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A mountain of millipedes IX: Species of the family Gomphodesmidae from the Udzungwa Mountains, Tanzania (Diplopoda, Polydesmida)

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Abstract. A new genus and six new species of the family Gomphodesmidae from the Udzungwa Mts are described, including *Pogoro alopias* Rosenmejer & Enghoff sp. nov., *Pogoro siren* Rosenmejer & Enghoff sp. nov., *Pogoropsis prolixopes* Rosenmejer & Enghoff gen. et sp. nov., *Emphysemastix frampt* Olsen & Enghoff sp. nov., *Agrophogonus hamulus* Olsen & Enghoff sp. nov., and *Agrophogonus pusillokiellandi* Olsen & Enghoff sp. nov. *Emphysemastix dracarys* Olsen & Enghoff sp. nov. from Iringa city is described. Descriptive notes are given for *Pogoro scharffi* Hoffman, 2005, and *Agrophogonus mwanihana* Hoffmann, 2005. General gomphodesmid gonopod morphology is described and illustrated. A key to Udzungwa gomphodesmids is presented, as well as revised keys to all species of *Emphysemastix* and *Agrophogonus*. All gomphodesmid species from the Udzungwa Mts are mapped.

Keywords. Taxonomy, new species, key, Eastern Arc Mountains.

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Introduction

This is the ninth in a series of articles on the millipede fauna of the Udzungwa Mts. For general information on the Udzungwa Mts, see Enghoff (2014) and Scharff *et al.* (2015).

Unlike the previous articles in this series (cited in Enghoff 2020), the present contribution deals with species of the family Gomphodesmidae Cook, 1896. The first species of this family was described by Peters (1855), and the family name Gomphodesmidae was coined by Cook (1896). Gomphodesmidae is one of the few millipede families which have been recently monographed, viz., by Hoffman (2005) who recognized 54 genera and 146 species in the family, including 32 genera and 45 species described

as new. Since 2005, almost nothing has been published on Gomphodesmidae: Nzoko Fiemapong *et al.* (2017) described a new species from Cameroon, and Enghoff *et al.* (2014) reported on the use of two gomphodesmid species as human food in Burkina Faso.

The family is endemic to sub-Saharan Africa without Madagascar. Within this range, gomphodesmids are found almost everywhere and have a wide range of habitats from rain forests to the savannah biome where they may be extremely abundant (Lewis 1971). They are highly adapted to seasonal semiaridity (Lewis 1971, 1974). Their overall appearance (Fig. 1) varies little, but there is a large diversification of the morphology of the gonopods which therefore, as commonplace in millipedes, provide the vast majority of taxonomic characters.

The availability of a recent monograph greatly facilitates taxonomic work on Gomphodesmidae. There are, however, two aspects of Hoffman's magnum opus which limit its utility. Firstly, 17 genera are placed as "Gomphodesminae of uncertain tribal affiliation" and do not appear in the keys to tribes and genera of the subfamily. Secondly, Hoffman (2005) was very economical with labels on his gonopod drawings. Whereas the drawings themselves are excellent, the lack of labelling frequently makes it difficult to connect the written description to the illustration. For this reason, we here include a labelled general description of a gomphodesmid (more precisely: gomphodesmine) gonopod (Fig. 3). We also include semi-diagrammatic illustrations of two structural elements (paxillus and torus) which are important for the identification of gomphodesmid species (Fig. 4).

Material and methods

All material described in this article is kept in the zoological collections of The Natural History Museum of Denmark (NHMD, formerly ZMUC).

Fig. 1. *Agrophogonus hamulifer* Olsen & Enghoff sp. nov., paratype, ♂ (NHMD 621681), showing the typical gomphodesmid habitus. Scale bar: 2 mm.

Figure 2 shows the collecting sites of the species. All studied specimens are from Tanzania, Udzungwa (sometimes spelled Uzungwa) Mts, except for the unique specimen of *Emphysemastix dracarys* sp.nov. from the town of Iringa close to the Udzungwas.

A total of 103 specimens (55 males, 19 females, 29 juveniles) were examined. All samples are kept in 70% ethanol which may have altered their colours. The colours described are based on the current appearance; the colour in life is unknown for all species concerned.

Specimens were examined in alcohol under a stereo microscope. As many specimens were broken into two or more pieces, length measurements could not be precise.

Female sexual characters, which are in general poorly known for Gomphodesmidae, are not considered.

Photographs of gonopods were produced using the high-quality digital imaging system Visionary Digital. A series of photographs of each gonopod was taken from the lowest to the highest point. These photographs were thereafter stacked into one picture, using the focus stacking software Zerene Stacker (http://zerenesystems.com/cms/stacker) for a multifocus image. This process was repeated from three different angles: mesal view, lateral view, and dorsal view. The same method was used for the photographs of the head and telson. The habitus photographs were produced using a Canon Eos 7D Mark II with macro objective. This was necessary due to the size of the entire specimens not fitting in the Visionary Digital system. The photos were roughly edited in Adobe Lightroom, and afterwards in detail in Adobe Photoshop CC; backgrounds were smoothed out to reduce any disruptive visuals and to make the images more similar in overall appearance. Drawings of *Pogoro* gonopods were produced in Adobe Photoshop

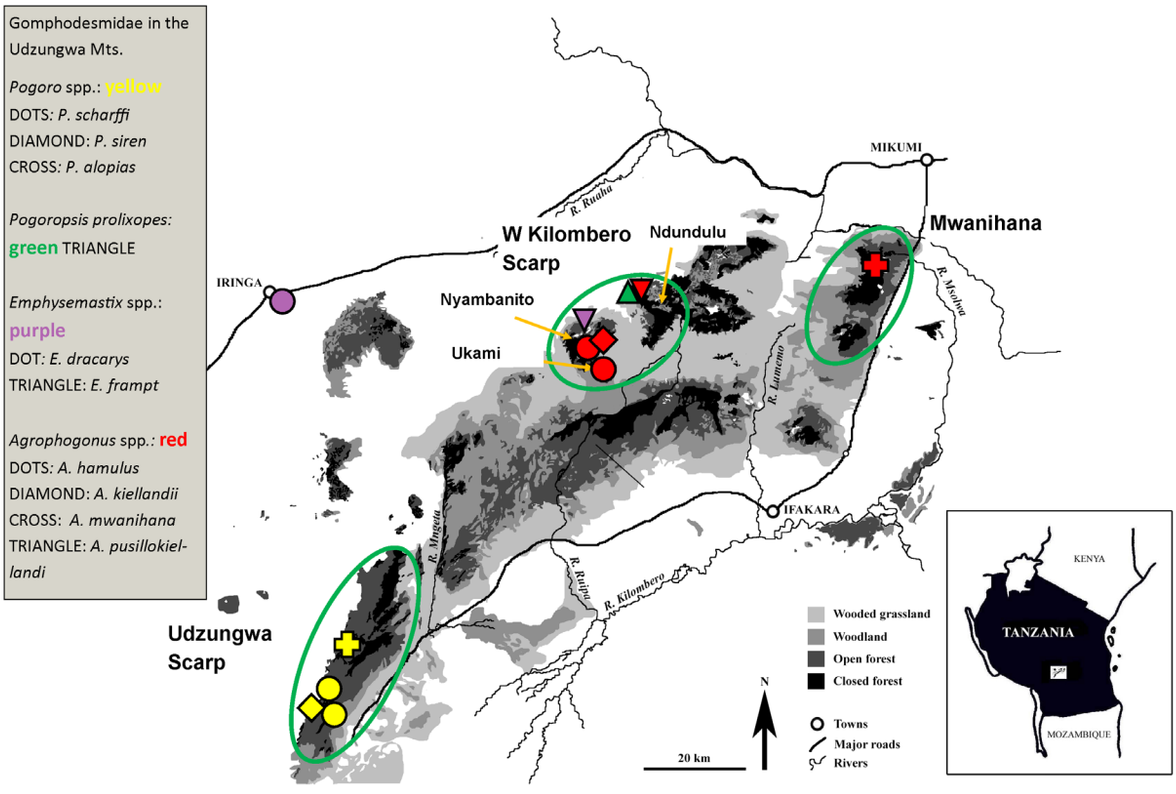

Fig. 2. Map of the Udzungwa Mts showing collection sites for gomphodesmids. Based on Marshall *et al.* (2010: fig. 1).

CC on the basis of the both the photographs and on direct stereomicroscopical observation. Drawings of *Emphysemastix* and *Agrophogonus* gonopods were sketched by hand based on direct observation with the stereo microscope, then drawn with an inkpen, and finally scanned as TIFF-files.

It was attempted to make the species descriptions as comparable as possible with those of Hoffman (2005). Since Hoffman emphasized different characters in different genera, the format of the present descriptions also differs somewhat between genera.

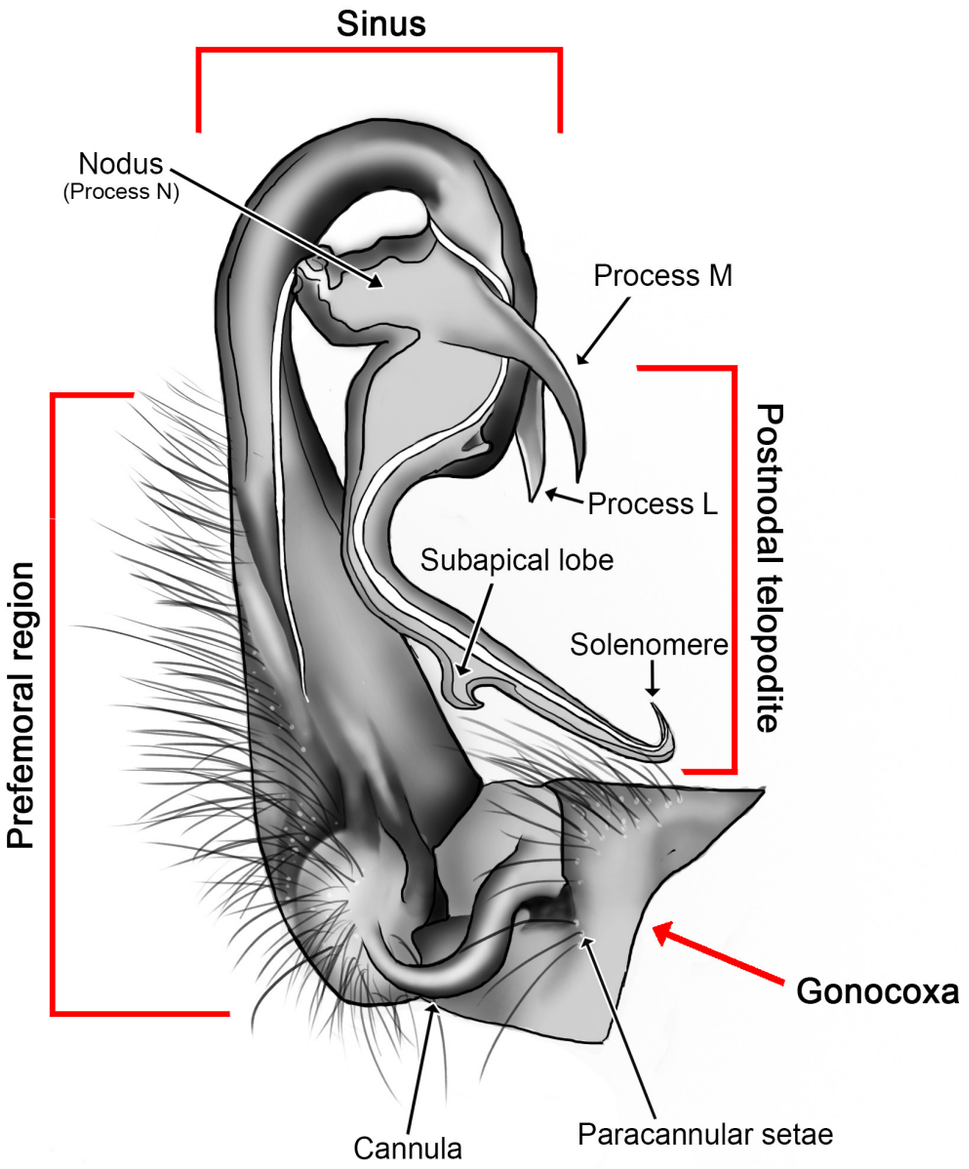

Fig. 3. Right gonopod of *Pogoro alopias* Rosenmejer & Enghoff sp. nov., mesal view, showing gonopod terminology. Not to scale.

Abbreviations

FR	=	Forest Reserve
H/W	=	height to width ratio of body ring eight
NHMD	=	Natural History Museum of Denmark
SI	=	Smithsonian Institution, Washington, DC, USA
W/L	=	body length to body width ratio

Results

Gomphodesmid gonopod morphology

Modified after Hoffman (2005). The description refers to the largest subfamily, Gomphodesminae, to which all species known from the Udzungwa Mts belong. Gonopods in the two other subfamilies, Marptodesmindae and Ovoidesminae, differ in several aspects from those of Gomphodesminae.

