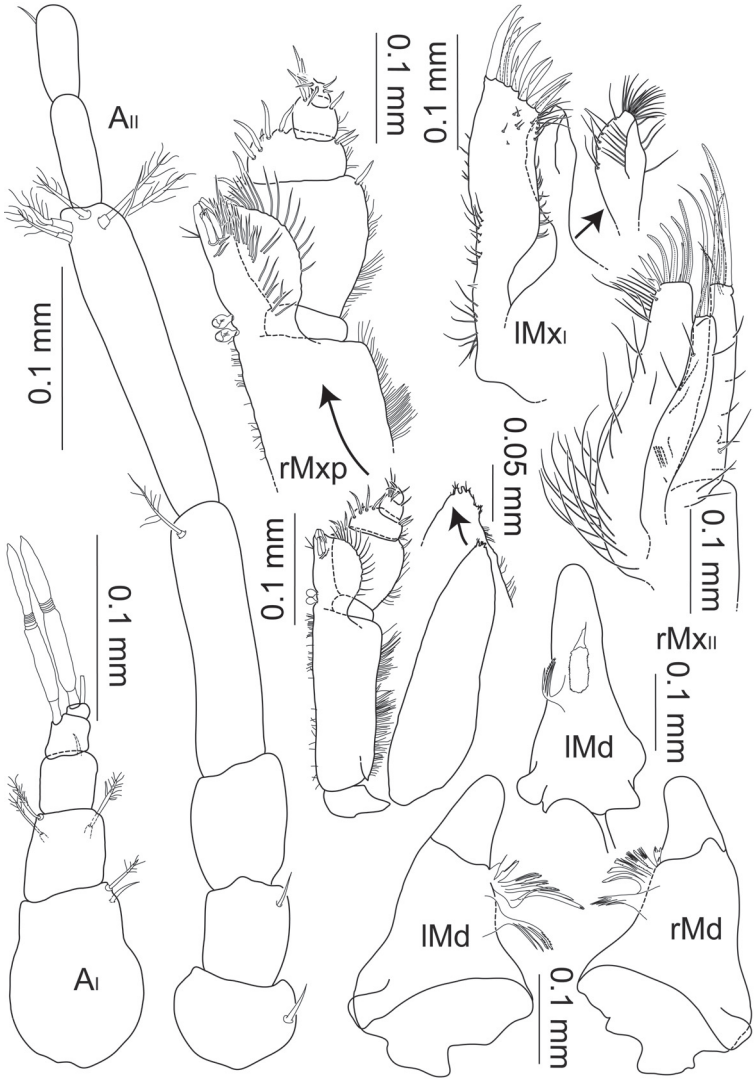

Figure 5. *Macrostylis uniformis* sp.n. (Holotype ♀, ZMH (K-42172)) antenna 1; antenna 2 (flagella broken off); left mandible (dorsal and medial view); right mandible (dorsal view); right maxilliped (dorsal view, some setae omitted); right maxilliped (enlarged endite and palp), right maxilla 1 (with inner endite illustrated separately), right maxilla 2.

article 3; endite medially thickening, proximomedially with two coupling hooks, distally with heavily sclerotized and denticulate tooth-like setae and fine dense setae; row of setae along rounded distolateral margin, lateral margins of basis and palp articles 1–3 with rows of thin setae; article 2 largest and longest, 3.5 times longer than article 1 and 2.3 times longer than article 3; articles 4 and 5 distomedially and distolaterally with medially scaled and distally pappose sensillae: 3 medially and 1 laterally on article 2, 5 medially and 2 laterally on article 3, 3 medially and 1 laterally on article 4, article

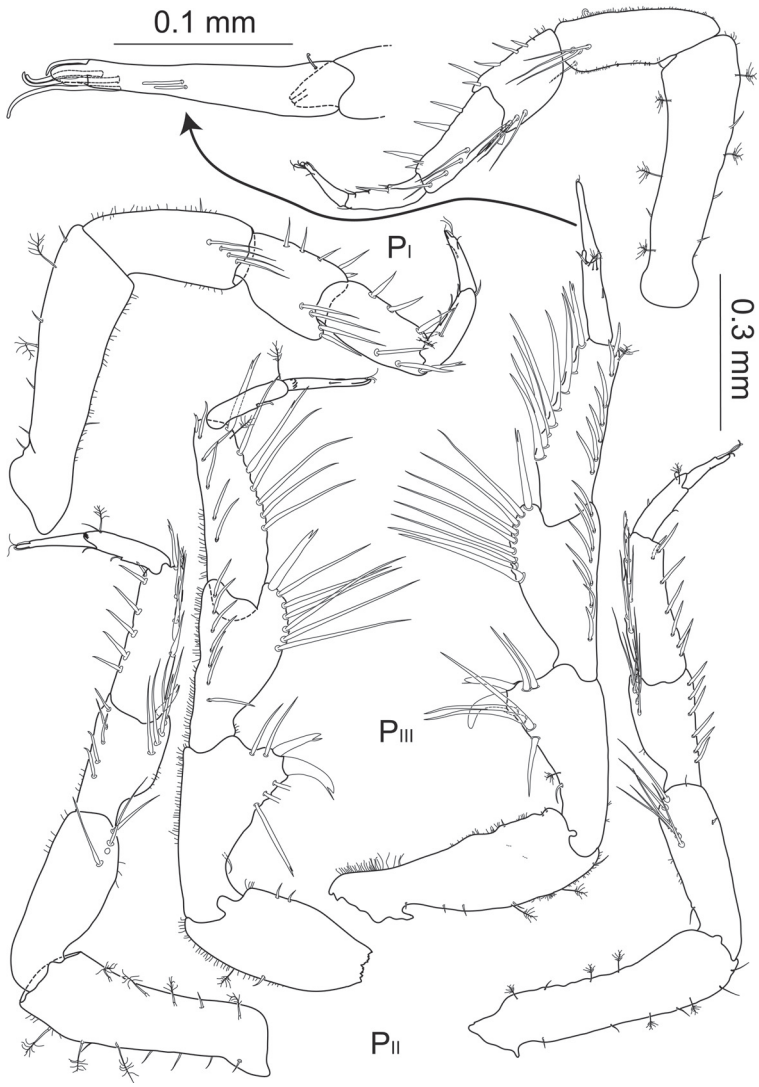

Figure 6. *Macrostylis uniformis* sp. n. (♀) pereopods 1–3 ($P_{I–III}$; 0.3 mm scale) of preparatory female (holotype, ZMH (K-42172); left side) and ovigerous female (paratype, ZMH (K-42173, right side); with dactylus of pereopod 3 enlarged (0.1 mm scale).

5 with 6 such setae terminally and subterminally; basis including endite 0.9 times epipod length.

Anterior pereopods (Fig. 6) slightly increasing in length, pereopod 1 0.9 times length of pereopods 2 and 3 respectively; all articles covered with tiny setules of varying density of coverage.

Pereopod 1 relative length ratios: 1:0.6:0.4:0.4:0.3:0.2, basis with at least 3 broom setae and 1 short simple seta dorsally and 2 broom setae and row of 5 short setae ven-

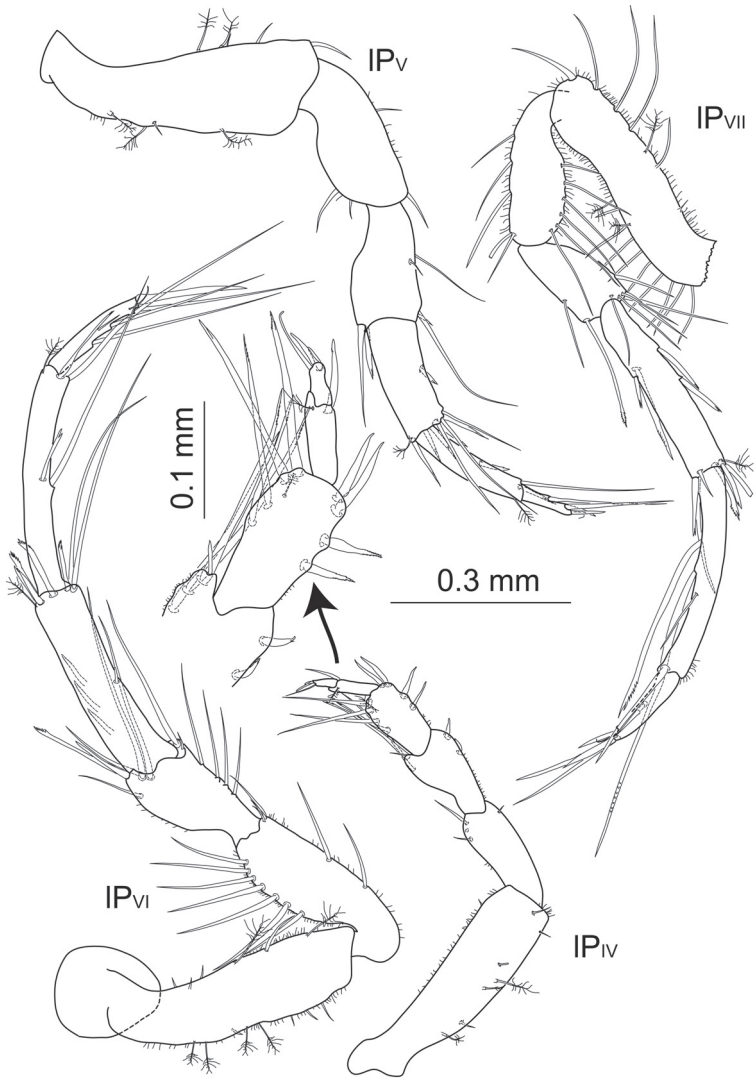

Figure 7. *Macrostylis uniformis* sp. n. (Holotype ♀, ZMH (K-42172)) pereopods 4–7 ($P_{IV–VII}$; 0.3 mm scale); pereopod 4 dactylus enlarged (0.1 mm scale).

trally, 3.6 times longer than wide; ischium 2.4 times longer than wide, with row of 4 long and slender setae distally, 1 seta on the opposite side, 1 short distally pappose sensilla ventrally, 1 short seta proximodorsally; merus compact, 1.4 times longer than wide, posteriorly on dorsal extension with row of 4 simple setae of different length and 1 bifurcate setae, along ventral margin 4 distally pappose setae and on distoventral extension 1 stout bifurcate seta; carpus 2.3 times longer than wide, distodorsally with row of 2 simple setae and 1 bifurcate seta most distally, 1 broom seta on distoventral margin, ventral margin with four distally fringed setae; propodus 3.4 times longer than wide, dorsally with 1 short setae, ventral side with 3 short sensillae, caudally with

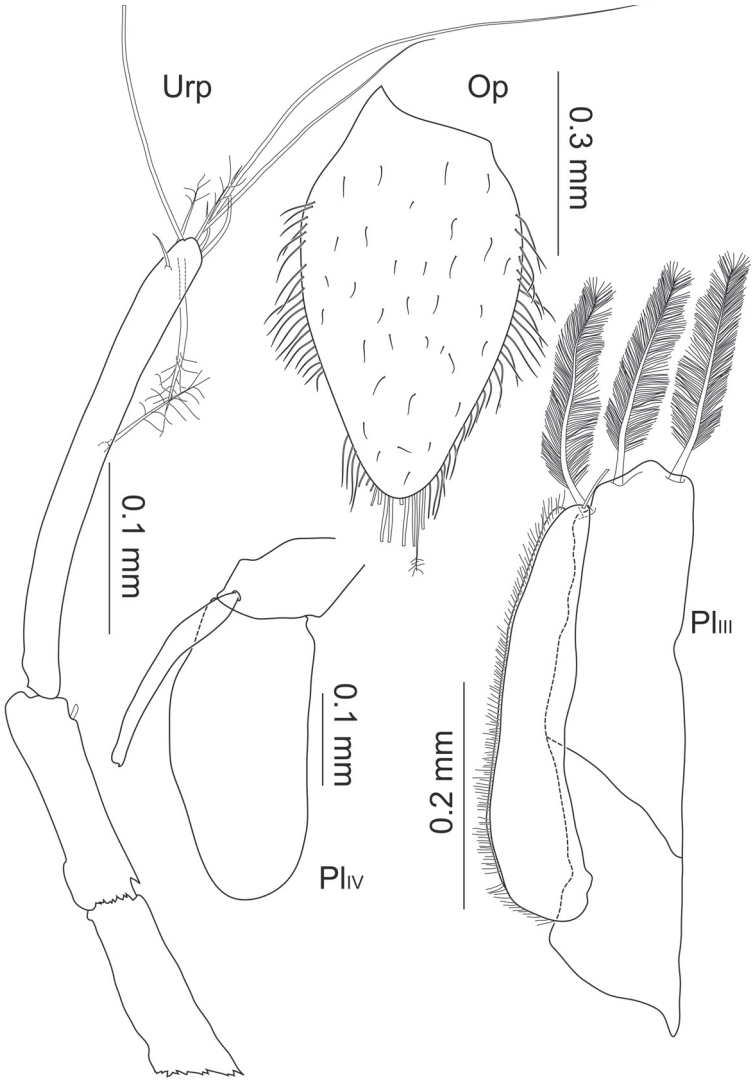

Figure 8. *Macrostylis uniformis* sp. n. (Holotype ♀, ZMH (K-42172)) operculum (Op; ventral view); pleopods 3–4 ($Pl_{III–PlIV}$, ventral view); uropod (Urp).

1 long and slender seta; dactylus 3 times longer than wide, about 0.7 times carpus length, with 1 sensilla on dorsal and ventral side respectively.

Pereopod 2 1.1 times longer than pereopod 1; setation comparable to pereopod 1 with slight variations in length and numbers; relative length ratios: 1:0.7:0.5:0.6:0.4:0.3, basis 3.1 times longer than wide; ischium 2.6 times longer than wide; merus 1.8 times longer than wide, with row of 5 distally serrate setae; on the anterior side of distodorsal extension with 1 robust unequally bifid seta; carpus 2.8 times longer than wide, distodorsally with row of 5 long setae, first 4 of this setae distally serrate, most distal one bifurcate, 1 broom seta; propodus 4.5 times longer than wide, 1 broom seta and

terminally expanded to subtriangular lobe dorsally with two notches at apex; dactylus 5 times longer than wide, anterior and posterior claw of about the same length, slender posterior extension clasping, reaching beyond claws.

Pereopod 3 1.1 times longer than pereopod 2, with bigger dorsal and ventral extensions and generally longer and more robust setae, relative length ratios: 1:0.7:0.7:0.8:0.3:0.3, basis damaged in holotype, 3.3 times longer than wide in paratype, with at least 2 broom setae and 3 short setae on ventral side, with 2 small setae on dorsal margin; ischium 1.8 times longer than wide, dorsal extension with concave flanks, with 3 serrate setae proximally and 2 distally of apex, on apex with 2 pronounced unequally bifid setae; proximal seta very robust and bent proximally; 1 seta bent towards proximal hollow of ischium articulation; merus about 2 times longer than wide with distodorsal and distoventral extensions, with row of 7 serrate setae dorsally, the most distal seta bifurcate and robust, along ventral margin with 7 distally pappose, fringed setae; carpus 3 times longer than wide, distodorsally with row of 7 serrate setae, most distal seta bifurcate, with 1 broom seta and 6 distally pappose, fringed setae ventrally; propodus 4.3 times longer than wide, distodorsally with 2 sensillae and 1 broom seta ventrally; dactylus long and slender, 6 times longer than wide, as long as carpus, with 1 proximal, 2 medial and 3 subterminal sensillae, claws as in pereopod 2.

Posterior pereopods (Fig. 7; pereopods 6–7 of paratype missing) length ratios: 1:1.4:1.9:1.7.

Pereopod 4 about 0.6 times the length of pereopod 1, relative length ratios: 1:0.5:0.4:0.3:0.2:0.1, basis 3.7 times longer than wide with at least 4 broom and 2 short simple setae; ischium 2.9 times longer than wide, distodorsally with row of 3 setae and 1 tiny seta distoventrally; merus 1.9 times longer than wide, distodorsally expanded and with 4 setae of very different lengths, first 3 longer than carpus, serrate, the most distal one smaller, 2 distally pappose, fringed setae on ventral margin; carpus 2.2 times longer than wide, anterior-posteriorly flattened, and 3 times broader than propodus, dorsally extended with row of 4 long serrated, bifurcate setae reaching beyond dactylus tip, distodorsally with broom seta, on ventral margin with 4 distally pappose, fringed setae; propodus distally projecting into a subtriangular lobe, 3.5 times longer than wide, distoventrally with 1 long bifurcate and terminally fringed seta projecting beyond dactylus tip, 1 broom seta distally on dorsal side; dactylus of half propodus length, twice as long as wide, 1 short terminal claw, 1 subterminal claw of 0.5 times dactylus length, with 1 long thin seta subterminally and 2 sensillae.

