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A new species of *Atractides* Koch, 1837 (Acari, Hydrachnidia, Hygrobatidae) from Ethiopia, with a discussion on the biodiversity of the genus *Atractides* in the Afrotropical region

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Abstract

A new species of *Atractides* Koch, 1837 (Acari, Hydrachnidia) is described from Ethiopia. The world number of *Atractides* now tallies 297 species. The diversity of the genus *Atractides* in the Afrotropical region is briefly discussed.

Keywords

Water mites, taxonomy, new species, Africa, biodiversity

Introduction

Water mites of the genus *Atractides* Koch, 1837 have been found in all biogeographical regions except Australia and Antarctica. Gerecke (2003) reported 123 species from Europe, 72 from Asia, 27 from North America, 33 from Central and South America and 54 from Africa. Since then, many new species have been described (Pešić et al. 2004, Pešić and Smit 2009, Tuzovskij 2011), suggesting that many more remain to be discovered.

The aim of our paper is to describe a new *Atractides* species from Ethiopia. Additionally, the worldwide biodiversity of the genus *Atractides* Koch, 1837 of the world, with an emphasis on the Afrotropical region, is briefly discussed.

Material and methods

Water mites were collected by hand netting, sorted on the spot from the living material, preserved in Koenike fluid and dissected as described elsewhere (e.g. Davids et al. 2007). Holotype and paratypes are deposited in the Zoological Museum in Amsterdam (ZMAN). All material has been collected by the junior author.

All measurements are given in µm. For a detailed description and discussion of the characteristics of the genus *Atractides* and a detailed methodological introduction, see Gerecke (2003).

The following abbreviations are used: Ac-1 = first acetabulum, alt. = altitude, asl. = above sea level, Cx-I = first coxae, dL = dorsal length, H = height, HB = central height, L = length, I-L-6 = Leg 1, sixth segment (tarsus), lL = lateral length, mL = medial length, P-1 = palp, first segment, S-1 = large proximal ventral seta at I-L-5, S-2 = large distal ventral seta at I-L-5, Vgl = ventroglandulare, vL = ventral length, W = width.

Systematics

***Atractides* (*Atractides*) *ethiopiensis* sp. n.**
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Figs 1–3

Type series. Holotype, male (ZMAN), dissected and slide mounted, Ethiopia, Roby River, 21.x.2006, 9°44.996N, 38°59.743E, 2507 m a.s.l. Paratypes: two males, one female (ZMAN, one female dissected and slide mounted), same data as holotype.

Diagnosis. Dorsal integument striated, palp slender with P-2 straight in the both sexes, S-1 in female ending in a fine hair-like tip, excretory pore surrounded by distinct oval sclerite, Vgl-1 fused to Vgl-2.

Description. General features. Dorsal integument: striated, muscle attachment plates unsclerotized. Coxal field: extended secondary sclerotization, caudal margin Cx-I broadly convex. Genital field: Ac in a weakly curved line. Excretory pore: sclerotized; Vgl-1 fused to Vgl-2. Palp: ventral margin of P-2 and ventral margin of P-3 slightly concave, ventral margin of P-4 straight, sword seta between ventral hairs, nearer to the distoventral hairs. Legs: I-L-5 S-1 and S-2 pointed, interspaced, S-2 basally enlarged,

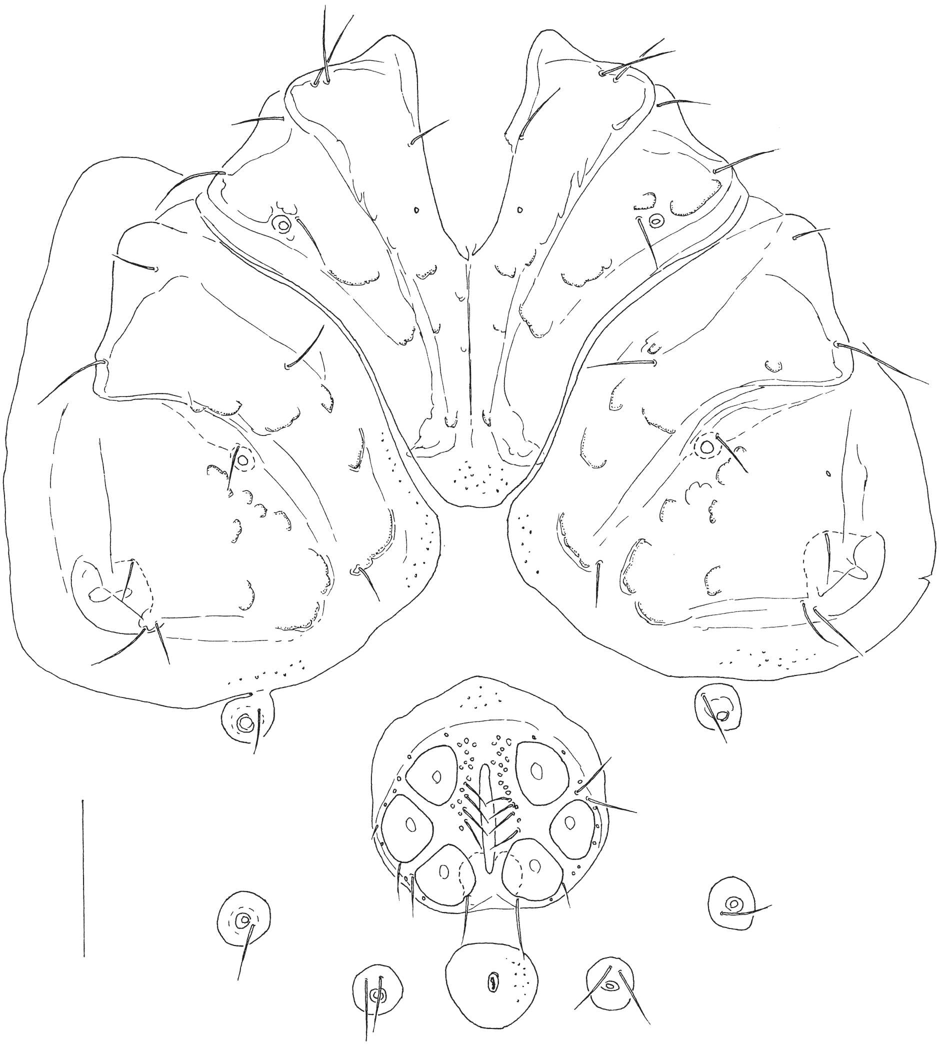

Figure 1. *Atractides ethiopiensis* sp. n., male: idiosoma, ventral view. Scale bar = 100 µm.

bluntly pointed; I-L-6 slender, curved, with maximum H proximally; leg claws with dorsal and ventral clawlets (Fig. 2C).

Morphology. *Male*: Idiosoma L/W 669-684/541-556; coxal field L 420; Cx-III W 484; Cx-I+II mL 156; lL Cx-I+II 265. Genital field (Fig. 1): anterior margin convex, with a border of secondary sclerotization convexely protruding, anterior margins of gonopore and Ac-1 considerably distant from anterior margin of genital field; L/W 150/150; L Ac 1–3: 38–41, 39–45, 39–41.

Palp (Fig. 2A): total L 369, dL: P-1, 35; P-2, 72; P-3, 92; P-4, 131; P-5, 39; L ratio P-2/P-4, 0.55; P-4 club-shaped, with maximum H near distoventral hair.

I-L: I-L-5 dL 243, vL 169, dL/vL ratio 1.44, HB 50, dL/HB 4.86, S-1 L 121, L/W 11.2, S-2 L 95, L/W 5.6, distance S-1-2 23, L ratio S-1/2 1.27; I-L-6 L 166, HB 16, L/HB ratio 10.3; L ratio I-L-5/6 1.46.

Female. Idiosoma L/W 1106/928; coxal field L 473; Cx-III W 644; Cx-I+II mL 147; lL Cx-I+II 284. Genital field (Fig. 3B): L/W 181/209; genital plate bean-shaped, with slightly concave medial margins, L 139; L Ac 1–3: 44, 47, 43.

Palp (Fig. 2D): total L 417, dL: P-1, 48; P-2, 80; P-3, 115; P-4, 132; P-5, 42; L ratio P-2/P-4, 0.6; P-4 not club-shaped, with maximum H near proximoventral hair; chelicera total L 250, claw L 83.

I-L: I-L-5 dL 279, vL 186, dL/vL ratio 1.5, HB 65, dL/HB 4.3, S-1 ending in a fine hair-like tip (Fig. 3C) L 162, L/W 11.3, S-2 L 117, L/W 4.8, distance S-1-2 29, L ratio S-1/2 1.38; I-L-6 L 210, HB 19, L/HB ratio 11.1; L ratio I-L-5/6 1.33.

Etymology. Named after its occurrence in Ethiopia.

Remarks. Due to the striated integument, a slender palp with P-2 lacking ventrodistal projection and similar morphology of I-L-5 and -6, with S-1 in female ending in a fine hair-like tip *Atractides ethiopiensis* sp. n. resembles *A. latisetus* (K. Viets, 1916), a species known from Cameroon (K. Viets 1916), Liberia (Cook 1966), East and South Africa (Lundblad 1952, Viets 1964). This species can be easily distinguished from *Atractides ethiopiensis* sp. n., by a smooth excretory pore and unfused Vgl-1 and -2.

Distribution. Ethiopia.

Discussion

a) The present biodiversity of *Atractides*

To get an overview of the biodiversity of the genus worldwide, we examined numerous papers, Gerecke (2003) and the website www.watermite.org (viewed on January 23, 2011). The total number of *Atractides* species worldwide tallies exactly 297 species, including the new species described in this paper. Most species are known from the northern Hemisphere: 138 are described from the Palaearctic, most of these from the Western Palaearctic and the countries surrounding the Mediterranean Sea (Gerecke 2003). In the Oriental region 56 species have been found, 47 species have been found in the Afrotropical region, including the new species from Ethiopia, while 32 and 27 species are described from the Neotropical and Neartic region, respectively (Fig. 4).

b) The biodiversity of *Atractides* in Afrotropical region

Thus far, 47 species and 3 subspecies have been recorded from the Afrotropical region, with large differences in the state of knowledge of different regions. The number of known species ranges from 14 from Kenya, 13 from South Africa and 9 from Liberia (Viets 1970; Jansen van Rensburg 1974). Conversely, only two species, *Atractides con-*

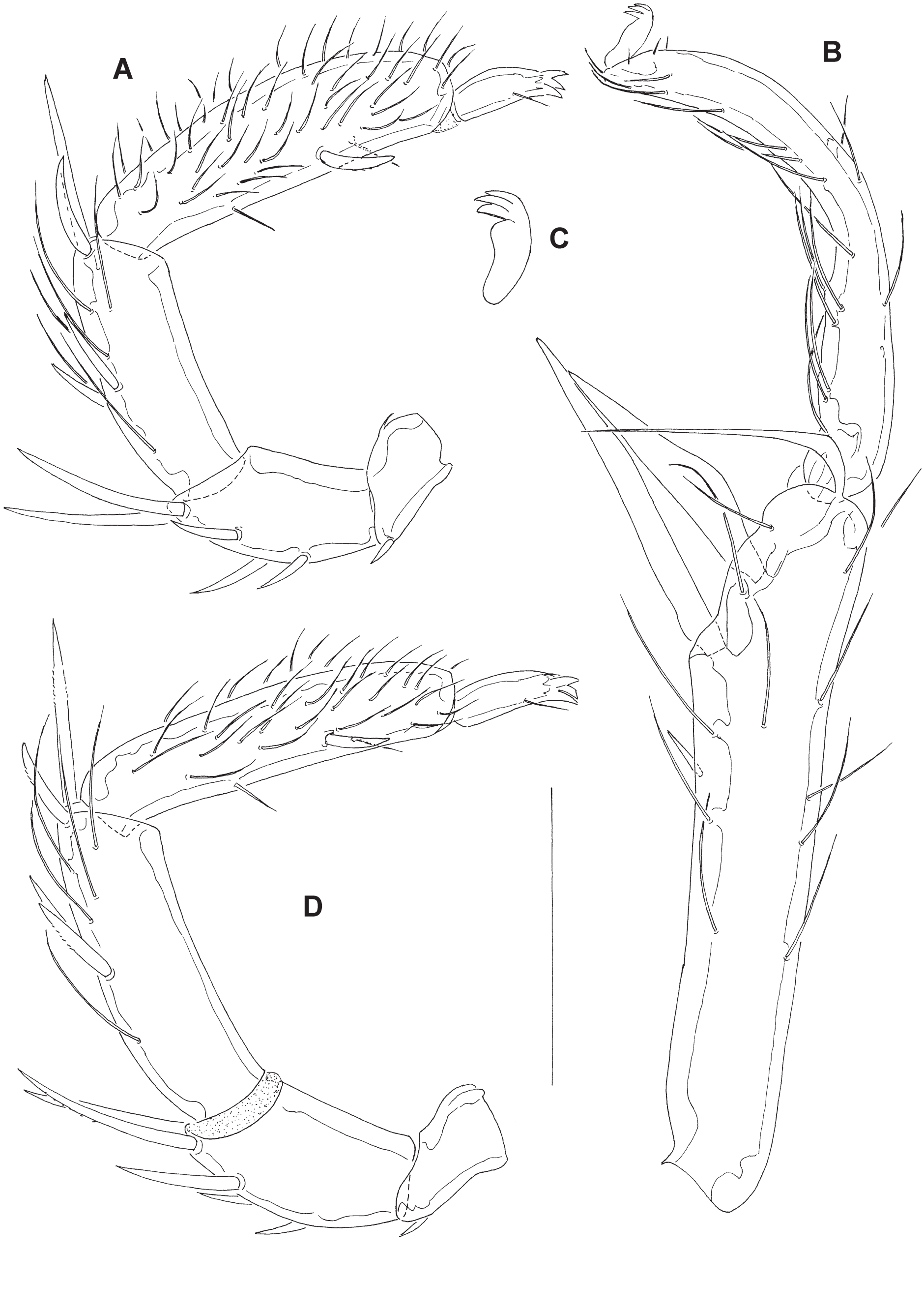

Figure 2. *Atractides ethiopiensis* sp. n., (**A–C** male, **D** female) **A, D** palp, medial view **B** I-L-5 and -6 **C** leg claw. Scale bar = 100 µm.

temptus (Lundblad, 1951) and *A. ethiopiensis* sp. n. are known from Ethiopia (Motaş and Tanasachi 1968, present paper).

The Afrotropical members of *Atractides* belong to the following subgenera *Atractides* Koch, 1837 *s.s.*, *Megabates* K. Viets, 1924, *Tympanomegapus* Thor, 1923 and *Polymegapus* K. Viets, 1926. However, the older data (Viets 1970; Jansen van Rensburg 1974), as well as the most recent catalogue of water mites (Viets 1987) assigned *Tympanomegapus* and triacetabulate members of *Polymegapus* to *Atractides* Koch, 1837 *s.s.*

A critical analysis of the Afrotropical *Atractides* species, with the aid of the diagnoses and the revised key presented in Gerecke (2003), shows that nine species (*i.e.*, *Atractides harrisoni* K.O. Viets, 1971, *A. levipapis* Bader, 1968, *A. neotestudo* Cook, 1966, *A. paratestudo* Cook, 1966, *A. pseudotestudo* Cook, 1966, *A. scutifer* (Lundblad, 1951), *A. subtestudo* Cook, 1966, *A. testudo* Cook, 1966 and *A. tuberipalpis* (K. Viets 1913)) should be assigned to *Tympanomegapus*, while four species (*i.e.*, *A. abruptus* Cook, 1966, *A. congoensis* K.O. Viets & Böttger, 1972, A. *kuhnei* (K. Viets, 1911) and *A. multiporus* Cook, 1966) should be assigned to the subgenus *Polymegapus*. The subgeneric position of *Atractides lautus* K.O. Viets & Böttger, 1972 is unclear. Due to P-1 by far longer than high and centrally narrowed, this species agrees with members of *Tympanomegapus*, but differs in a stout cheliceral basal segment (L/H 2.4, calculated from Viets and Böttger 1972) and a remarkably long claw (Viets and Böttger 1972).

The subgenus *Megabates* K. Viets, 1924, includes two Afrotropical species, i.e., *Atractides rectipes* (K. Viets, 1924) and *A. longicoxalis* (Cook, 1974). According to Gerecke (2003), *Megabates* is most probably a synonym of *Atractides*.

The other 35 species and subspecies are assigned to *Atractides s. s*. According to our present state of knowledge, slightly more than a half (54%) of these species are known from both sexes, i.e., *Atractides comorosensis* Smit & Pešić, 2010, *A. contemptus* (Lundblad, 1951), *A. coriacellus* K. Viets, 1956, *A. damkoehleri* (K. Viets, 1916), *A. ethiopiensis* sp. n., *A. falcipes* (Walter & Bader, 1952), *A. kilimandjaricus* Lundblad, 1952, *A. latisetus* (K. Viets, 1916), *A. linearis* (Lundblad, 1927), *A. lundbladi lundbladi* (Halik, 1947), *A. madagascariensis* K.O. Viets, 1964, *A. minutissimus* (Lundblad, 1927), *A. processiferus* (Walter & Bader, 1952), *A. pusillus* (Walter & Bader, 1952), *A. scutelliferus* K.O. Viets, 1964, *A. splendidus splendidus* (Lundblad, 1927), *A. splendidus superbus* (Lundblad, 1927), *A. thoracatus* Koenike, 1898 and *A. valididens* (Lundblad, 1951). Three species are known from the male only, *i.e*. *Atractides africanus* (Lundblad, 1951), *A. baderi* K.Viets, 1956 and *A. invidendus* K.O.Viets, 1964, while 12 species are known from the female only, *i.e., A. assimilis* K.O.Viets, 1964, *A. callosus* K.O.Viets, 1972, *A. exiguus* Lundblad, 1952, *A. immodestus* (Walter & Bader, 1952), *A. irangiensis* K.O. Viets & Böttger, 1972, *A. kuhlmanni* K.O.Viets, 1963, *A. lundbladi curvitarsis* K. Viets, 1955, *A. pulcher* K. Viets, 1956, *A. rostellatus* K.O.Viets, 1964, *A. sudafricanus* K. Viets, 1956, *A. tenuipes tenuipes* Lundblad, 1952 and *A. tenuipes ambiguus* K.O. Viets, 1971.

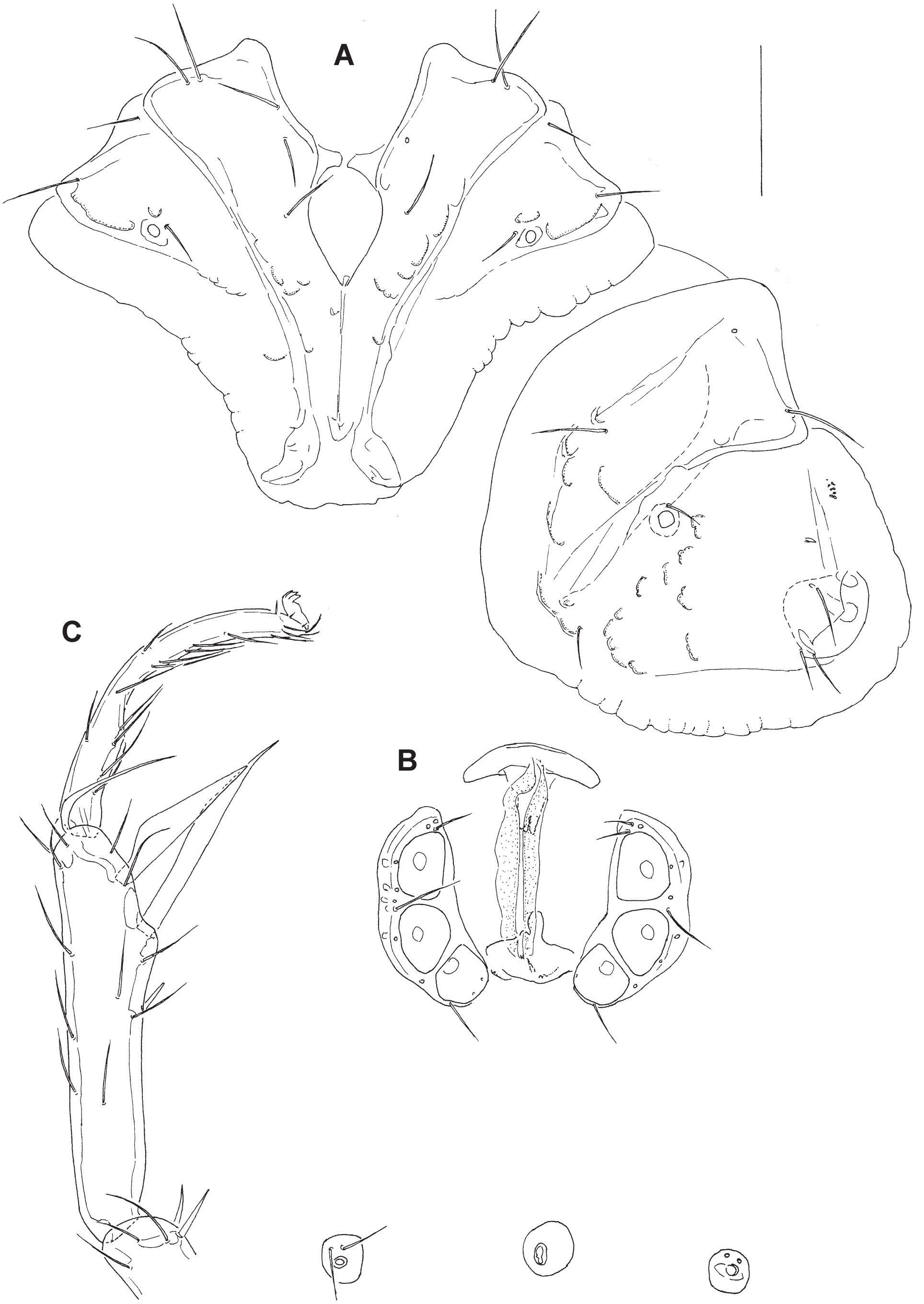

Figure 3. *Atractides ethiopiensis* sp. n., female **A** = coxal field **B** = genital field, excretory pore and Vgl-1 and -2 **C** = I-L-5 and -6. Scale bar = 100 µm.

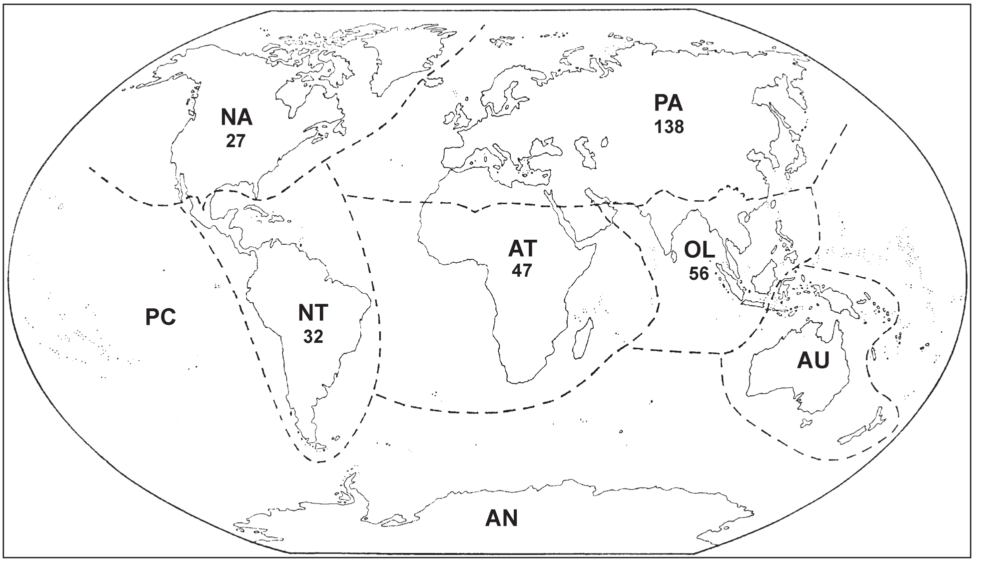

Figure 4. Distribution of freshwater mite species of *Atractides* per biogeographical provinces: PA–Palaearctic; NA–Nearctic; NT–Neotropical; AT–Afrotropical; OL–Oriental; AU–Australasian; PC–Pacific Oceanic Islands; AN–Antarctic. Biogeographical provinces are given according to Balian et al. (2008), modified to include northern Oman in the Oriental, and southern Oman in the Afrotropical region (see Smit and Pešić 2010 for discussion on the zoogeographical position of Oman).