The gonopod (Fig. 3) consists of two main parts, the **gonocoxa** and the **telopodite**.

The gonocoxa corresponds to the coxa of a normal millipede leg, and shows few differences between genera. Shape, size and setation may vary slightly. In particular, a group of setae, the **paracannular setae**, is sometimes present on the mesal side of the gonocoxa right in front of the cannula (see below), seen from mesal side. An example of a species lacking paracannular setae is *Emphysemastix dracarys* sp. nov. (Fig. 14A–B).

The telopodite is connected to the distal end of the gonocoxa and bears little resemblance to the telopodite of the walking legs. Traditionally, authors have attempted to homologize various parts of the telopodite with normal podomeres: prefemur, femur, postfemur, tibia and tarsus. There is hardly any justification for this, cf. that the developmental study by Petit (1976) indicated that the entire polydesmidan telopodite (*in casu* of a species of Polydesmidae) corresponds to the prefemur of a walking leg. We nevertheless follow Hoffman (2005) and earlier authors in using the term **prefemoral region** for the setose basal part of the telopodite. There is no clear demarcation of the distal limit of the prefemoral region. The gonocoxa is connected to the prefemoral region by a tube-like structure called the **cannula**, supposedly used to pick up sperm from the gonopore found on the third body ring (Koch 2015). Distal to the prefemoral region the telopodite forms a pronounced curve, the **sinus**. At the distal end of the sinus one finds the **nodus**, an often voluminous structure furnished with a variety of processes. The nodus may be placed inside the sinus: endonodal, half inside and half outside (to the mesal) side: mesonodal, or, as in the majority of genera, outside the sinus: ectonodal. The usually largest and most complicated nodal process, **Process N**, usually points to the sinus. Another two processes/spines may be present at approximately the same level, the mesal **Process M** and the lateral **Process L.** These two latter can be reduced or completely absent, e.g., in *Emphysemastix dracarys* sp. nov. (Fig. 14A–F showing absence of Process M). In the genus *Agrophogonus* the nodus carries several processes which cannot be homologized with **N, M** and **L** and are therefore denoted by A, B and C. The part of the telopodite distal to the nodus is called the **postnodal telopodite**. Various lobes may be present along this part of the telopodite, e.g., the different subapical lobes seen in *Pogoro* species (Figs 7, 9, 11), and the subglobose enlargement seen in the genus *Emphysemastix* (Figs 14, 17). The apical part of the telopodite is called the **solenomere**.

Key to species of Gomphodesmidae from the Udzungwa Mts

The key also includes *Emphysemastix dracarys* sp. nov. from Iringa town.

1. Sternal process of body ring 6 ca 1½ times as long as wide, with median apiculus (Fig. 5A). Postnodal telopodite with a subglobose enlargement along the outer curvature...(Genus ***Emphysemastix*** Hoffman, 1966)..... 2
– Sternal process of body ring 6 different (the sternal process of *Agrophogonus pusillokiellandi* Olsen & Enghoff sp. nov. is broken in the unique holotype). Postnodal telopodite without a subglobose enlargement..... 3

2. Paxillus (mid-ventral process on body ring 15) triangular (as Fig. 4A). Nodal process M absent .... ***Emphysemastix dracarys*** Olsen & Enghoff sp. nov.
– Paxillus rounded. Nodal processes M and L both present .... ***Emphysemastix frampt*** Olsen & Enghoff sp. nov.

3. Sternal process on body ring 6 longer than wide with triangular tip (Fig. 5D). Nodal process M present, L absent. Gonopod telopodite making a hairpin bend, postnodal telopodite very long and straight, running close to and parallel with coxa (Fig. 13). Paracannular setae absent .... ***Pogoropsis prolixopes*** Rosenmejer & Enghoff gen. et sp. nov.
– Sternal process of body ring 6 and postnodal telopodite different 4

4. Sternal process of body ring 6 broad and flat, or triangular with rounded tip (Fig. 5E–G). Nodal process M present...(Genus ***Pogoro*** Hoffman, 2005) 5
– Sternal process of body ring 6 more or less elongate, apically rounded (Fig. 5B–C). Nodal process M absent...(Genus ***Agrophogonus*** Hoffman, 2005)..... 7

5. Enlarged tubercles on hypoproct projecting beyond edge of sclerite 6
– Tubercles on hypoproct not projecting beyond edge of sclerite .... ***Pogoro siren*** Rosenmejer & Enghoff sp. nov.

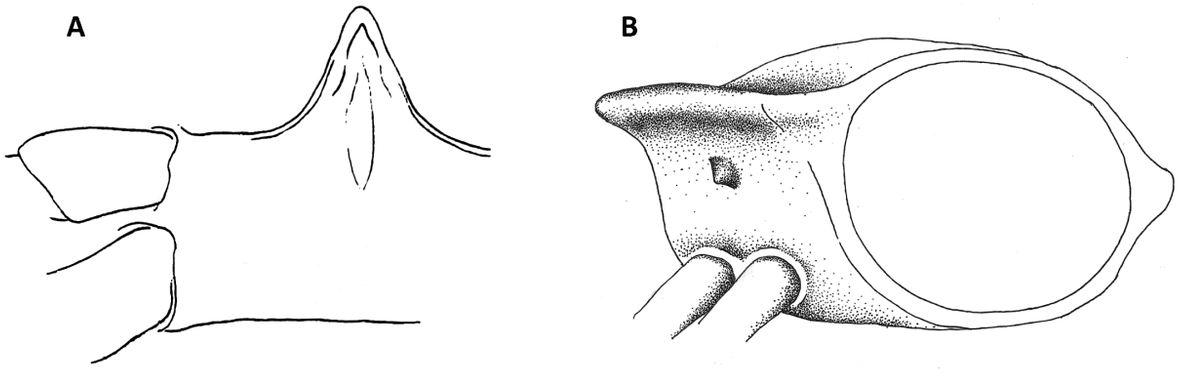

Fig. 4. Particular gomphodesmid structural elements. **A**. Paxillus – a mid-ventral, most often triangular process on body ring 15 in most gomphodesmid males, from Hoffman (2005), modified. **B**. Torus – a low convexity of variable size and shape, found on the ventral surface of the poriferous paranota in males of many gomphodesmid species. Not drawn to scale.

6. Two subapical lobes on postnodal telopodite, a triangular lateral lobe and an uncate mesal lobe (Fig. 7) ..... ***Pogoro scharffi*** Hoffman, 2005
– Only one subapical lobe, of a narrow triangular shape, on postnodal telopodite (Fig. 9) ..... ***Pogoro alopias*** Rosenmejer & Enghoff sp. nov.

7. Postnodal telopodite short, flattened, laminate (Fig. 19) … ***Agrophogonus mwanihana*** Hoffman, 2995
– Postnodal telopodite longer, slender, evenly attenuate to apex 8

8. Postnodal telopodite very long, forming a subcircular ¾ loop, evenly curved, no sharp angular twist. (Fig. 18) ..... ***Agrophogonus hamulifer*** Olsen & Enghoff sp. nov.
– Postnodal telopodite shorter, with a sharp twist in a dorsal direction, perpendicular to prefemoral region, not forming a ¾ circle (Fig. 21) 9

9. Body width 8.7 mm. Nodal process C very long, slender and curved (Hoffman 2005: fig. 451) .... ***Agrophogonus kiellandi*** Hoffman, 2005
– Body width 4.1 mm. Nodal process C shorter and less curved (Fig. 21) .... ***Agrophogonus pusillokiellandi*** Olsen & Enghoff sp. nov.

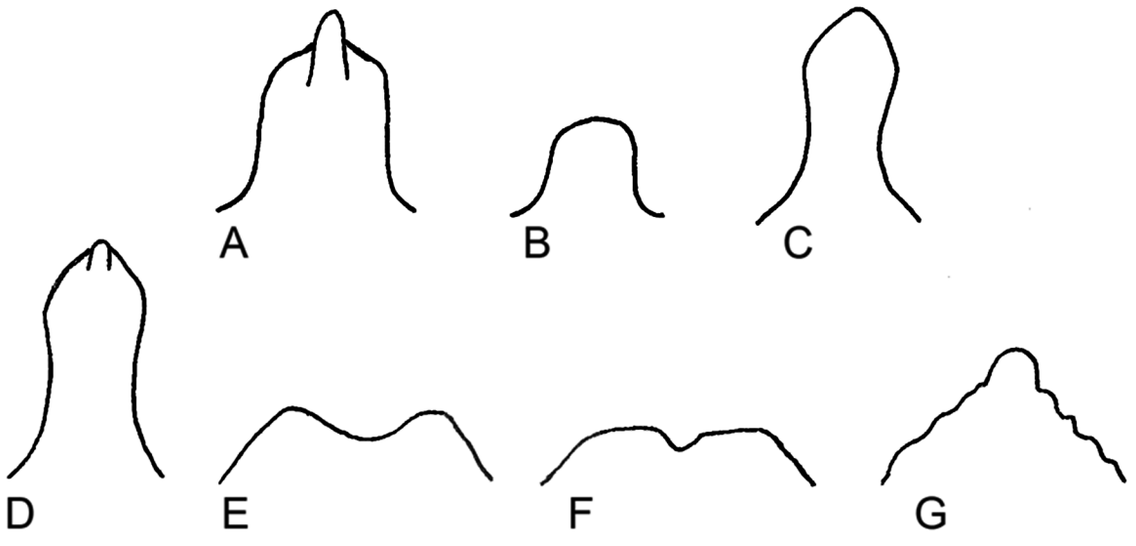

Fig. 5. Sternal process on body ring 6**. A**. *Emphysemastix* spp. **B**. *Agrophogonus* spp. except *A. hamulifer* Olsen & Enghoff sp. nov. **C**. *Agrophogonus hamulifer* Olsen & Enghoff sp. nov. **D**. *Pogoropsis prolixopes* Rosenmejer & Enghoff gen. et sp. nov. **E**. *Pogoro siren* Rosenmejer & Enghoff sp. nov. **F**. *Pogoro scharffi* Hoffman, 2005. **G**. *Pogoro alopias* Rosenmejer & Enghoff sp. nov. Not drawn to scale.

Taxonomy

Class Diplopoda de Blainville in Gervais, 1844
Order Polydesmida Leach, 1815
Family Gomphodesmidae Cook, 1896
Subfamily Gomphodesminae Cook, 1896
Tribe Gomphodesmini Cook, 1896

Genus ***Pogoro*** Hoffman, 2005

Diagnosis (after Hoffman 2005, modified)

Moderate/small-sized (length 40–55 mm), convex gomphodesmids, pore formula: 5, 7, 9–19. Four apical sensory cones on antennae, fossa present on 5th and 6th antennomeres. Collum transversely suboval, lateral ends strongly declivent. Paranota slightly declivent. Stricture poorly defined, with visible edge only in front of anterior spiracle. Pleurosternal carinae present on body rings 1–17. Anterior legs without ventral tubercles, with sparse setation. Setae on dorsal side of tarsi shorter and stouter than the rest. Subonychial pads on legs 1–6. Surface of sides of metazona slightly more uneven than sides of prozona. Postgonopodal sterna without transverse ridges, set with long silky setae. 15th body ring without paxillus. Caudal edge of gonopod aperture elevated in front of coxae, medially obliterated.

Hoffman (2005) described the sides of the metazona as being "coarsely rugovermiculose"; this character was, however, not observed on any of the type specimens of *P. scharffi*. Hoffman also stated that there are no paracannular setae in *Pogoro scharffi*, but some such setae were observed on the holotype and all of the paratypes

Included species

Pogoro scharffi Hoffman, 2005 (type species)
Pogoro alopias Rosenmejer & Enghoff sp. nov.
Pogoro siren Rosenmejer & Enghoff sp. nov.

Distribution

Udzungwa Mts, Tanzania.

As all known species of *Pogoro* live in the Udzungwa Mts, they can be keyed out using the key to Udzungwa gomphodesmids above.

Remarks

All three species of *Pogoro* have been collected within a relatively small area in the Udzungwa Scarp FR; the collecting sites are hardly more than 10 km apart (cf. Menegon & Salvidio 2005: fig. 1). Considering that the species are very similar to each other, and that only one male specimen of each is known for two of them, the possibility that they all represent one variable species cannot be excluded. Additional collecting is needed to elucidate this, but for the time being we consider the differences mentioned in the key and description as warranting separate species status.

Pogoro scharffi Hoffman, 2005
Figs 2, 5F, 6–7

Diagnosis

Differs from other species of the genus by the shape of the subapical lobes on the postnodal telepodite, and by the shape and curvature of the solenomere.

Material examined

Holotype

TANZANIA • ♂; Iringa Region, Udzungwa Mts, Udzungwa Scarp FR, above Chita Village; 1050 m a.s.l.; 26–29 Oct. 1984; N. Scharff leg.; pitfall traps in intermediate rain forest; NHMD 50501.

