

On the paradoxosomatid millipedes (Diplopoda: Polydesmida: Paradoxosomatidae) of the Philippines

Anh D. Nguyen^{1,2*}, Petra Sierwald^{3†} & Zoltán Korsós^{4,5}

Abstract. The paper deals with the paradoxosomatid specimens of the Philippines housed in the Field Museum of Natural History, Chicago, USA. A total of 17 species have been recorded, of which 11 are described as new to science, namely *Euphyodesmus simplex*, new species, *Eustrongylosoma amuyaomontis*, new species, *Eustrongylosoma erectispinum*, new species, *Eustrongylosoma peniculum*, new species, *Eustrongylosoma pterygotum*, new species, *Eustrongylosoma reductum*, new species, *Eustrongylosoma tuberculatum*, new species, *Luzonomorpha weberi*, new species, *Tectoporus lobus*, new species, *Tectoporus pilosus*, new species, and *Tectoporus retrospinosus*, new species. Together with previous records, the number of paradoxosomatid species of the Philippines has currently increased to 24.

Key words. diversity, taxonomy, museum specimens, new species, islands, Southeast Asia

INTRODUCTION

The Philippines is an archipelago of about 7,100 islands lying between the western part of the Pacific Ocean and the eastern part of Southeast Asia. Most of the mountainous islands are covered with tropical rainforest and are of volcanic origin. The archipelago is one of the 18 most biologically megadiverse countries, ranking at or near the top in terms of biodiversity per unit area (Berba & Matias, 2022).

Millipedes are known to be the third most diverse class of animals with more than 12,000 described species in about 150 families and 16 orders (Sierwald & Bond, 2007; Shear, 2011). Of these, the family Paradoxosomatidae is the largest with about 1,000 described species (Nguyen & Sierwald, 2013). The millipedes of the Philippines were first studied and summarised by Wang (1951, 1955, 1961, 1967), who identified more than 50 species, albeit to a very poor standard and being barely recognisable. Other species that

have since been described or recorded from the Philippines are largely readily identifiable (Hoffman, 1973; Jeekel, 2000; San Juan & Lit, 2010; Golovatch & Stoev, 2013). One species, *Orthomorpha bisulcata* Pocock, 1895, was excluded from the Philippine fauna because of its highly dubious identification (Golovatch & Stoev, 2013). Therefore, only 13 paradoxosomatid species have been reported till now from the Philippines. This number is obviously still far from fully reflecting the true diversity of the millipede family Paradoxosomatidae in the region. This work therefore aims to contribute to knowledge of this fauna by describing new species from the material preserved at the Field Museum of Natural History (FMNH), Chicago, USA.

List of paradoxosomatid millipedes currently known from the Philippines.

1. *Chondromorpha xanthotricha* (Attems, 1898) from Luzon Island;
2. *Euphyodesmus philippina* (Nguyen & Sierwald, 2010) from Mindanao Island;
3. *Eustrongylosoma penevi* Golovatch & Stoev, 2013 from Luzon Island;
4. *Helicorthomorpha luzoniensis* (Peters, 1864) from various parts of the Philippines;
5. *Luzonomorpha acutangula* (Newport, 1844) from Luzon Island;
6. *Luzonomorpha infulata* (Wang, 1951) from Mindanao Island;
7. *Luzonomorpha luzoniensis* (Peters, 1864) from Luzon Island;
8. *Luzonomorpha montana* (Chamberlin, 1921) from Luzon, Mindanao Island;
9. *Luzonomorpha pallidula* Jeekel, 2000 from Mindoro Island;

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10. *Luzonomorpha picea* (Brandt, 1841) from Manila, Luzon Island;
11. *Luzonomorpha polliloensis* (San Juan & Lit, 2010) from Pollilo Island;
12. *Luzonomorpha quatuorputeus* (Wang, 1951) from Mindanao Island;
13. *Orthomorpha coarctata* (de Saussure, 1860) from Mactan and Cebu Island;

Together with the newly described species below, there are currently 24 paradoxosomatid species known from the Philippines.