Pereopod 5 0.9 times pereopod 1 length, relative length ratios: 1:0.6:0.5:0.5:0.4:0.2, basis broad, 2.9 times longer than wide with at least 3 broom setae dorsally, 2 broom setae and 3 small setae ventrally, 1 large simple seta distoventrally; ischium 2.3 times longer than wide, on dorsal and ventral side with 2 simple setae respectively; merus about 1.8 times longer than wide, distodorsally extending with 1 bifurcate and 1 long seta, with 2 tiny and 2 long setae on ventral side, longer seta longer than merus; carpus 2.6 times longer than wide, ventrally with 1 stout bifurcate seta, articulation to propodus surrounded by 5 bifurcate setae, 1 broom seta and ventrally with 3 long and slender simple setae, longest seta exceeding propodus in length; propodus 5 times

longer than wide, with 1 short bifurcate seta ventrally, distally with 2 setae on ventral side, the longest more than 2 times dactylus length, 1 broom seta dorsally; dactylus 2 times longer than wide, half propodus length, with 2 setae ventrally of more than 2 times dactylus length, with 2 short claws, 0.7 times dactylus length; at least 2 thin subterminal sensillae.

Pereopod 6 1.2 times pereopod 1 length, relative length ratios: 1:0.6:0.4:0.7:0.7:0.4, basis 4.3 times longer than wide, dorsally with 3 short setae and 3 broom setae, ventrally with 4 broom setae and 4 short setae; ischium 2.7 times longer than wide, dorsally slightly projecting with row of 7 long setae, ventrally with 2 setae and distoventrally with a group of 3 simple setae of different lengths; merus short and broad, 1.8 times longer than wide, distodorsally extending with 6 setae, the longest exceeding carpus, some denticulate or bifurcate, with row of 6 setae on ventral side; carpus slender, 4.4 times longer than wide, dorsally with row of 3 short setae and 1 broom seta, 2 simple setae ventrally, distally 4 robust, bifurcate and one-sided serrate setae and 2 slender setae, longer than propodus; propodus 7.6 times longer than wide, along ventral margin with 2 groups of 1 short bifurcate and 1 slender seta each; dactylus 6 times longer than wide, with 2 small sensillae on anterior side, with 2 very long simple setae along ventral margin, with terminal claw as long as dactylus and 1 subterminal claw, 1.7 times longer than dactylus.

Pereopod 7 1.1 times longer than pereopod 1, relative length ratios: 1:0.6:0.4:0.8:0.9:0.4, basis 4.1 times longer than wide, dorsally with 9 simple setae as well as 2 broom setae, ventrally with 4 broom setae and 6 simple setae of different lengths as well as 1 broom seta; ischium 3.2 times longer than wide, dorsally with row of 6 long simple setae, ventrally with 5 simple setae; merus 2 times longer than wide, distodorsally extending with 6 long setae, on the ventral margin with 1 simple and 1 serrate seta; carpus slender, 5.7 times longer than wide, dorsally with 2 bifurcate setae and a broom seta distally, a group of serrate setae on ventral margin, mero-carpal articulation surrounded by 6 short, robust, bifurcate and one-sided serrate setae; propodus slender, 9 times longer than wide, 4 setae ventrally, the two proximal ones serrate and very long; dactylus 3.8 times longer than wide, with 1 intermediate and 1 long seta of 2 times dactylus length on ventral side, with 2 claws of different lengths and 1 sensilla on apex.

Pleopods 2–4 (Fig. 8). Presence of pleopod 5 could not be clarified for both specimens. Relative length ratios: 1:0.8:0.6; operculum (Figs 5, 9) 0.7 times pleotelson length. Operculum covered ventrally with small setules and setae, along proximolateral margins with plumose setae with few short setules, distally with at least 8 pappose setae, several setae broken off and substructures not reconstructable. Pleopod 3 protopod constituting half of total length, rhomboid shape, endopod as wide as protopod, not considerably narrowing distally, with 3 distally plumose setae of 0.4 times pleopod 3 length, exopod 0.7 times total length, proximally about 0.7 times maximal width of endopod, distally narrowing, with 1 pronounced seta subterminally, row of numerous simple setae laterally. Pleopod 4 endopod long oval, 0.8 times total length; protopod as long as wide; exopod thin and long, 0.6 times total length and 7.7 times longer than wide, distal seta broken off and missing.

Uropod (Figs 3, 4, 8) of 2 articles, about half pleotelson length, protopod 5.5 times longer than wide, endopod 0.5 times protopod length, protopod with at least 1 broom seta distally, and endopod with at least 4 broom setae distally next to 3 very long and 3 short simple setae.

Male unknown.

Intraspecific variations in pereopods. (Numerals in brackets and italics are variations in the ovigerous female, paratype).Pereopod 1 ischium 2.4 (3.2) times longer than wide, with row of 4 (3) setae distally. propodus 3.4 (2.8) times longer than wide; dactylus 3 (3.7) times longer than wide. Pereopod 2 basis 3.1 (3.7) times longer than wide; ischium 2.6 (3.2) times longer than wide; merus with row of 5 (6) setae; carpus distodorsally with row of 5 (6) long setae; propodus 4.5 (4) times longer than wide; dactylus 5 (5.5) times longer than wide.

Pereopod 3 ischium with 3 (4) setae proximally; merus with row of 7 (9) setae dorsally, along ventral margin with 7 (8) setae; carpus distodorsally with row of 7 (8) serrate setae, with 6 (7) setae ventrally. Pereopod 4 basis 3.7 (4.3) times longer than wide; ischium 2.9 (2.4) times longer than wide; merus 1.9 (2.4) times longer than wide; carpus 2.2 (2.8) times longer than wide; propodus 3.5 (3) times longer than wide. Pereopod 5 basis 2.9 (5) times longer than wide; ischium 2.3 (3) times longer than wide; carpus 2.6 (3.1) times longer than wide, propodus 5 (4.4) times longer than wide.

Etymology. "Uniformis" is derived from the latin word for "uniform" as this species' female on the first view resembles a most common macrostylid appearance and is hard to distinguish from other species.

Distribution. Only known from the type locations: Southern Ocean, northern and south-eastern Weddell Sea, 4651–4975m depth.

Remarks. Analysis of two specimens from different station reveals little variation. Differences in body shape and limb segments are usually too subtle to be detected in visual inspection. Variation in setal count tends to be allometric in the pereopods (compare Hessler 1970 for Desmosomatidae). Variation was observed in pereopod 3 in setal counts on ischium, merus and carpus, but none in length-width ratios. Setal variation also occurs in pereopod 1 ischium as well as pereopod 2 merus and carpus. In all cases, the number of setae is increased by one or two per row in the female paratype. In pereopods 1, 2 and 5 length-width ratios of all articles are increased or identical in the ovigerous female except for the propodus. The strong variation in pereopod 4 has to be treated carefully, as the articles are flattened and in the appendage contortions along the proximo-distal axis limit comparability between both specimens.

In the shape of the cephalothorax and lateral pleonite borders as well as the pleotelson apex *Macrostylis uniformis* sp. n. closely resembles that of *Macrostylis hadalis* Wolff, 1956, *M. zenkevitchi* Birstein, 1963 and *M. longifera* Menzies & George, 1972. *M. uniformis* sp. n. also shares the small subtriangular lacinia mobilis and the minute pars molaris with *M. hadalis*. They can be separated by bicusp and acute pars incisiva in *M. hadalis* (blunt and rounded in *M. uniformis* sp. n.) and the smaller relative length of

the antenna 2 compared to the antenna 1 in *M. hadalis*. *M. zenkevitchi* has more acute posterolateral corners of the posterior pereonites than found in *M. uniformis* sp. n. The mandible of *M. zenkenvitchi* has incisors with 3 blunt teeth and a strong lacinia mobilis (incisor without teeth, blunt and rounded, lacinia mobilis spine like and integrated into spine row in *M. uniformis* sp. n.). From *M. longifera* it can be distinguished by the pronounced posterolateral setae in pereonites 3–7 (no or tiny posterolateral setae in *M. uniformis* sp. n.) and in the stretched posterolateral protrusions of the posterior pereonites in *M. longifera* (protrusions subtle in *M. uniformis* sp. n.). The paratype female has damage on the pereon and exact measurements could not be taken. Nevertheless, length and width data from the anterior subsection indicate a high similarity in length and the ovigerous female being less wide in these pereonites.

No male specimen of this species could be identified and the male identity therefore remains unknown.

Macrostylis antennamagna sp. n.

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Figs 9–18

Material examined. Holotype. Adult male, 3.4 mm, ZMH (K-42168), Southern Ocean, North-western Weddell-Enderby Abyssal Plain, south of the South Orkney Islands, station 110-8 (ANDEEP III), 64°59.20'S, 043°002.05'W, 4698 m depth. Paratypes. 1 preparatory female, 4.7 mm, ZMH (K-42169) and 1 adult male ZMH (K-42169) from type locality; 1 male , 3.1 mm, ZMH (K-42171); 1 male fixed for SEM, 2.8 mm, ZMH (K-42172) Southern Ocean, northern Weddell Sea abyssal plain, south of the Endurance ridge, station 138-6 (ANDEEP II), 64°1.67'S, 39°7.68'W, 4760 m depth. For further material examined for comparison see Table 1.

Diagnosis. Cephalothorax semicircular, antenna 2 long, basal 5 articles pronounced, flagellum reaching to the posterior end of pereonite 3 when bent backwards, little shorter in female; mandible flat, dorsoventrally constricted proximally to laciniae; pars incisiva without pronounced or sharp teeth but bump-like structures; dominant setae on pereopods of bifurcate type; setation pattern on male pleopod 1 mostly not symmetrical, distolateral lobes of pleopod 1 projecting less distally than medial lobes, bent laterally (~90°) and ventrally, medial lobes rounded, each with 7 setae.

Description holotype male. Body (Figs 9, 10) elongate, 5.3 times longer than wide; maximal body width in pereonites 2 and 3, maximal pereonite width 1.5 times maximal width of pleotelson; pereonites 1–3 about the same width, from pereonite 3 towards pleotelson slightly but gradually narrowing, pereonite 7 0.8 times as wide as pereonite 3. Surface of body (Fig. 10) bearing comb-like structures which can be worn off in exposed areas, e.g. posterolateral protrusions, cephalothorax or dorsal surface of pereonite 3; numerous small simple setae and setules on general cuticle; pereonites 3–7 unsymmetrical with respect to number and length of 1–2 posterolateral setae. Cepha-

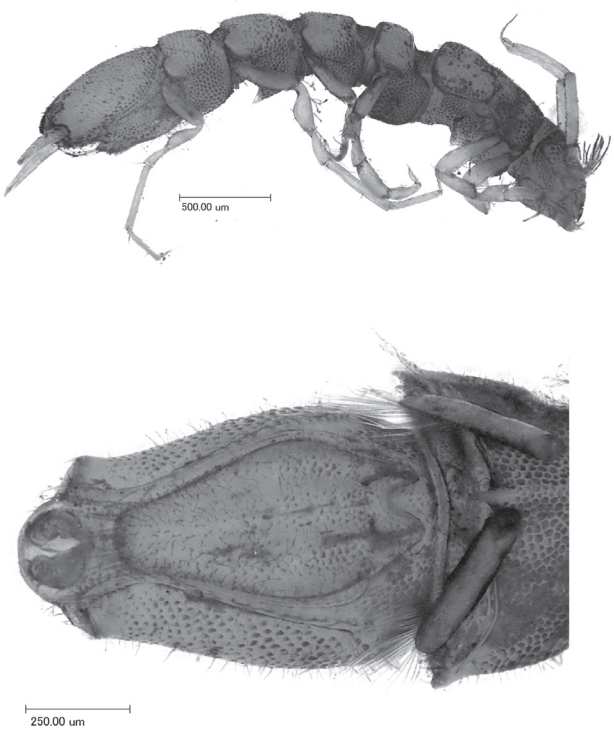

Figure 9. Top: *Macrostylis antennamagna* sp. n. (Holotype ♂, ZMH (K-42168)) digital stack photograph; stained with methylene green H2O solution, greyscale; below: *Macrostylis antennamagna* sp. n. (♀) digital stack photograph of pleotelson with operculum, ventrocaudal excavation and anus (ventral view).

lothorax almost semicircular, length 0.7 times maximal width posteriorly to antenna 2 articulation and less than 0.2 times total body length; width 0.9 times pereonite 1 width; transverse ridge on frons not recognized. Fossosome 0.2 times total body length; as long as wide, laterally slightly convex; median legth: 1:1:1.3; frontal spine in sternite of pereonite 1, dorsoventral constrictions close to the segment borders of pereonites 2–3. Posterior pereonites anteriorly strongly constricted; anterior margins overlapped by preceding tergite; relative medial lengths of pereonites 4–7: 1:1.2:1.4:1.2; laterally concave. Posterolateral parts of tergites slightly tapered backwards; pereonites 5–7 with ventral spines directed posteriorly. Pleotelson 0.2 times body length; about 1.7 times longer than wide, laterally concave, narrowing towards a constriction anterior to uropodal articulations; caudal apex concave surrounded by setules; compared to rest of body, most prominent sculpturation of cuticle, shingle-like appearance; cuticle slightly translucent, statocysts visible; slot-like apertures in dorsal cuticle; breathing cavity (Fig. 15) maximal opening width 0.7 times maximal pleotelson width, narrowest width of longitudinal excavation 0.2 times maximal pleotelson width.

Antenna 1 (Figs 10, 11) with 5 articles, small, barely reaching halfway to posterior margin of cephalothorax when directed backwards; length 2.6 times article 1 width; all

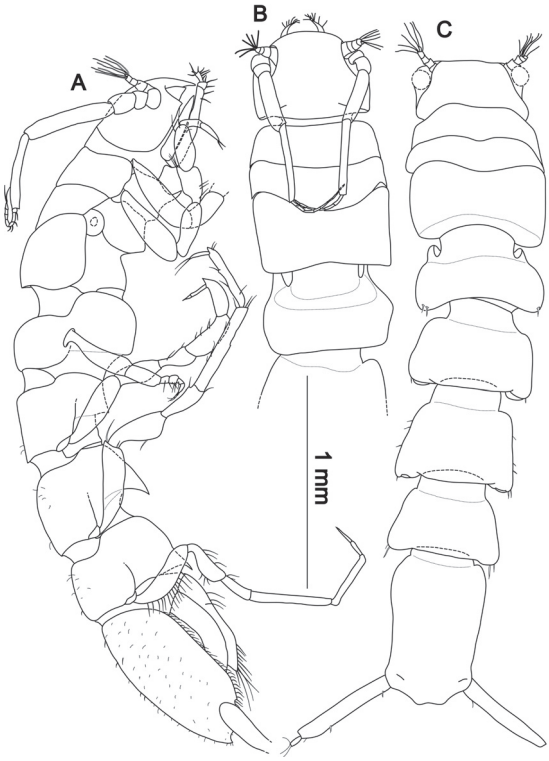

Figure 10. *Macrostylis antennamagna* sp. n. (Holotype ♂, ZMH (K-42168)) **A** lateral view, pereopod 3 broken off, uropods omitted **B** dorsal view anterior **C** dorsal view, AII and pereopods omitted, anterior part flexed.

articles about as long as wide, gradually decreasing in size towards distally; fifth article 0.1 times total length; at least 4 aesthetascs on each of articles 4 and 5, some broken off; broom setae around distal margin of article 2; some distally fringed sensillae on distal margins of articles 1–3; with 1 seta distally on article 5, next to aesthetascs.

Antenna 2 (Figs 10, 11) relatively long and broad, peduncle reaching to the posterior end of pereonite 2 and flagellum reaching to the posterior end of pereonite 3; each of articles 1–3 1.4 times longer than wide; article 4 longest, length 0.3 times total length, as wide as articles 1–3; article 5 0.8 times article 4 length, about 0.4 times article 4 width; flagellum of 7 articles; all 5 basal articles with 1–several distal broom setae (not shown in illustration) and some simple setae; tubular setae with large apical pores distally on flagellar articles 1–4 ans 7, articles 1–3 with 3 setae each, articles 4 and 7 with 2; article 7 with long simple distal setae, 3 times longer than article.