Paratypes

TANZANIA • 9 ♂♂, 2 ♀♀; Iringa Region, Udzungwa Mts, Udzungwa Scarp FR, above Chita Village; 1050–1650 m a.s.l.; 26 Oct.–13 Nov. 1984; N. Scharff leg.; intermediate and montane rain forest; NHMD 621669.

Description (modified after Hoffman 2005)

Male

Size and shape. Body length ca 40 mm. Maximum width 7.7 mm. W/L ratio 19%. Height of body ring eight 5 mm. H/W ratio = 65%.

Colour (Fig. 6). Face, collum, metaterga medium brown, legs and antennae lighter, prozona and sterna nearly colourless.

Sternal process on body ring 6. Transverse across sternum with dark brown edge and long setae.

Hypoproct. Almost semicircular, with moderate round median projection, paramedian tubercles above normal size, projecting beyond edge of sclerite.

Gonopod (Fig. 7). Gonocoxa with paracannular setae. Telopodite mesonodal. Process M twice as wide at base and slightly longer than process L, both curved laterad. Postnodal teleopodite relatively short, curved dorsomesad, with subapical triangular lobe on lateral side and uncate lobe on mesal. Solenomere of telopodite curved away from uncate subapical lobe (Fig. 7A–B).

Distribution

Known only from two very close sites in the Udzungwa Scarp FR (Fig. 2).

Fig. 6. *Pogoro scharffi* Hoffman, 2005, paratype, ♂ (NHMD 621669). Scale bar: 5 mm.

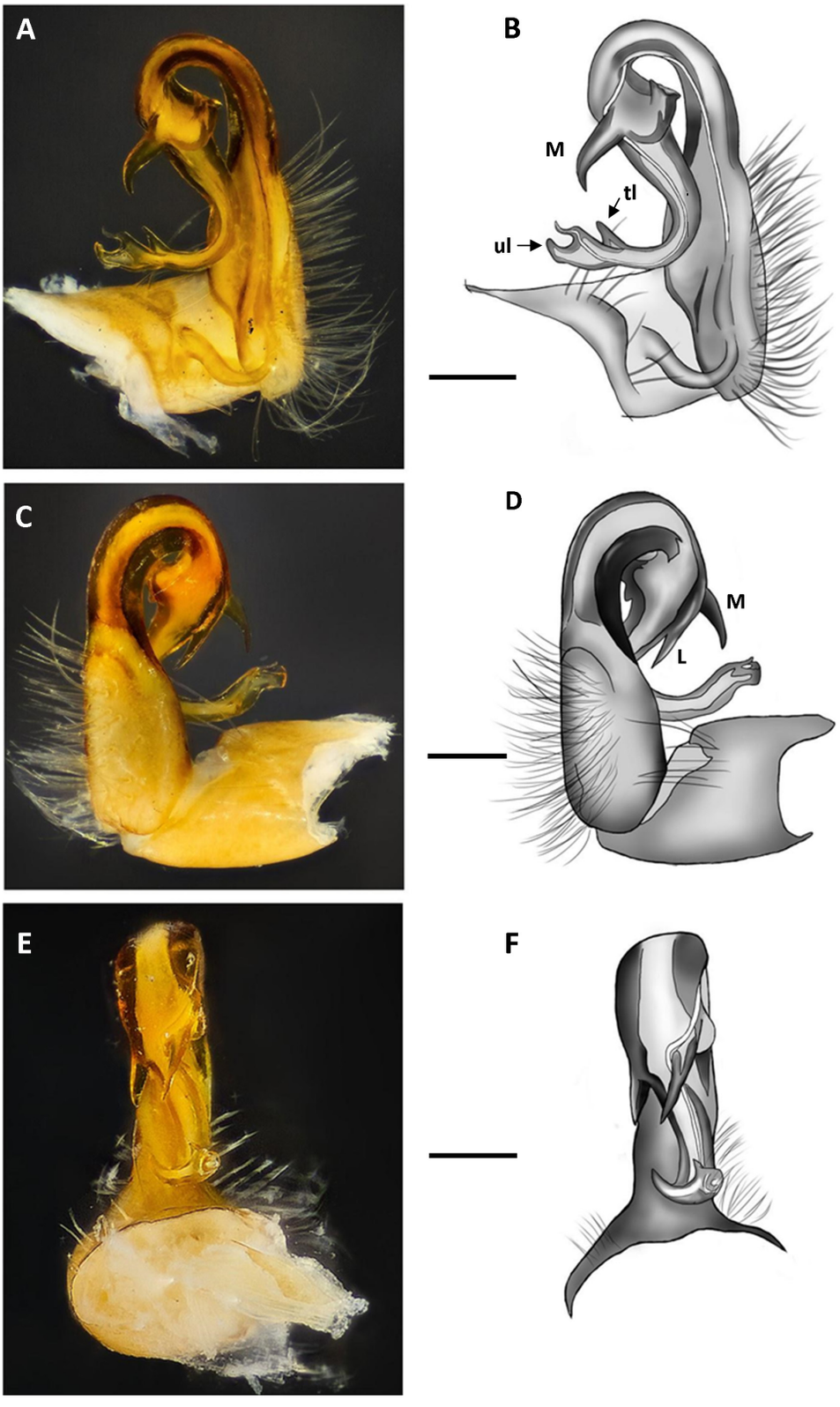

Fig. 7. *Pogoro scharffi* Hoffman, 2005, paratype, ♂, left gonopod (NHMD 621669). **A–B**. Mesal view. **C–D**. Lateral view. **E–F**. Dorsal view. Abbreviations: *L* = Process L; *M* = Process M; *tl* = triangular lobe; *ul* = uncate lobe. Scale bars: 0.5 mm.

Pogoro alopias Rosenmejer & Enghoff sp. nov.
urn:lsid:zoobank.org:act:9FC7C5B7-C5E0-4D66-8E9F-F1B75EBD1AA0
Figs 2, 5G, 8–9

Diagnosis

Differs from other species of the genus by the shape of the postnodal telopodite, which resembles a thresher shark's tail, and by the triangular shape of the sternal process on segment 6.

Etymology

The name is a noun in apposition, referring to the thresher shark, *Alopias vulpinus* (Bonnaterre, 1788), and its tail in particular, the shape of which resembles the postnodal teleopodite in the new species.

Material examined

Holotype

TANZANIA • ♂; Iringa District, Udzungwa Scarp Forest Reserve, 11 km SE of Masisiwe Village, Kihanga Stream; 08°22′05.7″ S, 35°58′41.6″ E, 1800 m a.s.l.; 17–27 May 1997; ZMUC and SI Exp. 1997; NHMD 621670.

Other material

TANZANIA • 1 ♀; same collecting data as for holotype; NHMD 621671.

Description

Male

Size and shape. Body length ca 53 mm. Maximum width 6.9 mm. W/L ratio 13%. Height of body ring eight 4.9 mm. H/W ratio= 72%.

Colour (Fig. 8). Face, collum, prozona, sterna and metaterga yellow/brown, legs and antennae slightly lighter.

Sternal process on body ring 6 (Fig. 5G). Triangular with 'wavy' dark brown edge and long setae.

Fig. 8. *Pogoro alopias* Rosenmejer & Enghoff sp. nov., holotype, ♂ (NHMD 621670). Scale bar: 5 mm.

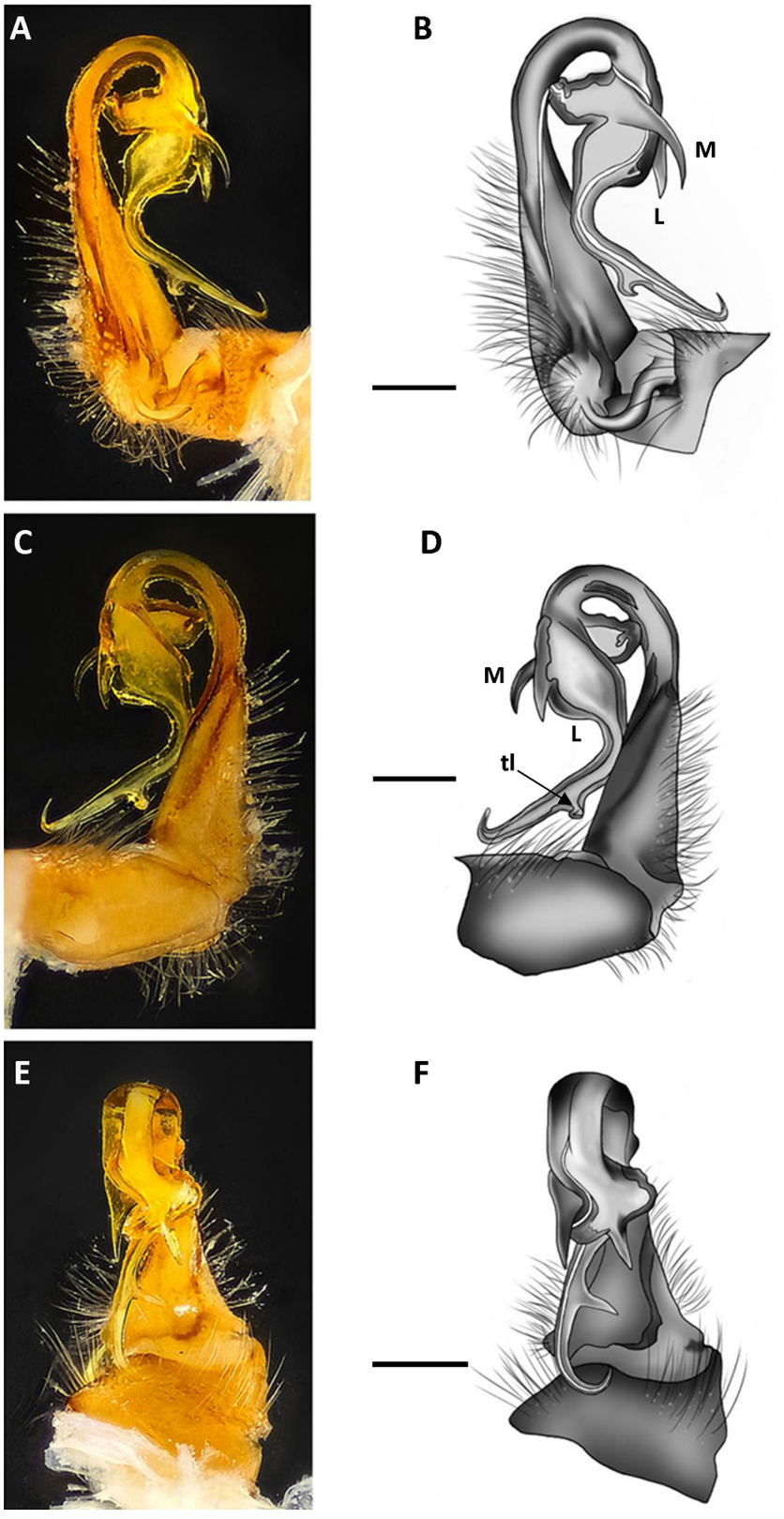

Fig. 9. *Pogoro alopias* Rosenmejer & Enghoff sp. nov., holotype, ♂ (NHMD 621670), right gonopod. **A–B**. Mesal view. **C–D**. Lateral view. **E–F**. Dorsal view. Abbreviations: *L* = Process L; *M* = Process M; *tl* = triangular lobe. Scale bars: 0.5 mm.

Hypoproct. Almost semicircular, with small round median projection, paramedian tubercles projecting beyond edge of sclerite.

Gonopod (Fig. 9). Gonocoxa with paracannular setae. Telopodite endonodal. Process M and L similar in shape and size, both curved laterad. Postnodal teleopodite wide at base, narrowing shortly after, relatively short, curved dorsad. With narrow triangular subapical lobe on lateral side. Solenomere of telopodite narrow and curved anteriad.

Distribution

Known only from the type locality in the Udzungwa Scarp FR (Fig. 2).

Pogoro siren Rosenmejer & Enghoff sp. nov.
urn:lsid:zoobank.org:act:90399199-DF61-47B0-8D5E-B01AAAF16DE2
Figs 2, 5E, 10–11

Diagnosis

Differs from other species of the genus by the shape of the postnodal telopodite and by the non-enlarged tubercles on the hypoproct.

Etymology

The name is a Latin noun in apposition, meaning mermaid, and refers to the mermaid tail-like shape of the postnodal telopodite when seen from the mesal side.

Fig. 10. *Pogoro siren* Rosenmejer & Enghoff sp. nov., holotype, ♂ (NHMD 621674). Scale bar: 5 mm.