Three species are of doubtful status and merit attention during future taxonomical studies: *Atractides africanus* (Lundblad, 1951) – possibly a synonym of *A. linearis* (Lundblad, 1927) (see Viets 1964 for a discussion); *A. pusillus* (Walter & Bader, 1952) - rather similar to and probably a synonym of *A. damkoehleri* (K. Viets, 1916) (see Viets 1964 for a discussion), and *A. processiferus* (Walter & Bader, 1952) – there is good reason to assume that this species will be found to be synonymous with *A. valididens* (Lundblad, 1951), a species overlooked in the original description of *A. processiferus* (see: Walter and Bader 1952).

In conclusion the current knowledge of the diversity of Afrotropical *Atractides* species is far from complete. Moreover, information on the diversity of Afrotropical *Atractides* among different freshwater habitats is unbalanced, and some important habitats are poorly (e.g., springs) or completely unexplored (e.g., hyporheic interstitial). Additional field work is highly needed for an appropriate evaluation of the extant diversity.

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RESEARCH ARTICLE

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On the Austral-Antarctic stenothoids *Proboloides, Metopoides*, *Torometopa* and *Scaphodactylus* (Crustacea Amphipoda) Part 2: the genus *Proboloides,* with description of two new genera and the transfer of two nominal species to *Metopoides*

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Abstract

This is the second part of a revision of the most plesiomorphic genera in the amphipod family Stenothoidae sensu lato (see Krapp-Schickel and Koenemann 2006 for an overview and Krapp-Schickel 2008 for the first part). 41 species not belonging to *Metopoides* were plotted in a matrix using the same 61 characters as in the first part. The resulting group of *Proboloides* species (most probably not existing in the Austral-Antarctic region) is discussed, a key for the members given and two new genera erected. Some species described as *Proboloides* are redescribed and 2 species transferred to *Metopoides.* A key for all actual members of *Proboloides* and a revised key for *Metopoides* is added. The remaining species, i.e. those actually being in the genera *Torometopa* and *Scaphodactylus*, will be dealt with in the final part of this series, together with a key to all of them.

Keywords

Stenothoidae sensu lato; systematics; phylogenetic analysis; gen. *Proboloides; Malvinometopa* gen. n.; *Victometopa* gen. n.; *Victometopa rorida* sp. n.

Introduction

Barnard and Karaman (1991: 694 ff.) list 23 species belonging to the genera *Metopoides* and *Proboloides*, which were always difficult to differenciate. Since this publication the number of species has increased, while our knowledge on character states did not grow the same way. The results of a phylogenetic analysis of the entire family Stenothoidae sensu lato by Krapp-Schickel and Koenemann (2006) showed not only that the genera treated therein had many plesiomorphic character states, but also that too many characters were still unknown or poorly described. Thus before further studies of the phylogenetic relationships, several species required redescription or at least checking of new characters not described so far.

Material and methods

As many species as possible of this group were studied and redescribed, in order to replace the (initially numerous) question marks in the start-up matrix. Species were borrowed from different Museums.

Acronyms for Museums

AMS	Australian Museum Sydney
BMNH	British Museum (Natural History), London
MNVCr	Museo civico di Storia Naturale Verona
NMV	Museum of Victoria, Melbourne, Australia
ZMUC	Zoological Museum, University of Copenhagen or København

Abbreviations in taxonomical descriptions as well as figures

A1, 2	antenna 1, 2
acc.	accessory
art	article
Cx	coxal plate
Ep	epimeral plate
flag	flagellum
Gn1, 2	gnathopod 1, 2
IP	inner plate
LL	lower lip
Md	mandible
Mx1, 2	maxilla 1, 2
Mxp	maxilliped
OP	outer plate
P3-7	peraeopod 3–7
ped	peduncle

T	telson
U1–3	uropod 1–3
UL	upper lip
Us	urosome

Character matrix

The chosen characters were as follows:

Head

(1.) *A1 length* (0) > A2; (1) ≤ A2
(2.) *A2 peduncle article 1 ratio length: breadth* (0) ≤ 3; (1) > 3
(3.) *ratio A1: body length* (0) ≥ 0.66% body; (1) < 0.66% body
(4.) *A1 flagellum acc.* (0) many articles; (1) 2–1 articles; ; (2) lacking
(5.) *A1 peduncle art 2* (0) < article 1; (1) ≥ article 1
(6.) *A1 peduncle art 1* (0) < ceph.; (1) = ceph.; (2) > ceph.
(7.) *A1 peduncle art 3* (0) ≤0.3 art 1 ; (1) 0.3–0.5 art 1; (2) ≥ 0.5 art 1
(8.) *A1 flagellum arts* (0) <10; (1) 11–20; (2) 21–30; (3) >30
(9.) *A2 peduncle art 5* (0) < flag,; (1) = flag.; (2) > flag.
(10.) *A2 peduncle art 4* (0) >art 5; (1) =art 5; (2) <art 5
(11.) *A2 nr. flagellum arts* (0) <9; (1) 10–15; (2) >15
(12.) *Lateral cephalic lobes* (0) rounded; (1) subacute, blunt
(13.) *Eyes* (0) medium; (1) small to absent; (2) large

Mouthparts

(14.) *Mandible palp art 3* (0) ≥ half art 2; (1) < half 2 or lacking
(15.) *Mandible palp art 2* (0) ≥3 setae; (1) 3–1 setae; (2) lacking
(16.) *Mandible palp art 3* (0) ≥2 setae; (1) one distally; (2) lacking
(17.) *Maxilliped outer plate : merus* (0) ≥ 0.5; (1) 0.5–0.2; (2) <0.2

Coxal plates

(18.) *Ratio length Cx2 : Cx1* (0) <2; (1) 2–2.5; (2) 2.5–3; (3) >3
(19.) *Cx2 ratio length : breadth* (0); ≥1.5; (1) < 1.5
(20.) *Cx4 ratio length : breadth* (0) l>b; (1) l=b; (2) l<b
(21.) *Cx4 distally excavated* (0) no; (1) yes

Gnathopods

(22.) *Gnathopod 1 dactylus* (0) ordinary; (1) spoon-shaped
(23.) *Gn 1 palm* (0) < half propodus length; (1) ≥ half propodus
(24.) *Gn 1 palm angle about* (0) no one = 180°; (1) blunt = 180–150° ; (2) acute = 120°; (3) transverse = 90°

(25.) *Gn 1, 2 propodus shape* (0) similar; (1) different
(26.) *Gn 1 propodus shape* (0) rounded; (1) linear-rectangular; (2) triangular
(27.) *Gn1 carpus* (0) short, length< 2 breadth; (1) l=2b; (2) l<2b
(28.) *Gn1 merus* (0) short; (1) elongate; (2) freeprojecting
(29.) *Gn1 ratio carpus : propodus* (0) < prop.; (1) = prop.; (2) > prop.
(30.) *Ratio length propodus Gn1 : Gn2* (0) ≥0.75; (1) 0.75–0.33; (2) <0.33
(31.) *Gn2 ratio propodus : coxa male* (0) ≥1; (1) 1–0.66; (2) <0.66
(32.) *Gn2 ratio propodus:basis male* (0) ≥1; (1) 1–0.66; (2) <0.66
(33.) *Gn2 ratio propodus:basis female* (0)) ≥1; (1) 1–0.66; (2) <0.66
(34.) *Gn2 ratio propodus : coxa female* (0) ≥1; (1) 1–0.66; (2) <0.66
(35.) *Gn2 palm male* (0) smooth; (1) toothed-serrated; (2) incision(s)
(36.) *Gn2 palm female* (0) smooth; (1) toothed-serrated; (2) incision(s)
(37.) *Gn2 carpus shape* (0) short, l<b; (1) ; elongate, l≥b
(38.) *Gn2 merus shape* (0) not lobate; (1) lobate

Peraeopods
(39.) *P4 ratio posterior margin of merus : propodus* (0) ≤1.33; (1) >1.33
(40.) *P5 basis* (0) ovoid widened; (1) rectangularly widened; (2) slim like basis P4
(41.) *P5 ratio anterior margin of merus : propodus* (0) ≤1.25; (1) >1.25
(42.) *P5 merus tip reaching* (0) no carpus; (1) 0.25–0.75 carpus; (2) full carpus
(43.) *P5 basis posterodistally* (0) no lobe; (1) small lobe; (2) medium lobe; (3) lobe wide and deep, reaching merus
(44.) *P5 basis width ratio maximum : minimum* (0); 1–1.1 (1) 1.1–1.4; (2) 1.4–1.6; (3) 1.6–1.8; (4) >1.8
(45.) *P6 basis* (0) ovoid widened; (1) narrow like P5; (2) rectangularly widened
(46.) *P6 basis hindmargin* (0); harmonically rounded (1) straight
(47.) *P6 basis posterodistal corner* (0) rounded lobe; (1) no lobe
(48.) *P6 merus length anterior: posterior margin* (0) =1; (1) >1
(49.) *P7 basis shape* (0) rounded; (1) narrow like P5; (2) rectangularly widened
(50.) *P7 merus reaching* (0) no carpus; (1) <0.5 carpus; (2) >0.5 carpus; (3) all carpus
(51.) *P7 ratio dactylus: propodus* (0) <0.5; (1) ≥0.5
(52.) *P7 basis posterior margin* (0); convex; (1) concave; (2) straight *Epimeral plates, Uropods + Telson*
(53.) *Ep3 posterodistally* (0) rectangular corner; (1) acute, 60–70°
(54.) *U1 rami* (0) equal; (1) very different
(55.) *U1 ratio peduncle : longer ramus* (0) ≤1; (1) 1–1.33; (2) >1.33
(56.) *U2 ratio of rami* (0) > 66%; (1) ≤ 66%;
(57.) *U2 ratio peduncle : longer ramus* (0) < 1; (1) > 1
(58.) *U2 peduncle spination* (0) no to weak; (1) strong
(59.) *U3 ramus ratio art 1 : art 2* (0) <1; (1) =1; (2) 1.1–1.9; (3) >2
(60.) *U3 ramus spination* (0) no; (1) 1–3 spines; (2) many
(61.) *Telson* (0); *length : breadth* ≤2 (1) ; *length : breadth* >2 (2) 3-dimensional

Schiecke (1973: 80 ff.) published in his doctoral thesis many suggestions about the morphological characters and their states in stenothoids in general. He surmises that the enlarged coxal plates are an advantage in a very densely structured environment such as cylindrical ramified branches in hydroids, bryozoans or algae, allowing stenothoids to “ride” on a branch gripping it with the paired anterior peraeopods from one side and with the posterior peraeopods from the other one, and hiding eggs or juveniles as well as the (usually) very thin posterior legs and uropods. Many species are known as associates with hydroids or bryozoans where they are observed to “steal” the little crustaceans collected and already paralyzed by the host from the tentacle-crown. But of course with stronger enlargement of Cx4 the vagility gets diminished and species with very large coxae are certainly very bad swimmers and probably detritus feeders. However, many stenothoids are excellent swimmers with an enlarged propodus on Gn2 and often with a long basis which affords great mobility, while Gn1 (inclusively Cx1) is extremely small.

It is remarkable that all mouthparts are always unusually long and narrow and it could be imagined that they all together function as a sucking device (it is said that the name steno-thoids stems from the narrow mouthparts, stenos meaning narrow in Greek). Mxp has reduced plates and Md has more or less reduced molars and palps, while pars incisivus and lacinia mobilis are very well developed with acute and robust “teeth”; also both maxillae have robust setae, which could help to divide the food parts already cut by the mandible.

In many stenothoids P3 4 are longer but weaker than P5–7, and all are kept parallel to the coxae and never twisted. Interesting are the quite often acutely lengthened meri (in P3, 4 anteriorly, in P5–7 posteriorly) which warrant an additional capacity against fallling off the substrate.

Taxonomy

Genus *Proboloides* Della Valle

Della Valle, 1893: 907

Type species. *Metopa gregaria* Sars, 1882: 93, t. 4, fig. 6

Proboloides mainly occurs in the Atlantic, but nominal *Proboloides* species have been reported also from the Pacific, Indian and Antarctic oceans. Its species are often found living in deep waters and show a clear sexual dimorphism, usually their gnathopods are quite different in size and shape, often with a strongly incised Gn2 palm, with palmar corner well defined in females, but not defined in males, and robust peraeopods.

Diagnostic characters. A1 peduncle art 1 usually short, length < 3× width, subequal to cephalon; A1 usually shorter than 2/3 body length, A1 accessory flagellum lacking. Md palp with a very short or lacking art3, poorly setose; Mx1 palp 2 arts; Mx2 inner plate ordinary; Mxp inner plates well separated, outer plates usually reduced (less than 0.2 of merus length). Ratio Cx2:Cx1 > 3. Cx2 length equal or more than 1.5 × the width. Gn1, 2 different in size and shape; Gn1 small, almost simple, rarely subchelate; carpus length equal to propodus; length of propodus Gn1 about half or less than half length of propodus Gn2; Gn2 palm has serrations or teeth, usually no incisions; Gn2 propodus is in males often, in females always smaller than Cx2; carpus shorter than wide, merus elongate. P5 basis linear, without posterodistal lobe; merus anterior margin shorter than 1.25 length of propodus anterior margin. P6, 7 basis expanded and lobate, merus tip reaching half to full length of carpus. Ep3 with acute posterodistal corner. U1 peduncle is longer than longer ramus. T length is shorter to equal the double width, triangular, laminar.

At the beginning of this study 16 species were known:

11 from the Atlantic, Pacific and Indian Ocean: *P. anophthalmus* Ledoyer, 1986, *P. calcaratus* (Sars, 1882), *clypeatus* (Stimpson, 1853), *P. grandimanus* (Bonnier, 1896), *P. gregarius* (Sars, 1895), *P. holmesi* Bousfield, 1973, *P. pacificus* (Holmes, 1908), *P. schokalskii* Gurjanova, 1946, *P. schuleikini* Gurjanova, 1946, *P. tundus* Barnard, 1962, *P. zubovi* Gurjanva, 1951.

5 members from Antarctic-Subantarctic region: *P. porcellanus* KH Barnard, 1932, *P. rotundus* (Stebbing, 1917), *P. stephenseni* Ruffo 1949, *P. typicamimus* Andres, 1995, *P. typicus* (Walker, 1906).

The differences between the current diagnoses of *Metopoides*, *Proboloides, Scaphodactylus* and *Torometopa* are still quite small and not satisfactory:

Metopoides. Mouthparts ordinary. Long antennae with 2-articulate flag. acc.; unspecialized gnathopods; short coxal plates; basis P6, 7 with weakly lengthened merus.

Proboloides. Md palp may have a shortened third article, the inner plates of Mxp may be fused. Antennae robust with 0–1 articulate acc. flag.; gnathopods with sexual dimorphism, Gn1 much smaller than Gn2; coxal plates enlarged; basis P6, 7 with strongly lengthened and widened merus.

Scaphodactylus. Mouthparts ordinary. Antennae with 2- articulate acc. flag.; gnathopods without or with sexual dimorphism (there are two groups within the genus); Gn1 dactylus spoon-shaped excavated; coxal plates small; basis P5 rectolinear with posterodistal lobe lengthened and widened; P6, 7 merus very weakly lengthened and widened.

Torometopa. Mouthparts ordinary. Antennae with 0–2- articulate acc. flag.; gnathopods without or with sexual dimorphism; coxal plates small or large; basis P5 rectolinear with posterodistal lobe lengthened and widened to varying degrees; P6, 7 merus weakly to strongly lengthened and widened. In short, characters of *Metopoides* and *Proboloides* together, but P5 basis with posterodistal lobe, which might have evolved independently. Thus this genus was the least convincing one.

To fill the gaps with question marks in the first matrix (see also Krapp-Schickel 2009), I studied the following species in detail:

1) *Proboloides porcellanus* KH Barnard, 1932: 111–112, fig. 61

This species has a small posterodistal lobe on P5 basis (like *Torometopa* and different from all other *Proboloides*), but P6, 7 bases are not rounded (like in all *Torometopa*), but narrowing distad. Gn1, 2 show a striking similarity with those of *Mesometopa sinuata* Shoemaker, 1964 (female) from the American west coast, but P5–7 in that species are totally different, and the other *Mesometopa* species are Pacific arctic-boreal (southernmost locality is S. California).

This species thus fits in no existing genus, and a new one is erected:

Malvinometopa gen. n.

urn:lsid:zoobank.org:act:17A26AB9-5D20-46FE-B5BA-4075DF82B8BD

Type species. *Proboloides porcellanus* KH Barnard, 1932

Diagnostic characters. Md palp with 3 arts, Mxp IP separated; Mx1, 2 unknown; A1, 2 peduncle strong, flagellum reduced to 4–6 arts. Cx4 not much wider than Cx2+3. P5 basis rectolinear, with small posterodistal lobe. P6, 7 basis narrowing distad, both with posterodistal small lobe reaching along half of ischium.

Etymology. The type species was collected from the pharynx of a large ascidian in the Falkland Islands, in Spanish Islas Malvinas.

Remarks. This genus has a posterodistal lobe on P5 basis like the members of *Torometopa;* it is different from all other known stenothoid genera by the rectangularly widened, distally narrowing basis of P6,7. In *Metopella* and *Mesoproboloides* P5 is rectolinear without a posterodistal lobe, P6,7 are differently widened; in *Hardametopa* P5–7 all have a slender basis. The genera *Metopelloides*, *Stenothoides, Vonimetopa* and *Zaikometopa* differ in having a 1-articulate Md palp, while the palp is absent in *Parametopella*.

Malvinometopa porcellana (KH Barnard, 1932)

Figs 1, 2

Proboloides porcellanus KH Barnard 1932: 111–112, fig. 61
Torometopa porcellana Barnard and Karaman 1991: 700

Material examined: Type material BMNH.

Redescription of type material:

Body smooth. Eyes rounded, large.

Length: 5–9 mm.

Antennae. A1 less than half of body length, peduncle robust, art 1 length about three times the width; acc. flag. absent, flagellum 6–7 arts. A2 subequal in length to A1, peduncle robust, art 4 < art 5, flagellum about as long as or shorter than peduncle art 5, with 7 arts.

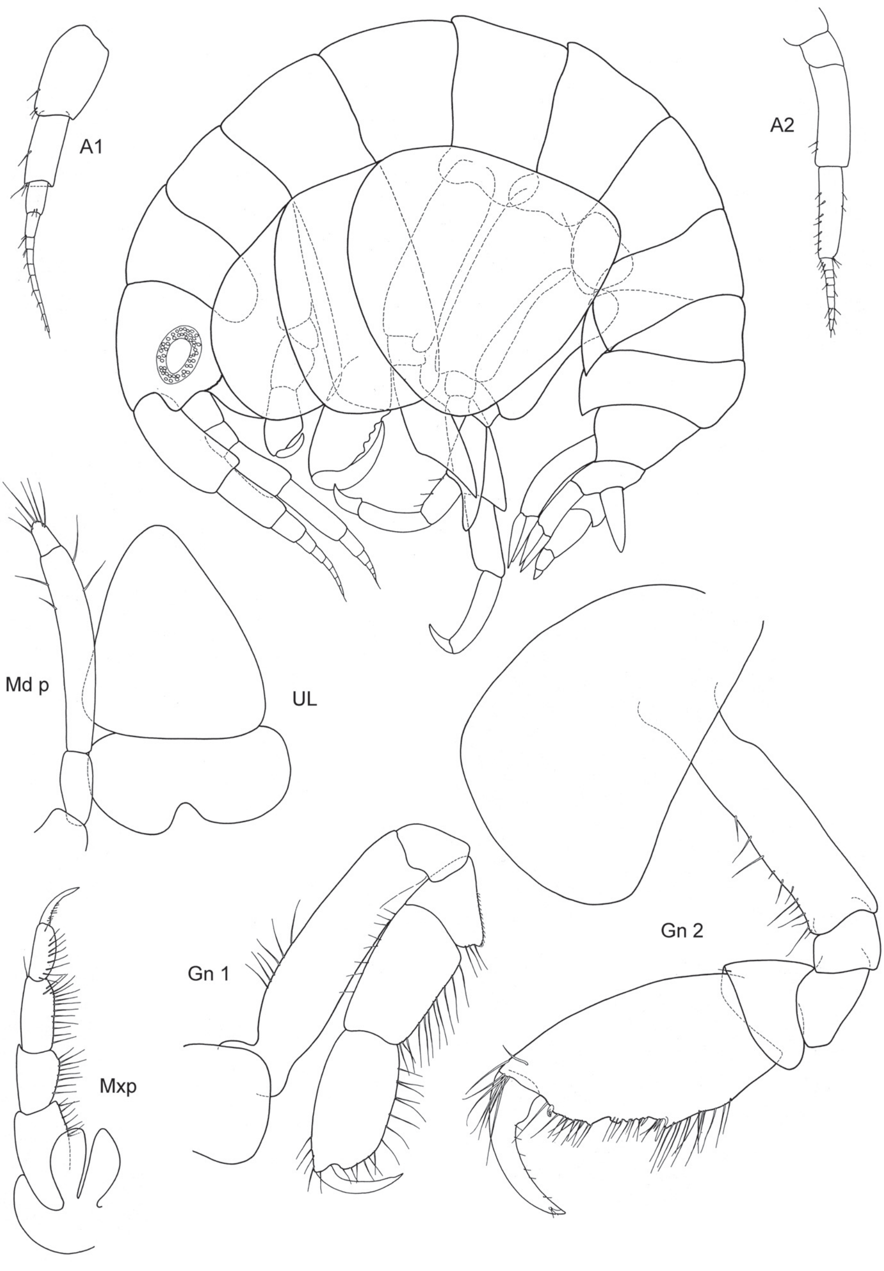

Figure 1. *Malvinometopa porcellana* (K.H. Barnard, 1932): Discovery Reports St. 51, Falklands.

Mouthparts. Md palp with 3 arts, art 1 and 2 unusually long, art 3 much shorter than 1/3 length of art 2, with many distal setae. Mx 1, 2 unknown; Mxp IP not fused, 2/3 length of ischium; OP vanishing; dactylus long, subequal to propodus.