Mandible (Fig. 11) flat, dorsoventrally constricted proximally to lacinia; pars incisiva without teeth, but bump-like structures, left mandible with 1 terminal, 1 ventral and 2 dorsal cusps, right mandible with a centered lobe-like cusp; left lacinia mobilis longer and more robust than right lacinia mobilis, with 4 strong blunt teeth, 1.5 times

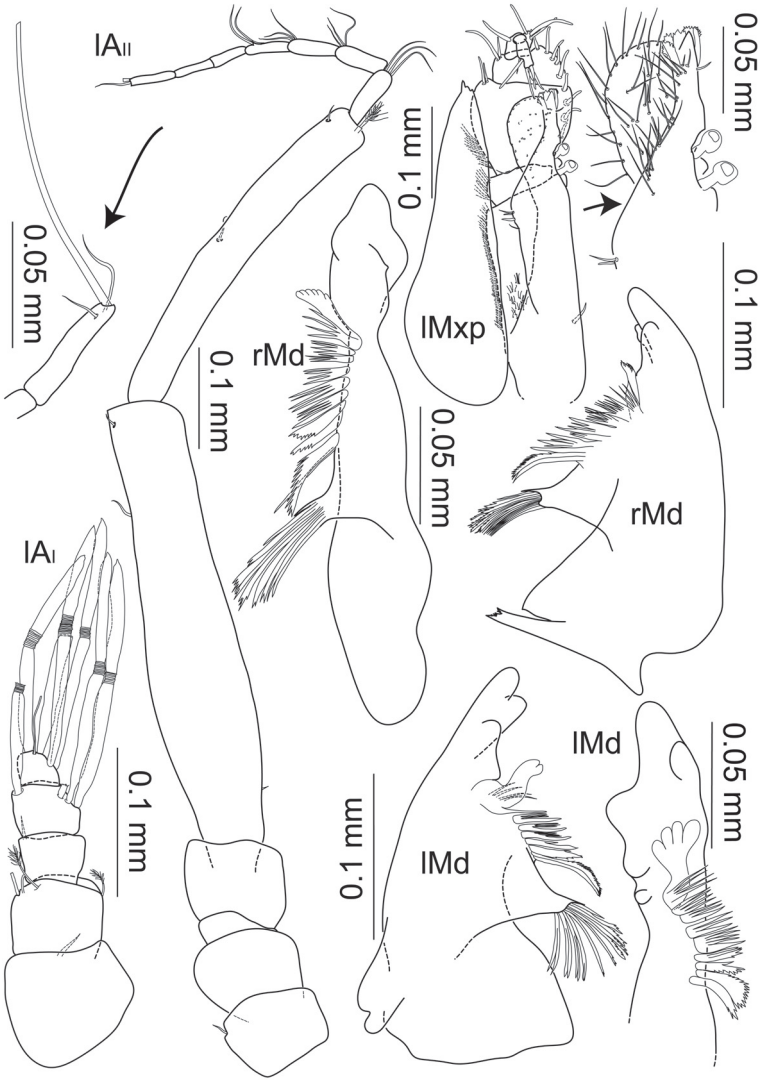

Figure 11. *Macrostylis antennamagna* sp. n. (Holotype ♂, ZMH (K-42168)) left antenna 1; left antenna 2; right antenna 2 enlarged last flagella article; left mandible (dorsal and medial view); right mandible (dorsal and medial view); left maxilliped (dorsal view, some setae omitted); left maxilliped (enlarged endite).

longer than following spines of spine row; right lacinia mobilis twice as long as following spines of spine row, with 6 teeth, more acute than in left lacinia mobilis, dorsoventrally arranged, with ventral teeth projecting most distally; spine row of about 8 spines with multiple cusps, partially serrated; Maxilla 1 and 2: see description of female paratype.

Maxilliped (Fig. 11) epipod oblong-subtriangular, distally narrowing to multiple small tips, distolaterally concave, without any setae or setules, reaching distal end of palp article 2; endite with 2 coupling hooks, densely covered with fine but rather long

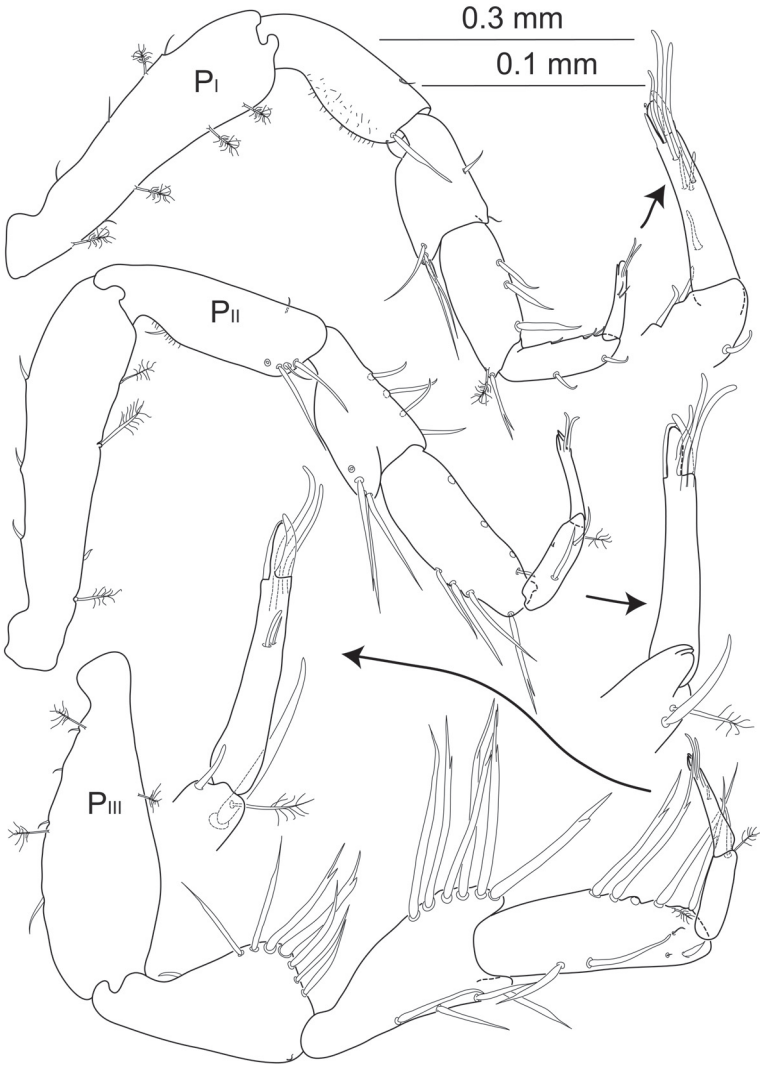

Figure 12. *Macrostylis antennamagna* sp. n. (Holotype ♂, ZMH (K-42168)) pereopods 1–3 ($P_{I–III}$; 0.3 mm scale) with dactyli enlarged (0.1 mm scale).

simple setae, medially broadening, more proximally and dorsally forming lobe-like protrusion with 4 setae on lateral blunt apex, together constituting a sheath in which the epipod rests; lateral margins of basis, and palp articles 1–2 with row of small setae, basis and epipod subequal in length; palp article 2 3 times longer than article 1, articles 2–4 distomedially and distolaterally with medially scaled and distally pappose (fringed) sensillae, article 5 with the same setae terminally and subterminally.

Anterior pereopods (Fig. 12) length ratios: 1:1.1:1.1, all articles covered with tiny setules of varying density of coverage.

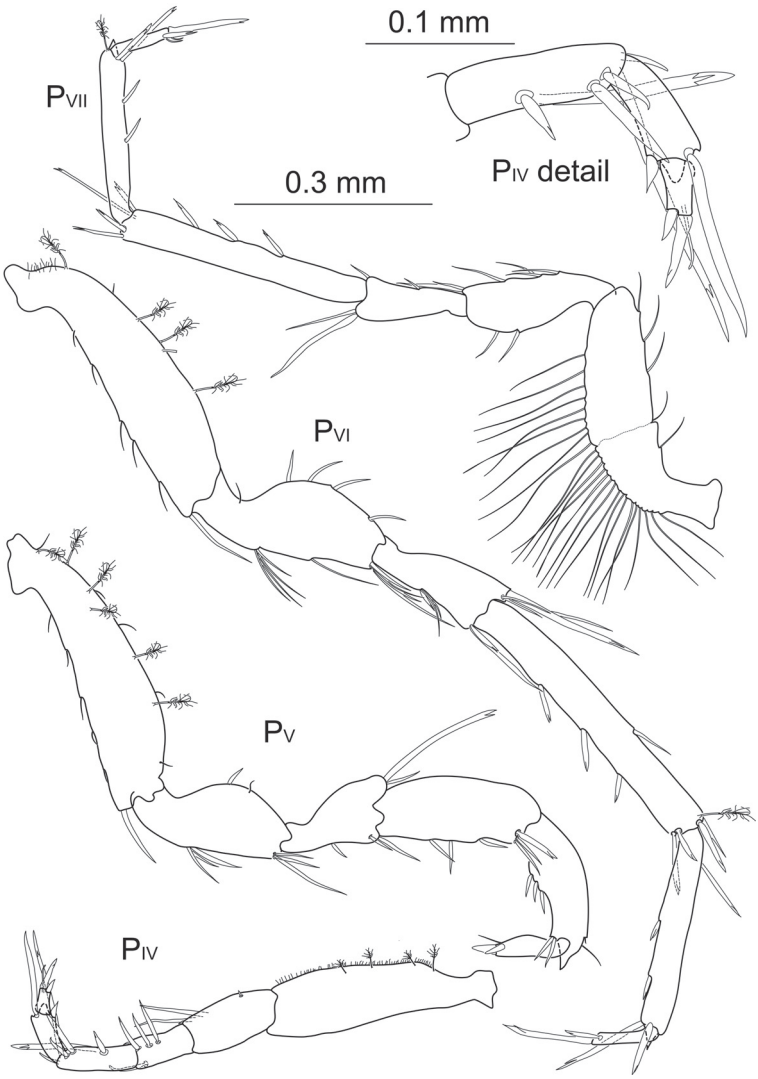

Figure 13. *Macrostylis antennamagna* sp. n. (Holotype ♂, ZMH (K-42168)) pereopods 4–7 ($P_{IV–VII}$); pereopod 4 dactylus enlarged.

Pereopod 1 relative length ratios: 1:0.5:0.4:0.3:0.4:0.2, basis 3.8 times longer than wide, with 4 broom setae and 1 short simple seta on dorsal side, 3 short simple setae and 1 broom seta ventrally,; ischium 2.3 times longer than wide, with 2 setae distodorsally and 1 small seta distoventrally; merus almost 1.4 times longer than wide, with distodorsal extension bearing 4 unequally long setae; carpus 2.4 times longer than wide, distodorsally with 1 bifurcate seta and 1 broom seta, 3 setae ventrally; propodus 3.5 times longer than wide, dorsally with 2 short setae, ventral side with 3 sensillae, terminally expanded to a subtriangular lobe; dactylus 4.6 times longer than wide, 0.7 times the length of carpus, with 7 sensillae of different lengths.

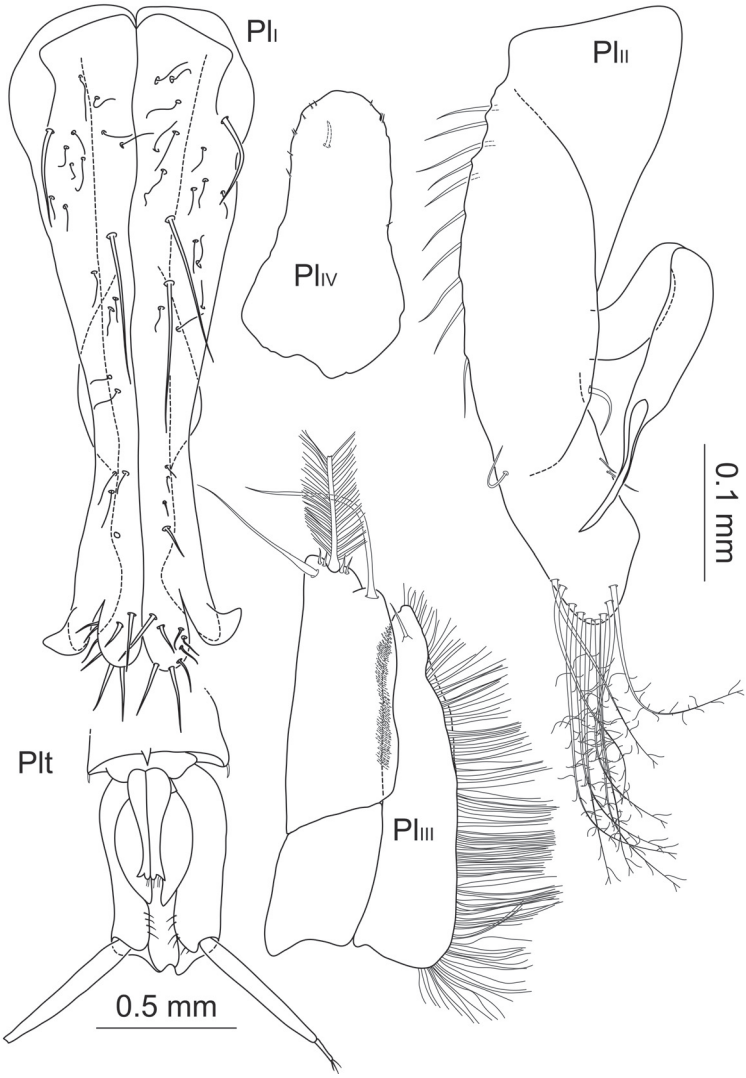

Figure 14. *Macrostylis antennamagna* sp. n. (Holotype ♂, ZMH (K-42168)) pleopods 1 (ventral view); left pleopods 2–4 (Pl_{II}–Pl_{IV}, ventral view); setules omitted in 2 of 3 distal plumose setae of pleopod 3 endopod (all pleopods' scale = 0.1 mm); pleotelson and uropods (ventral view, scale = 0.5 mm, pleopod 1 not planar but obscured projecting into plain of view).

Pereopod 2 relative length ratios: 1:0.6:0.3:0.5:0.2:0.2, basis with 3 broom setae dorsally and row of short setae ventrally, 4.2 times longer than wide; ischium 3.1 times longer than wide, with 1 small seta bent backwards proximodorsally, row of 4 long simple setae distodorsally and 1 small seta distoventrally; merus 1.5 times longer than wide with distodorsal extension bearing row of 4 long simple setae; carpus 2.6 times longer than wide, distodorsally with row of 4 long setae, most distal one bifurcate, with 4 unequal simple setae ventrally; propodus 3 times longer than wide, dorsally with 2

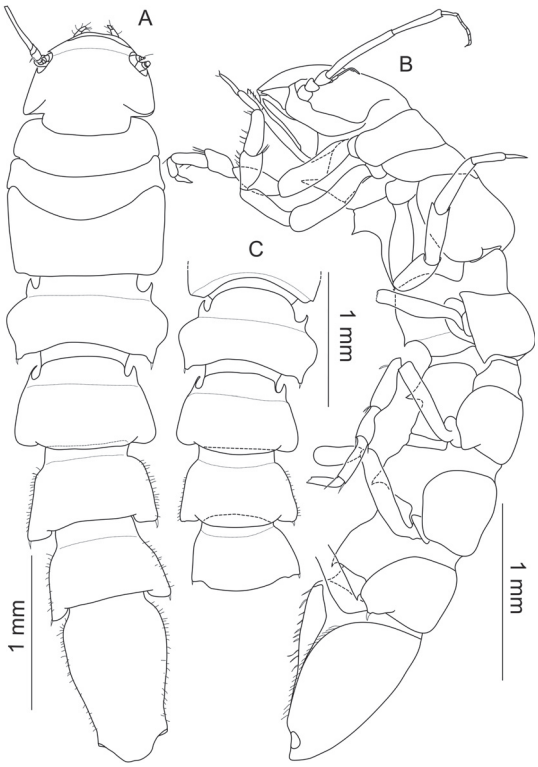

Figure 15. *Macrostylis antennamagna* sp. n. (Paratype ♀, ZMH (K-42169)) habitus: **A** dorsal view, flattened **B** lateral view **C** dorsal view of pereonites 4–7, bent.

simple setae, with 1 broom seta dorsally, terminally expanded to a subtriangular lobe; dactylus 5.2 times longer than wide, subterminally with 3 sensillae.

Pereopod 3, relative length ratios: 1:0.6:0.8:0.7:0.3:0.3, basis 2.9 times longer than wide with at least 3 broom setae, row of short setae on ventral side; ischium 1.8 times longer than wide, dorsal extension strongly expanded, sub-triangular, with 7 robust setae, apical 2 setae bifurcate, about as long as maximum ischium width, proximal 2 and distal 3 setae simple, but slightly increasing towards apex, proximodorsally 1 short seta, bent and directed towards proximal hollow of ischium articulation; merus twice as long as wide with weak distoventral extension and strong distodorsal extension bearing 6 bifurcate setae of similar length, 1.4 times maximal merus width, furcation not observed in most proximal seta of row, 4 simple setae ventrally; carpus 2.8 times longer than wide, distodorsally with 5 bifurcate setae and 1 broom seta, with 4 simple setae ventrally; propodus of 0.4 times carpus length, 3.6 times longer than wide, distoventrally with 1 simple and 1 broom seta, distodorsally with sensilla; dactylus 5.5 times longer than wide, 1.1 times carpus length, with 4 sensillae of different lengths arranged in 2 pairs on opposite sides.

Posterior pereopods (Fig. 13) length ratios: 1:1.7:2.3:1.9.