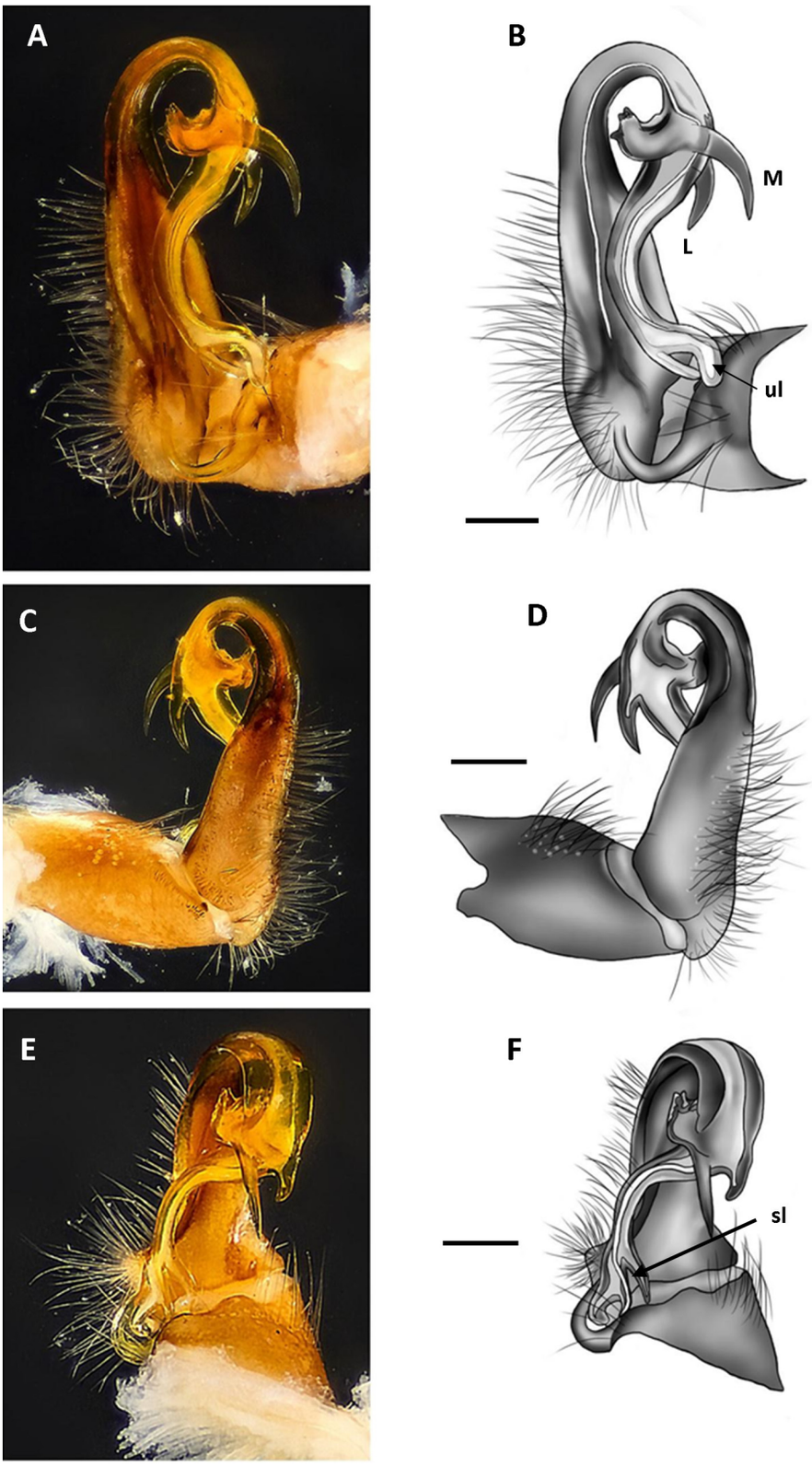

Fig. 11. *Pogoro siren* Rosenmejer & Enghoff sp. nov., holotype, ♂ (NHMD 621674), right gonopod. **A–B**. Mesal view. **C–D**. Lateral view. **E–F**. Dorsal view. Abbreviations: *L* = Process L; *M* = Process M; *sl* = subapical lobe; *ul* = uncate lobe. Scale bars: 0.5 mm.

Material examined

Holotype

TANZANIA • ♂; Morogoro Region, Udzungwa Scarp Catchment Forest Reserve, Chita, plot 18; 08°29′19.5″ S, 35°54′27.3″ E, 1531 m a.s.l.; 2 Nov. 2014; J. Malumbres-Olarte leg.; pitfall traps; NHMD 621674.

Description

Male

Size and shape. Body length ca 55 mm. Maximum width 7.8 mm. W/L ratio 13%. Height of body ring eight 6.5 mm. H/W ratio = 83%.

Colour (Fig. 10). Collum and dorsal surface of metaterga dark brown. Face, legs and antennae medium brown. Prozona and ventral surface lighter brown.

Sternal process on body ring 6 (Fig. 5E). Transverse across sternum with dark brown edge and long setae.

Hypoproct. Almost semicircular, without median projection, paramedian tubercles not projecting beyond edge of sclerite.

Gonopod (Fig. 11). Gonocoxa with paracannular setae. Telopodite mesonodal. Process M twice as wide at base and slightly longer than process L; both curved laterad. Postnodal teleopodite relatively short, curved dorsomesad, with curved narrow subapical lobe with rounded apex on lateral side. Uncate subapical lobe on mesal side. Solenomere of telopodite curved inwards against apex of uncate subapical lobe.

Distribution

Known only from the type locality in the Udzungwa Scarp FR (Fig. 2).

Pogoropsis Rosenmejer & Enghoff gen. nov.

urn:lsid:zoobank.org:act:6C14B744-AAFB-4A9C-8214-04129191DE1A

Type species

Pogoropsis prolixopes Rosenmejer & Enghoff gen. et sp. nov.

Diagnosis

Moderate/small-sized (length 33–37 mm), convex gomphodesmids, pore formula: 5, 7, 9–19.

Four apical sensory cones on antennae, fossa present on 5th and 6th antennomeres. Paranota slightly declivent. Stricture poorly defined, with visible edge only in front of anterior spiracle. Pleurosternal carinae present on body rings 1–17. Anterior legs without ventral tubercles, with sparse setation. Setae on dorsal side of tarsi shorter and stouter than the rest. Subonychial pads on legs 1–6. Sharing most of these characters with *Pogoro* but differing by: sternal process of segment 6 longer than wide, with triangular tip. Gonopod telopodite relatively long and slender, making a hairpin bend on the middle, so the postnodal telepodite lies close to the prefemoral region. Nodal process L and paracannular setae absent.

Etymology

The genus name refers to the similarity to the genus *Pogoro.* Gender feminine.

Included species

Pogoropsis prolixopes Rosenmejer & Enghoff gen. et sp. nov.

Pogoropsis prolixopes Rosenmejer & Enghoff gen. et sp. nov.
urn:lsid:zoobank.org:act:D35FD14F-0709-4AF2-945F-AEDA96FF91E3
Figs 2, 5D, 12–13

Diagnosis

As for the genus. Differs conspicuously from other Udzungwan gomphodesmids species by the very long and slender gonopod telopodite.

Etymology

The name is a Latin noun in apposition meaning "long leg/foot" and refers to the unusually long gonopods.

Material examined

Holotype

TANZANIA • ♂; Iringa region/district, West Kilombero Scarp Forest; 07°45′34.2″ S, 36°26′37.4″ E; 1510 m a.s.l.; 7 Dec. 2000; Frontier Tanzania UMBS leg.; open woodland, plot *Acacia*; NHMD 621672.

Paratypes

TANZANIA • 19 ♂♂, 2 ♀♀; same collecting data as for holotype; NHMD 621673 • 1 ♂, 2 ♀♀, 2 juv.; Iringa region/district, West Kilombero Scarp Forest; 07°53′19.5″ S, 36°23′11.6″ E; 1111 m a.s.l.; 23 Nov. 2000; Frontier Tanzania UMBS leg.; montane forest, plot 17, Ukami; NHMD 621685.

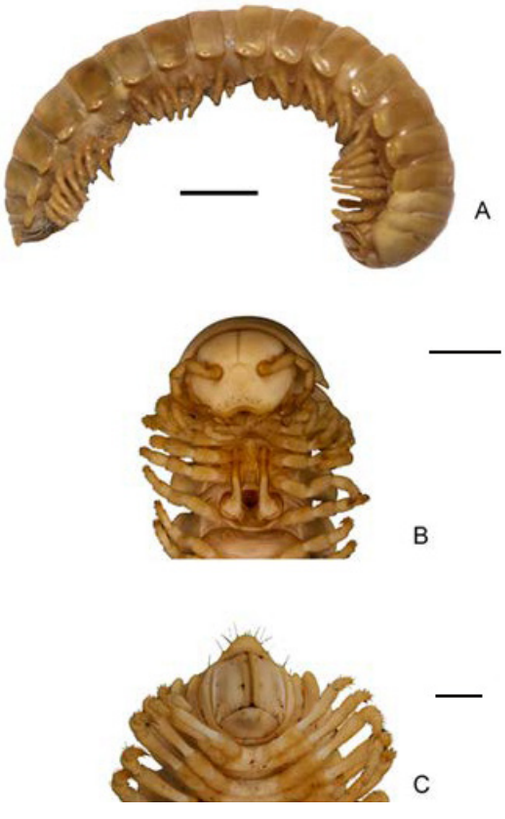

Fig. 12. *Pogoropsis prolixopes* Rosenmejer & Enghoff gen. et sp. nov., holotype, ♂ (NHMD 621672). **A**. Habitus. **B**. Front end, showing gonopods, ventral view. **C**. Hind end, ventral view. Scale bars: A = 5 mm; B = 3 mm; C = 1 mm.

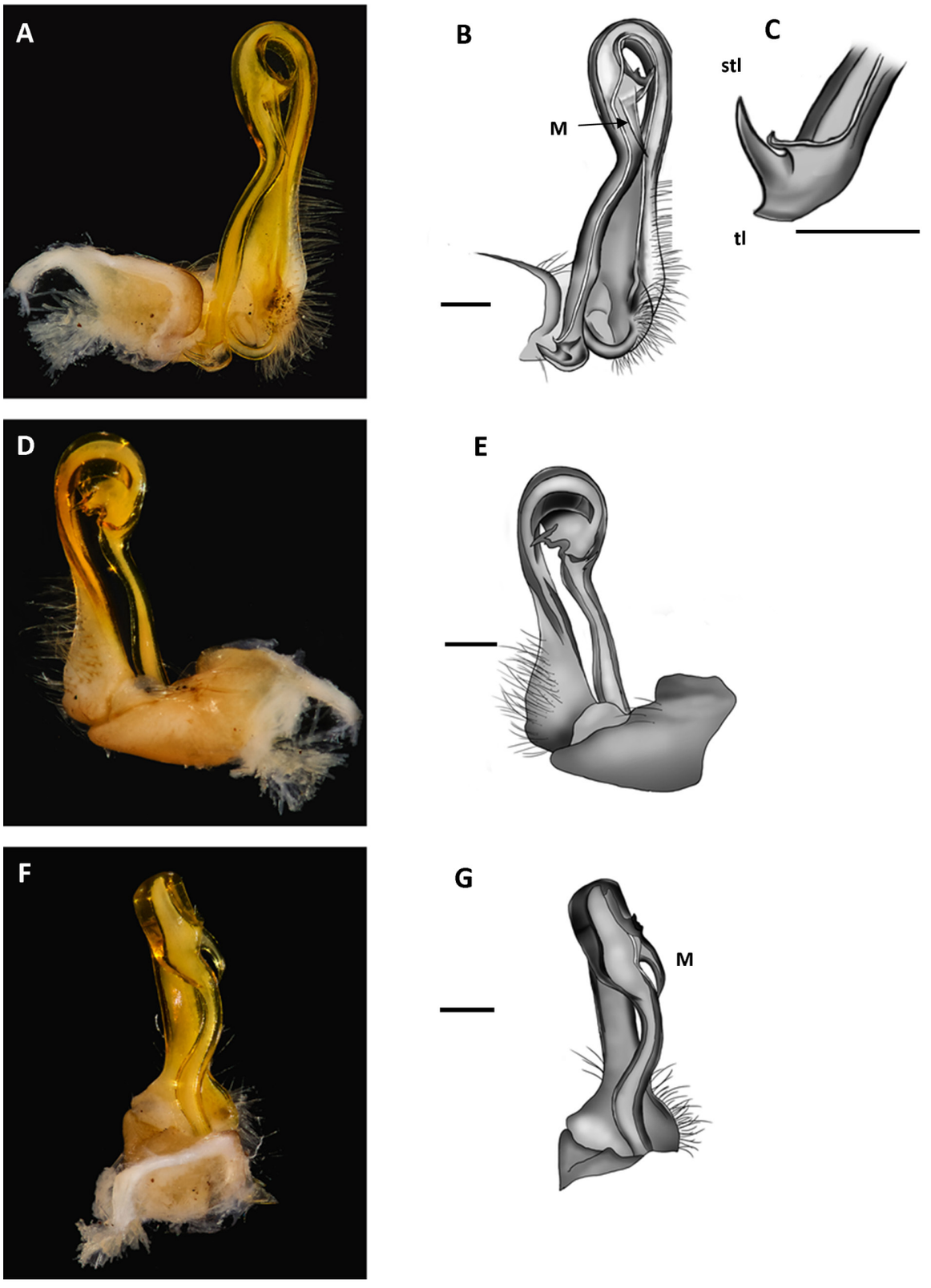

Fig. 13. *Pogoropsis prolixopes* Rosenmejer & Enghoff gen. et sp. nov., paratype, ♂, left gonopod (NHMD 621673). **A–B**. Mesal view. **C**. Apex of solenomere. **D–E**. Lateral view. **F–G**. Dorsal view. Abbreviations: *M* = Process M; *stl* = slender triangular lobe; *tl* = triangular lobe. Scale bars: 0.5 mm.