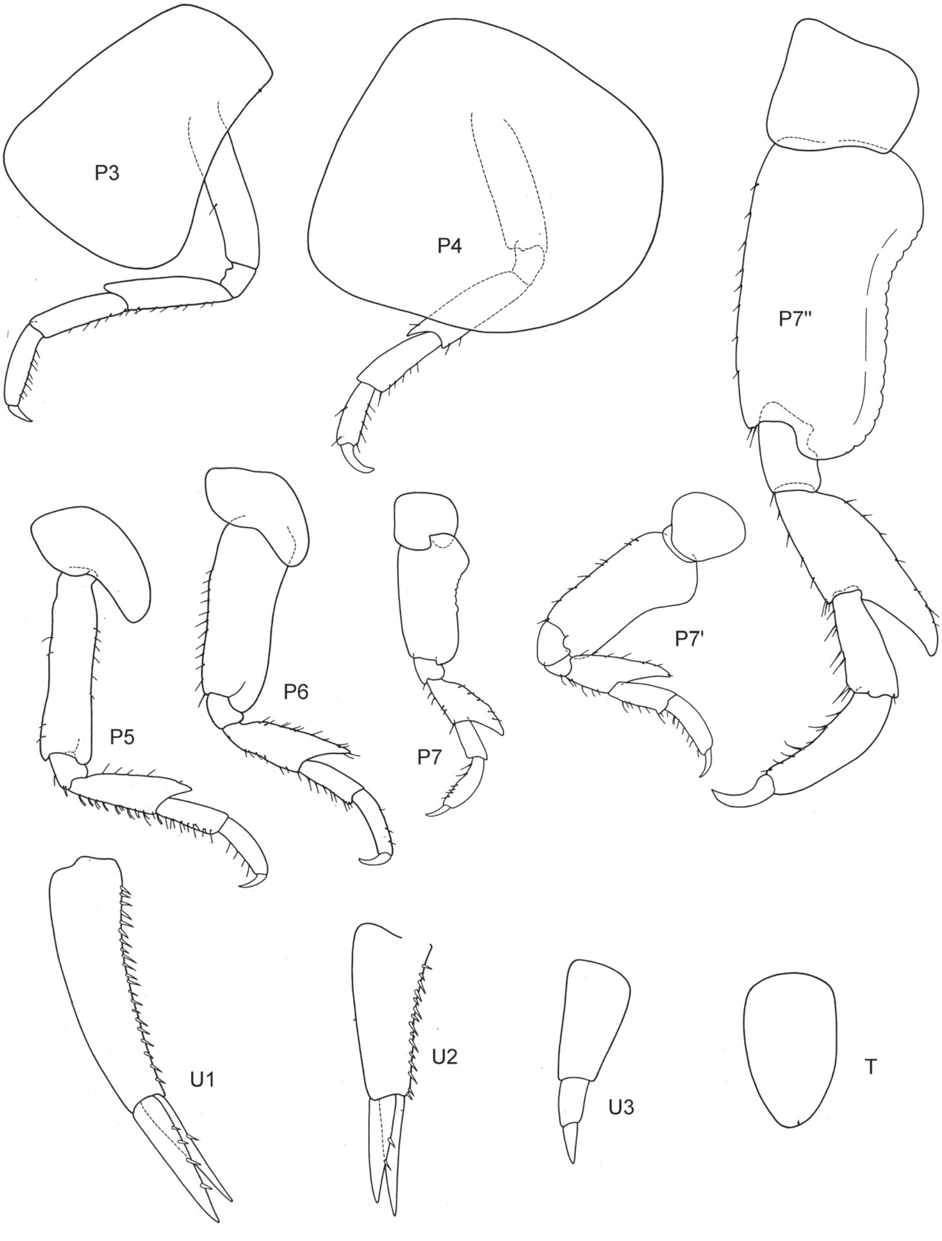

Figure 2. *Malvinometopa porcellana* (K.H. Barnard, 1932): Discovery Reports St. 51, Falklands.

Coxae. Cx2 with rounded anterior margin, straight behind, angle rounded without tooth; Cx3 trapezoid-shaped, distally widening, Cx4 not excavated, anterior and posterior margin rounded, about as long as wide.

Gnathopods. Gn1, 2 propodi similar in shape, different in size. Gn1 dactylus ordinary; propodus with parallel margins, palm not defined, about twice as long as wide; carpus longer than propodus, subtriangular, longer than wide, proximally wider than distally; merus incipiently chelate; all articles densely beset with setae. Gn2 length of propodus more than 2/3 of Cx2; propodus subelliptical, twice the size of propodus Gn1; hind margin subequal to length of palm which has shallow incisions, palmar corner well defined by small tooth-shaped prolongation but no U-shaped incision. Dactylus same length as palm. Gn2 carpus shorter than wide, cup-shaped, merus not lobate.

Peraeopods. P4 merus anterodistal margin somewhat lengthened. P5 dactylus half length of slim propodus; merus posterodistal margin not reaching half of carpus length, basis rectolinear with short posterodistal lobe. P6 basis hind margin straight, with posterodistal lobe similar to P5, merus posterodistal corner acutely lengthened and somewhat widened, not reaching to half of carpus length. P7 basis proximally widened with lobe, distad narrowing with small posterodistal lobe, hind margin crenulate and excavated; merus lengthened and widened, reaching about half carpus length.

Uropods. U1 peduncle with many short robust setae, nearly twice as long as subequal rami; U2 peduncle also beset with many small robust setae, longer than longer ramus, rami somewhat unequal; U3 totally unarmed, peduncle longer than ramus, art 1 of ramus longer than art 2.

Telson. Not reaching end of peduncle U3; less than twice as long as wide; distally tongue-shaped rounded, naked.

Sexual differences. Small.

Distribution. Falkland Islands.

Ecology. From pharynx of a large ascidian.

Remarks. M. porcellanus has extremely shortened A1, 2, no Mxp OP, a stout Gn1 and aberrant P6, 7: is this an adaptation to the life inside the pharynx of ascidians, where they certainly cannot swim but only crawl? All we know is that space there is at a premium.

2) ***Proboloides typicus*** **(Walker)**

Also this species is very sparsely described and figured. I found material at the Australian Museum Sydney, and compared it with one specimen deposited at the Verona Museum by Bellan-Santini. Both fit the written description by Schellenberg well, and this species clearly belongs in *Metopoides:*

Metopoides typicus **(Walker, 1906)**

Figs 3, 4

Proboliella typica Walker 1906: 14; 1907: 20–21 t.6 fig. 10

Proboloides typica Schellenberg 1926: 323–24 fig, 41; De Broyer et al. 2007: 213
not *Proboloides typica* KH. Barnard 1932: 109, f. 57
Metopoides sp. Bellan-Santini and Ledoyer 1974: 700 fig. 38 B

Material examined: Cape Bird, EBS, C3-C4, 70–100m, 14.12. 1971, several spec.; tide crack, near Cape Spencer, White Island, Ross Ice Shelf, 78°01'S, 167°20'E, 28.XII. 1976, coll. P. Ensor (AMS P 25504); Southern Rookery, Cape Bird, Ross Island, Antarctica (approx. 77°13'S, 166°27'E) AM P.80875 (1 slide); slide of "*Metopoides* sp.", Kerguelen, MNVCR.

Redescription after material from the Australian and Verona Museum:

Body smooth. Eyes rounded, medium size.

Length. 3–3,5 mm.

Antennae. A1 less than 2/3 of body length, peduncle robust, art 1 shorter than three times wide; acc. flag. with 2 (very small) articles, flagellum 10 arts. A2 subequal in length to A1, peduncle robust, art 4 somewhat > art 5, flagellum about as long as peduncle art 5, with 7 arts (Walker: without acc. flag., A1 reaching to the middle of the flagellum of A2).

Mouthparts. Md incisor and raker spine row well developed; no clear molar cusp; palp with 3 arts, art 3 about 1/3–1/2 length of art 2, with 3 distal long setae (Walker: Md palp lacking third art, therefore creating a new genus *Proboliella*; but Schellenberg already noticed 1926: 323 fig. 41, that there is a well-developed third article). Mx 1 IP with 1 distal seta, OP with 6 strong robust setae, palp with 2 arts; Mx 2 inner plate ordinary, shorter than outer; Mxp IP not fused, 2/3 length of ischium; OP narrow, well developed, reaching more than half of merus length; dactylus long, subequal to propodus.

Coxae. Cx2 with rounded anterior margin straight behind, angle rounded with small tooth; Cx3 narrow with parallel margins, Cx4 not excavated, inferior and posterior margin rounded, about as long as wide.

Gnathopods. Gn1, 2 propodi different in size and shape. Gn1 dactylus ordinary; propodus with parallel margins, palm well defined (corner about 120°), somewhat longer than half length of propodus, about twice as long as wide; carpus shorter than propodus, triangular, longer than wide, merus incipiently chelate. Gn2 length of propodus more than 2/3 of basis in male, less in female; propodus subelliptical, twice the size of propodus Gn1; hind margin half length of palm which is in male and female with incisions, palmar corner well defined by acute tooth-shaped prolongation and U-shaped incision. Dactylus clearly shorter than palm, probably working together with robust setae of palmar corner. Gn2 carpus shorter than wide, cup-shaped, merus not lobate.

Peraeopods. P4 merus anterodistal margin somewhat lengthened. P5 dactylus long, weak, much longer than half of slim propodus; merus posterodistal margin not reaching half of carpus length, basis slender without lobe. P6 basis hind margin harmonically rounded, clearly longer than wide, merus posterodistal corner acutely lengthened but not widened, not reaching to half of carpus length. P7 basis and merus similar to P6.

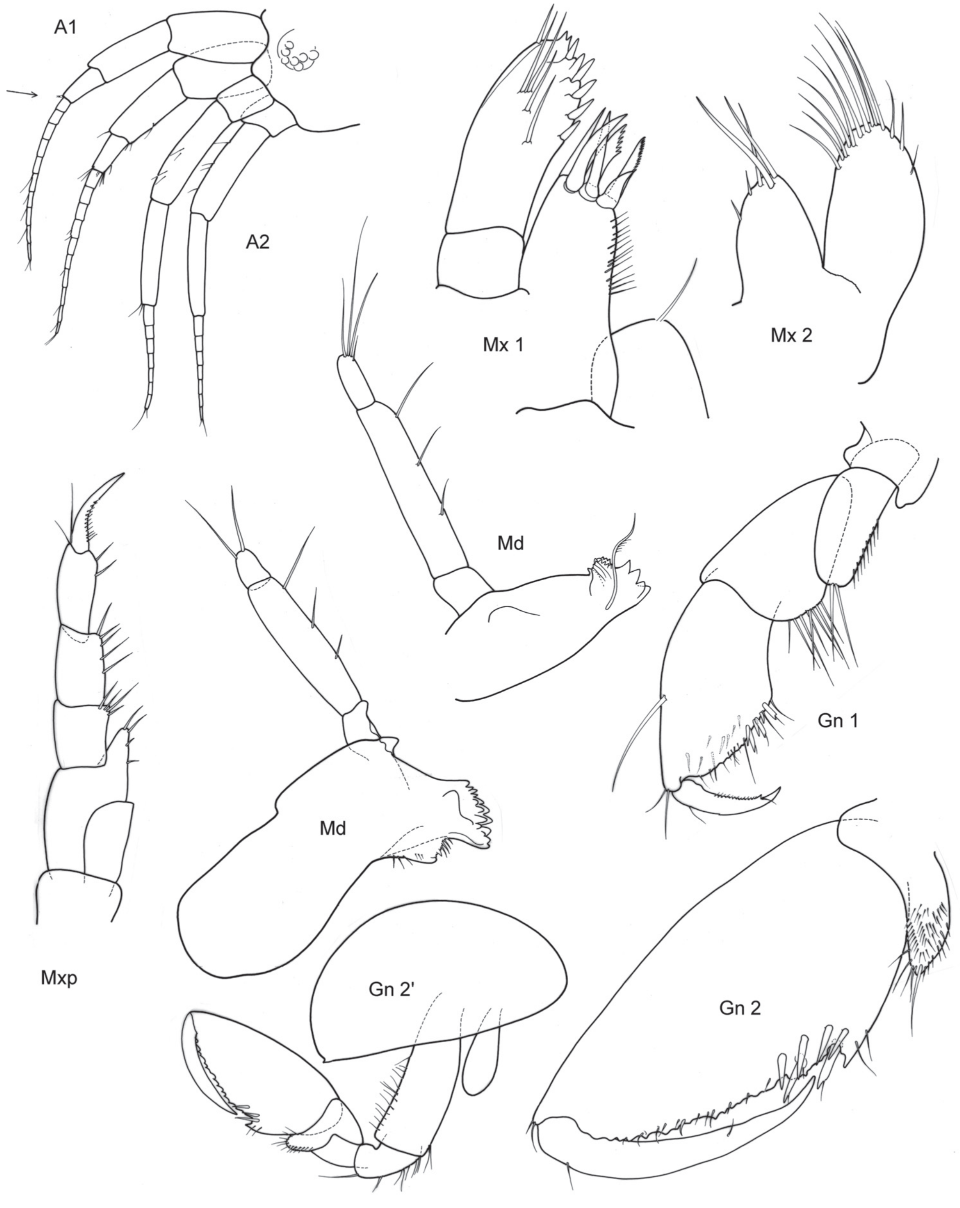

Figure 3. *Metopoides typicus* (Walker, 1906): Cape Bird, Southern Rookery; AMS.

Epimeral plates. Ep3 posterodistally lengthened to triangular corner.

Uropods. U1 peduncle slightly longer than subequal rami, with many robust setae; U2 peduncle longer than shorter ramus, rami clearly unequal; U3 peduncle shorter than ramus, first article of ramus shorter than peduncle, ramus art 2 about ¾ of art 1.

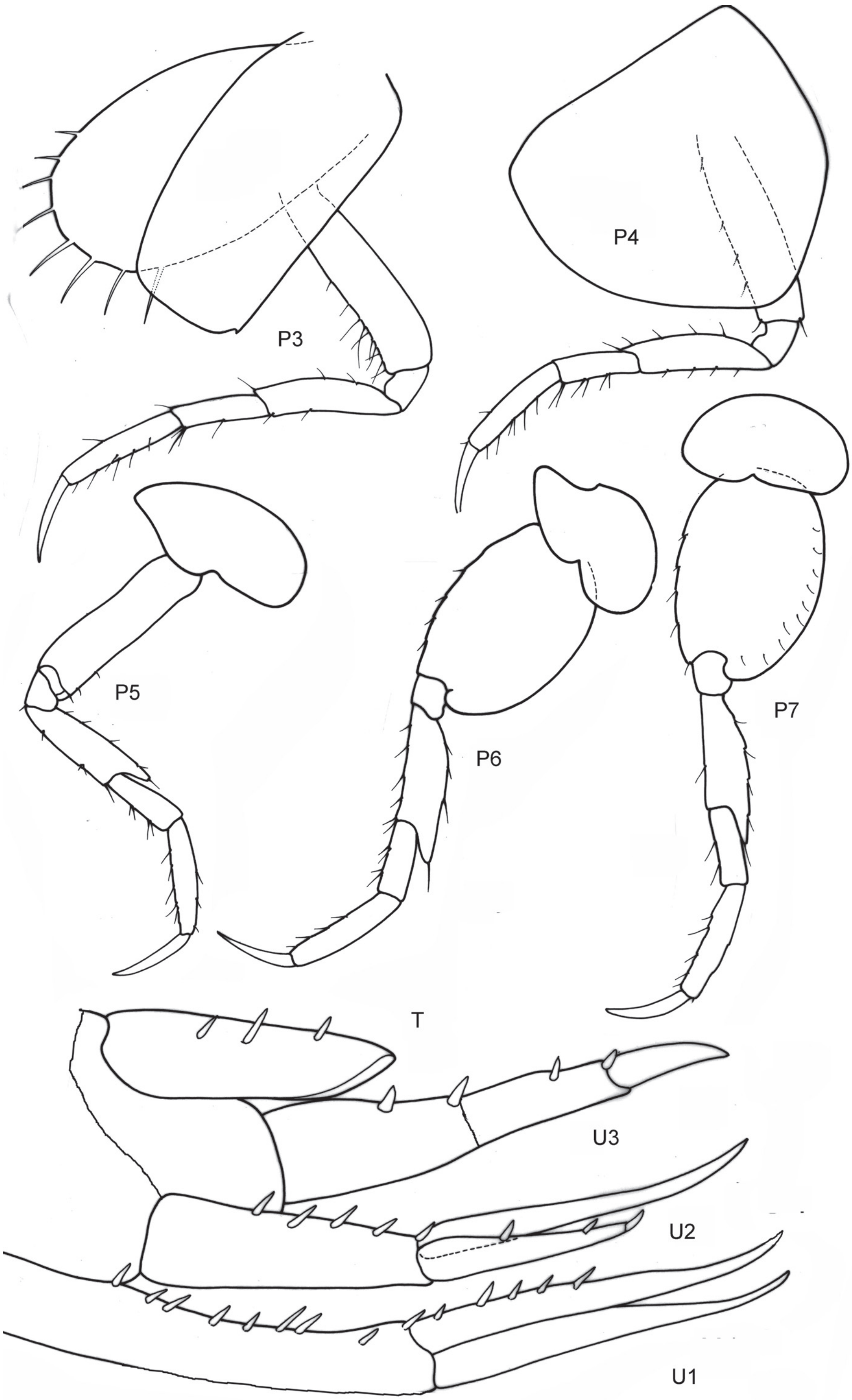

Figure 4. *Metopoides typicus* (Walker, 1906): Cape Bird, Southern Rookery; AMS.

Telson. Not reaching end of peduncle U3; about twice as long as wide; distally triangulary pointed, medio-laterally with 2–3 robust setae.

Sexual differences. Probably small.

Distribution. Antarctica, Hut Point near Mc Murdo, 77.47°S (Walker, 1906, 1907); S-Victoria Land, Gauß Station (Schellenberg 1926); White Island, Ross Ice Shelf, 78°01'S, 167°20'E, (AMS P 25504); Cape Bird, Ross Island, Southern Rookery, 77°13'S, 166°28'E (AMS P 80875).

Ecology. Steeply sloping rock bottom with encrusted bryozoans and hydroids.

Remarks: As this species clearly has an accessory flagellum (although tiny), unspecialized gnathopod propodi and neither much lengthened nor widened merus on P5–7, it has to be placed in the genus *Metopoides,* and even is a very "typical" representative of that genus.

3) *Proboloides stephenseni* Ruffo, 1949

Shortly after the war the possibility to check foreign literature was restricted. As only few characters were illustrated, the character states included in the matrix most probably were not always appropriate.

Until type material of *Metopa rotunda* can be checked, this species is synonymized with question mark to Stebbing's species *"Metopa rotunda"*. In any case it should belong to *Metopoides* for many plesiomorphic character states.

Metopoides rotundus (Stebbing, 1917)

Fig. 5

Metopa rotunda Stebbing, 1917: 39–40, pl. XCVIB; K.H. Barnard, 1940:444; Griffiths, 1974: 326

? *Proboloides stephenseni* Ruffo, 1949: 15, fig. 1 (12–18), fig. 2 (1–5), fig. 3 (1)

?*Torometopa stephenseni* Barnard & Karaman, 1991: 700

Proboloides rotundus Barnard & Karaman, 1991: 696

Material examined. Type material of *Proboloides stephenseni* MNVCr.

Redescription: *Body* smooth. Eyes rounded, large.

Length. Male 3,5 mm.

Antennae. A1 = A2, A1 less than half of body length, peduncle robust, art 1 length about three times the width; acc. flag. with 2 arts, flagellum 12 arts. A2 subequal in length to A1, peduncle robust, art 4 ≥ art 5, flagellum about as long as peduncle art 5, with 9 arts.

Mouthparts. Md palp with 3 arts, art 1 and art 3 subequal, art 3 longer than 1/3 art 2, with 2 long distal setae. Mx 1 palp with 2 arts. Mxp IP separated, OP longer than half ischium; dactylus as long as propodus.

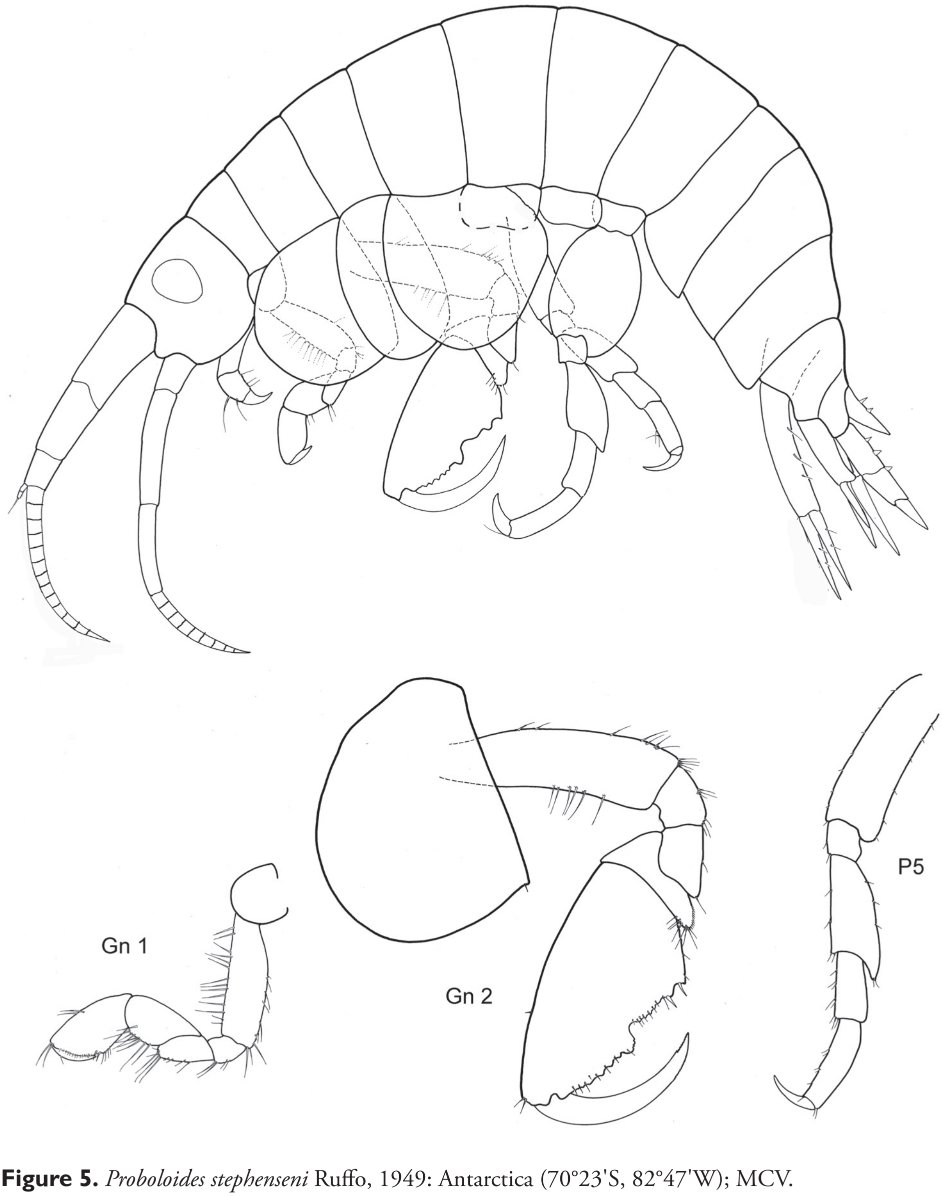

Figure 5. *Proboloides stephenseni* Ruffo, 1949: Antarctica (70°23'S, 82°47'W); MCV.

Coxae. Cx2 with rounded anterior margin, straight posterior one, angle rounded with small tooth; Cx3 with parallel margins, Cx4 not excavated, anterior and posterior margin rounded, about as long as wide.

Gnathopods. Gn1, 2 propodi similar in shape, different in size. Gn1 dactylus ordinary; propodus triangular, palm well defined, about twice as long as wide, about as long as hind margin; carpus shorter than propodus, trapezoid, longer than wide, with parallel margins; merus with very short distal free margin. Gn2 length of propodus =

Cx2; propodus more than twice the size of propodus Gn1; hind margin much shorter than length of palm which has shallow incisions and crenulations, palmar corner well defined by small tooth-shaped prolongation but no U-shaped incision. Dactylus shorter than palm. Gn2 carpus shorter than wide, cup-shaped, merus not lobate.

Peraeopods. P5 dactylus half length of slim propodus; merus posterodistal margin not reaching half of carpus length, basis rectolinear, width proximally and distally subequal, posterodistally rounded, but not lobed. P6, 7 similar, basis hind margin rounded, merus posterodistal corner shortly lengthened and somewhat widened, not reaching to half of carpus length.

Epimeral plates. Ep3 posterodistal corner rectangular, but rounded.

Uropods. U3 peduncle shorter than ramus, art 1 of ramus longer than art 2; peduncle with one short robust seta distally, ramus art 1 with 2 robust setae.

Telson not reaching end of peduncle U3; less than twice as long as wide; distally pointed, marginally two robust setae.

Sexual differences. Females unknown.

Distribution. Antarctica, 70°23'S, 82°47'W (?*P. stephenseni* Ruffo, 1949). South Africa (*P. rotunda* Stebbing, 1917).

Depth. 42 fathoms = 76,8 m (*P. rotunda,* Stebbing 1917: 40)

After Barnard and Karaman (1991: 696) the genus *Proboloides* has its distribution in the Atlantic Ocean, S-Africa and the Antarctica. Therefore it was important to check also non-Antarctic species.

4) ? *Proboloides holmesi* Bousfield, 1973

? *Proboloides holmesi* Bousfield, 1973
Figs 6, 7

Proboloides holmesi Bousfield, 1973: 89, fig. 16 (2)

Remarks. Although the shape of the gnathopods (especially the simple Gn1) creates doubt if it could not belong in *Metopa* or *Stenula,* checking of the mouthparts showed at least that this species has a Md palp with 3 arts and a palp of Mx1 with ? 2 arts (although the articulation is not clear, see Bousfield 1973: 98). It is different from the other Atlantic members, but for the time being it should remain in the genus *Proboloides*.