Pereopod 4 0.6 times pereopod 2 length, relative length ratios: 1:0.4:0.3:0.3:0.2:0.1, basis 3.9 times longer than wide, with at least 4 broom setae; ischium twice as long

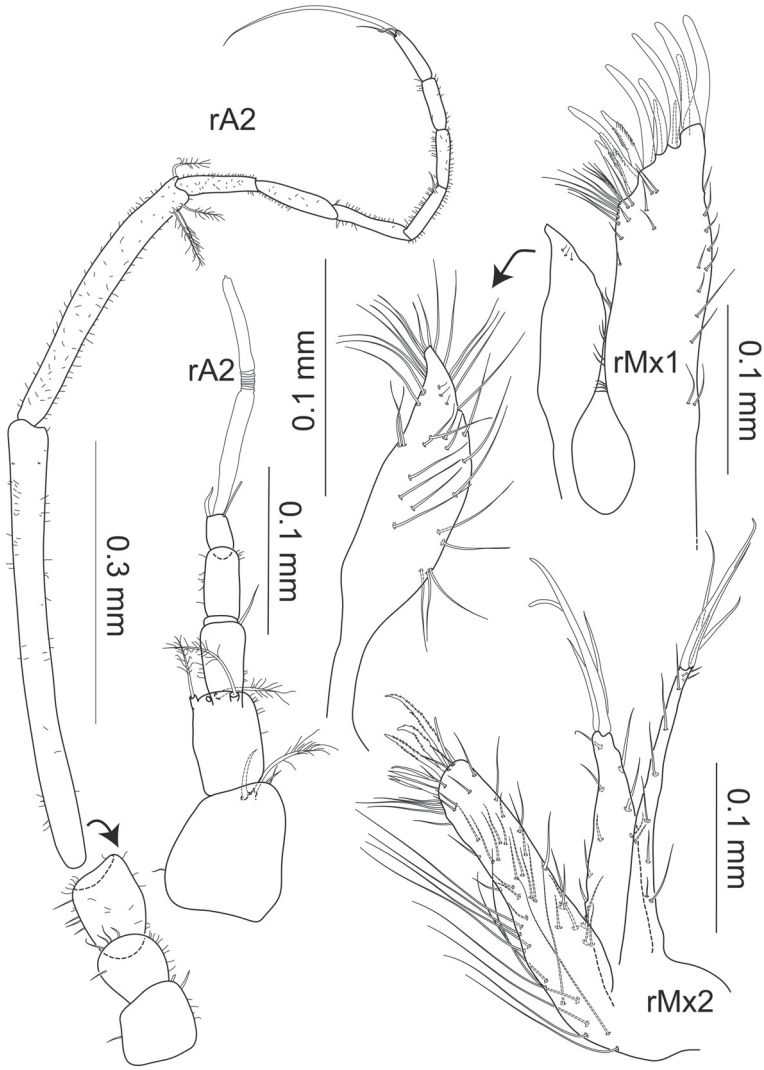

Figure 16. *Macrostylis antennamagna* sp. n. (Paratype ♀, ZMH (K-42169)) antenna 1 broken in 2 pieces; antenna 2, maxilla 1 (dorsal view); maxilla 2 (dorsal view).

as wide, with 2 short and 2 long setae; merus about 1.8 times longer than wide, row of 3 setae of same length as merus, most distal seta bifurcate, with 1 simple seta distally on opposite side of the article; carpus 3 times longer than wide, 1.3 times longer than merus, setation similar to merus but most proximal seta of row with bifurcation, and 1 very long bifurcate seta, almost reaching distal tip of propodus; with 1 very long bifurcate seta reaching the tip of the most distally reaching seta of propodus, projecting beyond all setae of dactylus; propodus distally projecting into a subtriangular lobe, 2.3 times longer than wide, distally with 1 long simple seta and 1 robust and acute seta; dactylus very small, twice as long as wide, about 0.4 times

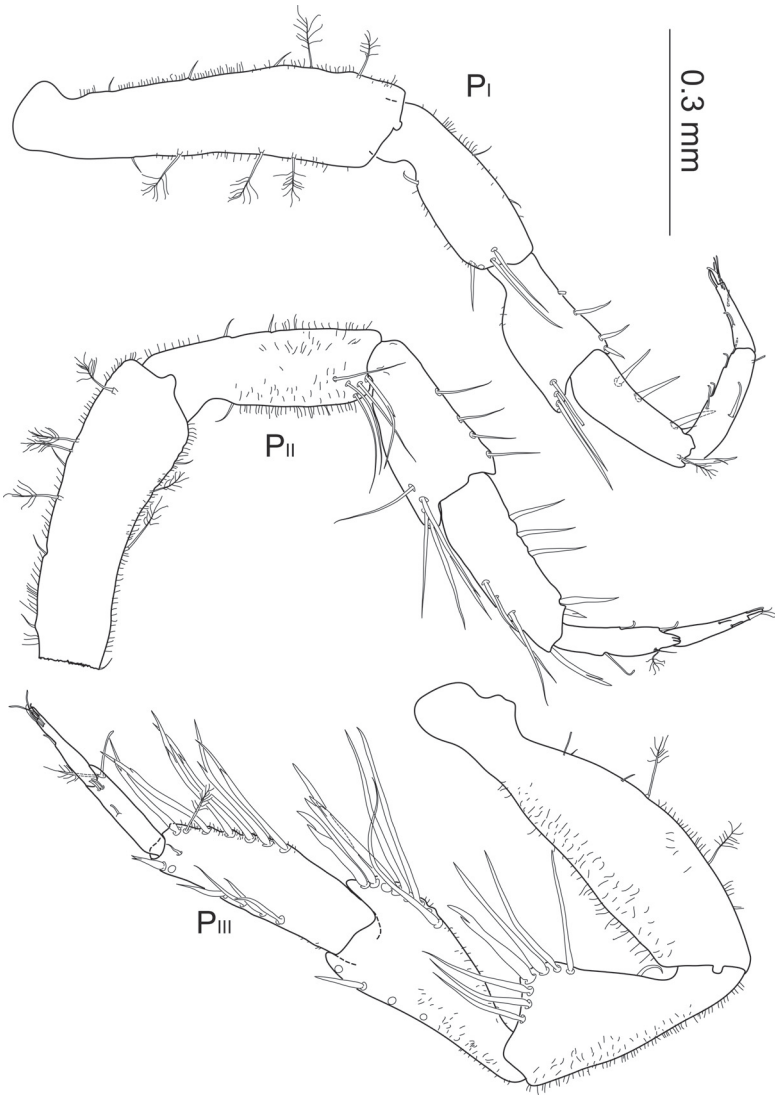

Figure 17. *Macrostylis antennamagna* sp. n. (Paratype ♀, ZMH (K-42169)) pereopods 1–3 (P_I–P_{III}), pereopod 2 basis broken off.

propodus length, with 1 terminal bifurcate claw of 1.3 times dactylus length and 1 subterminal claw of 0.5 times dactylus length, with 1 thin terminal seta of intermediate length.

Pereopod 5 as long as pereopod 2, relative length ratios: 1:0.6:0.4:0.6:0.5:0.2, basis 4.1 times longer than wide with at least 6 broom setae dorsally, 2 rows with 5 small, acute and distally directed setae respectively, arranged dorsally and ventrally, with 1 large simple seta distoventrally; ischium 2.3 times longer than wide, with 2 setae dorsally, 2 groups of 3 closely together articulating setae, 1 group medioventrally and 1 group dis-

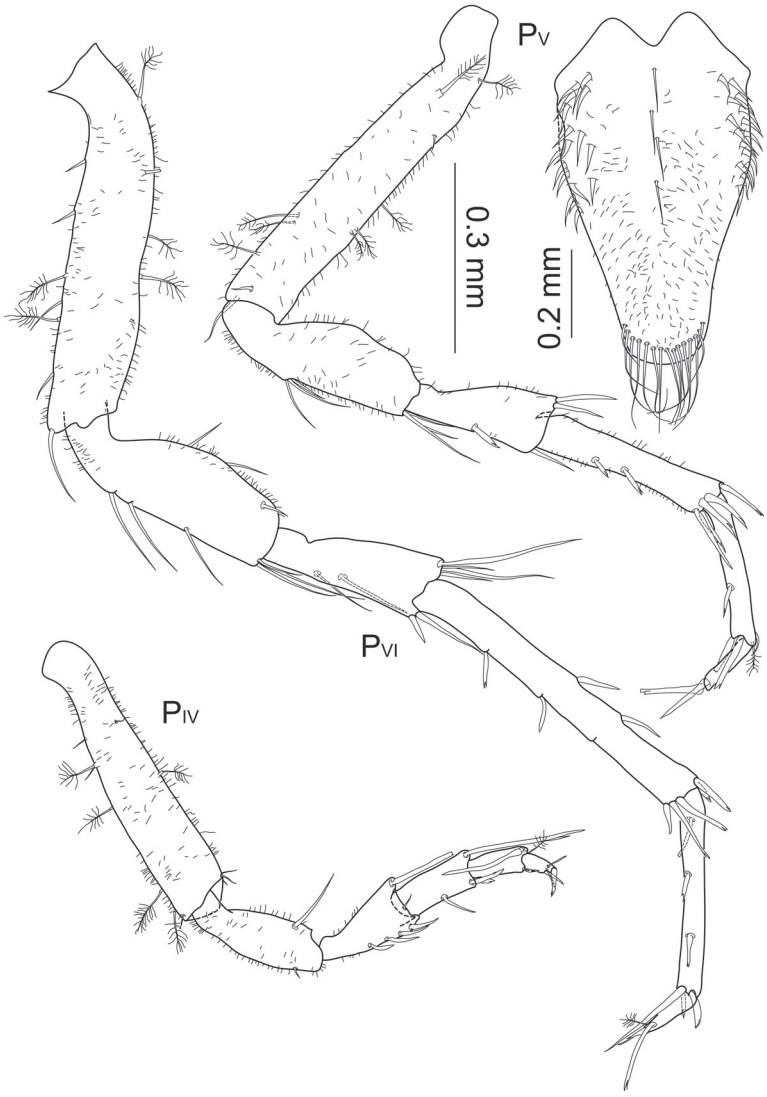

Figure 18. *Macrostylis antennamagna* sp. n. (Paratype ♀, ZMH (K-42169)) pereopods 4–6 (P_{IV}–P_{VI}), pereopod 7 missing (scale = 0.3 mm); operculum (ventral view, scale = 0.2 mm).

toventrally; merus 1.8 times longer than wide, distodorsally extending with 1 simple and 1 very long bifurcate seta of 1.1 times merus length, with 3 setae ventrally; carpus 2.5 times longer than wide, ventrally with 3 setae and distoventrally with 3 setae, the strongest of which is bifurcate; propodus 3 times longer than wide, distodorsally projecting into an acute subtriangular lobe, with 2 simple setae distodorsally and 2 on the opposite side, 3 setae ventrally, articulating closely together; dactylus small, 3.7 times longer than wide, of half propodus length, 2 claws, terminal claw of 0.4 times dactylus length, subterminal claw of 0.3 times the length of dactylus, with 1 thin subterminal seta ventrally.

Table 3. *Macrostylis antennamagna* sp. n. paratype; preparatory female ZMH (K-42169); relative length ratios of articles of pereopods 1–7 (PI–VII) (basis to dactylus, excluding setae); length-width ratios (L/W) of pereopodal articles; basis damaged in pereopod 2; pereopod 7 broken off and missing.

	Article length ratios	**L/W basis**	**L/W ischium**	**L/W merus**	**L/W carpus**	**L/W propodus**	**L/W dactylus**
P_I	1 : 0.5 : 0.4 : 0.4 : 0.3 : 0.3	4.1	2.9	2	2.7	3.8	4.7
P_{II}	???	???	3.2	2	2.7	2.6	4.6
P_{III}	1 : 0.6 : 0.6 : 0.5 : 0.3 : 0.2	3.9	2.2	2.4	3.1	4.3	7.5
P_{IV}	1 : 0.4 : 0.4 : 0.3 : 0.2 : 0.1	4.8	2.6	2.1	2.8	2.5	2
P_V	1 : 0.5 : 0.4 : 0.5 : 0.4 : 0.2	6.2	3.1	2.4	4.8	6.3	5
P_{VI}	1 : 0.6 : 0.5 : 0.5 : 0.4 : 0.2	5.2	2.8	2.8	7.7	8.3	3.3

Pereopod 6 1.3 times pereopod 2 length, relative length ratios: 1:0.6:0.4:1:0.7:0.2, basis 3.9 times longer than wide, setation as in pereopod 5 except no setae dorsally; ischium 2.4 times longer than wide, with 5 setae dorsally, 9 setae in 3 groups ventrally; merus about 2.3 times longer than wide, distodorsally extending with 4 unequal setae, the longest little longer than the article and bifurcate, 2 groups of setae ventrally; carpus elongated, as long as basis, 7.7 times longer than wide, dorsally with 1 seta and 1 broom seta, with 1 simple and 1 bifurcate seta distodorsally, ventrally with 3 robust bifurcate setae and distoventrally with a group of 3 bifurcate setae of varying lengths; propodus slender, 6.8 times longer than wide, distodorsally projecting into an acute subtriangular lobe, 2 bifurcate setae ventrally and 2 distoventrally, the longest one 1.5 times longer than dactylus; dactylus 5 times longer than wide, 0.3 times propodus length, with a terminal claw of 1.4 times dactylus length and a subterminal claw less than half as long.

Pereopod 7 1.1 times longer than pereopod 2, relative length ratios and setation similar to pereopod 6 except basis without broom setae, but dorsally with row of more than 25 simple setae of twice the length of basis width and a ventral row of at least 5 simple setae.

Pleopods 1–4 (Fig. 14) relative length ratios: 1:0.9:0.6:0.4. Operculum of 0.7 times pleotelson length, opening width of distoventral excavation about 0.2 pleotelson width. Pleopod 1 elongate, proximal width about 0.4 times length, width at distolateral lobes 0.3 times length, laterally convex with minimal width about 0.1 times length, setation pattern mostly not symmetrical, distolateral lobes not projecting as wide distally as medial lobes, bent laterally and ventrally, medial lobes rounded, with 7 simple setae of different lengths and strengths arranged symmetrically. Pleopod 2 elongate, proximal width 0.3 times length, maximal width (including stylet) 0.4 times length, stylet almost 0.5 times total length of protopod, laterally with row of at least 11 pappose setae, and 9 long distal pappose setae, medially some simple setae. Pleopod 3 protopod of rhomboid shape, 0.4 times total length, endopod not considerably narrowing, with 3 plumose setae and 2 pairs of 2 short setae distally, exopod 0.9 times total endopod length, distally narrowing, with 1 seta subterminally, row of numerous long simple setae surrounding the exopod laterally incl. distal apex and getting shorter medially. Pleopod 4 protopod and exopod broken off and missing; with several very small setae on apex margin and 1 pronounced seta subterminally.

Uropod (Figs 10, 14) of two articles, 0.8 times pleotelson length, protopod 7.9 times longer than wide, endopod small and slender, less than 0.2 times the length of protopod.

Description paratype female. Body (Fig. 15) elongate, 4.5 times longer than wide; maximal body width in pereonite 4, 1.6 times wider than pleotelson; pereonites 2–4 about the same width, 1.1 times pereonite 1 width, small ventral spine posteriorly on pereonite 3. Cephalothorax (Fig. 16) almost semicircular with maximal width at posterolateral corners, length 0.8 times width; slightly longer than 0.1 times total body length; transverse ridge on frons not very prominent, of curved shape. Anterior pereonal division (Fig. 16) 0.2 times total body length; 1.1 times longer than wide. Posterior pereonites (Fig. 16) relative medial segment lengths: 1:1.4:1.1:1.2; relative segment widths of pereonites 4–7: 1:0.9:0.8:0.8, pereonite 7 0.8 the width of pereonite 1. Pleotelson (Fig. 16) 0.2 times body length; about 1.7 times longer than wide; caudal apex slightly concave; breathing cavity maximal opening width 0.7 times pleotelson width, longitudinal excavation 0.2 times maximal pleotelson width.

Antenna 1 (Fig. 16) of 5 articles, 3.4 times longer than article 1 width; articles 1 and 5 as long as wide, fifth article 0.1 times total length, articles 2–4 2 times longer than wide, gradually decreasing in size; 1 aesthetasc on article 5, 0.6 times the length of antenna 1.

Antenna 2 (Fig. 16) relatively slender compared to male antenna 2; articles 1–3 as long as wide; article 4 half as wide as articles 1–3; article 5 0.6 times article 4 length and of same width.

Maxilla 1 (Fig. 16) inner endite shorter and more slender than outer endite, terminally narrowing, around distal apex, dorsally and along lateral margin with numerous long and some very small simple setae; outer endite 1.4 times longer than inner one, narrowing distolaterally, with at least 11 simple setae on lateral margin, with 4 combs of 2–4 simple setae on medial margin, numerous simple setae of different lengths distomedially and 12 robust distal setae, some two-sided denticulate on distal margin.

Maxilla 2 (Fig. 16) inner endite broadest, outer endite of intermediate width, medial endite longest, outer endite 0.8 times middle-endite length, inner endite 0.9 times middle-endite length; margin of inner endite with 12 long simple basomedial setae of more than half the length of endite, numerous small simple setae ventrally and laterally, distal margin with 8 robust setae: 5 simple and 3 denticulate; medial endite with 1 lateral row of simple setae, distally with 4 long simple setae; outer endite with small simple setae along both margins, distally with 4 stiff simple setae of different lengths, the longest of which is of more than half the length of the outer endite. Measurements of article lengths ratios and length-width ratios of articles are listed in Table 3.