Description

Males

Size and shape. Body length ca 32–37 mm. Maximum width 6.0–6.7 mm. W/L ratio 20%. Height of body ring eight 4.5 mm. H/W ratio= 68%.

Colour (Fig. 12A). Uniformly yellowish/light brown

Sternal process on body ring 6 (Fig. 5D). Longer than wide, triangular tip.

Hypoproct. Suboval in shape, without median projection (Fig. 12C). Paramedian tubercles of normal size, not projecting beyond edge of sclerite.

Gonopod (Fig. 13). Gonocoxa without paracannular setae. Telopodite mesonodal. Nodus with few small triangular processes. Process M thin, narrow at base, and closely following postnodal telopodite. Process L absent. Postnodal teleopodite relatively long, curved dorsomesad, closely following prefemoral region. Solenomere with triangular lobe, followed by longer and more slender triangular lobe. Apex thin and curved, projecting at right angles before end of solenomere.

Distribution

Known only from the type locality and one further site in the Udzungwa Mts, West Kilombero Scarp, montane forest and open woodland (Fig. 2). The two sites are ca 12 km apart and are situated in different forested areas (cf. Frontier Tanzania 2001: 26, 174).

Remarks

The shape of the sternal process on the 6th body ring is more similar to that seen in species of the genus *Ngurubates* Hoffman, 2005, than to that of species of *Pogoro*. In the key to genera of Gomphodesmini, Hoffman (2005) actually uses this character to distinguish between *Pogoro* and *Ngurubates*. After examining both genus descriptions, however, it became clear that *Pogoropsis prolixopes* gen. et sp. nov. fits into neither of these genera. *Ngurubates* species have subonychial pads only on legs 1–5 (*Pogoro*: 1–6), and ventral tubercles on anterior legs are present (*Pogoro*: absent). Almost all characteristics of the new species fit *Pogoro*. The only differences from the *Pogoro* species description are the absence of paracannular setae, the absence of gonopodal process L and in particular the very elongated, hairpin-bent gonopod telopodite.

Tribe Aulodesmini Hoffman, 2005

Genus ***Emphysemastix*** Hoffman, 1966

Diagnosis (after Hoffman 2005, modified)

Small to moderate-sized (length 32–65 mm) gomphodesmids, pore formula: 5, 7, 9–19. Four apical sensory cones on antennae, clear, transverse fossa present on 5th and 6th antennomere. Collum asymmetrically narrowed laterally, with a shallow emargination in the posterior edge. Paranota placed high on the sides, moderate to large in size, dorsum only slightly convex. Sterna broad, with two transverse carinae on posterior end of body ring 8, four transverse carinae on rings 9–19 (except *E. congdoni* Hoffman, 2005 and *E. dracarys* sp. nov.). Coxae and prefemora with long hairs originating in clear basal tubercles on at least posterior legs. Sides of metazona smooth. Torus (Fig. 4B) present as small, distinct, cone-shaped projections. Subonychial pads on male legs 1–6. Sternal process of segment 6 long and slender, with median apiculus (Fig. 5A). Paxillus (Fig. 4A) present on sternum of body ring 15 (except in *E. congdoni*).

Gonopod aperture asymmetrically oval, extended back between the 8th pair of legs, quite large, posterior edge elevated behind the gonocoxae, but not in front of coxae of the 8th pair of legs. Rim of aperture is thickened, variously emarginate medially. Gonocoxa slanting and shortened as usual, not produced over base of cannula. Prefemoral region without basal fossa on the median side, but deeply impressed on lateral side (where surface is membranous), making prefemur seem almost like carina. Telepodite endonodal. Process M present, varies in both size and shape (exception: *E. dracarys* sp. nov.). Process L can be quite small, but is larger in some species. Postnodal telopodite curved dorsomesad, with a subglobose, hollow enlargement along the outer curvature. Apex of telopodite with a subterminal process of variable shape and size (e.g., Fig. 15).

Included species

Emphysemastix trepidans (Attems, 1931) (type species)
Emphysemastix congdoni Hoffman, 2005
Emphysemastix dracarys Olsen & Enghoff sp. nov.
Emphysemastix flavosignatus (Carl, 1909)
Emphysemastix frampt Olsen & Enghoff sp. nov.
Emphysemastix image Hoffman, 2005
Emphysemastix magnifrater Hoffman, 2005

Distribution

Tanzania. None of the previously described species are known from the Udzungwa Mts.

Key to species of *Emphysemastix* (modified after Hoffman 2005)

1. Basal setose side of gonopod prefemur unmodified, as seen in mesal aspect not extended ventrad as a distinct subtriangular lobe (Hoffman 2005: fig. 201) 2
– Basal setose side of prefemur projected ventrad as a more (Hoffman 2005: fig. 204) or less (Figs 14, 17) distinct subtriangular lobe 3

2. Postnodal telopodite very short, scarcely longer than distal lobe of nodus; nodal process M long and slender, projecting dorsally well beyond telopodite (Hoffman 2005: fig. 201); sterna with sharp transverse carinae, body ring 15 with sternal paxillus..... ***E. trepidans*** (Attems, 1931)
– Postnodal telopodite 3–4 × as long as distal lobe of nodus; nodal process M small and short, not extending beyond edge of telopodite (Hoffman 2005: fig. 202); sterna without transverse carinae, 15th body ring without paxillus ..... ***E. congdoni*** Hoffman, 2005

3. Nodal process M absent (Fig. 14)..... ***E. dracarys*** Olsen & Enghoff sp. nov.
– Nodal process M present 4

4. Nodal process M broadly laminate, apical edge truncate and serrate (Hoffman 2005: fig. 205); distal nodal lobe elongate and subrectangular in mesal aspect; body width 14 mm ..... ***E. magnifrater*** Hoffman, 2005
– Nodal process M slender, subterete, gradually acuminate; distal nodal lobe shorter and subovoid; body narrower 5

5. Nodal process L long, visible in mesal aspect; postnodal telopodite of moderate length, not extending proximad beyond base of cannula 6
– Nodal process L very small, not visible in mesal aspect; postnodal telopodite very long, extending proximad far beyond base of cannula (Hoffman 2005: fig. 207)..... ***E. image*** Hoffman, 2005

6. Body width 9.0–9.3 mm. Paxillus triangular, pointed. Gonopodal nodus subrectangular, processes M and L relatively short, straight (Hoffman 2005: fig. 206)..... ***E. flavosignatus*** (Carl, 1909)
– Body width 13.1 mm. Paxillus rounded. Gonopodal nodus with slightly diverging sides, processes M and L longer, more curved (Fig. 17).....***E. frampt*** Olsen & Enghoff sp. nov.

Emphysemastix dracarys Olsen & Enghoff sp. nov.
urn:lsid:zoobank.org:act:3EE9B143-AA28-408B-9840-166A11AA7936
Figs 2, 14, 15A

Diagnosis

Differs from the other species of the genus by the combination of having a small, not very distinct subtriangular ventral lobe on the gonopod prefemur, missing nodal process M, possessing a well-developed process L, and having indentures on the postnodal telepodite on the outer side of the curvature.

Etymology

The name is to be treated as a noun in apposition. The tip of the gonopod looks like the gaping mouth of a dragon when seen from the dorsal side. The word "dracarys" is a command used in the TV series "Game of Thrones" to make dragons breathe fire.

Material examined

Holotype

TANZANIA • ♂; Iringa Region, Iringa City; 7°46′ S, 35°42′ E; Mar.–Apr. 1996; L. Sørensen leg.; NHMD 621675.

Other material

TANZANIA • 1 ♀; same collecting data as for holotype; NHMD 621676.

Description

Male

Size and shape. A rather slender species. Body length ca 46.5 mm. Maximum width 7 mm. W/L ratio 15 %.

Colour. Dorsum of metazona darker brown than sides, sternum and prozona; paranota light brown. Antennae very dark, legs dark brown.

Body rings. Paranotum of rings 2–4 extended anteriad, on rings 4–19 extended gradually more posteriad. Two transverse carinae on the posterior end of rings 8 and 9, and 4 transverse carinae on rings 10–19. Torus present as clear cones. Stricture relatively deep on dorsal side, with sharp edge in front of anterior spiracles and pleurosternal carinae. Pleurosternal carinae present on rings 2–17, but very small on ring 2. Paxillus triangular, pointed.

Legs. Coxae and prefemora with fewer setae, and basal tubercles smaller than in *E. frampt* sp. nov. and *E. flavosignatus*.

Hypoproct. Paramedian tubercles large, extended beyond edge of sclerite, but not beyond end of median projection.

Gonopod (Figs 14–15). Gonocoxae with lateral row of setae across distal edge of anterior side of gonocoxae, no paracannular setae. Prefemoral part with a small rounded ventral lobe. Telopodite endonodal, process L present, process M absent. Postnodal telepodite long, curved ventrad almost

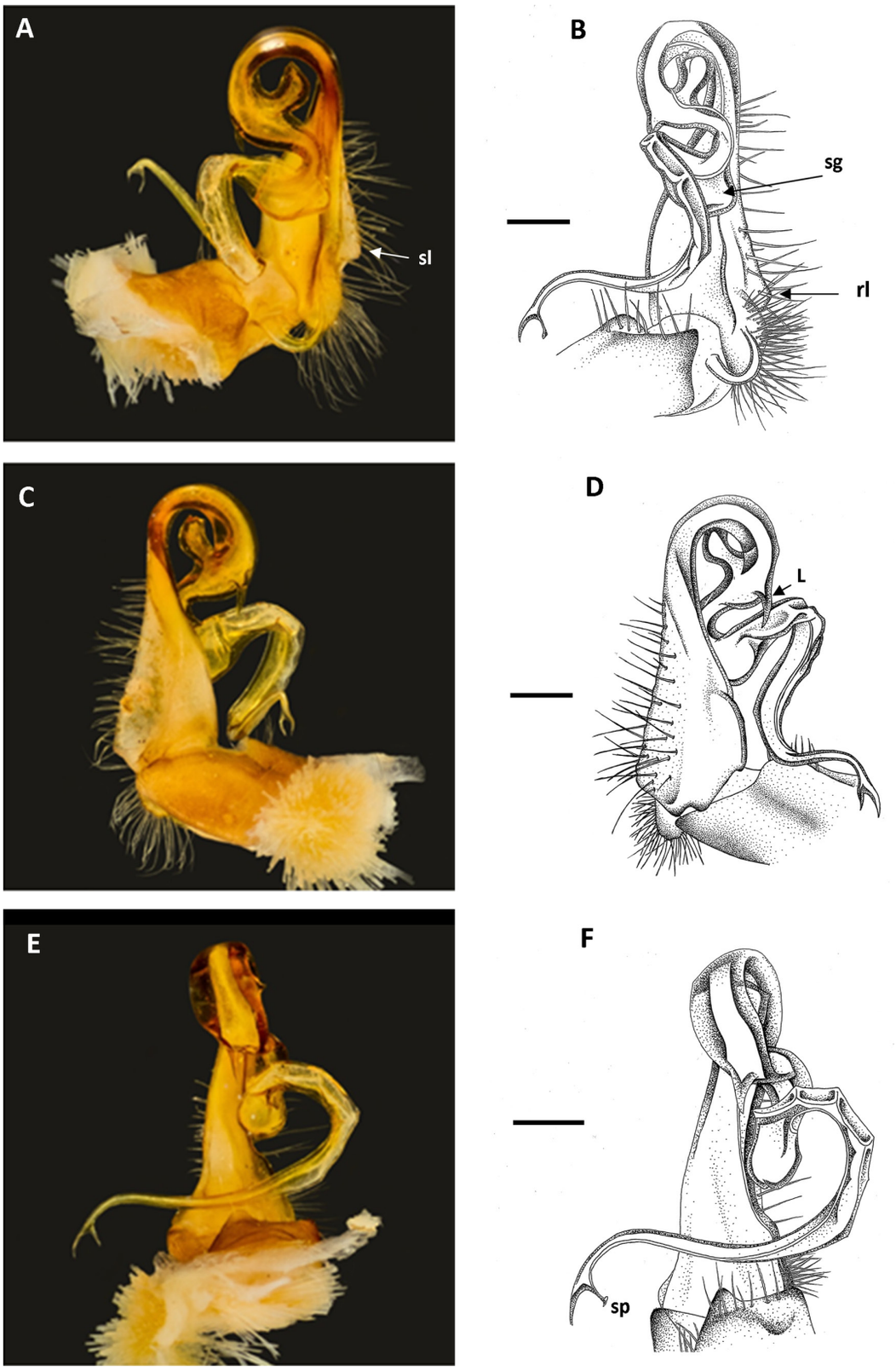

Fig. 14. *Emphysemastic dracarys* Olsen & Enghoff sp. nov., holotype, ♂, left gonopod (NHMD 621675). **A–B**. Mesal view. **C–D**. Lateral view. **E–F**. Dorsal view. Abbreviations: *L* = Process L; *rl* = rounded lobe; *sg* = subglobose enlargement; *sp* = subterminal process. Scale bars: 0.5 mm.

perpendicular to setose prefemoral region and slightly mesad, then sharply dorsad and expanding into subglobose, hollow enlargement, then curving almost 270° mesad and posteriad, extending laterad beyond gonocoxa and prefemoral region. Anterior and mesal side of this curvature with indentures. Subterminal process narrow, triangular, curved ventromesad.