At the Verona Museum I found a tiny specimen called "*Metopa* sp."(1,5 mm) which is extremely similar to *Proboloides holmesi*, except the rounded palmar corner (see Fig. 6, 7 and compare to Bousfield 1973 fig. 16 (2)); also here there seems to be a fine indistinct line in Mx1 palp. I am adding the illustration also to stress the fact how small the differences between the genera are, and to show that also the genus *Metopa* has to be included in this basic group of stenothoid genera.

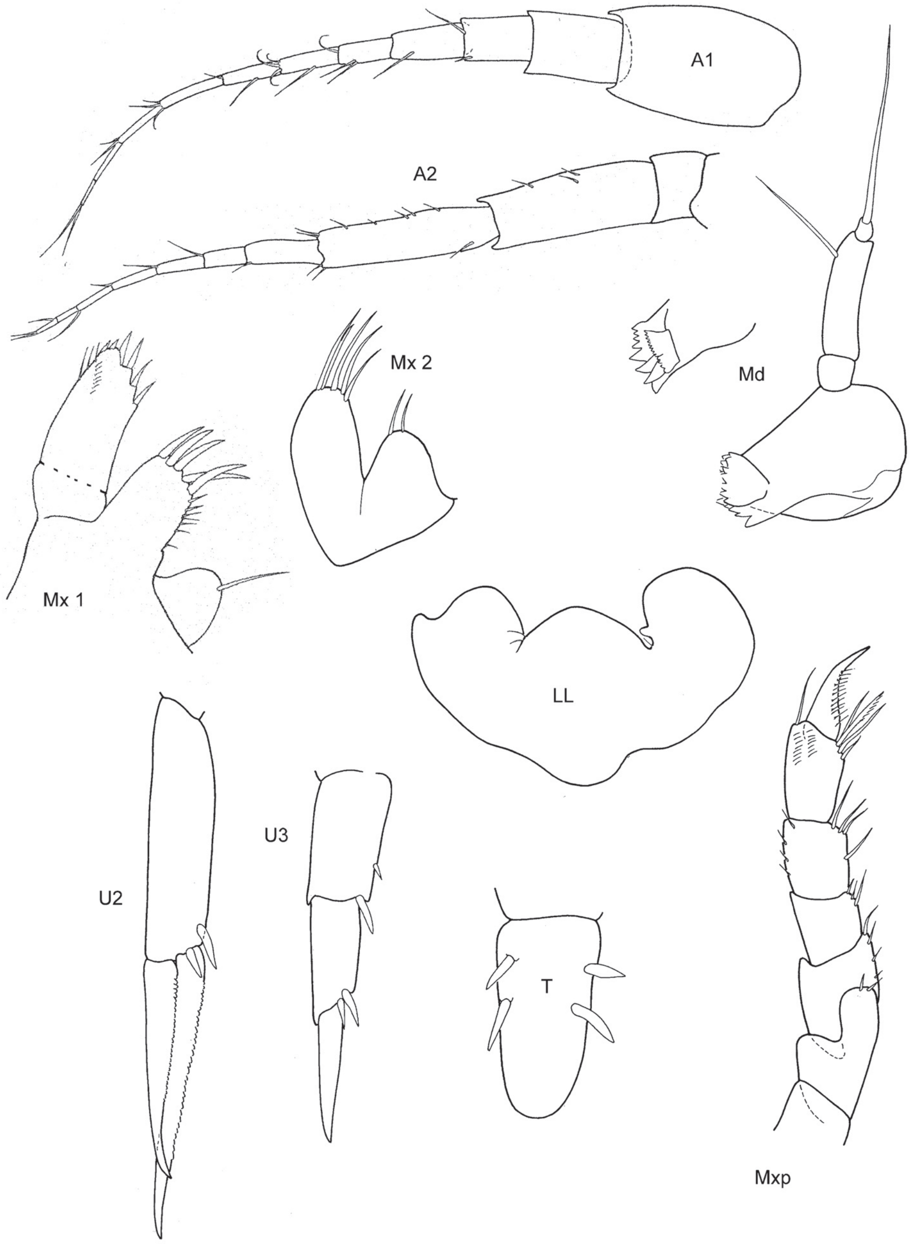

Figure 6. *?Proboloides holmesi* Bousfield, 1973: Raunefjorden near Bergen; MCV.

Distribution. S of Cape Cod; Vineyard Sound, Elizabeth Islands, Buzzard Bay (Bousfield 1973).

Ecology. Mainly on sandy and shelly sand bottoms, among hydroids and bryozoans, in depth of 5–30 m (Bousfield 1973: 89).

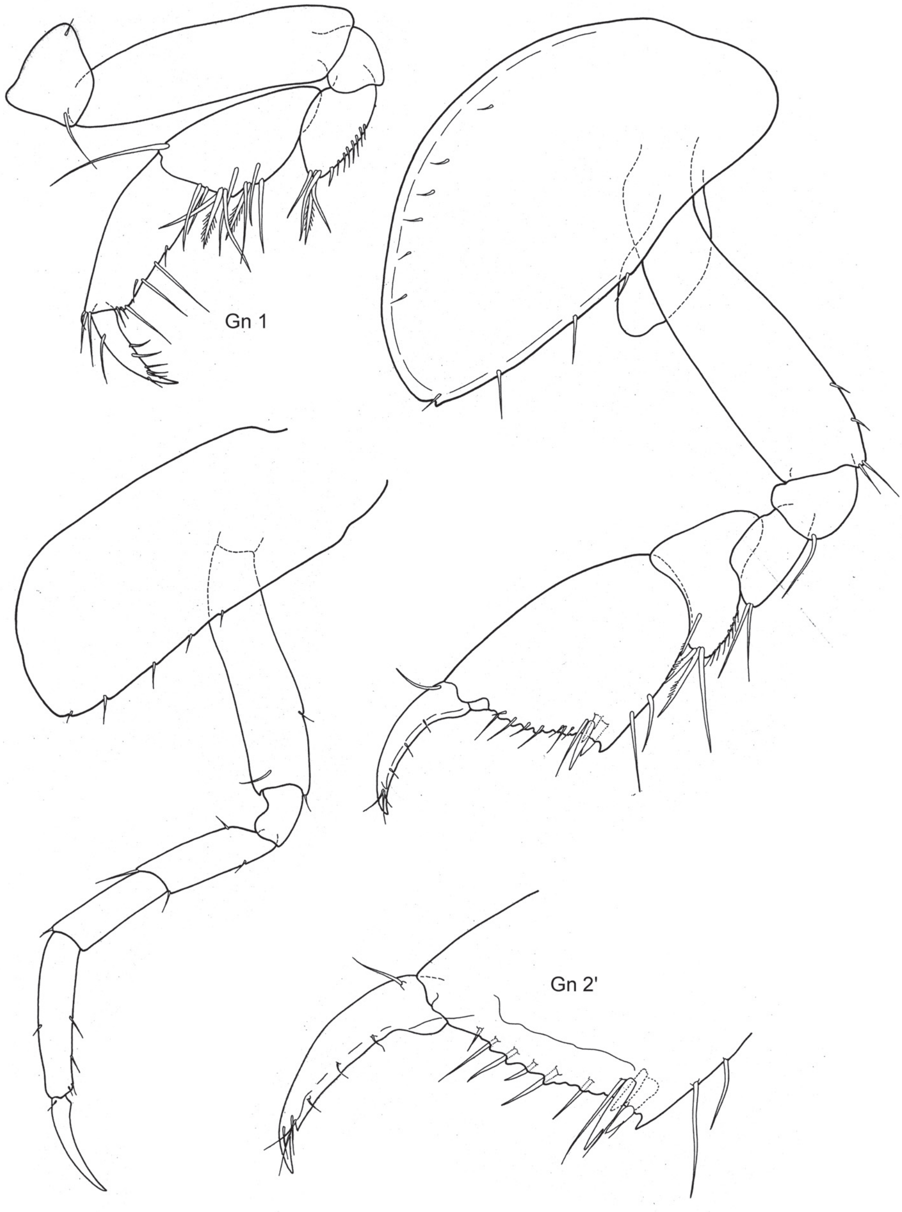

Figure 7. *?Proboloides holmesi* Bousfield, 1973: Raunefjorden near Bergen; MCV.

5) *Stenothoe aequicornis* Stephensen, 1931

During a stay at the Copenhagen Museum I checked Stephensen's type material of this species, as Barnard and Karaman (1991: 698) remarked "gnathopod 1 wrong, mouthparts unknown". And they were right: there is no doubt about a clearly developed 3-articulated Md palp and therefore this species cannot be a member of *Stenothoe,* where there is no Md palp at all. Less clear is the structure of the palp of Mx1: as often in other specimens, the articulation is not easily seen (Fig. 8, 9). But this character should not be the only one deciding if a species belongs to *Metopa* or to *Proboloides,* and the shape of gnathopods brings this material into the vicinity of the latter.

Proboloides aequicornis **(Stephensen, 1931)**

Figs 8–10

Stenothoe aequicornis Stephensen, 1931: 198, fig. 59

Material examined. Type material of *Stenothoe aequicornis* ZMUC.

Redescription.

Body smooth. Eyes rounded, small.

Length. Male 5 mm.

Head. Lateral cephalic lobes bluntly angular.

Antennae. A1 subequal A2 or A1 scarcely > A2. A1 peduncle robust, art 1 length about 2–3 x the width; art 3 only 1/3 of art 1 length; acc. flag. with 2 arts, flagellum about 1,5 x length of peduncle, 12–14 arts. A2 subequal in length to A1, peduncle subequal to flagellum, peduncle robust, art 4 ≥ art 5, flagellum with 9–11 arts.

Mouthparts. Md palp with 3 arts, art 1 and art 3 subequal, art 3 longer than 1/3 art 2, with 1 long distal seta. Mx 1 palp with 2 arts (but articulation not easy to see, cf. fig. 8, 9). Mxp IP separated, OP longer very short; dactylus as long as propodus.

Coxae. Cx2 with rounded anterior margin, straight or even somewhat concave behind, front angle rounded without tooth; Cx3 with trapezoid-shaped margins, Cx4 not excavated, anterior and posterior margin rounded, wider than long.

Gnathopods. Gn1, 2 propodi different in size and shape. Gn1 dactylus ordinary; propodus elongate, about 3× as long as wide, palm well defined, much shorter than hind margin; carpus longer than propodus, triangular, nearly 3× longer than wide, with parallel margins; merus with very long distal free margin. Gn2 length of propodus > Cx2; propodus about 3× the size of propodus Gn1; hind margin much shorter than length of palm which has shallow incisions and crenulations, palmar corner scarcely defined by group of robust setae, no U-shaped incision. Dactylus subequal to palm. Gn2 carpus very short, cup-shaped, merus acutely lobate.

Peraeopods. P5 dactylus > half length of slim propodus; merus posterodistal margin not reaching end of carpus length, basis rectolinear, width proximally and distally subequal, posterodistally rounded, but not lobed. P6 basis hind margin straight, merus posterodistal corner acutely lengthened and widened, reaching to end of carpus length; P7 similar to P6, but basis hind margin regularly rounded.

Epimeral plates. Ep3 posterodistal corner acute, but rounded at the apex.

Uropods. U3 peduncle shorter than ramus, art 1 of ramus subequal to art 2; peduncle with 3 robust setae distomarginally, ramus art 1 with 1 robust seta.

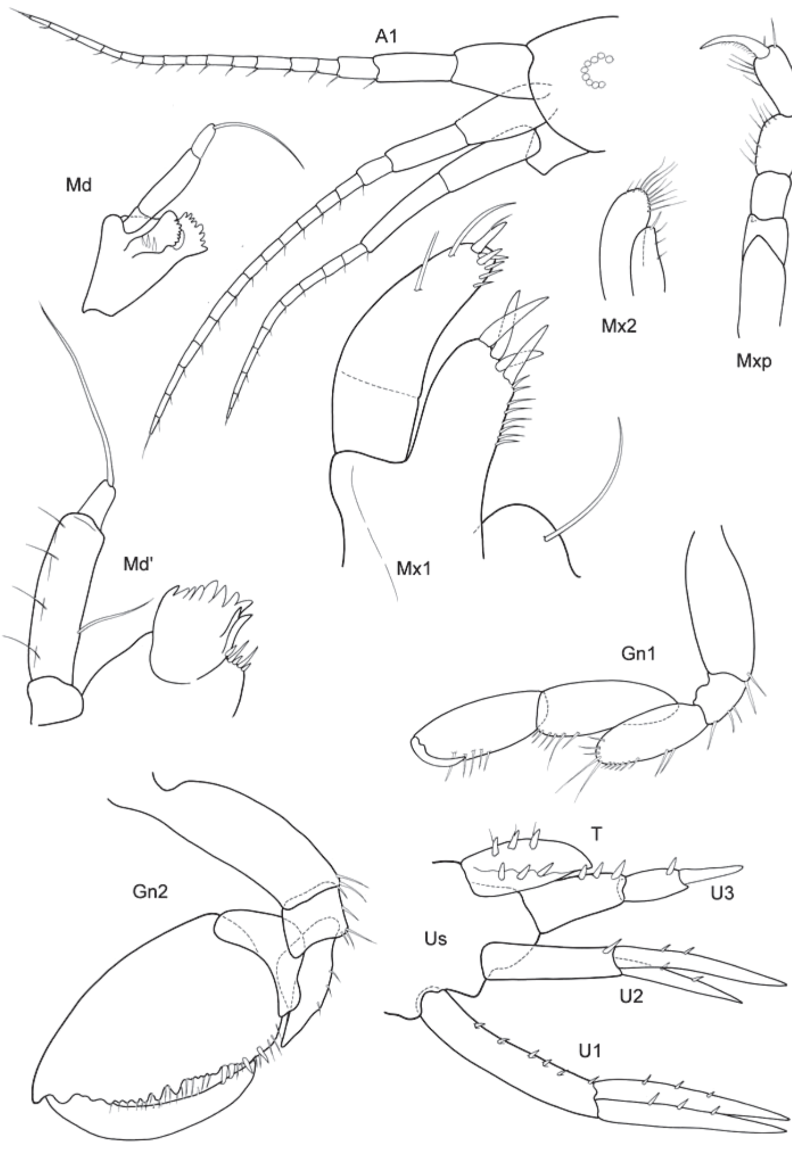

Figure 8. *Proboloides aequicornis* (Stephensen, 1931): after typical material from Atlantic, between Faroes and Iceland.

Telson. Not reaching end of peduncle U3; less than twice as long as wide; distally pointed, marginally 3 robust setae.

Sexual differences. Females unknown.

Distribution. Between Faroes and Iceland, 375 m depth.

At the Verona Museum I looked for the only species of the genus *Torometopa* cited in Barnard and Karaman (1991), where there is a question mark behind the genus name:

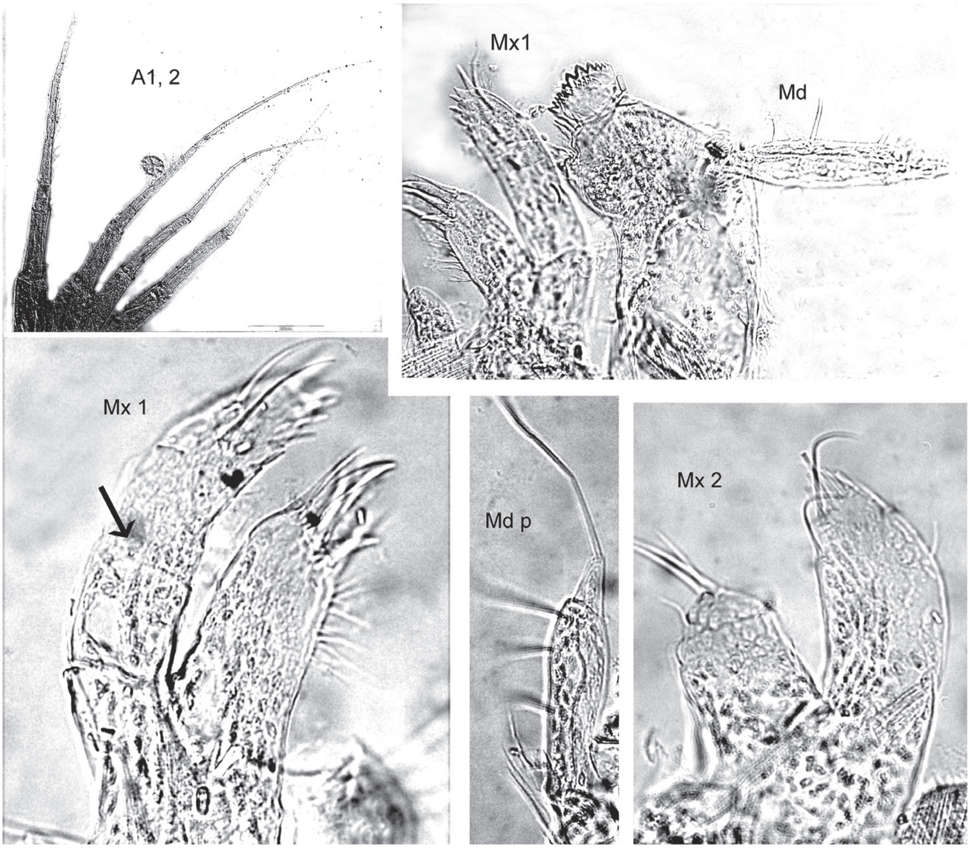

Figure 9. *Proboloides aequicornis* (Stephensen, 1931): as above, photographs of the material taken with Olympus BX51 with cell imaging software.

6) *Proboloides armata* Ledoyer, 1986: 966, fig. 381, 382 A

Torometopa? armata Barnard & Karaman, 1991: 700

It is the unique (female) type specimen from Îles Glorieuses N of Madagascar, from 3718 m depth.

Unfortunately I could not examine the slide and confirm the drawings of the subrectangularly widened Gn1 propodus and the 1-articulated Md palp, both very unusual characters in our treated group, as this type must be deposited elsewhere.

But at the Victoria Museum Melbourne I found a species from the Bass Strait from 770 m clearly belonging also to this basic species-complex of stenothoids, having a posterodistal lobe on P5 basis. To my big surprise it turned out that this species too had a 1-articulate Md palp.

As this character- combination does not fit any of the extant stenothoid genera, a new one was erected:

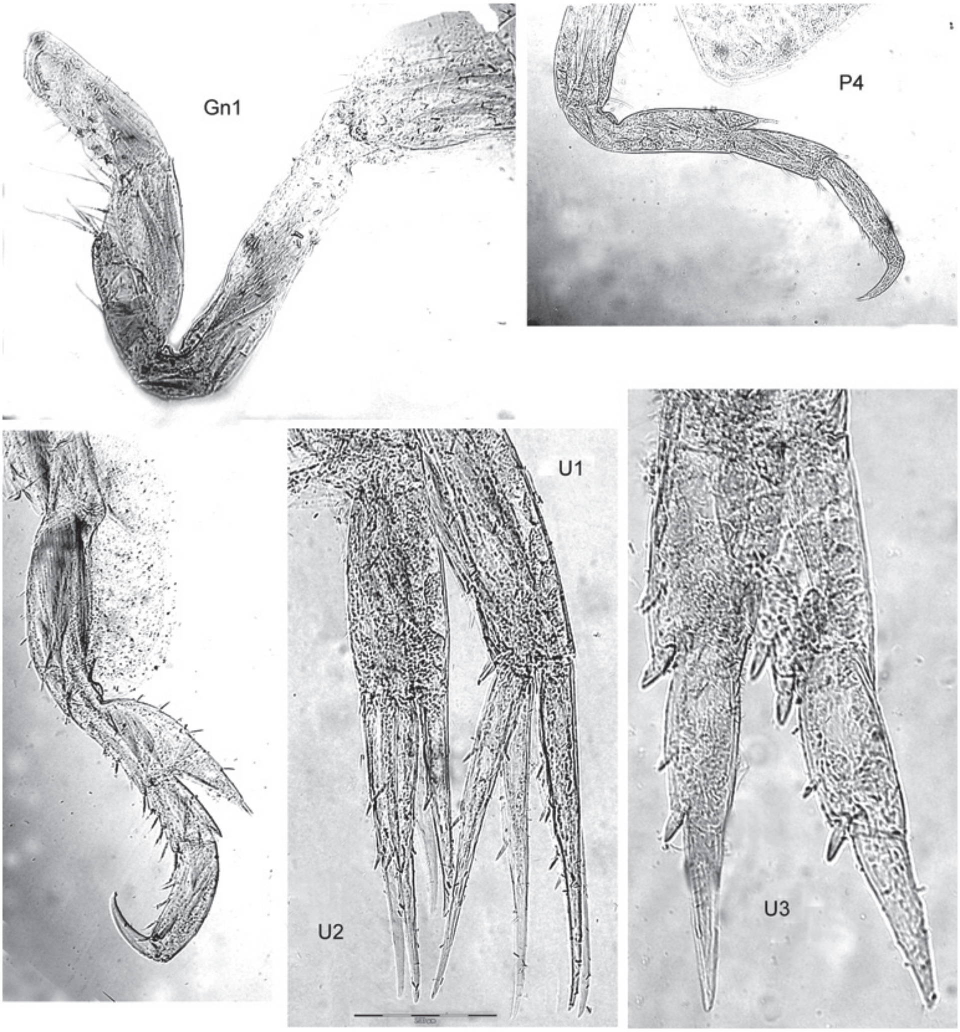

Figure 10. *Proboloides aequicornis* (Stephensen, 1931): as above, photographs of the material taken with Olympus BX51 with cell imaging software.

Victometopa gen. n.

urn:lsid:zoobank.org:act:5DA70786-2BC5-415E-9953-E2FA6850218F

Type species. *Victometopa rorida* sp. n.

Probably also included: *Victometopa armata* (Ledoyer, 1986), comb. n.

Diagnostic characters. Md palp with 1 art, Mxp OP reduced. P5 basis rectolinear, with posterodistal lobe. P6, 7 basis widening.

Etymology. The stem -metopa combined with the first letters of "Victoria", for expressing admiration for the rich collection at the Victoria Museum Melbourne (Australia).

***Victometopa rorida* sp. n.**
urn:lsid:zoobank.org:act:29F3DCFA-418C-4865-BA45-98F22273BFB8
Figs 11, 12

Holotype. Male 4.4mm. Cruise 79-K-1, Stn 34, 30°38.7'S, 148°49.4'E, Flinders Canyon, eastern Bass Strait, 770 m, 27.3.1979. Sediment: shell/sand, gear: dredge. MVM J 39597.

Paratype. Male 4.2mm. Same locality.

Etymology. The Latin adjective *roridus* means "set with dew" and should stress the "pearls" on the Cx3 in this species.

Description. *Length*. 4.2 - 4.4 mm

Body. Smooth. P3–7 all clearly prehensile, with falcate-concave, strikingly long merus and strong dactylus opposing with spinose propodus.

Head. Lateral cephalic lobes subacute or blunt, triangular. Eyes rounded, medium.

Antennae. A1: body length ≥ 0.66 body, ped. art 1 l:b >3; ped. art 2 ≥art 1; art 1 =cephalon; ped. art 3 ≤0.3 art 1; acc. flag. absent; flagellum arts 11–20. A2 ped .art 5> flag., ped. art 4 =art 5, nr. flag. arts ≤ 9 (A2 broken into pieces, thus indications not totally sure).

Mouthparts. Mdb palp one long article, on tip a fine articulation-line visible, marginally no setation, distally 1 long and 1 shorter seta. Mxp outer plate reduced.

Coxae. Cx2:Cx1 ratio of length >3. Cx2 l:b (l=parallel post. margin) < 1.5. Cx3 unusually widened, nearly as long as wide, distoposterior margin with strong "pearls" or stridulation ridges. Cx4 l<b, distally not excavated.

Gnathopods. Gn1 dactylus ordinary. Gn1 palm subequal to half propodus length; propodus palm angle 180–150°, blunt; propodus shape rounded, l≤ 2b; carpus l>2b; merus free projecting; carpus longer than propodus. Gn1 propodus < 0.33 Gn2 propodus. Gn1, 2 propodus shape different. Gn2 propodus ≥coxa and basis in male, palm in male smooth, only at dactylus-insertion some serrations; carpus very short, merus small, subquadrangular, not lobate.