Anterior pereopods (Fig. 17) increasing in length, relative length ratios, omitting basis: 1:1.2:1.3, with basis longest article. Shapes and setation as in holotype. Pereopod 2 basis damaged. Except: pereopod 3 relative length ratios and setation different from holotype: basis relatively elongated; ischium only 2.2 times longer than wide, dorsal expansion less prominent than in holotype; propodus 0.5 times the length of carpus;

dactylus long and slender, 0.9 times carpus length; lengths and robustness of setae as well as the number of setae per row increased in merus and carpus.

Posterior pereopods (Fig. 18). Pereopod 4 shortest, length ratios: 1:1.6:2.0; pereopod 7 missing. Pereopod 4 0.7 times pereopod 1 length; dactylus 0.6 times propodus length. Pereopod 5 1.1 times longer than pereopod 1; all articles elongated compared to holotype, especially carpus and propodus. Pereopod 6 1.4 times longer than pereopod 1; with more setae in carpus and propodus.

Operculum (Figs 9, 18) length/width ratio 1.6, densely covered with small setules, with 4 setae alternating along medial line of fusion, numerous setae ventrolaterally along proximal margin, distally with 15 pappose setae. Pleopod 3 and 4 as in male (Fig. 14). Uropods broken off and missing in analysed specimens.

Sexual dimorphism. The male specimen is more slender than the female, its pleotelson is less narrowing posteriorly. The antenna 1 is relatively smaller but wider than in female and with more aesthetascs. The antenna 2 is little larger in the male, almost 0.4 times the length of the total body, 0.3 in female. Pereopods are dimorphic by means of article length ratios while pereopod length in relation to body length and setation are identical in both sexes.

Etymology. "Antennamagna" is derived from the Latin word for "big antenna" as the second antennae are conspicuously large in both sexes.

Remarks. *Macrostylis antennamagna* sp. n. can be delimited from all other species by the large antenna 2, the three-lobed pars incisiva, the roundish appearance of the cephalothorax without a transverse ridge on frons and the shape of male pleopod 1. *M. antennamagna* sp. n. is most similar to *M. urceolata* Mezhov, 1989 which is the only known species of this genus with comparably prominent antenna 2. Both species also share the general appearance in dorsal view and have high similarities in following characters: mandibles, male pleopod 1 and ventral spines. *M. antennamagna* sp. n. can be distinguished from *M. urceolata* by the transverse ridge on frons lacking, antenna 1 being stouter, lacinia mobilis being smaller, the male pleopod 1 being wider and stouter, the smaller relative length of the pleotelson, and the "bifurcate" caudal tip of the pleotelson. *M. gerdesi* (Brandt, 2002), *M. carinifera* Mezhov, 1988, *M. grandis* Birstein, 1970, *M. hirsuticaudis* Menzies, 1962, *M. longiremis* (Meinert, 1890), *M. minuscularia* Mezhov, 2003, *M. sarsi* Brandt, 1992, *M. sensitiva* Birstein, 1970, *M. ovata* Birstein, 1970, and *M. vinogradovae* Mezhov, 1992 have a comparably long antenna 2. However, these species show distinct characters clearly delimitating them from *M. antennamagna* sp. n. of which only the most obvious are listed below: antenna 1 of *M. gerdesi* has nine articles, *M. carinifera* bears a posterior ventral spine on pereonite 4 and a much more stout pleopod 2, *M. grandis* and *M. ovata* have a much wider habitus in dorsal view, *M. hirsuticaudis* has an uniquely shaped pleotelson with an almost straight posterior end, the habitus of *M. longiremis* is constantly narrowing towards posteriorly and the cephalothorax bears spines in posterolateral corners, *M. minuscularia* has a comparably long but thinner antenna 2 and antenna 1 differs in article length ratios and size, *M. sarsi* shows a stouter habitus and more slender antenna 2, the latter is also true for *M. sensitiva* and *M. vinogradovae*.

Antenna 2 can be found even bigger in *M. spinifera* Sars, 1864, *M. polaris* Malyutina & Kussakin, 1996 and *M. porrecta* Mezhov, 1988. However, in *M. spinifera* shape and size ratios of male and female pleopods 1 and 2 differ from *M. antennamagna* sp. n. and in the other two species antenna 2 has more slender peducular articles and antenna 1 is bigger compared to *M. antennamagna* sp. n.

The slender habitus with almost parallel sides in dorsal view shown by *M. antennamagna* sp. n. is common in Macrostylidae. The "bifurcated" caudal end is also present in *M. bifurcatus* Menzies, 1962, although much stronger developed there. The pleopods 5 have not been found in both sexes. It is unclear, though, whether these have been broken off during dissection or if they are generally reduced in this species. The analysis of five specimens from two stations has revealed little individual variation. Variations in setal counts are probably allometric (compare Hessler 1970 for Desmosomatidae).

***Macrostylis obscurus* (Brandt, 1992), comb. n.**
Fig. 19

Desmostylis obscurus Brandt, 1992, p. 69–74, Fig. 11–13

Additions to original description. Pereopod 4 relative article length ratios: 1:0.5:0.5:0.4:0.3:0.1, basis 2.3 times longer than wide, with at least 5 broom setae, 1 short simple seta distodorsally; ischium 1.8 times longer than wide, with 1 short simple seta distodorsally; merus almost 1.8 times longer than wide, distodorsally with 1 stout bifurcate seta, distoventrally 2 acute simple setae, 1 reaching beyond propodal articulation; carpus 1.6 times longer than wide, distodorsally with 1 bifurcate seta, 1 broom seta distoventrally next to 1 long simple seta exceeding dactylus in length; propodus twice as long as wide, dorsally expanding into a distal lobe, with 1 long bifurcate seta distoventrally, exceeding dactylar claw, and 1 short and simple seta ventrally; dactylus small, twice as long as wide, about half propodus length and width, with 1 terminal stout and acute claw, 1.5 times article length, and 1 subterminal bifurcate claw, shorter than article, 2 setae terminally and 1 thin and long simple seta subterminally, twice as long as article.

Pereopod 5 propodus 3.3 times longer than wide, with 2 long simple setae distoventrally, thinner seta more than twice as long as dactylus, the stouter one almost reaching the tip of dactylus, 1 simple seta ventrally; dactylus 5 times longer than wide, half propodus length, with 3 simple, acute claws, terminal claw longer than dactylus, subterminal claw stout, robust and shorter than dactylus, second subterminal claw slender and more than twice as long as dactylus.

Pereopod 6 propodus expanding into a distal lobe, with 1 long bifurcate seta, reaching beyond tip of dactylus, with 1 very long and simple seta and 1 broom seta; dactylus 4.3 times longer than wide, with 1 terminal long and acute claw, 1.5 times dactylus length, and 1 subterminal claw, longer than article, with 2 thin and unequally long simple setae subterminally.

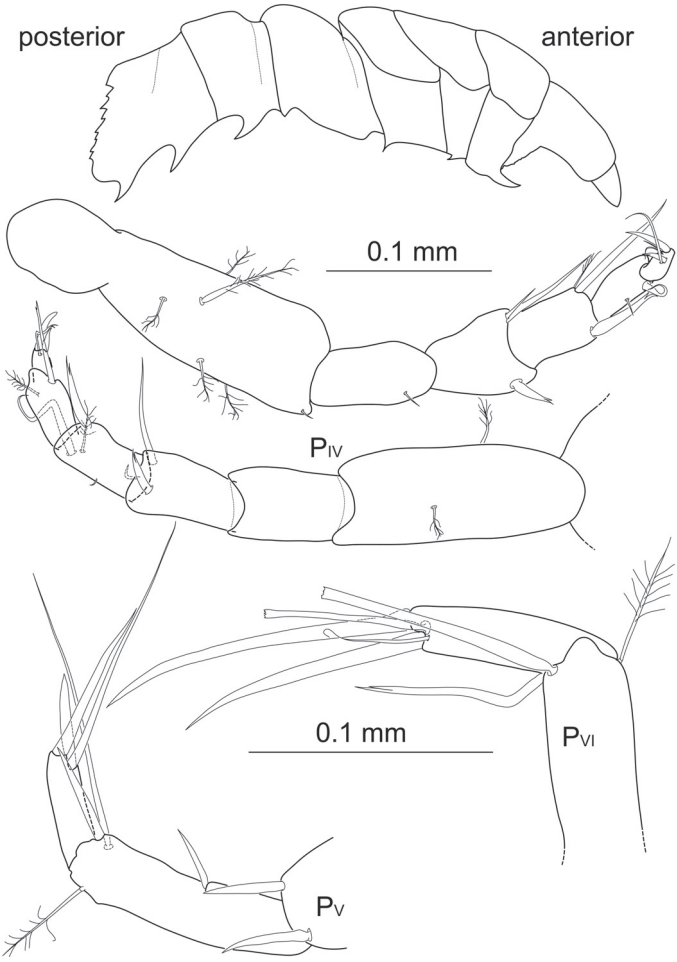

Figure 19. Top: *Macrostylis gerdesi* (Brandt, 2002), comb. n., holotype female (ZMH (K-39915)); lateral view on left side; specimen damaged: pereonite 7 broken off, pereopods, antennae 1–2 and mouthparts dissected; ventral spines on pereonites 1–3 and 5–7 (for measurements see original description); below: *Macrostylis obscurus* (Brandt, 1992), comb. n. holotype female manca, (BNHM 1990:39); left and right pereopods 4; dactyli of pereopods 5 and 6.

***Macrostylis gerdesi* (Brandt, 2002), comb. n.**
Fig. 19

Desmostylis gerdesi Brandt, 2002, p. 616–626, Fig. 1–4.

Additions to original description. Ventral spine in pereonite 1, directed onteriorly; ventral spines in pereonites 2–3 and 5–7, directed posteriorly. Pereonites 4–6 slightly constricted towards anterior margin.

Remarks. Re-examination revealed spines on all sternites not illustrated before, except from pereonite 4. In the latter a ventral constriction is present close to the posterior margin. In *M. gerdesi* comb. n. long sensory terminal setae on dactyli and additionally long sensory setae on propodi of posterior pereopods are considered to be apomorphies for *Desmostylis*. The value of these characters to discriminate between genera is discussed above. However, a dactylus is present in pereopod 4 and in contrast to the *M. obscurus* comb. n. holotype, pereopod 3 ischium is triangularly expanded in *M. gerdesi* comb. n. As a consequence of the character discussion listed above this species is transferred the genus *Macrostylis*.

Discussion

Pereopodal measures are variable within a species. Not only can differences be found between the sexes (see below) but also within a sex. Certain variability does not necessarily occur in all pereopods at the same time and to the same extend. In *Macrostylis uniformis* sp. n., for example, we have found the pereopod 3 to be almost similar with regard to length-width ratios in an ovigerous and a non-ovigerous female specimen. Here, only the number of setae per row was slightly different. Contrastingly, pereopod 5 shows rather strong variation. While the pereopod 5 in general and most of its articles were longer in the ovigerous female, ischium and merus had the same length compared to the preparatory female. Besides propodus and dactylus, all articles had the same width or were narrower in the ovigerous female compared to the preparatory one. These measures could be interpreted as allometry but may also be variable within a stage.

In *M. antennamagna* sp. n. we observed differences in posterolateral setation of cephalon and pereomeres with regard to robustness, length and substructures. These differences occurred between male and female as well as between left and right side of the same pereomere of one specimen. This indicates that such setal features are intraspecifically variable. To clarify if this is general variability or sexual dimorphism, higher numbers of specimens need to be analysed.

Sexual dimorphisms have been reported for a wide range of taxa. Not much is known about dimorphism in Macrostylidae. Here, species have been described based on one sex only. Sexual dimorphism is probably the reason why correct allocation of a complementary male or female is often impossible based solely on morphological characters. This is the case for example in *M. uniformis* sp. n. Knowledge about general patterns of dimorphism in closely related species could provide an aid for allocation in new species. However, we found distinct differences between males and females in macrostylids. A general pattern of sexual dimorphism can be found in the copulatory organs and a few additional characters: the male antenna 1 bears more aesthetascs and is sometimes broader than in the female (Hansen 1916, Menzies and George 1972). Furthermore, in the antenna 2 articles are sometimes broader in males than in females (Mezhov 2003a, b).

To date no cases of more extreme sexual dimorphism, as for example reported for the paramunnid genus *Abyssaranea* Wilson & Hessler, 1974, have been described in

Macrostylidae. It is possible that no example has been discovered so far but it also may be that in strongly dimorphic species males and females have been defined as distinct species. Wilson and Hessler (1974) mentioned the possible value of the dimorphic degree as being a significant character on generic level. A comprehensive comparison of gender differences has been reported for *M. dellacrocei* Aydogan, Wägele & Park, 2000. In the original description a juvenile male was compared to the preparatory female holotype. Differences found exceed the above mentioned general pattern for Macrostylidae by far. The differences that occurred between sexes (i.e. lack of sternal projection in pereonite 1, the relatively smaller pereonite 7, the smaller aesthetasc and terminal article in the antenna 1, the reduced sizes of pars molaris and spine row in the mandible, the reduced sizes in right and left lacinia mobilis, reduced number of setae on pereopod 7), though, are most likely allometric characters at an early ontogenetic stage in the juvenile male specimen. Therefore, these characters cannot be used to infer sexual dimorphism in this species or to gain insights into general patterns of sexual dimorphism in Macrostylidae.

On this background we assume sexual dimorphism likely to be common in Macrostylidae and to vary from species to species. Both sexes have so far only been described in species with low degree of sexual dimorphism, where allocation was straight forward. It is likely that in some cases only one gender per species has been collected, particularly where sample size is low. It may also be likely that strong sexual dimorphism leads to allocation of male and female specimens into separate species. This could e.g. be the case in *M. uniformis* sp. n. To allocate specimens safely it is necessary to know characters that are less affected by sexual dimorphism. For the identification of such characters, analyses of higher numbers of specimens from one sampling site are needed. Patterns could be not only generalized to allocate species where lower numbers of specimens are available but probably also be used to infer subtaxa (i.e. genera) within Macrostylidae.

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RESEARCH ARTICLE

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Raveniola niedermeyeri from Iran: redescription and new data on distribution (Araneae, Nemesiidae)

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Abstract

Raveniola niedermeyeri (Brignoli, 1972), a poorly known species, is rediagnosed and redescribed from the types and from recently collected material from northern and central regions of Iran. This species differs from its congeners in having the male embolus curved distally, as well as in the unique conformation of the spermathecae. New data on the distribution of *R. niedermeyeri* in Iran are also provided.

Keywords

Araneae, spiders, Nemesiidae, *Raveniola*, Iran

Introduction

Nemesiidae is the second largest mygalomorph family, containing 350 species (Platnick 2010) and is distributed worldwide. The diplurid *Brachythele niedermeyeri* was first described by Brignoli (1972) on the basis of a few mygalomorph specimens from Iran collected in the vicinities of Astrabad (now called Gorgan) by Oskar Niedenmeyer prior to World War I . Later, this species (hitherto known only from the type locality) and its closest relatives were transferred to the nemesiid genus *Raveniola* Zonstein, 1987 (Zonstein 1987), which currently contains 19 species mainly distributed in the Middle East and Central Asia (Platnick 2010). The original description by Brignoli contains some data interpreted erroneously. This species was presented as the largest

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nemesiid of Eurasia, with a carapace length of up to 10 mm in males and 15 mm in females (actually it was found to be considerably smaller), but the leg measurements of the male holotype given in the same paper were disproportional, amounting to less than half of that necessary to correspond to the stated carapace length (see Brignoli 1972). The original figures showing the configuration of the male palp and the spermathecae of *R. niedermeyeri* (Brignoli 1972: figs 1–2) are too schematic to permit reliable identification and differentiation from its congeners. These incorrect and incomplete data are corrected in our redescription and new data on the distribution of *R. niedermeyeri* are provided.

Material and methods

Specimens from the following institutions were studied: MHNG – Muséum d'histoire naturelle, Genève, Switzerland; TAU – Zoological Museum, Tel Aviv University, Israel; ZMMU – Zoological Museum of the Moscow State University, Russia.

Other abbreviations are as follows. *Eyes*: ALE – anterior lateral; AME – anterior median, PLE – posterior lateral, PME – posterior median. *Spinnerets*: PLS – posterior lateral, PMS – posterior median. *Spine positions*: p – prolateral; pd – prodorsal; pv – proventral; r – retrolateral; rd – retrodorsal; rv – retroventral; v – ventral.

Photographs were taken either using a Canon 500D digital camera with a 100 mm Canon macro lens and a Zeiss Discovery V20 stereomicroscope with a Canon PowerShot G9 digital camera attached to it. Measurements were taken through a Leica MZ12 stereomicroscope with an accuracy of 0.025 mm (approximated up to the nearest centesimal). All measurements are given in millimetres, except for eye diameters and interdistances which are given in microscope scale units (measured at 100×). Lengths of palps and legs are given as: total (femur, patella, tibia, metatarsus, tarsus).