Distribution

Known only from the type locality, Iringa city, some 50 km NW of the Udzungwa Mts (Fig. 2). The altitude of the type locality is ca 1600 m a.s.l.

Emphysemastix flavosignatus (Carl, 1909)

Euryzonus flavosignatus Carl, 1909: 307.

Aulodesmus flavosignatus – Attems 1931: 102.
Emphysemastix flavosignatus – Hoffman 1966: 208.

Material examined

Paratype

TANZANIA • 1 ♂; "Karagwe, D.-O.-Afr.; Carl ded.; cotype"; NHMD 3853.

Remark

Not reported from the Udzungwa Mts, but studied for comparison with the new species.

Emphysemastix frampt Olsen & Enghoff sp. nov.
urn:lsid:zoobank.org:act:CBF0C445-4D5A-48D1-83EA-C509E0567476
Figs 2, 15B, 16–17

Diagnosis

Differs from the other species of the genus by having a rounded, rather than triangular paxillus. Nodal processes M and L both present.

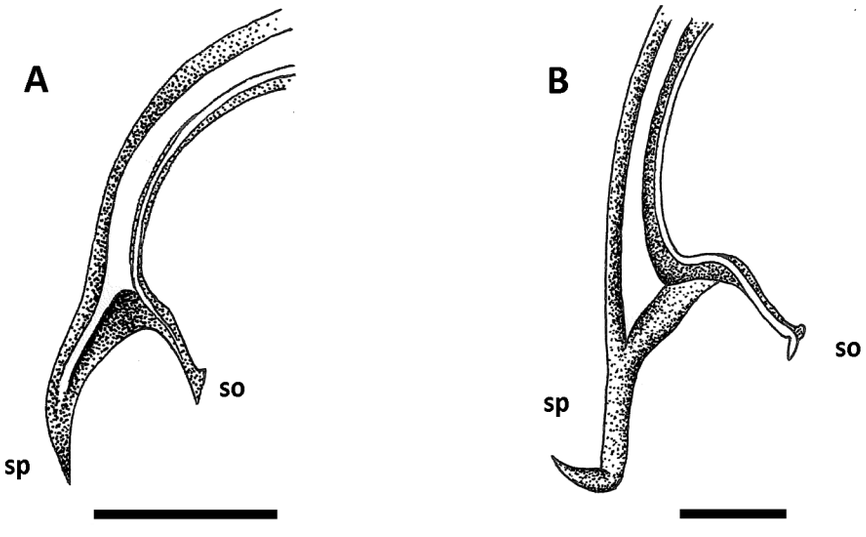

Fig. 15. *Emphysemastix* spp., gonopod tip. **A**. *E. dracarys* Olsen & Enghoff sp. nov., holotype, ♂ (NHMD 621675). **B**. *E. frampt* Olsen & Enghoff sp. nov., holotype, ♂ (NHMD 621677). Abbreviations: *so* = solenomere; *sp* = subterminal process. Scale bars: 0.25 mm.

Etymology

The species is named after Kingseeker Frampt from the Dark Souls video game series, due to the gonopods' resemblance to the creature. The name is to be treated as a noun in apposition.

Material examined

Holotype

TANZANIA • ♂; Iringa Region, Mahenge District, West Kilombero Scarp FR, Nyumbanitu Mts, S of Udekwa Village; 07°48′ S, 36°21′ E; 1700 m a.s.l.; Dec. 1993; L.A. Hansen and J.O. Svendsen leg.; NHMD 621677.

Description

Male

Size and shape. A large member of the genus, rather wide compared to length. Body length ca 55 mm. Maximum width 13.1 mm. W/L ratio ca 24%.

Colour (Fig. 16). Metazona orange-brown, with lighter colour on posterior part and on paranota; legs darker and more intensely/vividly orange. Prozona as metazona but without lighter areas.

Body rings. Paranota set high on sides, dorsum moderately convex. Anterior edge of ring 2–4 straight, anterior edge of rings 5–20 with gradually larger posterior-facing edge. Torus present, but small and indistinct. Stricture poorly defined, but with sharp edge in front of anterior spiracles. Pleurosternal carinae present, knobby, distinct from ring 3, increasing in size towards ring 8–9, afterwards decreasing in size towards posterior end, indistinct on ring 18. Transverse sternal carinae as typical of the genus, but very small on anterior of ring 9. Anterior edge of paxillus rounded, with ridges.

Legs. Relatively long (Fig. 16).

Hypoproct. Paramediean tubercles small, not extended past edge of sclerite. Median projection large and elongated.

Gonopod (Figs 15B, 17). Gonocoxa with some paracannular setae, row of setae continuing on anterior side of distal end of gonocoxa. Prefemoral part with rounded ventral lobe. Telopodite endonodal. Nodal processes M and L similar in size; process L slightly curved mesad; process M slightly longer, distal

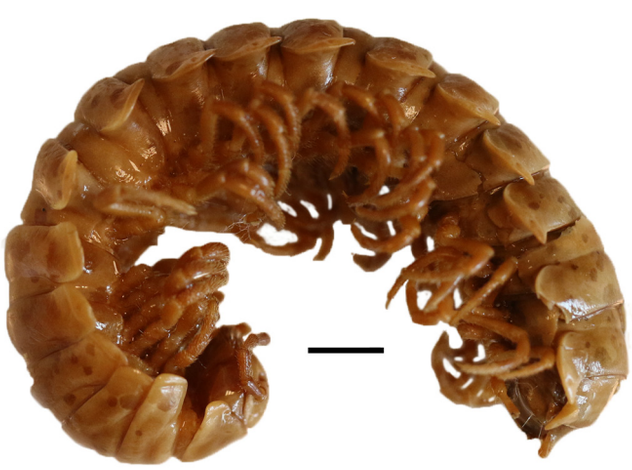

Fig. 16. *Emphysemastix frampt* Olsen & Enghoff sp. nov., holotype, ♂ (NHMD 621677). Scale bar: 5 mm.

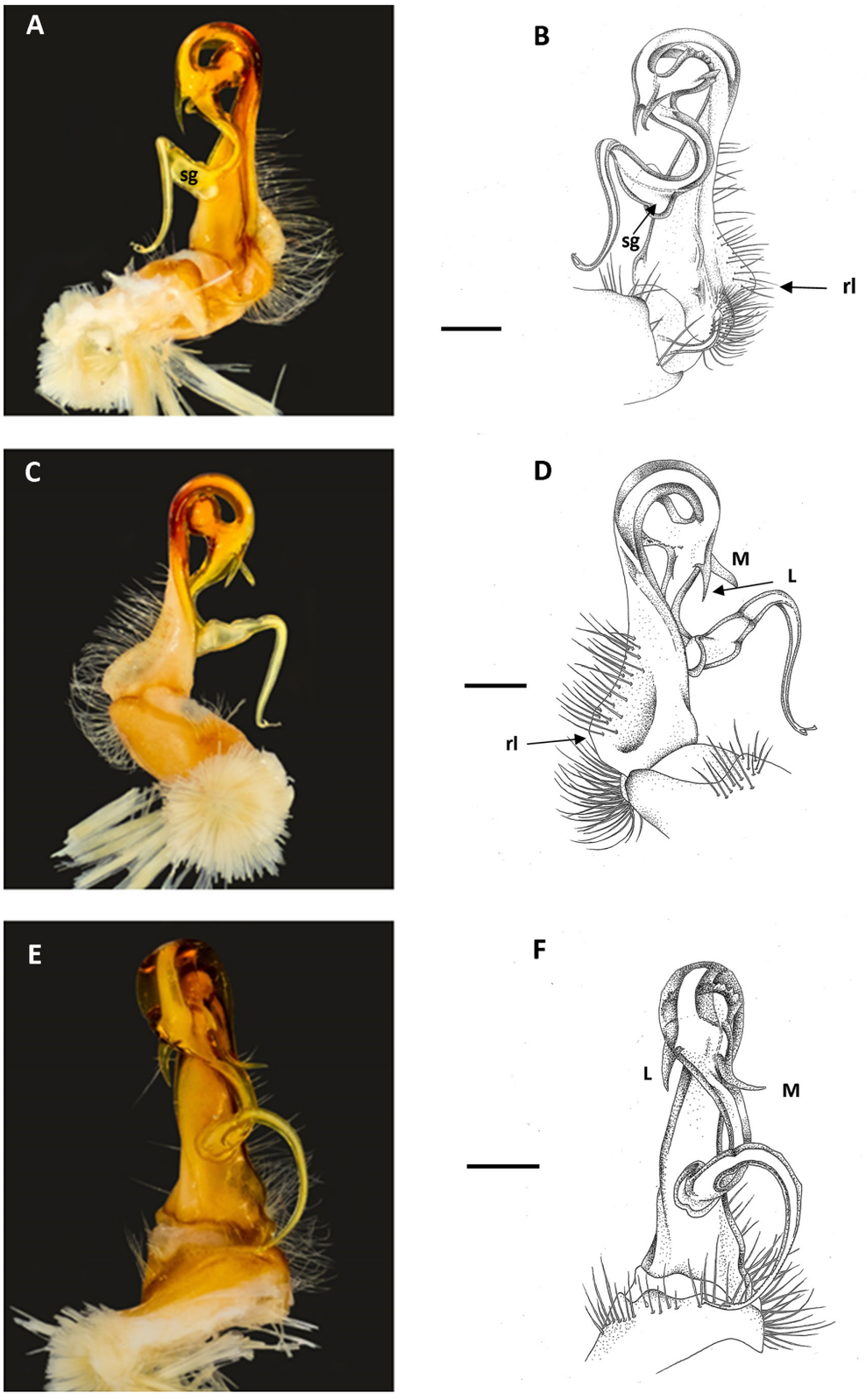

Fig. 17. *Emphysemastix frampt* Olsen & Enghoff sp. nov., holotype, ♂ (NHMD 621677), left gonopod. **A–B**. Mesal view. **C–D**. Lateral view**. E–F**. Dorsal view. Abbreviations: *L* = Process L; *M* = Process M; *rl* = rounded lobe; *sg* = subglobose enlargement. Scale bars: 1 mm.

end curved mesad. Postnodal telopodite relatively long, curved ventrad almost perpendicular to setose prefemoral region and directed first slightly mesad, then dorsad and expanding into subglobose, hollow enlargement, then curving mesad and forming a half-circle for the rest of its length. Subterminal process narrow and curved ventrad, solenomere curved dorsad, then ventrad.

Distribution

Known only from the type locality in the Nyambanitu Mts, West Kilombero FR (Fig. 2).

Remarks

The gonopods of *E. frampt* sp. nov. are particularly similar to those of *E. flavosignatus* (compare Fig. 17 with Hoffman 2005: fig. 206). Processes M and L in *E. frampt* sp. nov. are, however, longer and more curved, and the nodus is larger, with more divergent sides in *E. frampt* sp. nov.

Gomphodesminae of uncertain tribal affiliation

Genus ***Agrophogonus*** Hoffman, 2005

Diagnosis (after Hoffman 2005, modified)

Small to medium-sized (length 20–40 mm) gomphodesmids. Four apical sensory cones on antennae, pore formula: 5, 7, 9–19. Terga smooth. Legs 1–7 of males with large and conspicuous subonychial pads; coxae of 6th pair conically produced; sternum of ring 6 with elongate, apically rounded process; sterna of several postgonopodal rings with indistinct transverse carinae (apparently absent in *A. pusillokiellandi* sp. nov.); no paxillus on sternum 15. Side of metazona smooth, pleurosternal carinae present. No torus evident.

Gonopod aperture oval, posterior rim elevated into triangular lobes immediately behind each gonocoxa, cut down to level of sternum medially. Gonopods relatively long and slender, coxae in contact medially, without projection over base of cannula; telepodite set against coxa at a right angle, prefemur slender, nearly straight, gradually narrowed distally, without basal excavation on either side. Nodus entirely endonodal, without trace of median process M, lateral process L present or absent; inner edge of nodus produced into three or four acute projections of varying shape; postnodal telepodite relatively short, curved laterad (longer and curved in a ¾ circle in *A. hamulifer* sp. nov.), distally either slender and acuminate or laminately flattened, rather abruptly flexed immediately beyond nodus; prostatic groove visible over most of its length in mesal aspect.