Peraeopods. In all dactylus clearly longer than propodus. P3, 4 merus long, falcate curved, nearly twice the length of propodus. P5 basis distally somewhat widened but strongly lengthened to lobe maximal to minimal breadth 1.4–1.6; merus also nearly twice the length of propodus, posterodistal tip neither lengthened nor widened. P6 basis hind margin with straight margins, merus anterior and posterior margin subequal, distally not lengthened, reaching no carpus. P7 basis wider than in P6, but posterior margin also rather straight.

Epimeral plates. Ep3 posterodistally rectangular corner.

Urosome. U1 rami equal. U1 peduncle longer than ramus. U2 rami different, the shorter is longer than 0.66 % of the longer one, peduncle is longer than rami, spination weak. U3 with very long peduncle, much longer than ramus; ramus art 1:2 <1, spination poor.

Telson. l:b ≤2, distally rounded, marginally with two strong robust setae.

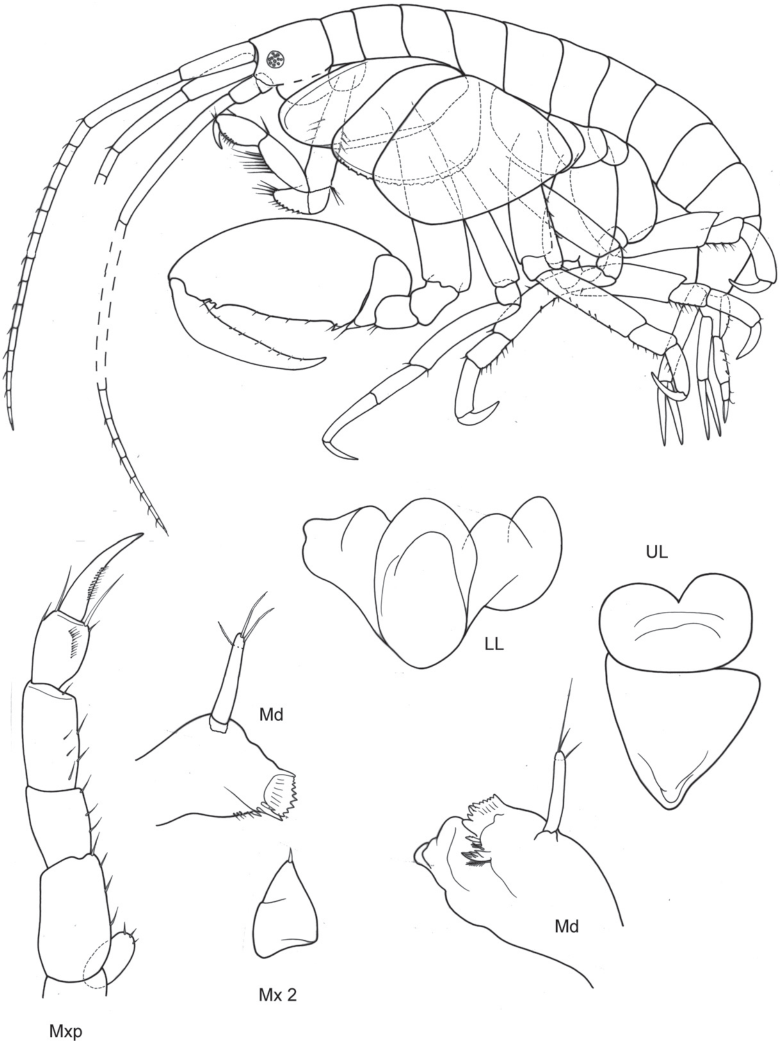

Figure 11. *Victometopa rorida* gen. n. sp. n.: Habitus ? male 4.4 mm; mouthparts UL, Mx1, 2 Md, LL, Mxp.

Cladistic analysis

Figure 13, 14.

A matrix of 38 species and 61 characters was built (Fig. 13): all presently known species in the genera *Proboloides, Torometopa* and *Scaphodactylus* were included. A hypothetical *Gammarus* species was chosen as out-group (see also Krapp-Schickel 2009, Fig. 5 without the species of *Metopoides*).

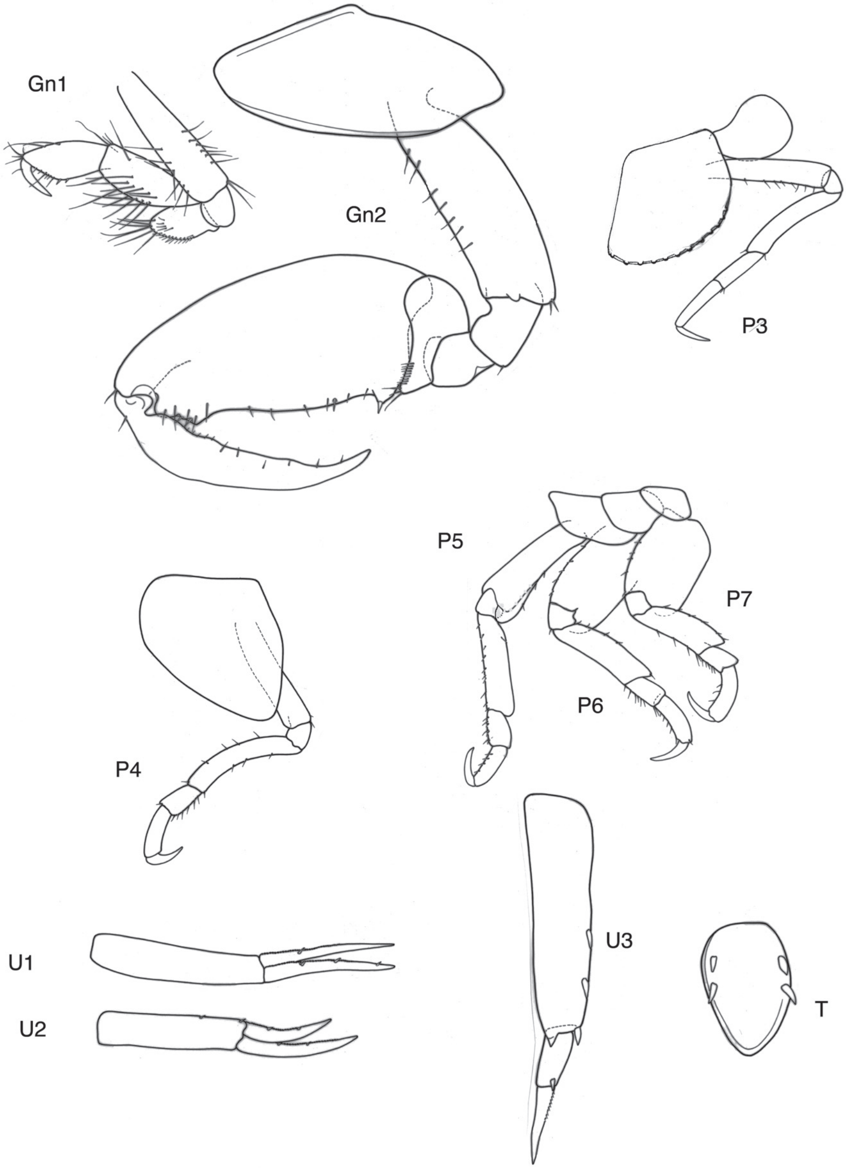

Figure 12. *Victometopa rorida* gen. n. sp. n.: Gn1, 2 = gnathopod 1, 2; P3-7 = peraeopods 3-7; U1-3 = uropods 1-3; T = telson.

The programs MacClade 4.06 (Maddison and Maddison 2003) and PAUP 40B.10 (Swofford 2002) were applied. Using 38 taxa and 61 characters a heuristic analysis with a hypothetical *Gammarus* as an outgroup - species was performed and the majority rule consensus tree of 28 trees illustrated in Fig. 14. The difference between the trees concerned only the arrangement within the groupings.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Gammarus		0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
P.	**anopht**	&48	0	1	2	1	2	0	?	0	?	0	1	1	1	1	1	2	?	0	2	0	0	1	1	1	0	0	1	1	1
P.	**calcara**	1	0	1	2	0&1	1	2	1	0	0	0	0&1	2	1	0	0	?	2	1	2	0	0	1	1	1	0	2	2	2	1
Prob	**gregar**	1	0	1	?	1	1	1	1	0	0	0	1	2	1	0	1	1	3	0	2	0	0	0	1	1	1	2	2	1	2
P.	**holmes**	1	0	1	2	0	1	2	0	0&1	1	0	0	0	0&1	1	1	1	?	0	0&1	0	0	1	0	1	1	1	1&2	1	0&1
P.	**pacifica**	1	0	1	2	1	?	0	1	2	0	0	1	1	1	1	?	2	?	?	2	0	0	1	1	1	0	2	2	1	2
P.T.	**palmat**	1	0	1	1	1	0	1	1	0&1	2	1	0	0&1	?	?	?	2	2	0	0	0	0	0	2&3	1	1	2	1&2	1	1
P.	**porcell**	1	0	1	2	0	1	0	0	2	2	0	0	2	1	0	0	2	3	0	1	0	0	0	0&1	1	1	0&1	0	1	1
P.	**rotund**	1	0	1	2	0	1	1	0	0	1	0	?	?	1	?	?	2	?	0	1	0	0	0	2	1	0&1	1	0	1	1
P.	**schoka**	1	0	?	2	1	?	1	1	0	0	1	?	?	0	1	1	1	?	1	?	1	0	0	2	1	2	1	2	0	1
P.	**schulei**	?	0	1	2	0	?	1	1	0	1	0	?	?	0	1	1	?	?	?	?	0	0	0	0	1	1	2	2	2	1
P.	**stephe**	1	0	0	1&2	0	1	1	1	1	1	0	1	0	1	0	0	0&1	3	1	0&1	0	0	1	1	1	0	1	1	0&1	1
P.	**tundus**	1	1	0	2	1	1	1	0	2	0	1	1	1	1	?	?	?	3	0	1	0	0	1	1	1	0	2	1	2	1
P.	**zubovi**	0	0	?	2	0	?	1	0	2	0	0	?	?	1	1	1	2	?	?	?	0	0	1	0	1	1	1	1&2	1	1
S.	**bentari**	0	1	?	?	0	1	1	0	0	0	0	1	0	0	1	?	?	2	0	2	0	1	1	1	1	0	1	1	1	1
S.	**folioda**	0	1	0	1	0	?	0	2	0	0	2	0	0	0	0	0	2	2	1	1	0	1	0	2	1	1	2	1	2	2
S.	**gigant**	0	1	0	1	1	2	1	2	0	0	2	0	1	0	0	0	1&2	2	1	2	0	1	0	2	1	1	2	1	2	2
S.	**simus**	0	0	1	1	0	1	1	1	0	0	0	1	1	0	1	0	0	2	0	1	0	1	0	1	1	0	2	1	2	1
T.	**aequal**	?	1	?	1	1	0	2	?	1	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	1	1	2	0	2	1
T.	**andres**	1	0	?	1	0	?	1	1	0	1	0	1	0	0	0	0	1	1	0	1	0	0	0	1	1	1	1	1	1	1
T.	**antarct**	1	0	1	1	0	?	1	1	1	0	0	1	0	1	0	0	2	3	0	1	0	0	1	1	1	1	1	1&2	2	2
T.	**armata**	0	1	0	2	1	2	1	2	1	0	?	1	1	1	1	1	0	?	1	1	0	0	0	2	1	2	2	2	0	1
T.	**carinat**	0	1	0	1	0&1	2	1	2	1	0	0	?	0	0	0	0	1	3	1	2	0	0	0	1	1	1	2	2	2	2
T.	**compa**	1	0	1	1	0	0	1	0	1	0	0	0&1	0	0	1	0	0	3	0	2	0	0	0	2	1	2	2	1&2	1	1
T.	**crassic**	1	0	1	1	0	2	1	0	0	0	0	1	0	0	?	?	?	?	?	2	0	0	1	1	1	0	1	2	0	?
Tor.	**crenati**	1	0	1	1	1	0	1	1	0	2	0	1	0	0	1	1	1	2	0	1	0	0	1	1	1	1	?	1&2	0	1
T.	**crypta**	1	1	?	1	1	0	1	2	2	1	2	1	0	0	0	0	2	1	1	2	0	0	0	2	1	2	2	2	2	2
T.	**dentim**	0	1	0	1	1	1	1	2	0	1	2	1	1	0	0	0	2	1	1	2	0	0	0	1	1	1	2	2	1&2	2
T.	**elepha**	0	1	?	1	0	?	1	2	0	0	2	1	0	0	0	0	2	3	1	2	0	0	0	0&1	1	1	2	2	2	?
T.	**laevis**	0	1	0	2	0	2	1	2	0	0	1	0	0	0	0	0	1&2	2	1	2	0	0	0	1	1	1	2	2	2	1
T.	**macroc**	1	1	0&1	1	1	2	1	1	0	0	1	0	0	1	1	0	0	1	1	2	0	0	0	0&1	1	1	2	1&2	2	1&2
T.	**macror**	1	0	0	1	0	?	1	1	0	0	0	0	0	1	0	0	1	2	0	1	0	0	0	0	1	0	2	1	2	2
T.	**medipa**	0	0	0	1&2	1	1	1	2	1	0	1	0	1	1	0	0	2	3	0	1	0	0	0	2	1	2	2	2	0	2
T.	**nitida**	1	1	1	2	1	2	1	1	1	0	0	1	0	1	1	0	1	?	1	2	0	0	0&1	1	1	1	2	1	2	1
T.	**paralle**	1	0&1	1	1	1	0	0&1	0&1	1	1	0&1	0	0	1	0&1	0	1	3	0	0	0	0	0	0&1	1	1	1&2	1&2	1	0
T.	**perlata**	0	1	?	1	1	2	1	2	0	0	0	0	0	0	0	0	0	3	0	2	0	0	0	1	1	1	2	2	2	2
T.	**pseudo**	0	1	?	1	1	?	1	2	0	0	1	1	0	0	0	0	1	2	1	2	0	0	0	1	1	1	2	2	2	1
T.	**saldani**	1	0	1	2	1	0	0	?	0	2	1	0	2	1	0	0	1	1	1	1	0	0	1	0&1	1	0&1	2	1	2	1
T.	**serrata**	0	0	?	1	0	?	1	1	0	1	1	1	2	1	1	0	0	1	0	1	0	0	0&1	1	1	1	1	1	0	0

		31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61
Gammarus		0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
P.	**anopht**	1	?	1	1	1	1	0	0	0	2	0	2	0	0	0	0	0	1	0	3	1	0	1	0	0	0	0	1	0	1	1
P.	**calcara**	0	0	1	1	1	0	1	1	1	2	0	2	0	0	0	0	0	1	0	3	1	0	1	0	0	0	0	1	1	1	0
Prob	**gregar**	0	0	0	1	2	1	0	1	1	2	1	1	0	0	0	0	0	1	0	3	1	0	1	0	1	0	1	1	2	1	0
P.	**holmes**	0	1	1	2	1	0	1	0	1	2	0	0	0	0	0	0&1	0	1	0	1	1	0	0	0	1	0	0&1	0	1&2	1	0
P.	**pacifica**	0	0	0	1	2	1	1	0&1	1	2	?	1	0	0	0	0	0	0	0	1	1	0	1	?	?	?	?	1	0	1	1
P.T.	**palmat**	?	?	0	1	?	1	0	0	0	2	0	1	2	1	0	0	0	1	0	1&2	1	0	0	0	2	0	1	1	2	2	0
P.	**porcell**	1	0&1	1	1	1&2	1	0	0	1	2	0	1	0&1	0	2	1	0	1	2	1&2	1	1	1	0	2	0	1	1	2	0	0
P.	**rotund**	?	?	1	1	?	2	0	1	0	2	0	1	0	0	0	0	0	1	0	3	1	0	?	1	?	0	?	1	3	1	?
P.	**schoka**	0	0	0	0	2	0&1	0	1	?	2	?	?	0	0	0	0	0	1	0	2	1	0	?	0	?	?	?	?	3	1	0
P.	**schulei**	1	?	?	1	2	?	0	0	?	2	?	?	0	0	0	1	0	1	0	3	1	0	1	?	?	?	?	?	3	1	0
P.	**stephe**	0	0	?	?	1&2	?	0	1	?	2	1	1	0&1	1	0	0	0	1	0	1	1	0	0	0	1	0	?	0	2	1	0
P.	**tundus**	0	0	0	1	1	1	1	0&1	?	2	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	0	1	1	3	1	0
P.	**zubovi**	?	?	?	?	1	1	1	0	?	2	?	?	0	0	0	1	0	1	0	1&2	1	0	?	?	?	?	?	?	1	1	0
S.	**bentari**	0	0	0	0	2	2	0	0	0	2	0	?	0&1	1	0	1	0	1	0	1	0	0	0&1	?	0	0	0	0	?	?	?
S.	**folioda**	0	0	0	0	2	2	0	0	1	2	1	1	3	3	0	0&1	0	1	0	1&2	0	0	0	0	2	0	1	1	3	2	0
S.	**gigant**	0	0	1	0	2	2	0&1	0	1	2	0	1	2&3	2	0	0&1	0	1	0	1	0	0	0	0	2	1	1	1	2	1	1
S.	**simus**	1	0	?	?	1	?	0	0	0	2	0	1	0&1	1	0	1	0	1	0	2	0	0	1	0	1	0	0	0	2	1	0
T.	**aequal**	0	0	0	0	1	1	0	0	0	2	0	1	1&2	2	0	1	0	0	0	0&1	?	0	0	?	?	?	?	?	?	?	0
T.	**andres**	1	0	0	2	2	1	1	0	1	2	1	1	2	1	0	1	0	1	0	2	1	0	0	0	1	0	0	1	1	1	0
T.	**antarct**	1	1	1	1	2	1	1	0	1	2	1	1	2	1	0	?	0	1	0	2	1	0	0	0	1	1	0	1	1	2	1
T.	**armata**	?	0	0	0	?	2	0	0&1	1	2	1	0&1	2	2	0	1	0	1	0	1	1	0	0	0	0	0	0	1	3	1	0
T.	**carinat**	0	0	0	0	2	2	0&1	0	1	2	1	1	2&3	3	0	1	0	1	0	2&3	1	0	0	0	2	0	1	1	1	1	0
T.	**compa**	?	?	1	2	?	0	1	1	1	2	0	1	2	1	0	?	0	1	0	2	1	0	0	0	?	0	?	1	2	1	0
T.	**crassic**	?	?	?	?	?	0	1	1	0	2	?	1	1	?	0	?	0	?	0	2	?	0	0	0	1	1	?	?	2	1	0
Tor.	**crenati**	?	?	1	2	?	1	1	0	0	2	0	1	2	2	0	1	0	1	0	1	1	0	0	0	?	0	0	1	0	1	0
T.	**crypta**	0	0	0	0	2	2	1	0&1	1	2	1	1	3	4	0	1	0	1	0	1	1	0	0	0	2	0	1	1	2	2	1
T.	**dentim**	0	?	0	0	2	2	0	0	1	2	1	1	3	2	0	1	0&1	1	0	1&2	1	0	0	0	1	0	1	1	0	1	1
T.	**elepha**	0	0	0	0	2	2	0	0	1	2	1	1	3	2	0	1	0	1	0	3	1	0	0	0	1	0	0	1	0	1	1
T.	**laevis**	0	0	0	0	1	1	0	0	1	2	1	1	3	2	0	1	0	1	0	1&2	1	0	1	0	1	1	0	1	0	1	0
T.	**macroc**	?	?	0	0&1	?	1&2	0	1	0&1	2	0&1	1	2	2	0	0	0	1	0	1&2	1	0	0	0	1	0	0	0	2	1	0
T.	**macror**	0	0	0	0	2	2	1	0	1	2	1	1	3	2	0	1	0	1	0	3	1	0	0	0	0	1	0	1	0	1	1
T.	**medipa**	0	0	0	0	1	1	0	1	1	2	1	1	3	2	0	1	0	1	0	2	1	0	0	0	1	1	0	1	2	1	0
T.	**nitida**	?	?	0	0	?	1	0	0	1	2	1	1	2	1	0	?	0	1	0	1	1	0	0	0	1	0	1	?	2	1	1
T.	**paralle**	?	?	0	1	?	1&2	0&1	0&1	1	2	1	1	1&2	1	0	0	0	1	0	1	1	0	1	0	1	1	0	1	2	1	0
T.	**perlata**	0	?	0	0	?	1	1	0	1	2	1	1	3	2	0	1	0	1	0	1	1	0	0	0&1	1	1	0	1	0	1	1
T.	**pseudo**	0	0	0	0	2	2	1	0	1	2	1	1	3	2	0	0&1	0	1	0	2&3	1	0	0	0	2	1	1	1	0	1	1
T.	**saldani**	1	0	?	?	2	0	1	1	1	1	1	1	3	2	0	0	0	1	0	3	1	0	0&1	0	1	1	0	1	2	2	0
T.	**serrata**	1	1	1	1	1	1	1	0	1	2	0	1	1	1	0	1	0	1	0	1&2	1	0	0&1	0&1	1	1	0	1	2	2	1

Figure 13. Matrix for 38 taxa and 61 characters (see description for character states in the text).

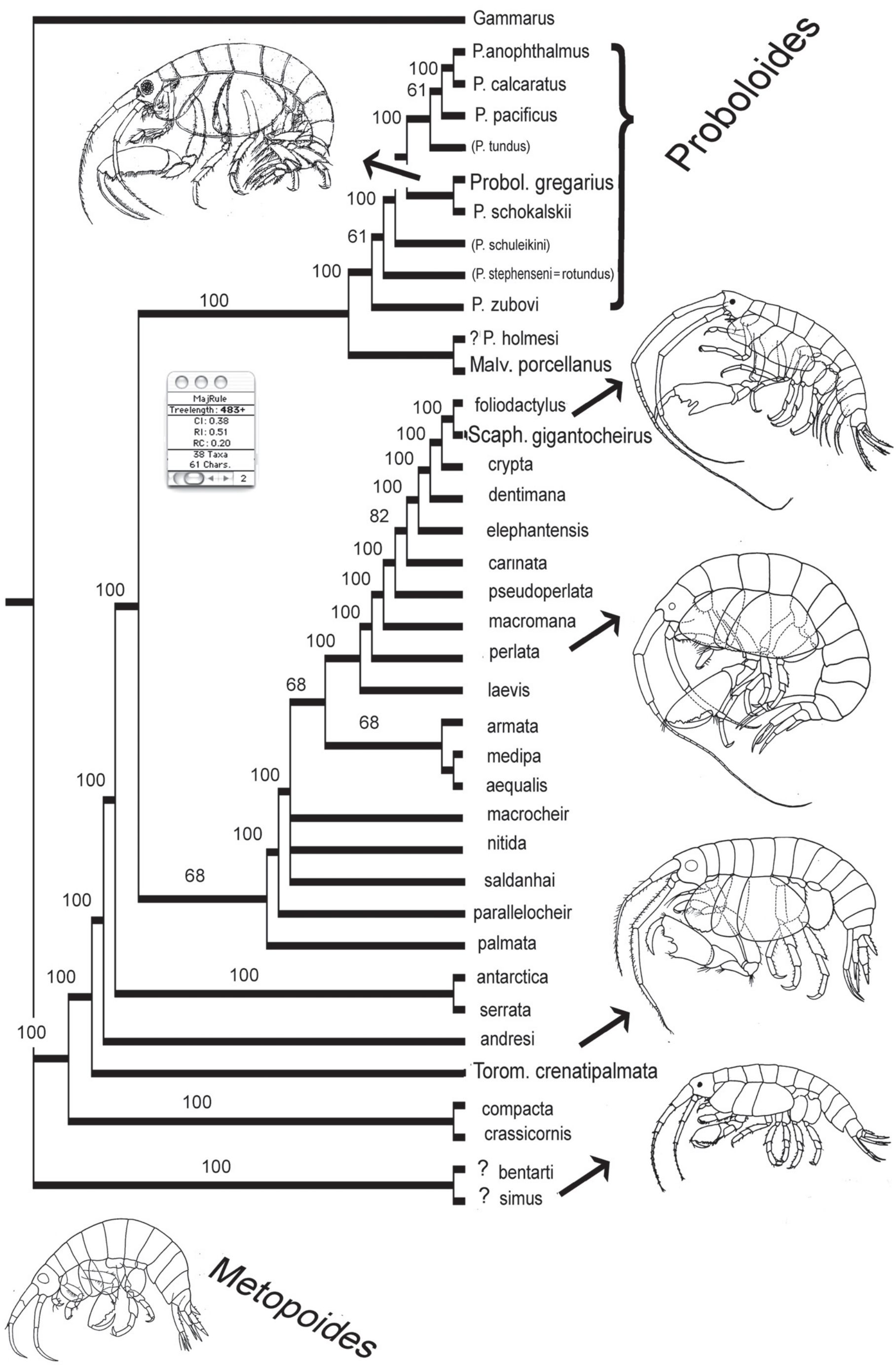

Figure 14. Heuristic analysis using 38 taxa and 61 characters: majority rule tree of 28 trees with length = 483. Genera abbreviated with more than one letter indicate type species; names written with small letters indicate that species are put in synonymy.