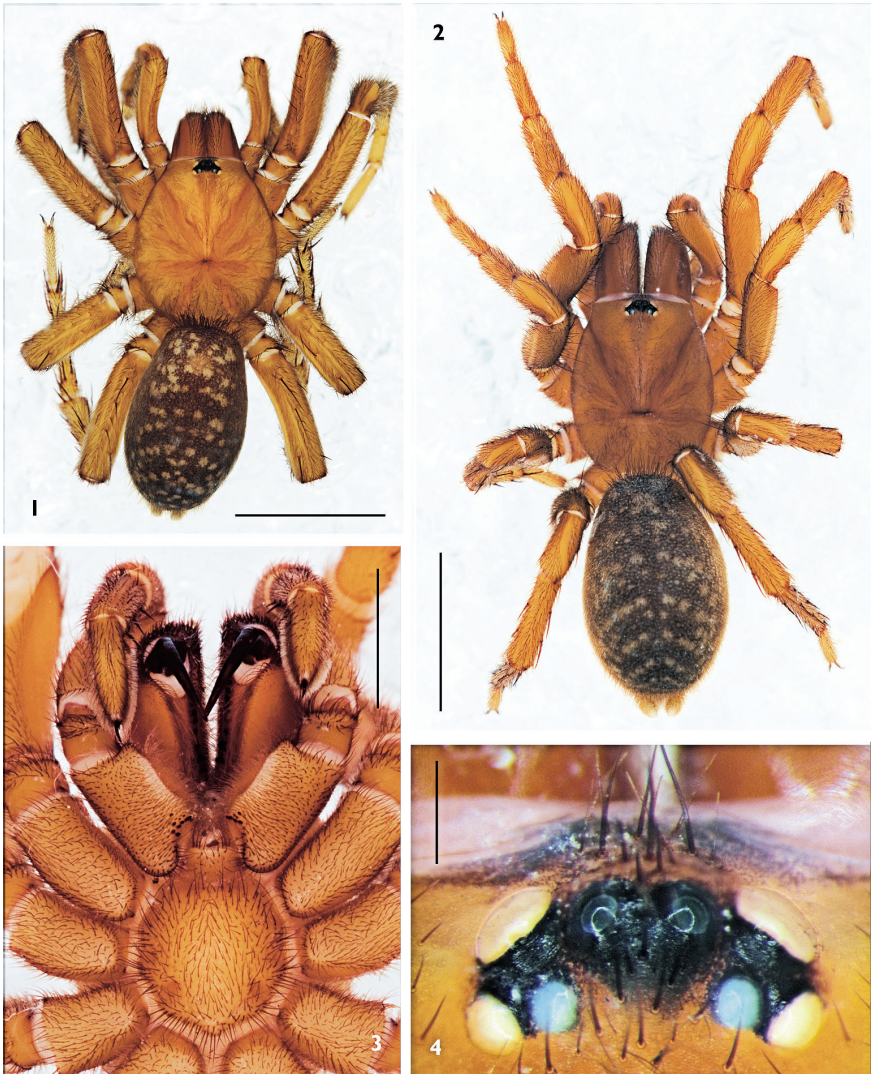
Taxonomy

***Raveniola niedermeyeri* (Brignoli, 1972)**
Figs 1–8

Brachythele niedermeyeri Brignoli, 1972: 412 (male holotype from Astrabad = now called Gorgan, Iran; deposited in the MHNG, examined); Brignoli 1983: 123; Zonstein 1985: 159.

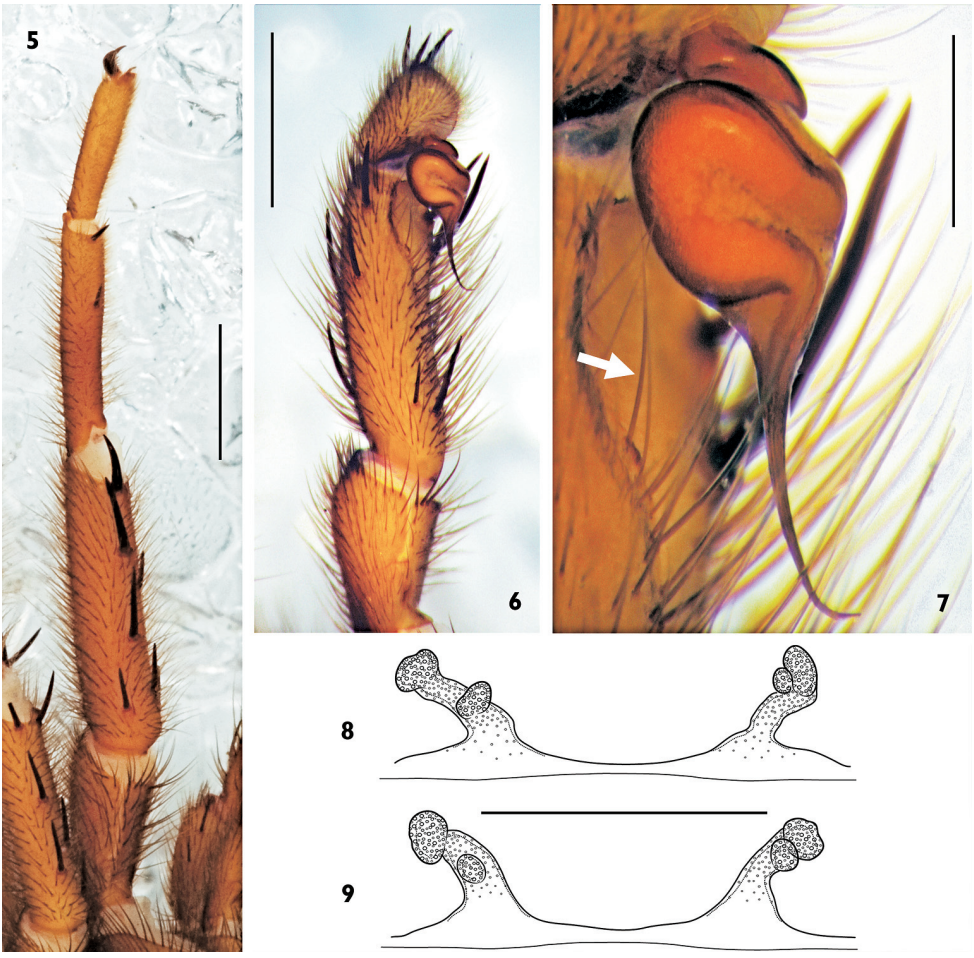
Raveniola niedermeyeri: Zonstein 1987: 1015; Platnick 1989: 90; Mozaffarian and Marusik 2001: 70; Ghahari and Marusik 2009: 4.

Types. ♂ holotype – IRAN: Alborz Mts., surroundings of Gorgan (36°50'N 54°26'E), date not specified but most probably in 1913–1914, prior to World War I, coll. O.R. Niedermeyer (MHNG). Paratypes: 3♂ 2♀ with the same collecting data (MHNG).



Figures 1–4. *Raveniola niedermeyeri*, conspecific male (**1**) and female (**2–4**); **1, 2** body, dorsal view **3** sternum, labium and maxillae, ventral view **4** eye tubercle, dorsal view. (scale bars: **1, 2** = 5 mm; **3** = 2 mm; **4** = 0.25 mm).

Additional material examined. IRAN: Gorgan, IX.2004, coll. H. Ghahari, 1♂ (TAU); Golestan Province, Aliabad, 36°53'N 54°57'E, 30.VII.1974, coll. A. Senglet, 1♀, 7 juv. (MHNG); Mazandaran Province, Elborz (Alborz) Mts, oak forest, VI.2004, coll. H. Ghahari, 1♂ 1♀ (ZMMU); Khorasan Province, surroundings of Mashad (36°17'N 59°36'E), IX.2005, coll. H. Ghahari, 1♀ (TAU); Esfahan Province, surroundings of Esfahan (32°40'N 51°40'E), XI.2005, coll. H. Ghahari, 1♂ (ZMMU).



Figures 5–9. *Raveniola niedermeyeri*, holotype male (**5–7**) and paratype/conspecific female (**8, 9**); **5** leg I, patella to tarsus, retrolateral view **6** palp, patella to cymbium, retrolateral view **7** palpal organ, retrolateral view **8, 9** spermathecae, dorsal view: specimens from Gorgan (paratype) and Mazandaran province, respectively. (scale bars: **5, 6** = 2 mm; **7, 8** = 0.5 mm).

Diagnosis. The species differs from all other congeners of *Raveniola* in having a gradually tapering and curved embolus in males (Figs 6, 7), and the lateral receptacles reduced to vestiges in females (Figs 8, 9).

Redescription. Male (holotype). Total body length including chelicerae 13.80. Colour in alcohol: carapace, chelicerae, palps and first pair of legs dorsally intense reddish brown; eye tubercle with darker spots surrounding AMEs and lateral eyes; sternum, labium, maxillae and legs II–IV light reddish brown; abdomen dorsally light greyish brown; typical darker dorsal pattern consisting of a longitudinal median spot crossed by a few poorly preserved transverse fasciae, ventral abdominal surface and spinnerets pale greyish brown.

General appearance as in Fig. 1. Carapace 5.32 long, 4.55 wide; covered with moderately dense and thin semi-adpressed dark hairs. Eye diameters (AME, ALE, PLE,

PME): 14, 26, 18, 16/17. Interdistances: AME–AME 12, ALE–AME 7, ALE–PLE 7, PLE–PME 7/6, PME–PME 33. Cheliceral furrow with 9–10 promarginal teeth and 7–8 mesobasal denticles. Labium 0.42 long, 0.87 wide. Maxillae with 6–7 cuspules. Sternum 2.45 long, 2.28 wide. Palp: 7.62 (2.75, 1.67, 2.23, –, 0.97). Leg I: 14.88 (4.17, 2.67, 3.27, 3.00, 1.77). Leg II: 12.15 (3.70, 2.33, 2.70, 2.67, 1.75). Leg III: 11.97 (3.27, 1.77, 2.25, 3.15, 1.63). Leg IV: 16.27 (4.25, 2.13, 3.33, 4.53, 2.03). Leg I: tibia slightly incrassate, metatarsus slightly curved retroventrally (Fig. 5).

Spination. Palp: femur d1–1–0, pd1, rd1; patella p1–1; tibia d1–1, p1–1–1, r1–1–1, v2–1–1–1; cymbium d4(5). Leg I: femur d1–1–0–0, pd1–1–1; rd 1(0)–1–1(0); patella 0; tibia p1–1–0, v3–2–1–1; metatarsus v1(0)–1. Leg II: femur d1–1–0–0; pd1–1; tibia p1–1–1, v2–2–3; metatarsus p1; v1–2–2–2. Leg III: femur d1–1–0–0, pd0–1–1, rd0–1–1; patella p1–1, r1; tibia d1–1, p1–1–1, r1–1–1, v2–2–2(3); metatarsus d1–1–2, p1–1–1, r1–1–1, v2(3)–2–3. Leg IV: femur d1–1–0–0, pd0–1–1, rd0–1–1; patella p1, r1; tibia d1–1–2, p1–1–1, r1–1–1, v2–2–2(3); metatarsus pd1–1–2, p1–1–1, r1–1–1, v2–1–2–1(0)–3. Patella I and tarsi I–IV aspinose.

Scopula: distally on metatarsus I, entire on tarsus I, divided by setae on tarsus II; elsewhere absent. Paired claws: 8–10 teeth in two rows on each claw. Trichobothria: 2 rows of 8–11 per row on tibiae, 10–13 on metatarsi, 10–12 on tarsi, 8 on cymbium.

Palpal tibia moderately long, provided with ventral subapical sensilla (Figs 6, 7; indicated by arrow in Fig. 7); cymbium spinose. Bulb pyriform with ejaculatory duct sinuous; embolus without keel, gradually tapering and curved ventrad apically (Fig. 7).

Spinnerets. PMS: length 0.25; diameter 0.15. PLS: maximum diameter 0.35; length of basal, medial and apical segments 0.67, 0.55, 0.37; total length 1.59; apical segment triangular.

Female (paratype): Total body length including chelicerae 15.90. Colour in alcohol and pubescence as in male, dorsal abdominal pattern better preserved, consisting of numerous irregularly arranged, small yellowish brown spots on darker brown background.

General appearance, eye tubercle and ventral aspect of sternum, labium and maxillae as in Figs 2, 4 and 3, respectively. Carapace 5.35 long, 4.23 wide. Eye diameters (AME, ALE, PLE, PME): 12, 26, 20, 13. Interdistances: AME–AME 13, ALE–AME 9, ALE–PLE 8, PLE–PME 4, PME–PME 38. Cheliceral furrow with 9 promarginal teeth and 5 mesobasal denticles. Labium 0.54 long, 1.06 wide. Maxillae with 10–11 cuspules. Sternum 2.38 long, 2.30 wide. Palp: 7.48 (2.25, 1.50, 1.73, –, 2.00). I: 11.82 (3.47, 2.30, 2.57, 2.03, 1.45). II: 10.63 (3.05, 2.03, 2.15, 1.93, 1.47). III: 10.32 (2.77, 1.77, 1.80, 2.45, 1.53). IV: 14.54 (3.63, 2.23, 2.92, 3.85, 1.90).

Spination. All femora with 1 basodorsal slender spine and a few stiff bristles (undeveloped spines) located medially and distally; palpal patella, patella I and tarsi I–IV aspinose. Palp: femur d1, pd1; tibia v2–1–2; tarsus d5(6). Leg I: femur d1, pd1; tibia v2–1–2; metatarsus v2–2–2. Leg II: femur d1, pd1; patella p1; tibia p1–1, v2–1–3; metatarsus v2–2–2. Leg III: femur d1, pd 1–1, rd 1–1; patella p1–1, r1; tibia d1, p1–1, r1–1, v2–2–3; metatarsus pd1–1, p1–1–1, r1–1–2, v2–1–3–3. Leg IV: femur d1, rd1; patella p1, r1; tibia p1–1, r1–1–1, v2–2–3; metatarsus d1–1–1, p1–1–1–1, r1–1–1–1, v2–1(2)–2(3)–3.

Figure 10. Localities of *Raveniola niedermeyeri* in Iran.

Scopula: distal on metatarsi I–II, narrowly divided by setae on palpal tarsus and tarsus I, widely divided on tarsus II, elsewhere absent. Paired claws: 5–7 teeth in two rows on each claw, palpal claw with 4 teeth on inner margin. Trichobothria: 2 rows of 7–9 per row on tibiae, 11–14 on metatarsi, 11–14 on tarsi, 9 on palpal tarsus.

Spermathecae as in Figs 8 and 9. Second (lateral) receptacles underdeveloped, sessile, rudimentary to almost absent.

Spinnerets. PMS: length 0.42; diameter 0.20. PLS: maximum diameter 0.55; length of basal, medial and apical segments 0.65, 0.48, 0.40; total length 1.53; apical segment triangular.

Variability. Carapace length in males varies from 5.05 to 5.90; in females from 5.10 to 7.05. The general coloration is usually the same as shown in Figs 1 and 2, with insignificant variation throughout the series of specimens examined. In males, variations in the shape of the bulb and embolus were not evident. Two variants of the female spermathecae, which differ only slightly, are shown in Figs 8 and 9.

Distribution. Iran: Alborz Mts., Khorasan and Zagros Mts. (Fig. 10)

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RESEARCH ARTICLE

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A new *Antaeotricha* species from Southeastern Arizona (Gelechioidea, Elachistidae, Stenomatinae)

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Abstract

The new species *Antaeotricha arizonensis* is described from southeastern Arizona and southwestern New Mexico. Adults and genitalia are illustrated.

Keywords

Antaeotricha arizonensis, Arizona, Elachistidae, Gelechioidea, New Mexico, Stenomatinae

Introduction

Duckworth (1964) reviewed the North American Stenomidae (now treated as Stenomatinae based on the revision by Hodges, 1999, p. 136) and described only two new taxa: *Antaeotricha fuscorectangulata* (TL South Fork of Cave Creek, Chiricahua Mts., [Cochise Co.] Arizona, and *Mothonica kimballi* (TL Siesta Key, Sarasota County, Florida). In 1968, Jerry Powell and Paul Opler reared an *Antaeotricha* species from southeastern Arizona from larvae found in Madera Canyon, Santa Rita Mts., and in 1988 Powell reared specimens from Miller Canyon, Huachuca Mts. The moth was

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not described. Since 2004 I have collected specimens of this same species in UV light traps in the Chiricahua and Mule Mts. in Cochise Co., Arizona, and in the Pinos Altos Mts., Grant Co., New Mexico. *Antaeotricha arizonensis* is now described from a series of ninety-three specimens.