Included species

Agrophogonus mangalisa Hoffman, 2005 (type species)
Agrophogonus hamulifer Olsen & Enghoff sp. nov.
Agrophogonus harrisi (Verhoeff, 1941)
Agrophogonus kiellandi Hoffman, 2005
Agrophogonus mwanihana Hoffman, 2005
Agrophogonus pusillokiellandi Olsen & Enghoff sp. nov.
Agrophogonus tridens Hoffman, 2005

Distribution

Tanzania. Two of the previously described species are known from the Udzungwa Mts, viz., *A. kiellandi* and *A. mwanihana*.

Key to species of *Agrophogonus* (modified after Hoffman 2005)

1. Postnodal telepodite short, flattened, laminate (as Fig. 19) 2
– Postnodal telepodite mostly longer, slender, evenly attenuate to apex (as Figs 18, 21) 3

2. Nodus with four primary dentations (Hoffman 2005: fig. 450), not deeply constricted at base ..... ***A. harrisi*** (Verhoeff, 1941)
– Nodus with three primary dentations (Fig. 19; Hoffman 2005: fig. 449), basally with deep constriction ..... ***A. mwanihana*** Hoffman, 2005

3. Nodal process A broad, apically tridentate; ectal nodal surface distinctly convex; processes B and C robust, subequal in size and shape (Hoffman 2005: fig. 453) ..... ***A. tridens*** Hoffman, 2005
– Nodal process A acute and spiniform; ectal nodal surface flattened (in mesal aspect, Hoffman 2005: fig. 451) 4

4. Nodal process A with a small, bifid accessory process at base on lateral side (Hoffman 2005: figs 456–457, see remark to *A. mwanihana*, below) ..... ***A. mangalisa*** Hoffman, 2005
– Nodal process A without an accessory basal process on lateral side 5

5. Postnodal telepodite relatively short, curved abruptly dorsad, almost perpendicular to prefemoral region 6
– Postnodal telepodite long, evenly curved dorsad, appearing hook-like (Fig. 18) ..... ***A. hamulifer*** Olsen & Enghoff sp. nov.

6. Width 8.7 mm. Nodal process C very long, slender and curved (Hoffman 2005: fig. 451) ..... ***A. kiellandi*** Hoffman, 2005
– Width 4.1 mm (Figs 19–20). Nodal process C shorter and less curved (Fig. 21) ..... ***A. pusillokiellandi*** Olsen & Enghoff sp. nov.

Agrophogonus hamulifer Olsen & Enghoff sp. nov.

urn:lsid:zoobank.org:act:646486B2-BF4F-45D9-9E74-E8FD6FC70DD5

Figs 1, 5C, 18

Diagnosis

Resembles *A. kiellandi* and *A. pusillokiellandi* sp. nov. in having the postnodal telopodite slender, and having nodal process A spiniform, without an accessory basal process. Differs from these species in having the postnodal telopodite very long and evenly curved. Differs further from *A. kiellandi* by smaller body size (width 5.2–6.2 mm vs 8.7 mm in *A. kiellandi*) and from *A. pusillokiellandi* sp. nov. (width 4.1 mm) by larger body size.

Etymology

The name is a Latin noun in apposition, meaning ‘carrying a small hook’ and refers to the resemblance of the postnodal telepodite to the curvature of a fishing hook.

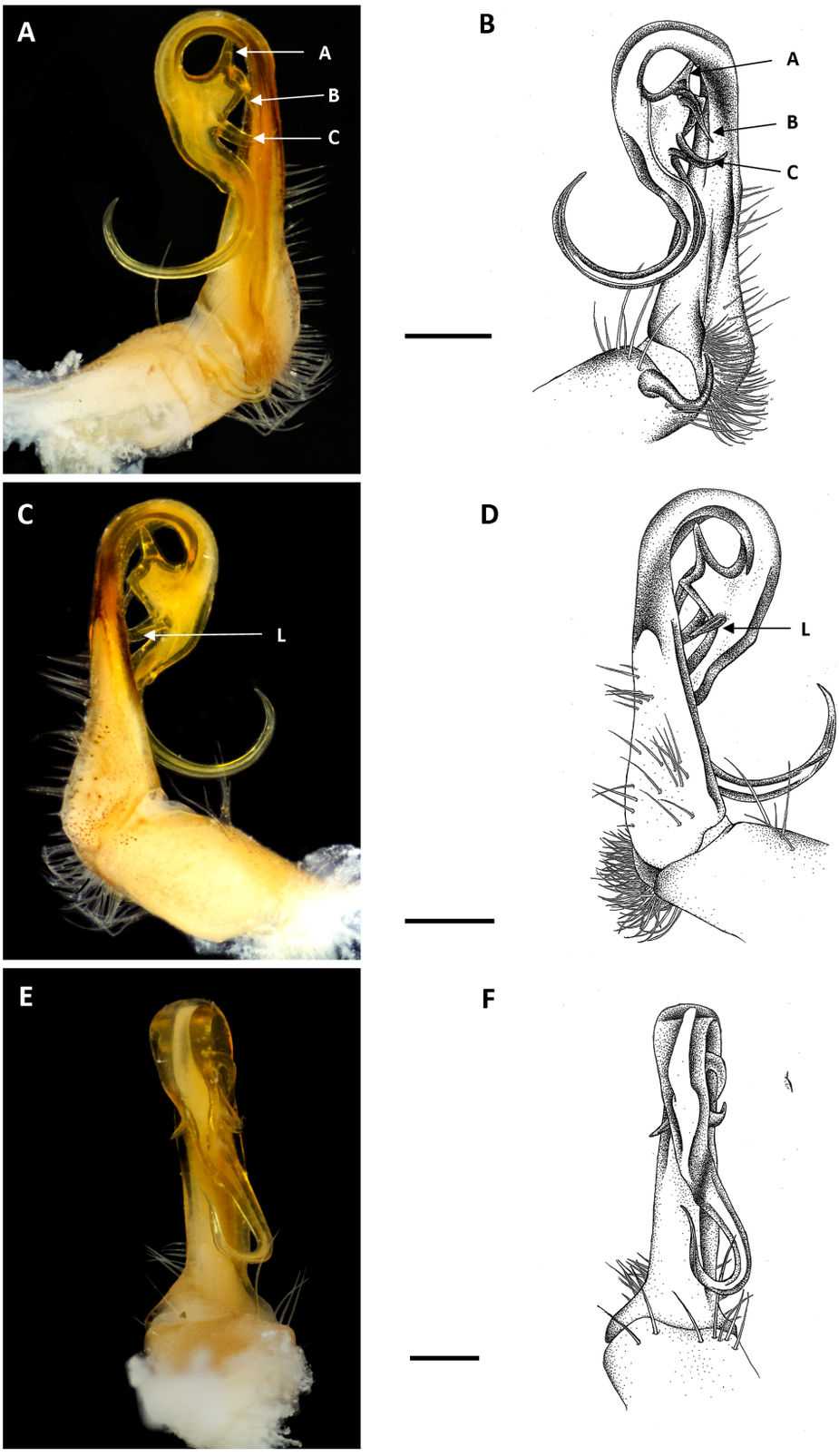

Fig. 18. *Agrophogonus hamulifer* Olsen & Enghoff sp. nov., holotype, ♂ (NHMD 621678), left gonopod. **A–B**. Mesal view. **C–D**. Lateral view. **E–F**. Dorsal view. Abbreviations: *A* = Process A; *B* = Process B; *C* = Process C; *L* = Process L. Scale bars: 0.5 mm.

Material examined

Holotype

TANZANIA • ♂; Iringa Region/district, West Kilombero Scarp FR; 07°53′19.5″ S, 36°23′11.6″ E; 1115 m a.s.l.; 25 Nov. 2000; Frontier Tanzania UMBS leg.; plot 17, Ukami, montane forest; NHMD 621678.

Paratypes

TANZANIA •11 ♂♂, 7 ♀♀, 29 juv.; same collecting data as for holotype; NHMD 621679 • 3 ♂♂, 2 ♀♀; same collecting data as for holotype; 1100–1130 m a.s.l.; 30 Nov. 2000; NHMD 621680 • 1 ♂, 1 juv.; same collecting data as for holotype but 07°50′38.4″ S, 36°22′17.6″ E; 1390–1410 m a.s.l.; plot Paradiso; NHMD 621681.

Description

Males

Size and shape. Body length 27–31 mm. Maximum width 5.2–6.2 mm. W/L ratio 20%.

Colour (Fig. 1). Very pale brown, darker around base of setae. Specimen stored in ethanol since 2000; thus, any pigmentation that may have been present in life is now faded.

Sternal process on body ring 6 (Fig. 5C). Long and slender, but broader towards basis and anterior end. Tip evenly rounded.

Body rings. No transverse sternal carinae.

Telson. Epiproct flattened at posterior end, forming a small vertical plane, with four protruding setae. Hypoproct semicircular to slightly triangular, paramedian tubercles large, extending beyond edge of sclerite. Setae on paraproct protruding from clear basal tubercles.

Gonopod (Fig. 18). Gonopod aperture suboval, extended back between second pair of legs on seventh segment, elevated in front of coxae, eliminated medially. Paracannular setae present. Nodal process L present, process M absent. Processes A and B slender and curved, process C longer than A and B. Processes B and C forcipulate in their curvature and position to each other. Postnodal telepodite very long, slender and acuminate, longer than in other members of the genus, without an abrupt flexure after nodus.

Distribution

Found at two separate locations within the same forest (Ukami) in the West Kilombero FR, Udzungwa Mts.

Agrophogonus kiellandi Hoffman, 2005

Agrophogonus kiellandi Hoffman, 2005: 483.

Material examined

None.

Distribution

Known only from the type locality, Iringa Region, Iringa District, Udzungwa Mts, Mt. Nyumbenito, 2000 m a.s.l.

Agrophogonus mwanihana Hoffman, 2005
Fig. 19

Agrophogonus mwanihana Hoffman, 2005: 479.

Material examined

TANZANIA • 8 ♂♂, 5 ♀♀; Morogoro Region, Udzungwa Mts National Park, Sanje Kati camp and plot; 07°45′47.6″ S, 36°53′10.4″ E; 850 m a.s.l.; 7 Feb. 2014; J. Malumbres-Olarte leg.; pitfall traps; NHMD 621682.

Distribution

Known from the type locality: Iringa Region, Iringa District, Udzungwa Mts, Mwanihana FR, 3000–4000 ft a.s.l. (corresponds to 900–1200 m a.s.l.), Sanje River valley, and now also from a very close site at a slightly lower elevation (850 m).

Remarks

The new specimens agree with the description by Hoffman (2005). It should be noticed that the drawings on p. 481 in Hoffman's book, although the caption states "Figs 454–455: Gonopods, *Agrophogonus mwanihana* ….", actually are figs 456–457 and show *A. mangalisa*.

We here present new illustrations of the gonopod of *A. mwanihana*, based on one of the newly studied specimens (Fig. 19).

Agrophogonus pusillokiellandi Olsen & Enghoff sp. nov.
urn:lsid:zoobank.org:act:8373DE9E-91BB-4F66-85AC-921DD8E2ADC6
Figs 20–21

Diagnosis

Differs from the other species of the genus by the combination of small size (width 4.1 mm), a slender postnodal telopodite, and lack of a bifid accessory process laterally on nodus. Virtually similar to *A. kiellandi* except for size and for having process C of the gonopod telopodite shorter and broader.

Etymology

The specific name is derived from the Latin 'pusillus', meaning 'small', and 'kiellandi', to emphasize the strong similarity with *A. kiellandi*, except for size.

Material examined

Holotype

TANZANIA • ♂; Iringa region/district, West Kilombero Scarp Forest Reserve; 07°45′34.2″ S, 36°26′37.4″ E; 1510 m a.s.l.; 8 Dec. 2000; Frontier Tanzania leg.; plot Acacia, (open)woodland; NHMD 621683.

Other material

TANZANIA • 1 ♀; same collecting data as for holotype; 5 Dec. 2000; NHMD 621684.

Description

Size and shape. Body length 20.3 mm (approximate, specimen broken into several pieces). Maximum width 4.1 mm. W/L ratio 20 %.