Heuristic search settings:

Optimal criterion = parsimony
Characters were unweighted and unordered
Gaps are treated as "missing"
Multistate taxa interpreted as polymorphism
Starting tree(s) obtained via stepwise addition
Addition sequence: random
Number of replicates = 50
Starting seed = 1191736759
Number of trees held at each step during stepwise addition = 7
Branch-swapping algorithm: tree-bisection-reconnection (TBR)
Steppest descent option not in effect
Initial "MaxTrees" setting = 200 (will be auto-increased by 100)
Branches collapsed (creating polytomies) if maximum branch length is zero
'MulTrees' option in effect
Topological constraints not enforced
Trees are unrooted
Total number of rearrangements tried = 46863460
Score of best tree(s) found = 486
Number of trees retained = 28
Tree length = 483
CI = 0,38
RI = 0,51
RC = 0,20

Results

At the beginning of the present analysis 16 species were cited for *Proboloides:*

Eight species were reported from the Atlantic or Arctic Ocean: *P. calcaratus, clypeatus, grandimanus, gregarius, holmesi, schokalskii, schuleikini, zubovi.* In most species at least the females have a pronounced palmar corner in Gn2, while Gn1 is weak and slender. In the deep-water species *P. calcaratus* and *P. gregarius* the males have Gn2 propodus + dactylus very much lengthened and the eyes large, Cx3 has no parallel margins, but becomes wider distally and is not much narrower than Cx 4, while *P. holmesi* has a narrow Cx3 with parallel margins, very different from Cx4.

P. clypeatus must remain a species dubia, as it is too poorly described.

The species *P. gregarius* and *schuleikini* (originally only subspecies of *P. gregarius*) show differences only in the even more elongated Gn1 in the latter, and I think *P. schuleikini* is a big female of *P. gregarius.* I have also my doubts about the description of *P. grandimana* (Bonnier), where all details match *P. gregarius* except the big and triangular Cx1 which should be even larger than Cx2, an extremely unusual character in stenothoids; it seems quite probable that this is an error and that Cx2 is repeated.

- Branch et al. (1991) illustrate a *Proboloides* sp. with U3 with 2 rami, which undoubtedly is also an error of the drawing.

Thus the only certain Atlantic-Arctic members are *P. calcaratus, gregarius, schokalskii* and *zubovi.*

There are 5 nominal *Proboloides* species from S-Africa and the Antarctic-Subantarctic region: *P. porcellanus, rotundus, stephenseni, typicamimus, typicus.* The species *P. stephenseni* and *P. rotundus* are morphologically similar and may be synonymized; *P. typicus* is redescribed and both could be transferred to *Metopoides*, as they have more plesiomorphic character states than members of *Proboloides*. - *P. porcellanus* is redescribed and is the type of a new monotypic genus *Malvinometopa.*

The remaining species *P. typicamimus* would then be the only member of the genus *Proboloides* living in the Antarctic, but it seems quite probable that also this species does not belong to this genus. But it is incompletely described though, based on a single specimen and knowledge about its character states is still very inadequate.

There are two nominal Pacific species of *Proboloides* remaining, *P. tundus* and *pacificus,* which may well be synonymous: the shape of Gn2 matches (the only illustrated detail of the first), and the written description of the shape of P5-7 merus in *P. tundus* "narrow, scarcely produced" matches the description by Shoemaker, 1964 for *P. pacificus* "very slightly expanded". Furthermore both species were found off California at greater depth (302 fathoms = 552 m and 718 fathoms = 1313 m, among hydroids on the back of a spider crab). - Shoemaker describes and illustrates *P. pacificus* with slender P5–7 merus, but at the end of his remarks he adds: "as shown here, the merus [of the last peraeopods] is widely expanded", which must be a lapsus linguae.

Proboloides anophthalmus is the only species living in the Indian Ocean (Madagascar). It is very similar to the Atlantic species *P.? holmesi*, however there are some differences in the shape of T, the presence of pearls on the Cx3 margin and the shape of A1, 2. This deep-sea species has no eyes.

Two species can be added here:

"Metopa nordmanni" sensu Shoemaker, 1955: 128 fig. 10 a-j (non *Metopa nordmanni* Stephensen) has to be described as new member of *Proboloides,* but as I could not see the material it must be cited as *Proboloides* sp. (Shoemaker, 1955) for the time being.

Proboloides aequicornis (Stephensen, 1931), as explained above.

After the thorough check of 16 species, eight (plus one doubtful member) remain belonging to *Proboloides* and show that the title in this series of papers is no longer appropriate, as none of them was found in the Austral-Antarctic region:

aequicornis (Stephensen, 1931: 198 fig. 59); between Faroes and Iceland, N-Atlantic.
anophthalmus Ledoyer, 1986: 965–66 (Madagascar, 335–450 m); Indian Ocean.
calcaratus (Sars, 1882: 92, t.4 sub *Metopa c.,* 1895: 247, t. 85 sub *Probolium. c.*; 1992: 247 t. 85), Atlantic.

gregarius (Sars, 1882: 93; 1895: 245 pl. 84), Atlantic; = probably *grandimanus* (Bonnier, 1896: 638 sub *Probolium grandimanum*), species dubia, Atlantic; = probably *schuleikini* Gurjanova, 1946: 283 sub *Proboloides gregarius* ssp. *schuleikini,* Arctic.
? *holmesi* Bousfield, 1973: 89 fig. 16/2, Atlantic.
pacificus (Holmes, 1908: 524), Pacific O, = ? *tundus* JL Barnard, 1962: 147–149, Pacific.
schokalskii Gurjanova, 1946: 283, Arctic, Kara Sea
sp. Shoemaker, 1955: 128, Arctic, Point Barrow
zubovi Gurjanova 1951: 412–13, Arctic, Kara Sea

Species dubia.
Proboloides clypeatus (Stimpson, 1853: 51 sub *Stenothoe clypeata*), Atlantic.

Species incertae sedis.
? Metopoides typicamimus Andres 1995: 355–364, Antarctica. [This species may very well belong to *Metopoides,* but has very elongate antennae and lacks OP on Mxp, or at least not seen with certainty, both advanced character states. More material is needed for solving this question].

? Proboloides holmesi Bousfield 1973: 89, fig. 16(2). [Aberrant member of this genus. May belong in *Metopa*].

***Species transferred* to Metopoides.**
Metopoides rotundus (Stebbing, 1917) (= ? *P. stephenseni* Ruffo, 1949)
Metopoides typicus (Walker, 1906)

Key to 15 members of *Metopoides* species (including ?*Metopoides typicamimus*)

1	P7 basis posterodistally regularly rounded	**2**
–	P7 basis distally clearly narrowing	**13**
2	Gn2 male palm with incisions, excavations and teeth; palmar corner about 90°	**3**
–	Gn2 male palm smooth or serrated	**4**
3	Gn1 carpus < propodus; P5–7 merus distoposteriorly lengthened, clearly reaching more than half length of carpus, in P7 even more than full carpus length; U3 ramus art 1 = art 2, peduncle and ramus art 1 with 1 robust seta each	***M. pollex* Krapp-Schickel, 2008** (3–4 mm)
–	Gn1 carpus > propodus; P5–7 merus posterodistal tip not reaching half length of carpus; U3 ramus art 1 > art 2, peduncle and ramus art 1 with many robust setae	? ***M. typicamimus* Andres, 1995** (3–3,5 mm)

4 Gn1 carpus twice as long as wide; propodus widening distad, with concave palm and upturned palmar corner......***M. clavatus*** **Schellenberg** (5.5–8 mm)

– Gn1 carpus not as long; propodus not as above **5**

5 P6 basis widened, but anterior and posterior margin parallel, not convex ... **6**

– P6 basis posterior margin convex, rounded as P7 .... **7**

6 Gn1 short and wide, propodus and carpus l < 2b; Gn2 palm 1/3 of total length of propodus; U3 ramus art 1 subequal length of peduncle .... ***M. sarsii*** **(Pfeffer)** (2.8–6.5 mm?!)

– Gn1 elongate, propodus and carpus l > 2b; Gn2 palm > 1/3 of total length of propodus; U3 ramus art 1 < length of peduncle.. .... ***M. lanceolatus*** **Rauschert** (3–4 mm)

7 Cx4 inferior margin distinctly excavated, concave....................................... **8**

– Cx4 inferior margin convex or only slightly excavate **9**

8 Gn2 fem. propodus with parallel margins, palmar corner about 150°, width < half length of anterior margin ....***M.*** **cf.** ***heterostylis*** (3 mm), ***M. heterostylis*** **Schellenberg** (2.8–3.3 mm)

– Gn2 fem. propodus widest at palmar corner, which is < 120°, width > half length of anterior margin .... ***M. latus*** **Rauschert** (2.8–3.4 mm)

9 Gn 1, 2 propodus with parallel margins, shape very similar; P7 merus twice as wide as carpus, reaching half length of carpus .... ***M. curvipes*** **Schellenberg** (juv. fem. 2 mm)

– Gn2 propodus widening **10**

10 Gn2 crenulated, in the middle of the long palm a semicircular excavation ....***M. rotundus*** **(Stebbing, 1917), ?=** ***M. stephenseni*** **(Ruffo, 1949)** (3.5 mm)

– Gn2 palm serrated or smooth **11**

11 Gn2 palmar corner well defined by short and acute tooth as well as shallow excavation; P6,7 merus distoposterior tip not reaching half length of carpus... .... ***M. typicus*** **(Walker, 1906)** (3–3.5 mm)

– Gn2 palmar corner smooth **12**

12 U3 peduncle = ramus, strongly spinose; P7 basis posteriorly semicircularly rounded .... ***M. bellansantiniae*** **(Bushueva)** (3 mm)

– U3 peduncle < ramus, naked; P7 basis oval... .... ***M. magellanicus*** **(Stebbing)** (2.8–3 mm)

13 Gn2 propodus twice as long as wide; A1>A2 .... **14**

– Gn2 propodus clearly much more than twice as long as wide; A1< A2...... **15**

14 Gn1 length of propodus = carpus length; P7 basis proximally twice as wide as distally and about twice as long as the distal width....................................... .... ***M. longicornis*** **Schellenberg** (2–3 mm)

– Gn1 length of propodus < carpus length; P7 basis proximally only a little wider than distally, about three times as long as the distal width .... ***M. angustus*** **Rauschert** (3.2 mm)

15 P6 basis elliptical, distally and proximally about the same width; P7 posterior margin regularly convex, but posterodistally no lobe.. ***M. ellipticus*** **Schellenberg** (4.5 mm)

– P6, 7 basis trapezoid shaped, distally distinctly narrower than proximally.. ***M. leptomanus*** **Rauschert** (3.6–3.9 mm)

Key to 9 members of *Proboloides* (including ? *P. holmesi* and *P.* sp.)

1 Gn2 male palm identical to propodus length; propodus longer than 2× width **2**

– Gn2 male palm not identical to propodus length; propodus shorter than 2× width **3**

2 Gn2 male propodus with short serrated margin near dactylus-insertion, then rectangular corner, two humps along the remaining palmar margin; Gn2 female palm with similar serrated part near dactylus insertion, remaining palmar margin somewhat excavated.. ***P. gregarius*** **(Sars, 1882)** (5–6 mm, N-Atlantic, Arctic)

– Gn2 male propodus with short serrated margin near dactylus insertion, defined by blunt corner, remaining palmar margin smooth; Gn2 female propodus rounded, smooth, palm = hind margin.. ***P. calcaratus*** **(Sars, 1882)** (5–6 mm, N-Atlantic)

3 Gn2 male palmar margin not defined by acute tooth................................. **4**

– Gn2 male palmar margin defined by acute tooth **5**

4 Gn2 propodus l:b about 3:2, palm about the length of remaining hind margin, corner rounded; Gn1 simple, triangular carpus < propodus .... ?***P. holmesi*** **Bousfield, 1973** (2,5 mm, Pacific)

– Gn2 propodus l:b about 2:1, palm not defined, dactylus reaching along 2/3 of palm which is unregularly serrated; Gn1 subchelate, elongate carpus with parallel margins, > propodus.. ***P. aequicornis*** **(Stephensen, 1931)** 5 mm, Faroes, N-Atlantic

5 Gn2 male, female palm longer than remaining hind margin of propodus; Gn1 propodus triangular, palmar corner about 120° **.................................** .... ***P. schokalskii*** Gurjanova (5 mm, Kara Sea)

– Gn2 male, female palm not longer than remaining hind margin of propodus...**6**

6 Gn2 male next to dactylus insertion strongly serrate; besides the palm-defining strong and acute tooth in the middle of the palm another one, followed by a small narrow incision; in male, female P7 basis oval .... ***P. pacificus*** **(Holmes, 1908)** (6 mm, Pacific)

– Gn2 palm not divided by additional tooth, regularly serrated from dactylus-insertion to corner **7**

7 Gn1 carpus clearly longer than propodus, more than 4× longer than wide.... ...***P.* sp.** (see "Proboloides nordmanni" in Shoemaker, 1955 p. 30 fig. 10(a-j)
– Gn1 carpus subequal to propodus...**8**
8 Gn1 propodus l:b = 2; P6 basis with regularly rounded margin, merus reaching end of carpus ...***P. anophthalmus*** **Ledoyer, 1986** (2,5 mm, Madagascar)
– Gn1 propodus l> 2b; P6 with straight, parallel margins, merus not reaching end of carpus ....***P. zubovi*** **Gurjanova, 1951** (5 mm, Kara Sea)

The habitus sketches added to the resulting tree in Fig.14 (from above: *Proboloides,* a large *Scaphodactylus, Torometopa* with A1> A2, *Torometopa* with A1 < A2*,* small *Scaphodactylus* and *Metopoides*) may give an idea about the differences in the body shapes in this basic group of stenothoids: e.g. members of *Proboloides* have a disto-posteriorly lengthened and widened merus on the last three peraeopods, which is much less the case in all other groups. Ed Bousfield (in litteris) opines that this must have an important hydrodynamic function, which could well be imagined. Also the relative length and width of Cx 4 (in *Scaphodactylus gigantocheirus* strikingly small) or the relation of the antennae (in the group near *Torometopa antarctica* and *crenatipalmata* with the second one always being longer and stronger) could tell us something about the swimming (or even digging?) ability, if we would know more about their life style. However, it seems probable that *Proboloides* members are mainly free-living and do not live in association with, or at least not inside of, other animals; they ought therefore to be good swimmers and have a rather strong sexual dimorphism.

The remaining species in Fig. 14., not belonging to the genus *Proboloides*, will be treated in the following and final part.

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As already written in part 1 (Krapp-Schickel 2009), this paper developed during more than a decade, and the card-files of these species accompanied me to every Museum's visit or even during my stay in hospital. In addition to the friends already mentioned in part 1 (Hans-Georg Andres, Stefan Koenemann, Jim Lowry, Gary Poore, Sandro Ruffo and Wim Vader), I want to thank this time also Ed Bousfield, with whom I had a lively correspondence. As was nearly always the case when publishing, also here Wim Vader helped with very constructive critical remarks.

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Jacobyana Maulik, an Oriental flea beetle genus new for the Afrotropical Region with description of three new species from Central and Southern Africa (Coleoptera, Chrysomelidae, Alticinae)

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Abstract

An Oriental flea beetle genus *Jacobyana* Maulik, 1926 including 7 species from India, Nepal, Vietnam and Sri Lanka, is reported in the Afrotropical Region for the first time. It is represented there by three new species, *J. bezdeki* **sp. n.**, *J. centrafricana* **sp. n.**, and *J. sudafricana* **sp. n.** Micrographs of male and female genitalia, scanning electron micrographs of some diagnostic morphological characters, a key to identification and distributional data for the new species, are provided.

Keywords

Afrotropical Region, Oriental Region, Chrysomelidae Alticinae, *Jacobyana*, new species

Introduction

The flea beetle genus *Jacobyana* was described by Maulik (1926) with the type species *Sphaerophysa piceicollis* Jacoby, 1889 from Burma (Myanmar). Subsequently, Chen (1934, 1935) ascribed to this genus two taxa, *J. piceicollis* (Jacoby, 1889) var. *nigra*

Chen, 1934 from Tonkin (Vietnam) and *J. nigrofasciata* Chen, 1935 from Sikkim (India). Later Scherer (1969) described *J. naini* from Uttar Pradesh (India). More recently *Jacobyana* was found in Panchthar, Nepal (*J. nepalica* Medvedev, 1990) and Sri Lanka (*J. ovata* Medvedev, 2001). Finally, Sprecher-Uebersax (2002) described two more species: *J. flurinae* and *J. serainae* from northern-eastern India.

In this paper we report the first records of *Jacobyana* for Sub-Saharan Africa and describe three new species: *J. bezdeki* sp. n., from Malawi, *J. centrafricana* sp. n., from Democratic Republic of Congo, and *J. sudafricana* sp. n., from Republic of South Africa. This extends considerably the geographical distribution of *Jacobyana* and widens already important Oriental component in the Afrotropical flea beetle fauna (Biondi and D'Alessandro 2010).

The Afrotropical Region, in fact, shares the highest number of flea beetle genera with the Oriental Region (26 of 102 genera in total) (Biondi & D'Alessandro 2010). The presence of some Oriental genera in the Afrotropical Region may be due to a possible Gondwanian origin: *Sanckia* Duvivier, 1891, which mainly occurs in Madagascar although species are found in the Sub-Saharan Africa and southern part of the Oriental Region; *Torodera* Weise, 1902, occurs in Sub-Saharan Africa and the Oriental Region, but it is absent from Madagascar; *Amphimela* Chapuis, 1875, *Nisotra* Baly, 1864, and *Paradibolia* Baly, 1875, occur in the Afrotropical, Oriental and Australian Regions; and *Bikasha* Maulik, 1931, occurs both on the Seychelles Islands and peninsula of Vietnam.

Materials and methods

Material consisted of dried insects preserved in the institutions listed below. Further faunistic data on the *Jacobyana* species in Sub-Saharan Africa were collected during zoological collecting trips that were part of an Italian research project (PRIN 2004057217) aimed at interpreting the disjunct distribution of different plant and animal groups in the Mediterranean-South African regions. Specimens were examined and dissected using WILD MZ12.5 and LEICA M205C binocular microscopes. Photomicrographs were taken using a Leica DFC500 camera and the Auto-Montage Pro 2006 software (license number: 15224*syn2459*153a2112_maurizio_266836). Scanning electron micrographs were taken using a HITACHI TM-1000. Geographical coordinates of the localities are reported in degrees and minutes (DMD-WGS84 format); those included in square brackets were added by the authors.

Abbreviations. Morphology. LAED: length of median lobe of aedeagus; LAN: length of antennae; LB: total length of body; LE: length of elytra; LP: length of pronotum; LSP: length of spermatheca; WE: width of elytra; WP: width of pronotum.

Collections and depositories. BAQ: collection of M. Biondi preserved in the Dipartimento di Scienze Ambientali, University of L'Aquila, Italy; BMNH: The Natural History Museum, London, United Kingdom; SANC: South African National Collection, Plant Protection Research Institute, Pretoria, Gauteng, Republic of South Africa; TMSA: Transvaal Museum, Pretoria, Gauteng, Republic of South Africa.

Taxonomy

Genus *Jacobyana* Maulik

Jacobyana Maulik, 1926: 284, 302–303.

Type species. *Sphaerophysa piceicollis* Jacoby, 1889: 195, by original designation. (Type locality: Burma).

Morphological remarks. Based on newly examined material, morphological characteristic of *Jacobyana* is revised and updated with respect to the original description (Maulik, 1926). Body roundish, strongly convex (Figs 2, 8, 14). Head with evident setiferous punctures (Figs 3, 9, 15); antenna short, generally not reaching pronotal base (Figs 2, 8, 14); third antennomere clearly thinner than first two antennomeres and about as long or longer than fourth and fifth together (as in *J. piceicollis* and *J. flurinae*); distal antennomeres (7 through11) distinctly longer than middle ones (3 through 6). Pronotum (Figs 4, 10, 16) clearly transverse (WP/LP > 2.2), anteriorly narrower than posteriorly, without antebasal furrow; lateral margins distinctly bordered, with anterior setiferous pore rearward towards middle of pronotal side; posterior margin not bordered, clearly sinuous. Elytral punctation (Fig. 17) arranged in regular rows; interstriae flat. Hind femur strongly enlarged; all femora ventrally with a large and generally deep furrow as long as femoral length, with smooth surface, to receive tibiae in resting position; hind tibia dorsally clearly channeled with distinct apical spur; tarsal claw sub-appendiculate (Fig. 7). Ventral surface (Figs 5, 11, 18) with numerous setiferous punctures, generally rather uniformly distributed; procoxal cavities posteriorly open; metasternum about as long as first abdominal sternite; elytral epipleura wide and slightly concave.

Metafemoral spring (Fig. 19) similar to springs of *Psylliodes* morpho-group (Furth & Suzuki 1998) but likely constitutes a new morpho-group with dorsal lobe regularly curved, with rather long extended arm; basal edge straight, angled < 90° with central axis of dorsal lobe; dorsal edge of ventral lobe straight; basal angle of ventral lobe acute, short, apically pointed; recurve flange distinctly sclerotized.

Distribution. Oriental (India, Nepal, Vietnam and Sri Lanka) (Medvedev 2009) and Afrotropical (Democratic Republic of Congo, Malawi, and Republic of South Africa) Regions (Fig. 1).

Notes. *Jacobyana bezdeki* sp.n. (LB = 2.64 mm), *J. centrafricana* sp. n. (LB = 2.66 mm), and *J. sudafricana* sp.n. (LB ♂ = 2.25 mm and ♀ > 2.43 mm) are the smallest species of the genus (Sprecher-Uebersax, 2002). All new Afrotropical species share a ratio of the length between antennomeres 3 and 4 (= 2) with *J. ovata* Medvedev from Sri Lanka (known only by a single female). However, all three African species are distinguishable from *J. ovata* by their smaller size (*J. ovata*: LB = 3.40 mm), interantennal space distinctly narrower than length of first antennomere (as broad as first antennomere in *J. ovata*) and, with the exception of some specimens of *J. sudafricana* sp. n., by the colour of the dorsal integuments, never uniformly black (entirely black in *J. ovata*).