Taxonomy

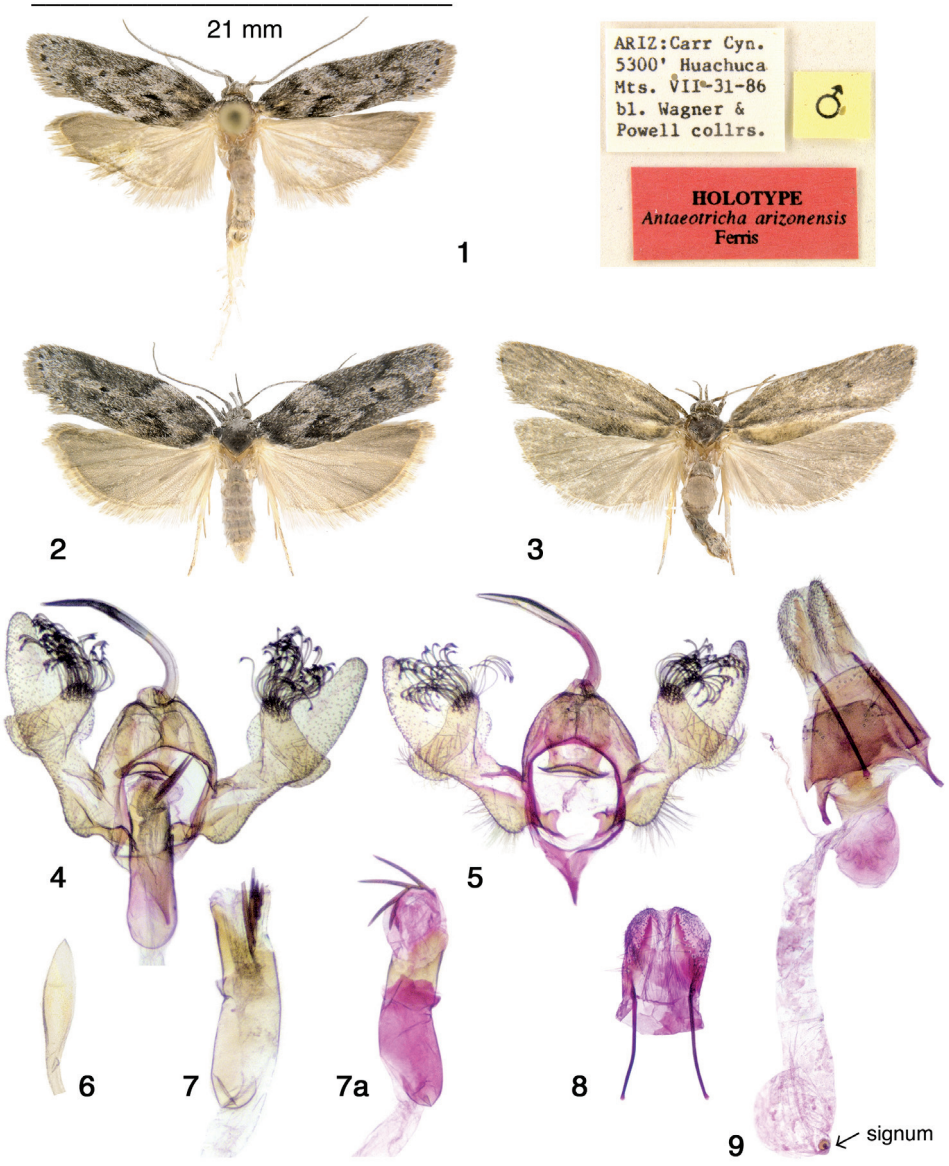
***Antaeotricha arizonensis* Ferris, sp. n.**
urn:lsid:zoobank.org:act:521FAB65-4310-42E2-83C8-41099160AC46
Figs. 1–9

Type material. Holotype male (Fig. 1): **Arizona**, Cochise Co., Huachuca Mts., Carr Canyon, 5300' (1617m), 31.vii.1986, Wagner & Powell; deposited in the Essig Museum of Entomology (EME), University of California, Berkeley, CA. **Paratypes** (deposited in EME): **Arizona**, Pima Co. Larvae Santa Rita Mts., Madera Canyon, 5–6.vi.1968, emerged 22.vii.1968 (1m, 1f), P. Opler, reared from *Quercus hypoleucoides* under lot no. J. Powell 68F54-55. Cochise Co. Larvae Huachuca Mts., Miller Canyon, 1775m, 14.iv.1988, emerged 28.vi–3.vii.1988 (2m, 2f), J. Powell, reared from *Q. hypoleucoides* under lot no. J. Powell 88D34.; Huachuca Mts., Miller Canyon, 5800' (1617m), 3.viii.1986 (1m, 2f) at black light, J. W. Brown & Powell; 7.viii.1991 (1f), J. A. Powell; (in author's collection): **Arizona**, Cochise Co., Chiricahua Mts., above Onion Saddle, 7630', 22.vii.2007 (1f), 10.x.2007 (1f); Pinery Canyon, 7000', 19.viii.2004 (1m), 15.viii.2004 (5m, 2f), 24.viii.2006(2m); Mule Mts., 5700', Banning Creek, 16.vi.2009 (1m). **New Mexico**, Grant Co., Pinos Altos Mts., 7975', Signal Peak, 23 August, 2004 (1m); all C. D. Ferris collector; (deposited in National Museum of Natural History [USNM], Washington, DC): **Arizona**, Cochise Co. Chiricahua Mts., East Turkey Creek, 6400', 13.viii.1967 (2f), J. G. Franclemont; Onion Saddle, 7600', 6.vii–21.viii.1966 (9m, 3f), 6.vii–21.viii.1967 (4m, 4f), J. G. Franclemont; Pima Co., Madera Canyon, Santa Rita Mts., 5900', 11–16. ix.1950 (4f), R. H.Reid/C. W. Kirkwood; 30.vii–29.ix.1959 (12m, 30f), R. W.Hodges.

Etymology. The name *arizonensis* (adjective) denotes the geographic locality from which the species is described.

Diagnosis. *A. arizonensis* immediately separates from other *Antaeotricha* species by its narrow elongate medium gray forewings with patchy dark maculation and unmarked fuscous hindwings.

Description. Sexes similar except antenna and genitalia. Forewing length 9–11 mm (n = 25). **Adult** (Figs. 1–3): *Head* – (Antenna grayish brown with a few scattered white scales on scape; heavily ciliated ventrally in males, not ciliated in females. Frons with brown and white scales; labial palpus upcurved extending beyond crown of head, speckled brown and white with basal segment interiorly white. *Thorax* – Grayish-brown speckled with small white scales, tegula speckled brown and white. *Legs* – Speckled brown and white dorsally, white ventrally. *Abdomen* – Dorsally ochreous fuscous, whitish ventrally in ungreased specimens. *Wings* – Forewing clothed with a mixture of white, gray, and



Figures 1–9. *Antaeotricha arizonensis* adults and genitalia. **1** Male holotype and pin labels **2** Fresh adult female, AZ Cochise Co., Pinery Canyon, 19.viii.04 **3** Worn adult female, AZ Cochise Co., Shaw Peak Trail–Onion Saddle, 10.x.07 **4** Male genitalic capsule **5** Male genitalic capsule with aedeagus removed (see 7a) **6** uncus tip flattened **7** Aedeagus (corresponding genitalic capsule not shown), (7a) with vesica partially everted (from genitalic capsule in Fig. 5) **8** Flattened ovipositor lobes of female genitalia **9** Complete female genitalia.

grayish-brown scales producing an apparent medium gray ground color. Dorsal forewing dark maculation consists of: black basal patch with zigzag distal margin; narrow antemedial black band, convex from costa to a mid-wing pale broken segment, then inwardly an-

gulate from a dark longitudinal spot to junction at inner margin from which an irregular narrow band extends diagonally upward and outward to a discal apex black spot; a narrow post-medial black band extends basally from the costa to just above the discal apex black spot from which it forms a convex semicircle terminating at the inner margin; the terminal line consists of eight black spots; a dark patch extends along the costa from the antemedian to postmedian bands over the upper one-third of the wing. Fringe fuscous. Dorsal hindwing fuscous, unmaculated, with fuscous fringe. Ventral surfaces fuscous, with forewing slightly darker than hindwing.The forewings of worn specimens may appear nearly uniformly gray (Fig. 3). *Male genitalia* (Figs. 4–7; 4 dissections by author, 3 slides from J. A. Powell, 1 slide from USNM) – *Uncus*: decurved, narrow basally with long spatulate apex; gnathos expanded at tip with straight margin, but upcurved at middle and outer edges; vinculum complete, with dorsally produced projecting frontal process that tapers to an apical point. *Anellus*: without distinct lobes. *Valva*: with thumb-like projection on costa bearing long recurved bifurcate setae; *Aedeagus*: long, robust; cornuti four robust spines, three of similar length, one shorter. *Female genitalia* (Figs. 8–9; 2 dissections by author, 3 prepared slides [USNM]) – Genital plate broad and long with tongue-like projection into ostium bursae; ostium bursae large, urn-like, opening into a large spherical membranous sac, from which the ductus bursae originates at one side; inception of ductus seminalis is just below ostium; ductus bursae membranous, initially narrow then expanding below inception of ductus seminalis into a long wide uniform-diameter tube; corpus bursae spherical with one large signum; signum a circular disk with central outward projection.

Distribution and biology. Mountain ranges in Southeastern Arizona (Cochise, Pima cos.) and southwestern New Mexico (Grant Co.). Reared from *Quercus hypoleucoides* A. Camus at Madera Canyon and Miller Canyon. Adults from mid-June to October suggests more than one generation.

Acknowledgments

My thanks to Jerry A. Powell, Essig Museum of Entomology, University of California, Berkeley, CA for supplying host plant information, additional specimens, genital slides for study, and for reviewing the initial draft of this paper, and to John W. Brown, ARS, USDA [USNM], Washington, DC for making a long specimen series available for study. Three external reviewers made helpful suggestions.

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RESEARCH ARTICLE

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Species of the genus *Mastrus* Förster (Hymenoptera, Ichneumonidae) of China with descriptions of two new species parasitizing sawflies (Hymenoptera)

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Abstract

Four species of *Mastrus* Förster, 1869 are reported from China. Two, *Mastrus nigrus* Sheng & Zeng, **sp. n.** reared from *Arge pullata* (Zaddach) and *Mastrus rugotergalis* Sheng & Zeng, **sp. n.** reared from *Diprion jingyuanensis* Xiao & Zhang, are new to science. One, *M. deminuens* (Hartig, 1838), is a parasitoid of *Pachynematus itoi* Okutani. A key to species of *Mastrus* Förster known in China is provided.

Keywords

Mastrus, new species, host, Argidae, Diprionidae, Tenthredinidae, Lepidoptera, *Arge pullata*, *Diprion jingyuanensis*, *Pachynematus itoi*

Introduction

Mastrus Förster, 1869, belonging to the subfamily Cryptinae of Ichneumonidae (Hymenoptera), comprises 50 described species (Yu et al. 2005), of which 30 are known from the Palearctic, 16 from the Nearctic, one is Holarctic, one from the Neotropics, and two from the Oriental Region. The European species of the *pictipes* group of *Mastrus* were revised by Horstmann (1990).

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The genus has not been studied thoroughly in China. Only two species, *M. deminuens* (Hartig, 1838) and *M. ineditus* (Kokujev, 1909), have been recorded (Kokujev 1909, Sheng and Chen 2001). In the present paper, two new species of *Mastrus* Förster, reared from *Arge pullata* (Zaddach) (Hymenoptera: Argidae) and *Diprion jingyuanensis* Xiao & Zhang (Hymenoptera: Diprionidae) collected from P. R. China, are reported.

Methods

Materials used were collected using the following methods.

Rearing parasitoids. Cocoons of sawflies were collected from forests where there had been an outbreak of sawfly larvae lasting two or three years. Cocoons were stored individually in glass tubes with a piece of filter paper dipped in distilled water for maintaining moisture and plugged tightly with absorbent cotton at room temperature. Glass tubes are 60 mm long and 6 mm diameter. Emerged insects were collected daily.

Some European specimens of *M. deminuens* (Hartig, 1838) for comparing with Chinese specimens mentioned in this article were provided by Dr. G. Broad and Dr. K. Horstmann. Photographs of the type of *Mastrus ineditus* were taken by Dr. A. Khalaim.

The morphological terminology mostly follows Townes (1969). Wing vein nomenclature is based upon Ross (1936) and the terminology of Mason (1986, 1990).

All specimens of Ichneumonidae and hosts (except those identified by Prof. Mei-Cai Wei preserved in Central South University of Forestry and Technology, P. R. China) are deposited in the Insect Museum, General Station of Forest Pest Management, State Forestry Administration, P. R. China.

Descriptions

Genus *Mastrus* Förster, 1869

Mastrus Förster, 1869. Verhandlungen des Naturhistorischen Vereins der Preussischen Rheinlande und Westfalens, 25(1868):176. Type species: (*Phygadeuon* (*Mastrus*) *neodiprioni* Viereck) = *aciculatus* Provancher.

Diagnosis. Fore wing vein 3rs-m absent. Hind wing vein 1-cu inclivous. Clypeus with pair of small teeth. Notaulus not reaching to center of mesoscutum. Propodeum completely areolated. Spiracle of first tergum a little behind middle. Upper valve of ovipositor with nodus, lower valve with distinct teeth.

Key to species of *Mastrus* known in China

1. First to fifth terga black. Antennae black or brownish black **2**
– Second and third terga brown to reddish brown. Antennae yellowish brown, at least basal half brown, apical half darker brown **3**
2. Malar space approximately as long as basal width of mandible. Postocellar line about 0.7 times as long as ocular-ocellar line. Mesopleuron with dense and strong transverse wrinkles. Tegulae, hind femora (except base) and tibiae black ..... ***M. nigrus*** **Sheng & Zeng, sp. n.**
– Malar space 1.2 times as long as basal width of mandible. Postocellar line about 1.1 times as long as ocular-ocellar line. Mesopleuron almost smooth medially. Tegulae yellowish to reddish. Hind femora yellowish brown distally, tibiae yellowish brown ..... ***M. ineditus*** **(Kokujev)**
3. Second tergum distinctly granulate and dull, or partly and obliquely granulate-strigose ..... ***M. deminuens*** **(Hartig)**
– Second tergum with more or less distinct longitudinal wrinkles ..... ***M. rugotergalis*** **Sheng & Zeng, sp. n.**

Mastrus nigrus **Sheng & Zeng, sp. n.**
Figs 1, 2, 3, 4, 5, 6
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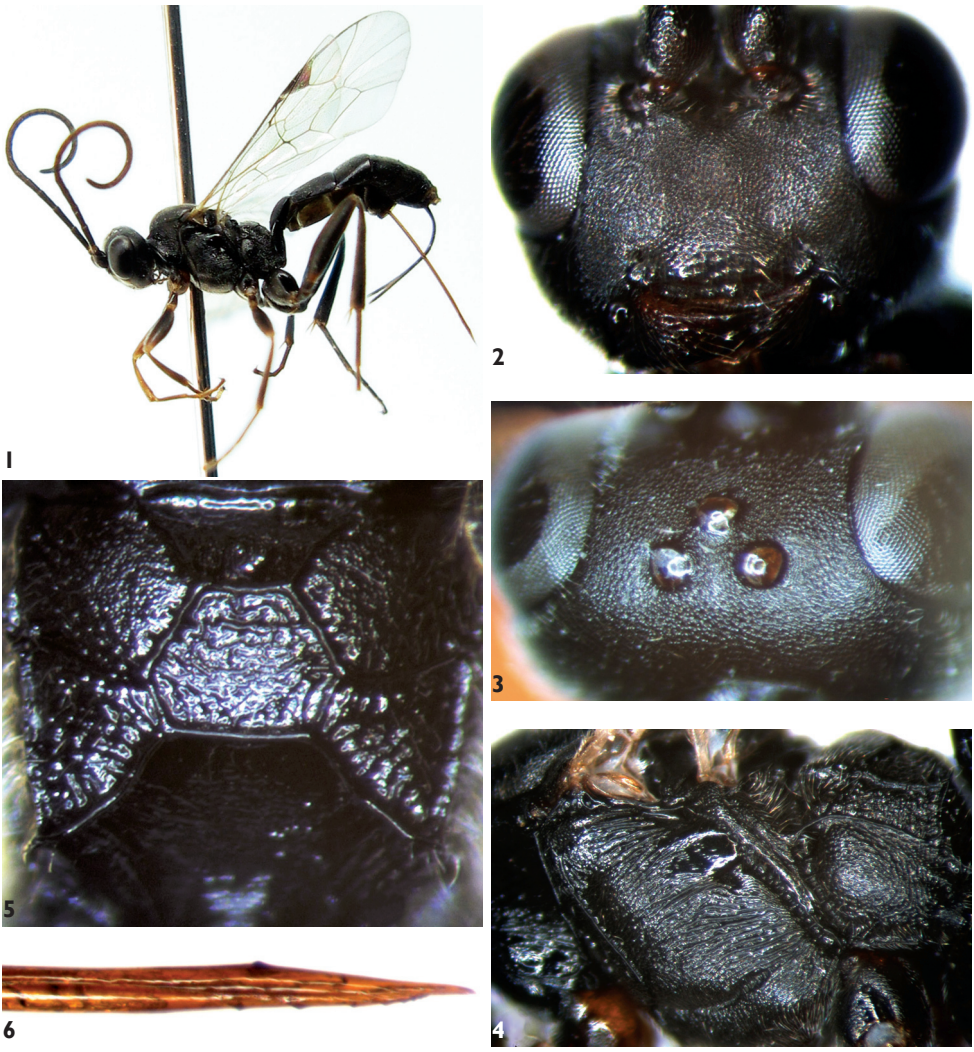
Etymology. The specific name is derived from the body being entirely black.