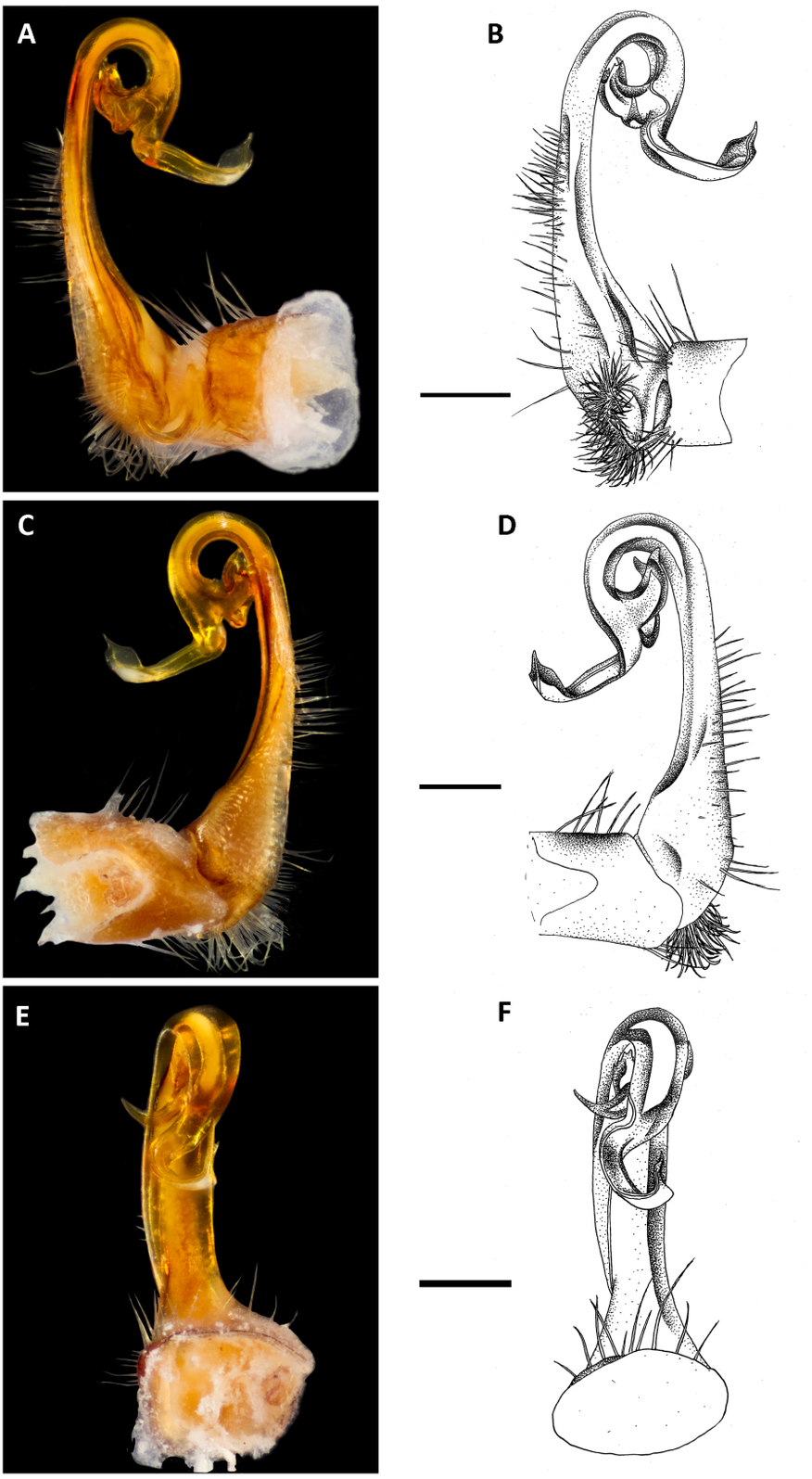

Fig. 19. *Agrophogonus mwanihana* Hoffman, 2005, specimen from Udzungwa Mts National Park, Sanje Kati camp & plot (NHMD 621682), right gonopod. **A–B**. Mesal view. **C–D**. Lateral view. **E–F**. Dorsal view. Scale bars: 0.5 mm.

Colour. After 18 years in alcohol without pigmentation (Fig. 20).

Body rings. Sternal process on ring 6 probably damaged, anterior edge very unevenly rounded and jagged (Fig. 21H). Apparently no transverse sternal carinae.

Telson. Epiproct flattened at posterior end, forming a small, vertical flat surface with four protruding setae. Hypoproct semicircular with slightly triangular edge, paramedian tubercles large, extended beyond edge of sclerite. Setae on paraprocts protruding from distinct basal tubercles.

Gonopod (Fig. 21A–G). Gonopod aperture suboval, extending back between second pair of legs on seventh ring, elevated in front of coxae, eliminated medially. Gonocoxa with paracannular setae. Prefemur with deep basal fossa on lateral side. Nodal process L present, process M absent. Processes A and B slender and curved, process C broader and longer than A and B. Processes B and C somewhat forcipulate in their curvature and position to each other. Postnodal telepodite slender and acuminate, slightly flattened, but not laminate as in *A. mwanihana* and *A. harrisi*. The right gonopod has a considerably higher number of small spikes and outgrowths than the left, and whereas process L on the left gonopod is slender and lance-shaped (Fig. 21D), on the right gonopod it is laminate and has a secondary tip halfway along its length (Fig. 21E). The angle between the prefemoral region and postnodal telepodite is almost 90° on the left gonopod, but the postnodal telopodite is more slanting posteriad on the right gonopod. The gonopods are almost identical to those of *A. kiellandi*, but nodal process C is shorter, broader and less curved in *A. pusillokiellandi* sp. nov. (Fig. 21) than in *A. kiellandi* (Hoffman 2005: fig. 451).

Distribution

Known only from the type locality, West Kilombero Scarp Forest Reserve, in the Udzungwa Mts, Tanzania.

Remarks

The right-left differences observed on the gonopods of the unique specimen of *A. pusillokiellandi* sp. nov. emphasize the desirability of having more than a single individual at hand when describing a new species, since with only one specimen it is impossible to estimate the level of intraspecific variation. Basing a new species on a single specimen which is almost identical to a known species (also known only from a single

Fig. 20. *Agrophogonus pusillokiellandi* Olsen & Enghoff sp. nov., holotype, ♂ (NHMD 621683). Scale bar: 5 mm.

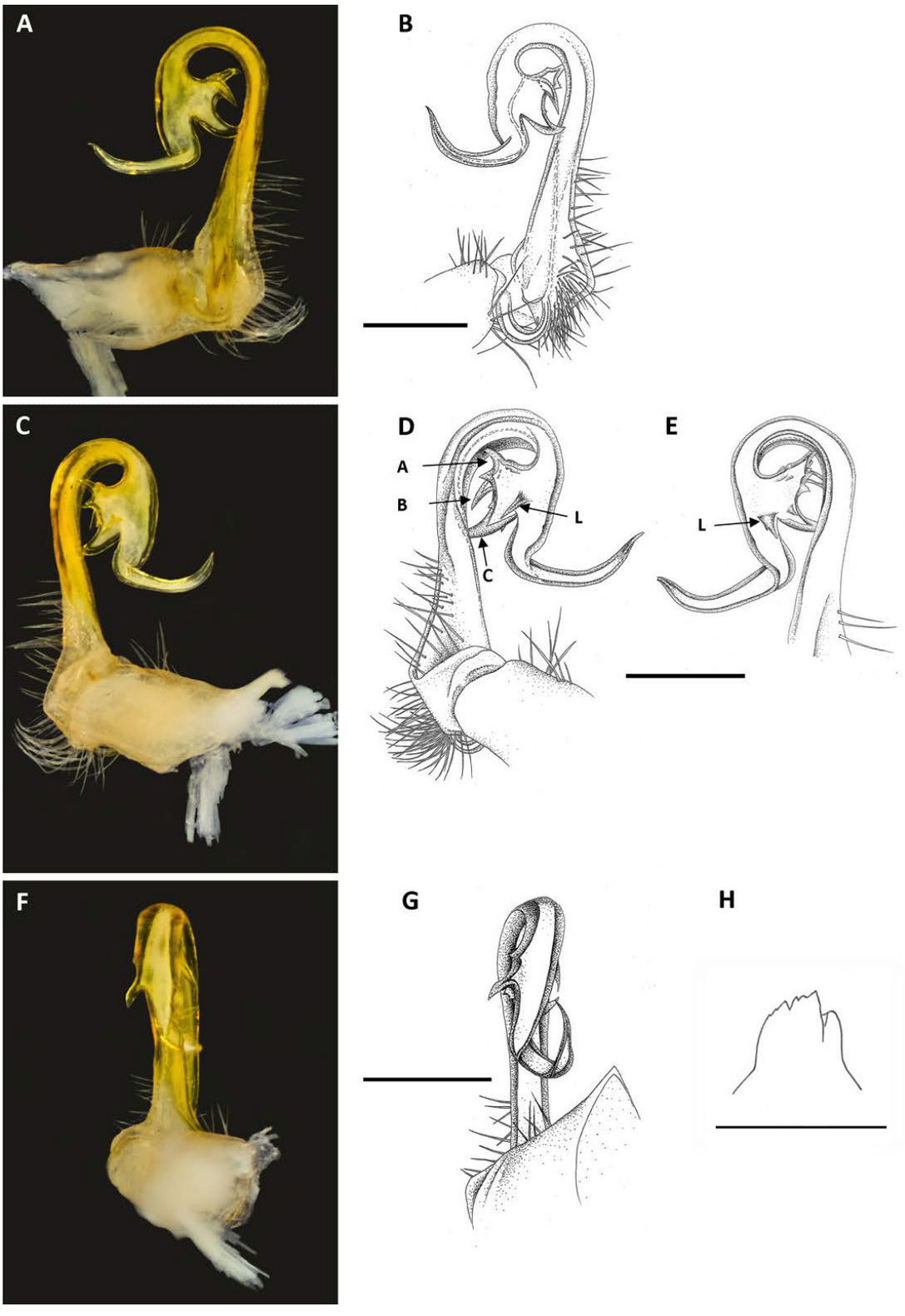

Fig. 21. *Agrophogonus pusillokiellandi* Olsen & Enghoff sp. nov., holotype, ♂ (NHMD 621683). **A–D, F–G**. Left gonopod. A–B. Mesal view. C–D. Lateral view. F–G. Dorsal view. **E**. Right gonopod, lateral view. **H**. Sternal process on ring 6. Abbreviations: *A* = process A; *B* = process B; *C* = process C; *L* = process L. Scale bars: 0.5 mm.

specimen), except for its body size, might seem ill-advised. The size difference in question, however, is dramatic: the width of the holotype of *A. kiellandi* is 2.1 times that of the holotype of *A. pusillokiellandi* sp. nov., corresponding to an almost tenfold volume difference. Large intraspecific size differences are not very frequent among polydesmidan millipedes, but there are some cases: in the Gomphodesmidae, the most variable species known to date is *Astrodesmus laxus* (Gerstäcker, 1873) in which male width varies from 6 to 15 mm. The smallest form was originally described as a separate species, *A. petilus* Cook, 1899, but was ranked as a subspecies of *A. laxus* by Hoffman (2005). Other subspecies of *A. laxus* have male widths varying from 9.3 to 15 mm (Hoffman 2005). Decker (2016, pers.comm.) found male width to range from 1.5 to 4.3 mm in *Somethus castaneus* (Attems, 1944) (Paradoxosomatidae) and from 2.1 to 3.4 mm in *S. lancearius* Jeekel, 2002, in the latter case even within one small conservation park. Mesibov (2006, pers. comm.) found male widths between 1.2 and 1.8 mm in *Lissodesmus hamatus* Mesibov, 2006 (Dalodesmidae) and on https://myriapodology.org/polydesmida/size.html he published a striking photo of two female *L. hamatus*, one a "dwarf", the other a "giant". Boyan Vagalinski (pers. comm.) has seen size differences on the same scale in *Polydesmus mediterraneus* Daday, 1889 (Polydesmidae). We nevertheless choose to describe our small *Agrophogonus* as a new species, also being under the impression of the recent finding of two taxa of the genus *Thyropygus* Pocock, 1894 (family Harpagophoridae Attems, 1909) with identical gonopods, but of different sizes and molecularly sufficiently different to be regarded as separate species (Pimvichai *et al.* 2011). The coexistence of several pairs of morphotypes, interpreted as species, of the genus *Nepalmatojulus*, Mauriès, 1983 (family Julidae Leach, 1814) with identical or extremely similar gonopods in the mountains of northern Thailand (Enghoff 1987) also suggests that size plays an important role in millipede speciation.

Discussion

With nine species from the Udzungwa Mts now known, the Gomphodesmidae lag far behind the families so far treated in this series of papers: Odontopygidae with 41 known species (Enghoff 2018a, 2020), and one genus (*Eviulisoma*) of Paradoxosomatidae with 20 (Enghoff 2018b). Most likely, gomphodesmid diversity is higher in the Usambara Mts, from where eight species have currently been reported (Enghoff *et al.* 2016), and several additional ones (in coll. NHMD) await description. In contrast, odontopygid and paradoxosomatid diversity is far lower in the Usambaras (HE unpublished). Also in terms of numbers of individuals, gomphodesmids lag behind odontopygids and paradoxosomatids; thus, four of the six new species described here are based on single males. This, on the other hand, suggests that additional new gomphodesmids are likely to be discovered by future collecting efforts.

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