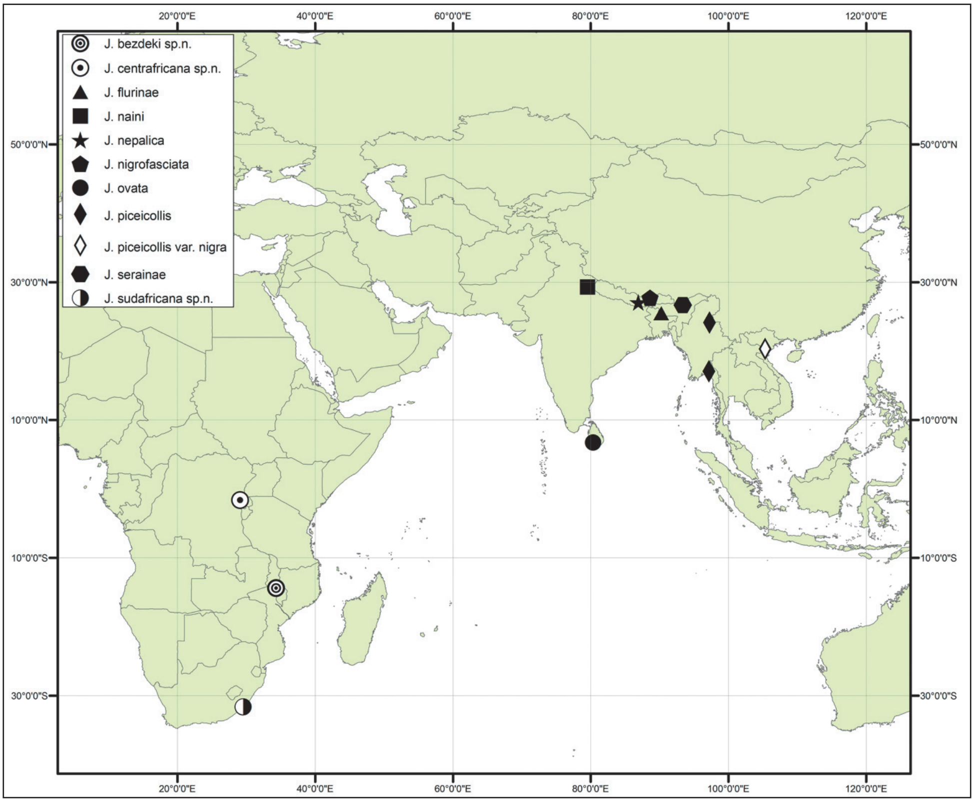


Figure 1. Geographical distribution of the genus *Jacobyana* Maulik.

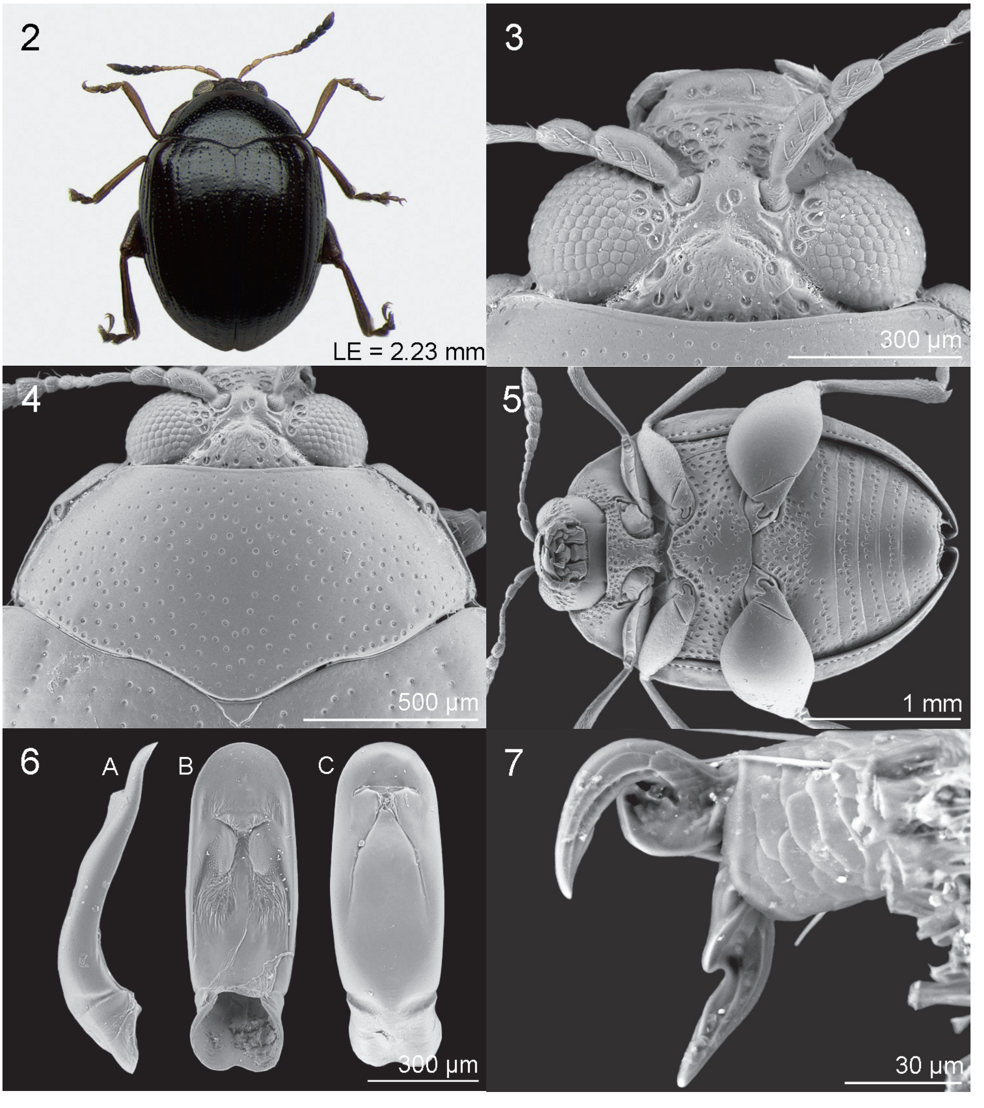
Jacobyana bezdeki sp. n.

urn:lsid:zoobank.org:act:8429491E-26FC-469C-B106-8B97C94A3D4B

Type series. Holotype ♂: MALAWI: Dedza env. [~ S14° 23' E34° 19'], 06–13.i.2002, J. Bezděk leg. (BAQ).

Diagnosis. *Jacobyana bezdeki* sp. n. is different from *J. centrafricana* sp.n. and *J. sudafricana* sp.n. in having dorsal integuments reddish-brown (integuments are entirely or almost entirely black in *J. sudafricana* sp. n. and black with reddish elytral apex in *J. centrafricana* sp.n.). Other distinctive characters are: head with frons and vertex distinctly raised (Figs 3, 9, 15); punctation medially absent in distal part of first abdominal sternite and in last abdominal sternite (Figs 5, 11, 18); median lobe of the aedeagus in ventral view laterally sub-parallel and apically widely rounded (Figs 6, 13, 20).

Description. Holotype ♂. Dorsal integument (Fig. 2) reddish-brown with evident metallic reflection; head, pronotum and elytral punctation darkened. Body elliptical (LB = 2.64 mm), weakly elongate, strongly convex. Maximum pronotal width at base (WP = 1.38 mm); maximum elytral width at basal third (WE = 1.80 mm).



Figures 2–7. *Jacobyana bezdeki* Biondi & D'Alessandro, sp. n. ♂, holotype (Malawi). **2** habitus **3** head **4** pronotum **5** ventral parts **6** median lobe of aedeagus, in lateral (**6A**), ventral (**6B**), dorsal (**6C**) view **7** tarsal claws.

Frons and vertex (Fig. 3) distinctly raised, with clearly wrinkled and punctulate surface and distinct setiferous punctures; frontal tubercles indistinguishable; interantennal space distinctly smaller than length of first antennomere, medially with two jointed setiferous pores clearly impressed on sub-smooth and punctulate surface; frontal carina not raised; clypeus triangular with large setiferous punctures; labrum subrectangular, reddish; palpus yellowish; eye sub-elliptical, normally sized; antenna much shorter than body length (LAN = 0.94 mm; LAN/LB = 0.36), with antennomeres 1–6 entirely pale, antennomere 7 partially darkened, antennomeres 8–11 clearly darkened; antennomeres 1–2 and 7–11 clearly enlarged; length of each antennomere proportional to numerical sequence 22:13:18:9:9:8:12:11:12:12:23 (right antenna).

Pronotum (Fig. 4) sub-trapezoidal, strongly transverse (LP = 0.66 mm; WP/LP =2.08), laterally clearly and evenly rounded, basally as wide as elytra; basal margin distinctly sinuous, not bordered; lateral margin distinctly bordered, with anterior setiferous pore rearward little before middle of pronotal side; punctures densely and uniformly distributed on very finely and sparsely punctulate surface; punctures small but clearly impressed. Scutellum very small, sub-triangular, with sub-smooth surface.

Elytra moderately elongate (LE = 2.23 mm; LE/LP = 3.36), covering entire pygidium, laterally clearly arcuate, apically jointly rounded; punctures small but clearly impressed, arranged in 9 regular rows (+ 1 short scutellar row); surface sub-smooth with dense punctulation; interstriae flat; humeral callus very weakly prominent; macropterous metathoracic wings.

Legs with partially darkened femur and reddish tibia and tarsi; hind tibia straight without dentate external margin; apical spur of hind tibiae short, reddish. First anterior and middle tarsomeres slightly dilated with adhesive setae on ventral side (Fig. 12).

Ventral parts (Fig. 5) dark-brown, with dense and rather uniformly distributed setiferous punctures, but medially sparser or absent on prosternum, metasternum, distal part of first abdominal sternite and last abdominal sternite; last abdominal sternite without special preapical impressions.

Median lobe of aedeagus (Fig. 6) short and robust (LAED = 0.91 mm; LE/LAED = 2.44), in ventral view laterally sub-parallel, apically widely rounded; ventral sulcus very wide, clearly impressed, with partially wrinkled surface and two paired short longitudinal carinae and numerous small protruding structures; dorsal sulcus poorly-developed; dorsal ligula well-developed, apically acute; median lobe in lateral view clearly arcuate at basal third and slightly sinuous in apical part; surface of median lobe with pores, especially on ventral side of apical part.

Etymology. This species is named after its collector J. Bezděk (Czech Republic), valued specialist of Chrysomelidae.

Distribution. Malawi (Fig. 1). Eastern Afrotropical chorotype (EAF) (Biondi and D'Alessandro 2006).

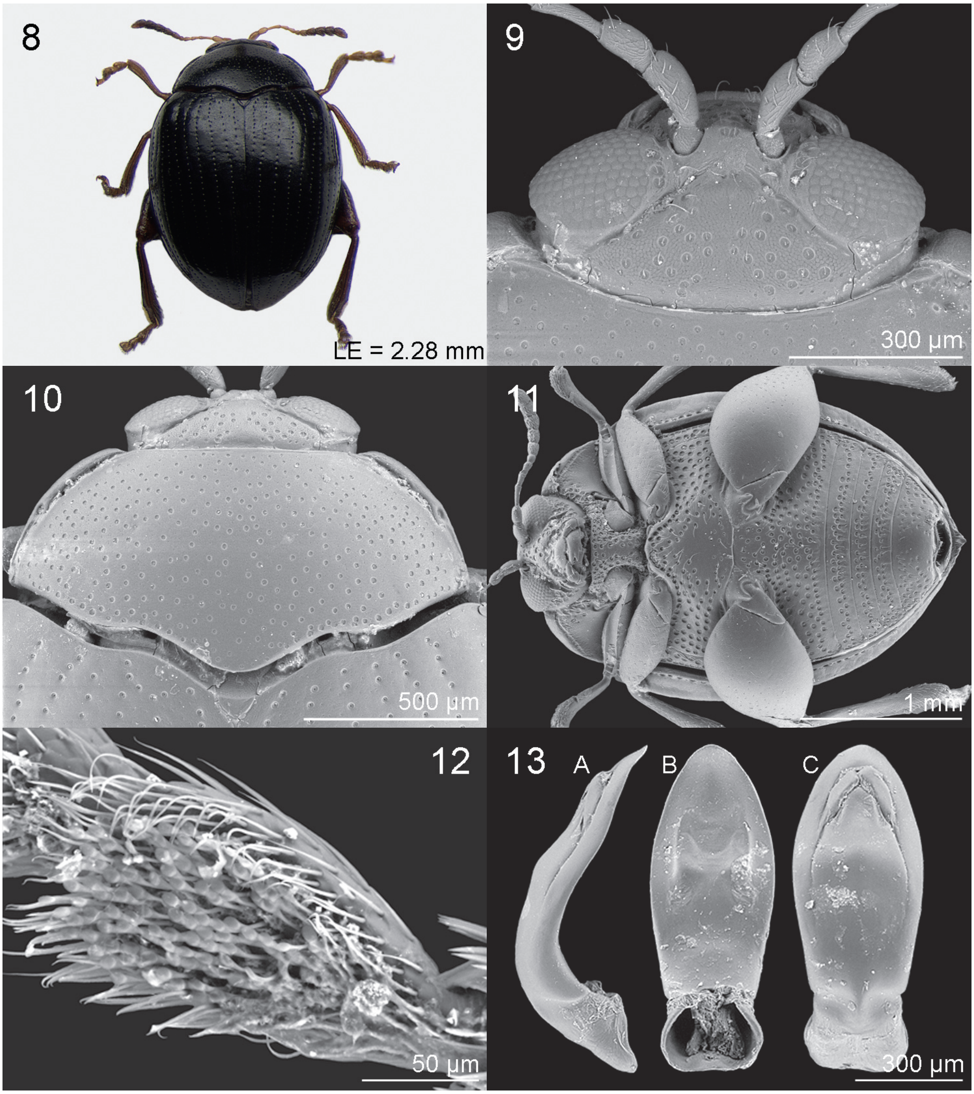
Ecological notes. Host plant is unknown.

Jacobyana centrafricana **sp.n.**

urn:lsid:zoobank.org:act:55ECC82E-16CE-4D8D-BABD-EE02D92840BF

Type series. Holotype ♂: ZAIRE [= REPUBLIC OF CONGO]: Nord Kivu, Lac Mugunga [~ S1°37' E29° 32'], 1520 m, 16.vii.1990, G. Carpaneto & S. Zoia leg. (BAQ).

Diagnosis. *Jacobyana centrafricana* can be distinguished from *J. bezdeki* sp. n. and *J. sudafricana* sp. n. by the following features: the dorsal integuments being black with elytral apex clearly reddish and legs distinctly paler (reddish-brown in *J. bezdeki* sp.



Figures 8–13. *Jacobyana centrafricana* Biondi & D'Alessandro, sp. n. ♂, holotype (Democratic Republic of Congo). **8** habitus **9** head **10** pronotum **11** ventral parts **12** ventral side of first anterior tarsomere in male **13** median lobe of aedeagus, in lateral (**13A**), ventral (**13B**), dorsal (**13C**) views.

n.; more diffusely black in *J. sudafricana* sp. n.); the basal margin of the pronotum is slightly more sinuous (Figs 4, 10, 16); punctures of the ventral side of the body more densely impressed (Figs 5, 11, 18); the median lobe of the aedeagus in ventral view is clearly lanceolate, laterally with the maximum width about middle and with acutely rounded apex (Figs 6, 13, 20).

Description. Holotype ♂. Dorsal integument (Fig. 8) entirely black with evident metallic reflection; elytral apex clearly reddish. Body roundish (LB = 2.66 mm), strongly convex. Maximum pronotal width at base (WP = 1.39 mm); maximum elytral width at basal third (WE = 1.88 mm).

Frons and vertex (Fig. 9) with clearly shagreened and punctate surface, and distinct setiferous punctures; frontal tubercles subtriangular, blackish, very scarcely delimited, with shagreened surface; frontal grooves distally deep, particularly along ocular margin; interantennal space distinctly narrower than length of first antennomere, medially with two setiferous pores; frontal carina not raised; clypeus triangular with large setiferous punctures; labrum sub-rectangular, distally brownish; palpus yellowish; eye subelliptical, normally sized; antenna much shorter than body length (LAN = 1.00 mm; LAN/LB = 0.38), entirely pale, but with antennomeres 8–11 clearly blackened; antennomeres 1–2 and 7–11 clearly enlarged; length of each antennomere proportional to numerical sequence 23:14:20:10:9:8:14:14:16:16:20 (right antenna).

Pronotum (Fig. 10) sub-trapezoidal, strongly transverse (LP = 0.68 mm; WP/LP = 2.06), laterally clearly and evenly rounded, basally as wide as elytra; basal margin distinctly sinuous, not bordered; lateral margin distinctly bordered, with anterior setiferous pore rearward at middle of pronotal side; punctures densely and uniformly distributed on shagreened and very finely punctulate surface; punctures small but clearly impressed. Scutellum very small, half-roundish, with sub-smooth surface, medially clearly depressed.

Elytra moderately elongate (LE = 2.28 mm; LE/LP = 3.37), covering entire pygidium, laterally strongly arcuate, apically jointly rounded; punctures small but clearly impressed, arranged in 9 regular rows (+ 1 short scutellar row); surface sub-smooth with very finely and sparsely punctulation; interstriae flat; humeral callus very weakly prominent; macropterous metathoracic wings.

Legs with blackish femur and tibia but with paler tarsi; hind tibia straight with no dentate external margin; apical spur of hind tibia short, reddish. First anterior and middle tarsomeres slightly dilated with adhesive setae on ventral side (Fig. 12).

Ventral side (Fig. 11) blackish, with very dense and rather uniformly distributed setiferous punctures, sparser or absent in middle part of prosternum, metasternum and last abdominal sternite; last abdominal sternite without special preapical impressions.

Median lobe of aedeagus (Fig. 13) short and robust (LAED = 0.93 mm; LE/LAED = 2.46), in ventral view clearly lanceolate, laterally with maximum width about at middle; apex acutely rounded; ventral sulcus very wide, moderately impressed, without any evident carinae or sulci but medially weakly protruding; dorsal sulcus obliterate; dorsal ligula well developed, apically acutely rounded; median lobe in lateral view basally strongly arcuate at basal third and slightly sinuous in distal half; apex slightly bent in ventral direction.

Etymology. This species name refers to the geographic region where it lives and means "from Central Africa".

Distribution. Republic of Congo (Nord Kivu) (Fig. 1). Central Afrotropical chorotype (CAT) (Biondi and D'Alessandro 2006).

Ecological notes. Host plant is unknown.

***Jacobyana sudafricana* sp. n.**
urn:lsid:zoobank.org:act:2BFA5865-4DA2-41DC-A189-A444C992F2AD

Type series. Holotype ♂: REPUBLIC OF SOUTH AFRICA: Eastern Cape Province, Port St. Johns, Silaka Nature Reserve, S31°39.45' E29°30.14', 10.xi.2006, G. Osella leg. (BAQ). Paratypes: same locality, date and collector as the holotype, 2 ♀♀ (BAQ; SANC); ditto, E. Colonnelli leg., 2 ♀♀ (BAQ; TMSA); South Africa, Pondoland, Port St. Johns [S31°38' E29°32'], 29.i-5.ii.1924, R.E. Turner leg., 2 ♀♀ (BMNH).

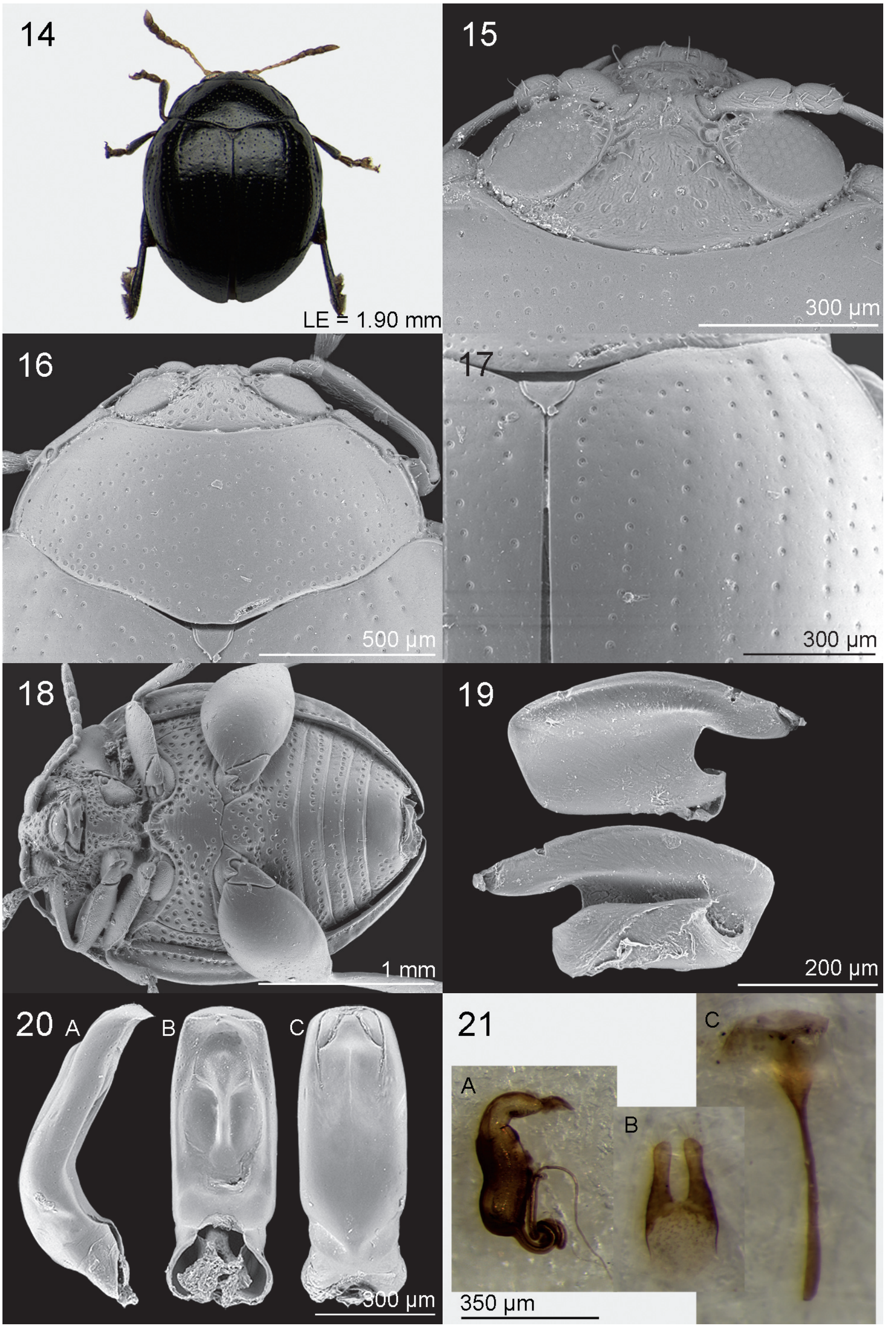
Diagnosis. *Jacobyana sudafricana* sp. n. is the smallest species of the genus (LB ♂ = 2.25 mm); it is also distinctly smaller than *J. bezdeki* sp. n. (LB = 2.64 mm) and *J. centrafricana* sp.n. (LB = 2.66 mm). The following characters separate *J. sudafricana* from the rest African species: pronotal surface laterally slightly depressed (Figs 4, 10, 16); elytra laterally more rounded (Figs 2, 8, 14); punctation of the ventral part medially absent on the last four abdominal sternites (Figs 5, 11, 18); median lobe of aedeagus in ventral view laterally sub-parallel with widely sub-truncate apex (Figs 6, 13, 20).

Description. Holotype ♂. Dorsal integument (Fig. 14) entirely black with evident metallic reflection; tip of elytral apex reddish. Body roundish (LB = 2.25 mm), strongly convex. Maximum pronotal width at base (WP = 1.28 mm); maximum elytral width at basal fourth (WE = 1.71 mm).

Frons and vertex (Fig. 15) with clearly shagreened and finely punctulate surface, with distinct setiferous punctures; frontal tubercles subtriangular, brownish, scarcely delimited, with shagreened surface; frontal grooves distally deep, particularly along ocular margin; interantennal space distinctly narrower than length of first antennomere, medially with two setiferous pores not well delimited; frontal carina not raised; clypeus triangular with large setiferous punctures; labrum sub-rectangular, distally brownish; palpus yellowish; eye sub-elliptical, normally sized; antenna much shorter than body length (LAN = 1.00 mm; LAN/LB = 0.44), entirely pale but with antennomeres 5–11 very slightly obfuscate; antennomeres 1–2 and 7–11 clearly enlarged; length of each antennomere proportional to numerical sequence 18:14:22:11:10:8:12:14:16:16:22 (right antenna).

Pronotum (Fig. 16) sub-trapezoidal, strongly transverse (LP = 0.55 mm; WP/LP = 2.32), laterally clearly rounded, basally as wide as elytra; pronotal surface laterally weakly depressed; basal margin not bordered, sinuous; lateral margin distinctly bordered, with anterior setiferous pore rearward at middle of pronotal side; punctures small but distinctly impressed, few densely but uniformly distributed on very finely and sparsely punctulate surface. Scutellum small, sub-triangular, apically with very small median tooth; surface smooth, anteriorly finely rugose.