Types. *Holotype*, female, CHINA: Shennongjia, 2360m, Hubei Province, 15 April 2009, leg. MAN-QUN WANG. *Paratypes*: 2 females and 1 male, CHINA: Shennongjia, 2110 to 2360m, Hubei Province, 15 to 20 April 2009, MAN-QUN WANG.

Diagnosis. Clypeal suture weak and indistinct; subapex of clypeus slightly raised. Hind wing vein 1-cu strongly inclivous, about 3.5 times as long as cu-a. Area superomedia of propodeum approximately as wide as long. Ventral profile of scape with distinct punctures. Tegulae black.

Description. Female. Body length 5.5–7.0 mm. Fore wing length 5.0–6.0 mm. Ovipositor sheath length 2.5–2.8 mm.

Head. Face (Figure 2) 1.9–2.1 times as wide as long, with fine granulose texture and dense punctures, diameter of punctures 1.0–2.0 times distance between punctures, weakly convex centrally; upper margin medially concave. Clypeal suture weak and indistinct. Clypeus slightly convex, 2.5 times as wide as long; basal portion with texture as that of face, but medially sparsely punctate and apically smooth; subapex somewhat raised; apical margin with two small median protruberances. Mandible with dense punctures, upper tooth slightly longer than lower tooth. Median portion of cheek slightly rough, hind portion with punctures. Malar space approximately as long as basal width of mandible.



Figures 1–6. *Mastrus nigrus* Sheng & Zeng, sp. n. **1** Body, lateral view **2** Face **3** Vertex **4** Mesopleuron **5** Propodeum **6** Apical portion of ovipositor.

Subocular sulcus indistinct. Gena with fine leathery texture and unclear punctures, about as long as middle width of compound eye. Vertex (Figure 3) with fine, unclear punctures, posterior portion with indistinct oblique lines. Postocellar line about 0.7 times as long as ocular-ocellar line. Upper portion of frons approximately flat, with texture as that of face; lower portion concave and shiny, with fine, transverse wrinkles. Antenna short, with 27 to 28 flagellomeres, apical portion not attenuated, ratio of length from first to fifth flagellomeres: 6.0:6.0:5.3:4.1:3.3. First and second flagellomeres about 3.75 times as long as widest diameter; ventral profile of scape with distinct punctures. Occipital carina complete.

Mesosoma. Pronotum smooth, upper half of anterior margin with weak longitudinal wrinkles and punctures; median portion with dense oblique transverse wrinkles; upper

posterior portion with weak, dense, oblique longitudinal wrinkles. Epomia weak. Mesoscutum evenly convex, with fine granulose texture, punctures indistinct. Notaulus evident on front portion of mesoscutum. Scutoscutellar groove smooth, with weak longitudinal wrinkles. Scutellum evenly convex, with fine granulose texture and fine punctures, diameter of puncture 1.0 to 2.0 times as long as distance between punctures. Postscutellum short, with fine punctures. Mesopleuron (Figure 4) with dense and strong transverse wrinkles, upper anterior corner with weak and short oblique wrinkles. Epicnemium with fine punctures, diameter of puncture approximately as long as distance between punctures. Epicnemial carina strong, upper end reaching to subalar prominence. Speculum small, with weak and fine transverse lines. Sternaulus sharp, reaching to hind margin of mesopleuron. Metapleuron rough, anterior portion with unclear transverse wrinkles, hind portion with unclear longitudinal wrinkles. Anterior section of juxtacoxal carina distinct, hind section unclear. Submetapleural carina complete and strong. Wings hyaline. Fore wing with vein 1cu-a distal of 1/M by about 0.3 times length of 1 cu-a. Vein 3rs-m absent; 2rs-m about 1.1 to 1.3 times as long as distance between it 2rs-m and 2m-cu. Vein 2-Cu approximately 2.0 times as long as 2cu-a. Hind wing vein 1-cu strongly inclivous, about 3.5 times as long as cu-a. Legs robust. Ratios of length of hind tarsomeres 1:2:3:4:5 are 10.0:4.0:3.0:1.7:2.0. Propodeum (Figure 5) completely areolate, carinae strong. Area basalis an inverse trapezium, with weak longitudinal wrinkles. Area superomedia hexagonal, approximately as wide as long, with very weak and fine transverse wrinkles. Costula connecting area superomedia distinctly behind its middle. Area petiolaris strongly sloping, with dense, oblique, transverse wrinkles. Area externa slightly coriaceous. Area dentipara, areae spiracularis and lateralis with irregular fine wrinkles. Area posteroexterna with strong longitudinal wrinkles. Spiracle circular, very small. Propodeal apophysis short and compressed.

Metasoma. First tergum 1.8 times as long as apical width, with fine granulose texture, posterior portion with indistinct, fine, longitudinal wrinkles. Median dorsal carinae indistinct. Dorsolateral and ventrolateral carinae complete. Spiracle circular, very small, located slightly behind middle of first tergum. Second tergum approximately 0.7 times as long as apical width, with texture as that of mesoscutum. Third tergum 0.6 times as long as basal width, with fine granulose texture. Fourth and following terga strongly convergent backward. Ovipositor sheath 1.1 to 1.2 times as long as hind tibia. Ovipositor slightly compressed. Apical portion of lower valve with 7 weak ridges, basal 3 widely spaced, distal 4 moderately close together.

Color (Figure 1). Black, except the following. Apical margin of pedicel yellowish brown. Ventral profile of apical portion of flagellomeres dark brown. Upper margin of mandible slightly reddish brown. Maxillary and labial palpi brownish black. Ends of front and middle trochanters, basal ends of all femora, apical portions of front and middle femora, front tibiae (at least ventral profiles), brown; middle tibiae blackish brown. Tarsi more or less brown. Posterior portion of sixth and seventh terga white. Stigma brownish black except white base. Veins blackish brown.

Male. Body length about 6.0 mm. Fore wing length about 4.8 mm. Antenna with 23 flagellomeres, tenth and eleventh flagellomeres with linear tyloids. Ventral profile

of scape, mandibles except teeth, maxillary and labial palpi, upper posterior corner of pronotum, tegulae, coxae and trochanters of front and middle legs buff. Front and middle legs sandy beige, except apices of tarsi slightly darkened. Hind femora and basal 0.7 of tibiae reddish brown, apical portion of each tarsal segment slightly brown.

Host. *Arge pullata* (Zaddach) (Hymenoptera: Argidae).

Host plant. *Betula albo-sinensis* Burkill (Betulaceae).

Biology. The mature larva forms a cocoon outside the body of the larval host and inside the cocoon of the host.

Remarks. This new species is similar to *Mastrus ineditus* but can be distinguished from the latter by the following combination of characters: clypeal suture weak and indistinct; subapex of clypeus slightly raised; ventral profile of scape with distinct punctures; costula connecting area superomedia distinctly behind its middle; tegulae black; middle and hind femora, tibiae and tarsi black or mostly black. *Mastrus ineditus*: clypeal suture distinct and deep; apical portion of clypeus depressed and lamelliform; ventral profile of scape almost smooth, punctures indistinct; costula connecting area superomedia at its middle; tegulae, apical portion of femora, tibiae and tarsi red.

Mastrus ineditus (Kokujev, 1909)

Figs 7, 8, 9

Notes. No specimens were examined. Figures of the type, including the body (lateral profile), face, mesopleuron, wings, propodeum and ovipositor, were checked. Drafted figures by Dr. K. Horstmann were consulted.

Host. Unknown.

Distribution: China (Qinghai, Xizang) (Kokujev 1909, Chao 1976).

Mastrus deminuens (Hartig, 1838)

Specimens examined. 1 female, CHINA: Dongfeng, Jilin Province, 15 May 2004, Mao-Ling Sheng.

Host. *Pachynematus itoi* Okutani (Hymenoptera: Tenthredinidae).

Host plant. *Larix gmelinii* (Rupr.) Rupr. (Pinaceae).

Distribution. China (Jilin), Russia, Europe (Yu et al. 2005).

Mastrus rugotergalis Sheng & Zeng, sp. n.

Figs 10, 11, 12

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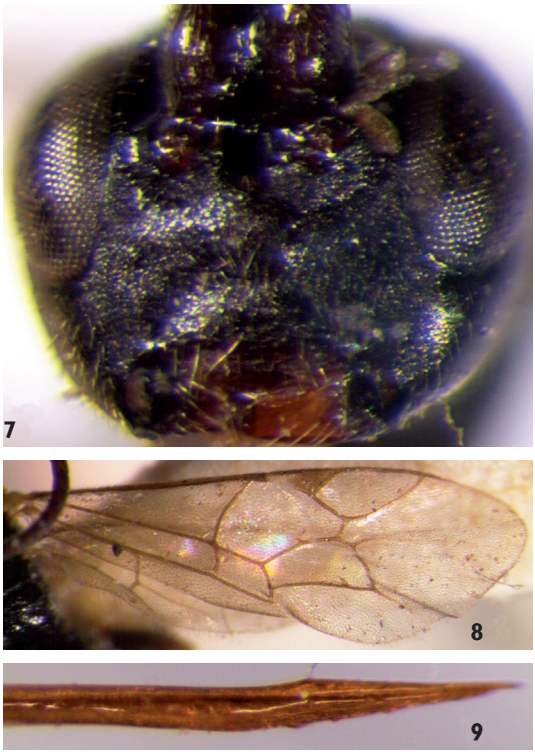
Etymology. The specific name is derived from the longitudinal wrinkles on the second tergum.



Figures 7–9. *Mastrus ineditus* (Kokujev, 1909). **7** Face **8** Wings **9** Apical portion of ovipositor.

Types. *Holotype*, female, CHINA: Qinyuan, Shanxi Province, 6 July 1996, Mao-Ling Sheng. *Paratypes*: 2 females, CHINA: Qinyuan, Shanxi Province, 5 June 1995. 4 females 2 males, CHINA: Qinyuan, Shanxi Province, 6 July 1996, Mao-Ling Sheng; 1 female, CHINA: Qinyuan, Shanxi Province, 12 June 1999, Guo-Fa Chen. 1 female (reared from a pupa of moth), CHINA: Weichang, 1673 m, Chengde, Hebei Province, 16 June 2010, Tao Li.

Diagnosis. Malar space 1.1–1.2 times as long as basal width of mandible. Hind wing vein 1-cu strongly inclivous, about 4.0 times as long as cu-a. Area superomedia 1.3 to 1.7 times as wide as long. Second tergum with longitudinal wrinkles. Tegulae darkish brown.

Description. Female. Body length 5.5–6.5 mm. Fore wing length 3.8–4.0 mm. Ovipositor sheath length 2.0–2.2 mm.

Head. Face (Fig. 11) 1.9–2.0 times as wide as long, with granulose texture and indistinct fine punctures, diameter of punctures 0.5–2.0 times distance between punctures, evenly convex centrally; upper margin with a small median protuberance. Clypeal suture weak and unclear. Clypeus slightly convex, 2.2 times as wide as long; basal portion with indistinct fine punctures, apically smooth and sparsely punctate; apical margin with two small median protruberances. Mandible with indistinct sparse punctures, upper tooth distinctly longer than lower tooth. Cheek finely granulated. Malar

Figures 10–12. *Mastrus rugotergalis* Sheng & Zeng, sp. n. **10** Body, lateral view **11** Face **12** Second tergum.

space 1.1–1.2 times as long as basal width of mandible. Without subocular sulcus. Gena with fine leathery texture and fine punctures, about 0.9 times as long as middle width of compound eye. Vertex with texture as that of gena. Postocellar line about as long as ocular-ocellar line. Upper portion of frons approximately flat, with texture as that of face, but distinctly punctate; lower portion concave and shiny. Antenna with 23 to 24 flagellomeres, apical portion not attenuated, ratio of length from first to fifth

flagellomeres: 5.2:5.0:4.2:3.3:2.9. First and second flagellomeres about 3.7 and 3.3 times as long as respective widest diameter. Occipital carina complete.

Mesosoma. Anterior portion of pronotum smooth, upper portion with punctures; median portion with dense oblique transverse wrinkles; upper posterior portion with fine granulose texture, punctures distinct. Epomia weak. Mesoscutum with fine granulose texture, punctures indistinct. Notaulus evident on front portion of mesoscutum. Scutoscutellar groove nearly smooth, with weak longitudinal wrinkles. Scutellum shiny, evenly convex, with fine punctures, diameter of puncture 1.0 to 3.5 times as long as distance between punctures. Postscutellum transverse, anterolaterally deeply concave, punctures indistinct. Mesopleuron with dense and oblique transverse wrinkles, upper anterior corner with weak and short transverse wrinkles. Epicnemium with fine punctures, diameter of puncture approximately as long as distance between punctures. Epicnemium punctate indistinctly. Epicnemial carina strong, upper end reaching to subalar prominence. Speculum small, anterior portion with weak and fine transverse lines. Sternaulus sharp, reaching to hind margin of mesopleuron. Metapleuron slightly rough, with unclear oblique transverse wrinkles. Juxtacoxal carina anteriorly distinct, hind section unclear. Juxtacoxal and submetapleural carinae complete and strong. Wings brownish hyaline. Fore wing with vein 1cu-a distal of 1/M by about 0.3 times length of 1 cu-a. Vein 3rs-m absent; 2rs-m about 1.1 to 1.3 times as long as distance between it 2rs-m and 2m-cu. Vein 2-Cu approximately 2.0 times as long as 2cu-a. Hind wing vein 1-cu strongly inclivous, about 4.0 times as long as cu-a. Legs robust. Ratios of length of hind tarsomeres 1:2:3:4:5 are 10.0:4.2:3.0:1.7:3.0. Propodeum completely areolate, carinae strong. Area basalis inverse trapezium, almost smooth. Area superomedia hexagonal, 1.3 to 1.7 times as wide as long, slightly coriaceous. Costula connecting area superomedia at its apical 0.3. Area petiolaris strongly sloping, centrally rough, with short oblique wrinkles. Area dentipara with irregular fine wrinkles. Area posteroexterna with strong irregular wrinkles. Areae spiracularis and lateralis with irregular transverse wrinkles. Spiracle circular, very small, close to lateral longitudinal carina. Propodeal apophysis short and compressed.

Metasoma. First tergum 1.4 to 1.6 times as long as apical width. Petiole with granulose texture. Postpetiole with fine, longitudinal wrinkles. Without median dorsal carinae. Dorsolateral and ventrolateral carinae complete. Spiracle circular, very small, slightly convex, located at apical 0.4 of first tergum. Second tergum (Fig. 12) approximately 0.6 times as long as apical width, with more or less distinct longitudinal wrinkles. Third tergum 0.6 times as long as basal width, 0.7 times as long as apical width, almost smooth. Fourth and following terga strongly convergent backward. Ovipositor sheath 1.1 to 1.2 times as long as hind tibia. Ovipositor not compressed, with weak nodus. Apical portion of lower valve with weak oblique ridges, basal 2 widely spaced.

Color (Fig. 10). Black, except the following. Ventral profiles of scape and pedicel, flagellomeres 1 to 4 (5), legs except hind tibiae and tarsi slightly darkish brown, brown. Mandible yellowish brown, except teeth black. Maxillary and labial palpi dust-coloured. Longitudinal fleck of median portion of petiole, postpetiole, second and third terga, basal median portion of fourth tergum red. Tegulae darkish brown. Posterior

margins of sixth and seventh terga and most of eighth tergum white. Stigma, except white base and veins, blackish brown.

Male. Body length about 5.0 mm. Fore wing length about 4.0 mm. Face with distinct punctures. Antenna with 21 flagellomeres, tenth and eleventh flagellomeres with linear tyloids. Ventral profiles of scape and pedicel whitish yellow. Tegulae buff. Middle and hind coxae blackish brown. Second and third terga brown with more or less irregular darkish fleck.

Host. *Diprion jingyuanensis* Xiao & Zhang (Hymenoptera: Diprionidae). Pupa of moth (Lepidoptera).

Host plant. *Pinus tabulaeformis* Carr. (Pinaceae).

Remarks. This new species is similar to *Mastrus deminuens* but can be distinguished from the latter by the following combination of characters: face distinctly and densely punctate on a slightly granulate background; second tergum with more or less distinct longitudinal wrinkles, or finely granulose basally-centrally. *Mastrus deminuens*: face granulate and dull, with fine punctures; second tergum distinctly granulate and dull, or partly and obliquely granulate-strigose.

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