Elytra moderately elongate (LE = 1.90 mm; LE/LP = 3.37), covering entire pygidium, laterally strongly arcuate, apically jointly rounded; punctures small and moderately impressed (Fig. 17), arranged in 9 regular rows (+ 1 short scutellar row); surface very finely and sparsely punctulate; interstriae flat; humeral callus very weakly prominent; macropterous metathoracic wings.



Figures 14–21. *Jacobyana sudafricana* Biondi & D'Alessandro, sp. n. ♂, holotype (Republic of South Africa). **14** habitus **15** head **16** pronotum **17** elytral surface **18** ventral parts **20** median lobe of aedeagus, in lateral (**20A**), ventral (**20B**), dorsal (**20C**) views. *Jacobyana sudafricana* Biondi & D'Alessandro, sp. n. ♀, paratype (Republic of South Africa). **19** metafemoral spring **21A** spermatheca **21B** vaginal palpi **21C** tignum.

Leg entirely reddish-brown with partially blackened femur; hind tibia very slightly curved with no dentate external margin; apical spur of hind tibia short, reddish. First anterior and middle tarsomeres very weakly dilated, with adhesive setae on ventral side (Fig. 12).

Ventral surface (Fig. 18) blackish, with dense and rather uniformly distributed setiferous punctures, medially sparser or absent on prosternum, metasternum and last four visible abdominal sternites; last abdominal sternite without special preapical impressions.

Median lobe of aedeagus (Fig. 20) short and robust (LAED = 0.75 mm; LE/LAED = 2.45), in ventral view laterally sub-parallel in basal 2/3 and slightly convergent in apical third; apex widely sub-truncate; ventral sulcus very wide, clearly impressed, with evident longitudinal median carina distally clearly expanded, with numerous small protruding structures; dorsal sulcus obliterate; dorsal ligula well-developed, apically sub-triangular; median lobe in lateral view very strongly curved at basal third and clearly bent in ventral direction at apex; surface of median lobe with pores, especially on ventral side of apical part.

Variation. ♂ (n = 1): LE = 1.90 mm; WE = 1.71 mm; LP = 0.54 mm; WP = 1.28 mm; LAN = 1.00 mm; LAED = 0.75 mm; LB = 2.25 mm; LE/LP = 3.45; WE/WP = 1.34; WP/LP = 2.32; LE/LAED = 2.53; LAN/LB = 0.44. ♀ (n = 6; mean and standard deviation): LE = 2.25 ± 0.10 mm; WE = 2.01 ± 0.08 mm; LP = 0.65 ± 0.02 mm; WP = 1.46 ± 0.06 mm; LAN = 1.10 ± 0.03 mm; LSP = 0.45 ± 0.02 mm; LB = 2.61 ± 0.10 mm; LE/LP = 3.46 ± 0.08; WE/WP = 1.38 ± 0.02; WP/LP = 2.25 ± 0.08; LE/LSP = 4.96 ± 0.27; LAN/LB = 0.42 ± 0.01.

Paratypes (all females) very similar in shape, sculpture and color to the holotype, but distinctly bigger. Tip of elytral apex variable in color from entirely black to partially reddish. Spermatheca (Fig. 21A) with sub-reniform and elongate basal part, clearly more developed than apical part; apical part with distinct collum and apex; appendix evident; ductus elongate, sub-apically inserted, with several coils in proximal part. Vaginal palpi and tignum as in Fig. 21B, 21C.

Etymology. This species name refers to the geographic region where it lives and means "from Southern Africa".

Distribution. Republic of South Africa (Eastern Cape Province) (Fig. 1). Southern-Eastern African chorotype (SEA) (Biondi and D'Alessandro 2006).

Ecological notes. Host plant is unknown. Biome: Forest (Rutherford and Westfall, 1994). Veld type: Coastal Forest and Thornveld (Acocks, 1988).

Key to species

1	Dorsal integuments reddish-brown. Frons and vertex distinctly raised (Fig. 3). Median lobe of aedeagus (Fig. 6) short and robust, in ventral view laterally sub-parallel, apically widely rounded; ventral sulcus very wide, clearly impressed; in lateral view basally clearly arcuate at basal third and slightly sinuous in apical part	***J. bezdeki*** **sp. n.**
–	Dorsal integuments entirely black or with reddish elytral apex. Frons and vertex flat (Figs 9, 15)	**2**

2 Dorsal integuments black with clearly reddish elytral apex. Abdominal sternites with uniformly and densely impressed punctures (Fig. 11). Median lobe of aedeagus (Fig. 13) in ventral view clearly lanceolate with acutely rounded apex; in lateral view strongly arcuate at basal third and slightly sinuous in distal half with apex slightly bent ventrally................. ***J. centrafricana* sp. n.**

– Dorsal integuments entirely black (sometimes only with slightly reddish tip of elytra). Distal abdominal sternites medially without punctation (Fig. 18). Median lobe of aedeagus (Fig. 20) in ventral view apically widely sub-truncate, with ventral sulcus very wide with evident longitudinal median carina; median lobe in lateral view very strongly curved at basal third with apex clearly bent ventrally .... ***J. sudafricana* sp. n.**

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RESEARCH ARTICLE

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A New Species of *Dialictus* from Sombrero Island, Anguilla (Hymenoptera, Halictidae)

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Abstract
A new species of *Lasioglossum* Curtis subgenus *Dialictus* Robertson (Halictinae, Halictini) is described and figured from a series of female and males collected on Sombrero Island, Anguilla; the northernmost island of the Lesser Antilles. *Lasioglossum* (*Dialictus*) *sombrerense* **sp. n.** is distinguished from its congeners and the name made available for a forthcoming work on the arthropod diversity of Sombrero Island.

Keywords
Apoidea, Anthophila, Halictidae, Halictinae, Halictini, taxonomy, Anguilla, West Indies

Introduction

Since the overview by Eickwort (1988), work has steadily increased on the West Indian halictine fauna (e.g., Snelling 2005; Genaro 2006, 2007, 2008; Genaro and Franz 2008; Smith-Pardo 2009) and it is greatly hoped that a new synthesis of this entire region is undertaken. The purpose of the present contribution is to provide a name for a new species of halictine bee on Sombrero Island, Anguilla. The name is established here so that it may be used in a forthcoming study of

Sombrero Island arthropod diversity by Mike Ivie and Justin Runyon (Ivie and Runyon, in prep.).

Institutional acronyms used in the sections on the type material are: SEMC, Snow Entomological Collection, Division of Entomology, University of Kansas Natural History Museum, Lawrence; NHML, Department of Entomology, The Natural History Museum, London; FSCA, Museum of Entomology, Florida State Collection of Arthropods, Gainesville; and MTEC, Montana Entomology Collection, Montana State University, Bozeman. Morphological terminology generally follows that of Engel (2001, 2009) and Michener (2007), while the format for the description loosely follows that of Engel (2000) and Engel et al. (2007). Measurements were taken using an ocular micrometer on an Olympus SZX-12 stereomicroscope while photomicrographs were prepared with a Nikon D1x digital camera attached to an Infinity K-2 long-distance microscopic lens. Measurements are of the holotype, with ranges for paratypes provided in parentheses.

Systematics

Genus *Lasioglossum* Curtis
Subgenus *Dialictus* Robertson

***Lasioglossum* (*Dialictus*) *sombrerense* Engel, sp. n.**
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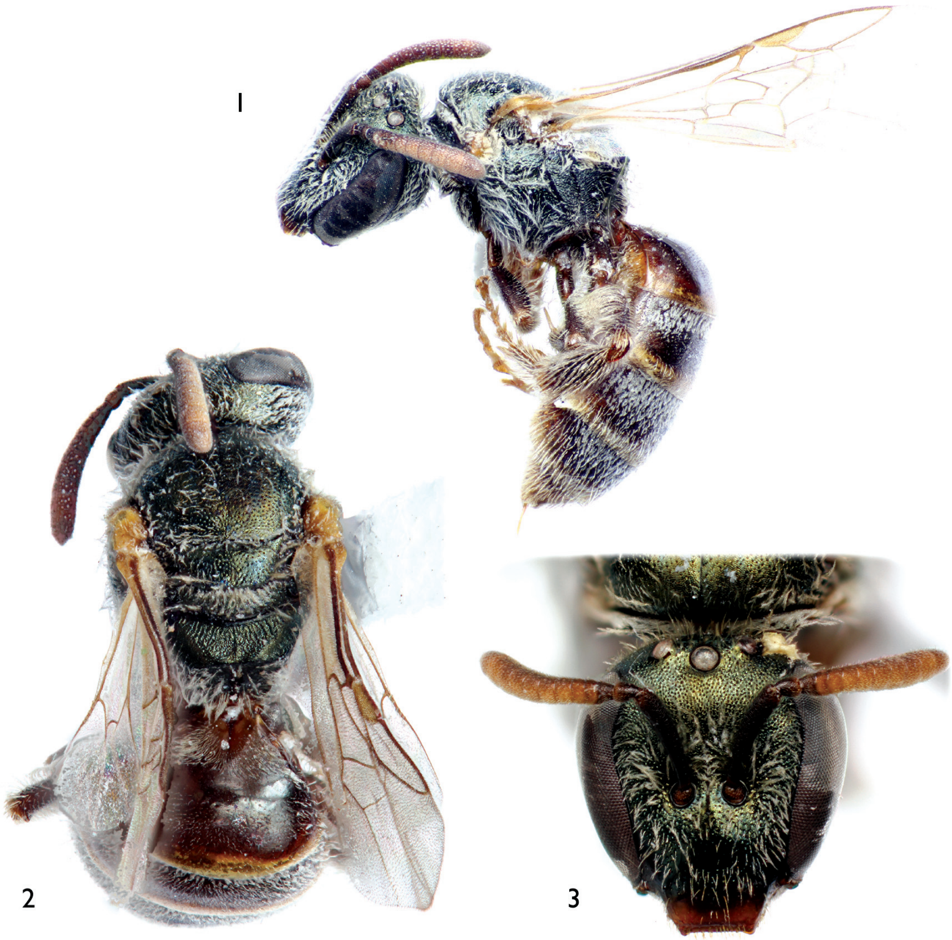
Figs 1–9

Holotype. ♀, Sombrero, West Indies: 18°35.19'N, 63°25.63'W, 12 November 1999, M.A. Ivie & J.B. Runyon (SEMC).

Paratypes. 5♀♀ Sombrero, West Indies: 18°35.19'N, 63°25.63'W, 12 November 1999, M.A. Ivie & J.B. Runyon (SEMC, MTEC, NHML); 5♀♀1♂, Sombrero, West Indies: 18°35.171'N, 63°25.631'W, 12–13 November 1999, M.A. Ivie & J.B. Runyon (SEMC, MTEC, FSCA).

Diagnosis. Small bees, around 5 mm or less in total length; integument of head and mesosoma dark metallic green with bluish and coppery tints in places (Figs 1–5); apical half of clypeus of male and female dark brown to brown (Figs 3, 6); flagellum two-toned, brown to dark brown above, honey brown below (Figs 1, 3, 4, 6); female metasoma with abundant appressed tomentum on metasomal terga III–V and basally and laterally on tergum II (Fig. 1); male face densely covered with plumose appressed to subappressed setae (Fig. 6); and male genitalia as in figures 7–9.

Description. *Female*: Total body length 4.93 mm (4.03–5.00 mm); forewing length 2.83 mm (2.53–2.86 mm). Head longer than wide, length 1.32 mm (1.23–1.34 mm), width 1.22 mm (1.13–1.22 mm); upper interorbital distance 0.77 mm (0.73–0.77 mm); lower interorbital distance 0.66 mm (0.60–0.66 mm). Mandible with weak subapical tooth; labrum with weak apical callosity; majority of clypeus

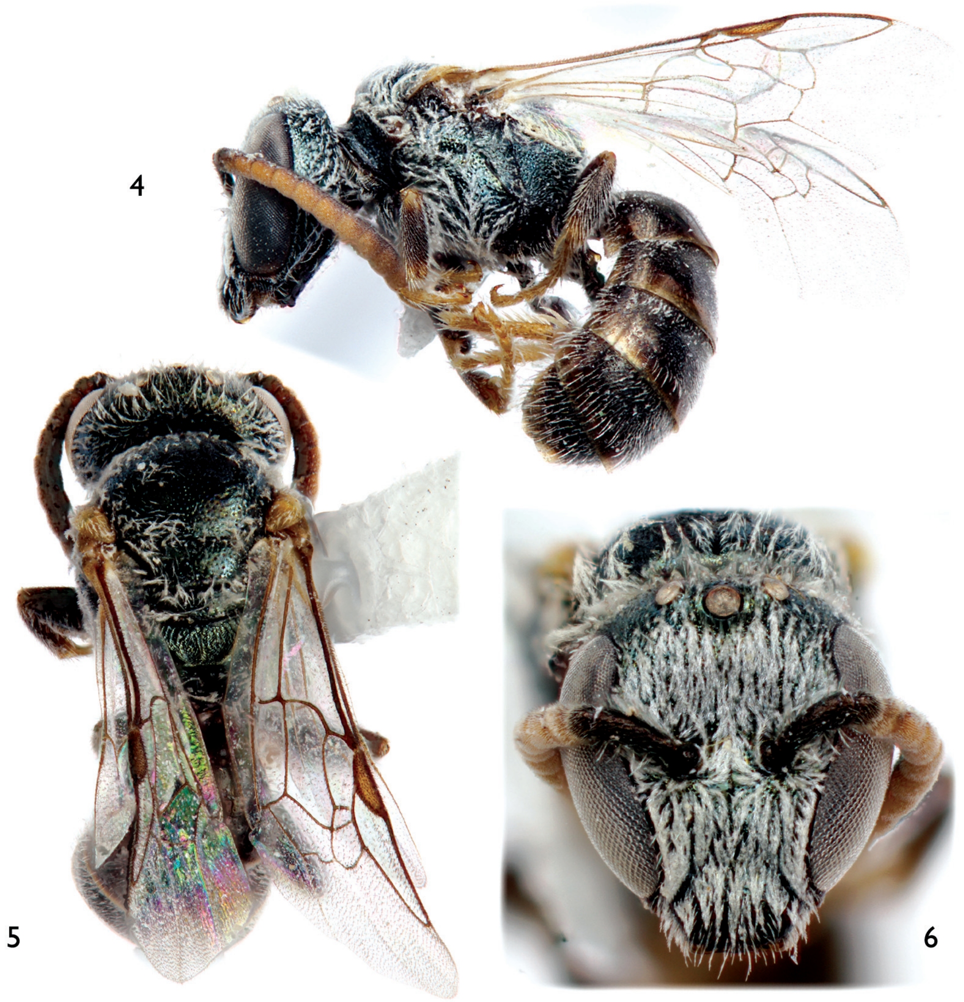


Figures 1–3. Female of *Lasioglossum* (*Dialictus*) *sombrerense* Engel, sp. n. **1** Lateral habitus **2** Dorsal habitus **3** Facial aspect.

below lower tangent of compound eyes; malar space linear. Intertegular distance 0.89 mm (0.81–0.91 mm); mesoscutellum slightly longer than metanotum, about as long as basal area of propodeum. Forewing with distal venation weakened (1rs-m, 2rs-m, and 2m-cu); basal vein 2–2.5 times distad cu-a; combined lengths of second and third submarginal cells slightly less than length of first submarginal cell; second submarginal cell slightly narrowed anteriorly, anterior border along Rs about as long as that of third submarginal cell along Rs; hind wing with distal hamuli arranged 2-1-2. Inner metatibial spur with three distinct branches distributed along rachis of spur and decreasing in size and angle relative to rachis from proximal to apical, sometimes with a minute fourth branch apically and poorly differentiated from rachis.

Mandible outer surface smooth with scattered minute punctures; labrum smooth with scattered minute punctures, punctures more sparse leading up to apical callosity; clypeus with apical half smooth and with sparse shallow coarse punctures, basally faintly imbricate with small punctures separated by 1–2 times a puncture width; supraclypeal area imbricate with small punctures separated by a puncture width except along border with clypeus integument between punctures smooth to faintly imbricate; face below level of antennal toruli imbricate with small punctures, punctures separated by less than a puncture width to nearly contiguous except bordering compound eye and clypeus integument smooth to faintly imbricate and punctures separated by a puncture width or less; face above level of antennal toruli with small punctures separated by less than a puncture width, integument between punctures, where evident, faintly imbricate; punctures separated by a puncture width or less in parocular area and between lateral ocelli, integument between punctures smooth; vertex with scattered small punctures; gena with small punctures separated by a puncture width or less, integument smooth to faintly imbricate; postgena imbricate. Pronotum imbricate; mesoscutum imbricate with small punctures separated by a puncture width or less, such punctures more faint anteromedially and becoming separated by 1–2 times a puncture width; punctures outside of parapsidal lines separated by a puncture width or less; punctures along posterior border separated by less than a puncture width; mesoscutellum imbricate with small punctures separated by 1–2 times a puncture width on disc, punctures more closely spaced along borders; metanotum with minute punctures separated by less than a puncture width, integument between punctures apparently smooth; pleura with small punctures separated by less than a puncture width in hypoepimeral area, integument between punctures smooth to faintly imbricate; remainder of pleuron with slightly larger punctures separated by less than a puncture width although becoming more widely spaced ventrally and ventroposteriorly, integument between punctures faintly imbricate; metepisternum faintly imbricate to imbricate with punctures separated by less than a puncture width; basal area of propodeum strongly imbricate to nearly granulose, with irregular striae radiating from basal margin, such striae stronger laterally, medially becoming more rugulose apically; lateral surface of propodeum smooth to faintly imbricate with small punctures separated by less than a puncture width; posterior surface of propodeum imbricate. Metasomal terga faintly imbricate with scattered minute shallow punctures, punctures separated by 2–3 times a puncture width, becoming sparser and fainter in apical margins; sterna faintly imbricate.

Integument of head and mesosoma dark metallic green, with some faint bluish and or coppery tints except labiomaxillary complex and labrum dark brown; apical half of clypeus brown to dark brown; mandible dark brown at base, blending to honey brown medially, then to reddish brown at apex; scape, pedicel, and first flagellomere dark brown, remainder of flagellum brown to dark brown above and honey brown ventrally. Pronotal lobe honey brown; tegula honey brown and semi-translucent; legs dark brown except lighter on tarsi and at femorotibial joints. Wing membranes hyaline, veins generally honey brown except C, Sc+R, and R distad pterostigma brown. Metasoma generally dark brown except apical margins of terga semi-translucent and



Figures 4–6. Male of *Lasioglossum* (*Dialictus*) *sombrerense* Engel, sp. n. **4** Lateral habitus **5** Dorsal habitus. **6** Facial aspect.

lighter brown, pseudopygidial area lighter brown; sterna brown to dark brown with narrow lighter apical margins.

Pubescence generally white (Figs 1–6). Head and mesosoma with scattered short to long, branched, suberect to erect setae, not obscuring integument; such setae more numerous on face around and below level of antennal toruli, and on vertex, gena, pronotal dorsal ridge, around pronotal lobe, on metanotum, pleura, and lateral and posterior surfaces of propodeum. Metasomal terga III–V with abundant plumose, appressed tomentum (Fig. 1), similar tomentum on basally and laterally on second metasomal tergum, first metasomal tergum without such tomentum but with sparse, suberect to erect setae, such setae minute over disc, becoming longer laterally, such setae appressed and posterolaterally-directed basally on anterior-facing surface; such suberect to erect setae scattered on remaining metasomal terga but most prominent and numerous laterally and on more apical terga; sterna with areas of longer erect setae apically on discs and margins.

Male: As described for the female except in usual gender differences and as follows: Total body length 5.17 mm; forewing length 2.63 mm. Head longer than wide, length 1.21 mm, width 1.09 mm; upper interorbital distance 0.68 mm; lower interorbital distance 0.46 mm. Mandible simple; labrum transverse, without callosity; apical half of clypeus below lower tangent of compound eyes. Intertegular distance 0.73 mm. Forewing second submarginal cell with anterior border along Rs much shorter than that of third submarginal cell along Rs. Inner metatibial spur simple. Male genitalia as in figures 7–9.

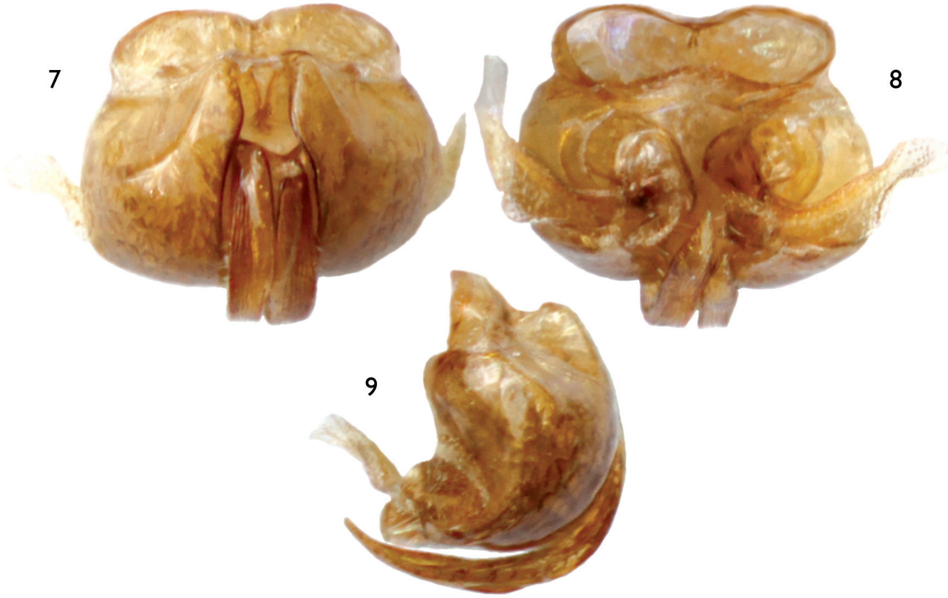
Face below level of antennal toruli imbricate with small punctures, punctures separated by less than a puncture width to nearly contiguous; face above level of antennal toruli with small punctures separated by less than a puncture width, integument between punctures, where evident, faintly imbricate or smooth; punctures separated by less than a puncture width in parocular area and between lateral ocelli, integument between punctures smooth. Punctation of mesosoma coarser than in female; mesoscutum imbricate with small punctures separated by a puncture width, such punctures more faint anteromedially and becoming more widely spaced; punctures outside of parapsidal lines and along posterior border separated by less than a puncture width.

Mandible largely honey brown with reddish brown apex; scape and pedicel dark brown, flagellum brown to dark brown above and honey brown ventrally.

Face densely covered in appressed to subappressed, plumose setae, largely obscuring integument (Fig. 6); metasomal terga without abundant plumose, appressed tomentum (Fig. 4) except for thin patches basolaterally on II and III.

Etymology. The specific epithet is based on the name of the island to which the species was captured, Sombrero Island (a.k.a. Hat Island), Anguilla, West Indies, northernmost island of the Lesser Antilles.

Comments. The new species has some similarities to the widespread *Lasioglossum* (*Dialictus*) *parvum* (Cresson). Both are of relatively similar proportions and coloration but the antenna in *L. parvum* is not so strikingly two-toned, the integument tends to have a more bluish cast, the apex of the clypeus is more dark brown, the abdomen lacks the dense covering of tomentum observed in *L. sombrerense* (e.g., Fig. 1), the mesoscutal punctures are more widely spaced (separated by a puncture width or more on disc), and the propodeum is much more strongly rugosostriate throughout and reaching to the margins, particularly laterally where such striae extend onto the upper portions of the lateral surfaces. In other small West Indian species such as *L.* (*D.*) *busckiellum* (Cockerell), the abdomen in darker with reddish brown apical margins to the terga, the tegulae are reddish brown, the apical abdominal terga are not obscured by tomentum, the head is broader, and the propodeum has a finer file-like striation (Cockerell, 1915), and in *L.* (*D.*) *gundlachii* (Baker) the punctation is finer and more widely spaced (Baker, 1906).



Figures 7–9. Male genitalia of *Lasioglossum* (*Dialictus*) *sombrerense* Engel, sp. n. **7** Dorsal aspect **8** Ventral aspect **9** Lateral aspect.

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