MATERIAL AND METHODS

Specimens are preserved in 75% ethanol and kept in the collection of the Field Museum of Natural History (FMNH), Chicago, USA. Some specimens are shared with the National Museum of Natural History, Philippines.

Specimens were examined under an Olympus SZX16 microscope. Colour images were taken using a Nikon SMZ800N microscope and NIS-Element BR v.5.20.00 at the Institute of Ecology and Biological Resources (IEBR, currently known as Institute of Biology, Vietnam), or an imaging system using Nikon5100 plus various ranges of lens under normal and ultraviolet (UV) light at the Field Museum of Natural History (FMNH, Chicago, USA). Images were stacked using Helicon Focus ver.7.0., and assembled into plates using Photoshop CS6. SEM images were taken with a Leo Scanning Electron Microscope (Carl Zeiss SMT, Peabody, MA) at the FMNH.

Abbreviations:

FMNH = Field Museum of Natural History, Chicago, USA
 FMNHINS: FMNH Insects collection catalog number
 CNHM = Chicago Natural History Museum, Field Museum's name 1943-1966

IEBR = Institute of Ecology and Biological Resources, Hanoi, Vietnam

PNM = National Museum of Natural History, Manila, The Philippines

UPLB = University of the Philippines Los Baños, Philippines
 VAST = Vietnam Academy of Science and Technology, Vietnam

co = gonocoxite

pref = gonoprefemorate

fe = gonofemorate

sph = solenophore

sl = solenomere

ca = cannula

dfs = distofemoral process

RESULTS

TAXONOMY

Order Polydesmida Leach, 1814

Family Paraxosomatidae Daday, 1889

Generic placement of species within the species-rich family of Paradoxosomatidae may be considered preliminary with the current state of phylogenetic analyses of the family, indicated by some recent changes of generic placements of species. Generic and suprageneric taxa within the family are currently rarely defined by unambiguous apomorphic characters.

Genus *Orthomorpha* Bollman, 1893

Orthomorpha Bollman, 1893: Bulletin of the U.S. National Museum, 46: 159, 196; new name for *Paradesmus* de Saussure, 1859. Type species: *Polydesmus beaumontii* Leguilou, 1841 (L'Institut [I], 9: 279), by subsequent designation of Pocock, 1910: Biologia Centrali-Americana, 14: 159. Type species designation discussed by Jeekel, 1971: 229

Orthomorpha coarctata (de Saussure, 1860)

Material examined. PHILIPPINES • 1 male; Dumaguete, Negros Is., leg. Rabar D.S. (from CNHM #754076); **FMNH-INS 013 035**

Remarks. This is a pantropical species commonly found in disturbed habitats in tropical regions. It is often referred to as the genus *Asiomorpha* Verhoeff, 1939. In the Philippines, the species was recorded from Mactan and Cebu (Wang, 1955), which is about 173 km NE of Dumaguete. The species is also known from Los Baños, Luzon Province (1 female, UPLB campus, Makiling Botanic Garden, 2 April 2008, leg. Z. Korsós, deposited in the Museum of Natural History, University of the Philippines Los Baños).

Genus *Chondromorpha* Silvestri, 1897

Chondromorpha Silvestri, 1897: Annales de la Société Entomologique de Belgique, 41: 356. Type species: *Chondromorpha severini* Silvestri, 1897, by monotypy.

Remarks. The genus *Chondromorpha* currently contains 8 species mostly distributed in India, Nepal, and Sri Lanka. Only *Chondromorpha xanthotricha* (Attems, 1898) is a pantropical species.

Chondromorpha xanthotricha (Attems, 1898) (Figs. 1–6)

Material examined. PHILIPPINES • 1 male; Mindanao, Davao Province, Sitio Taglawig, Maco, Tagum; near sea level; original dipterocarp forest; CNHM–Philippine Zool. Exped. (1946–1947); 1 October 1946, leg. Hoogstraal H. &

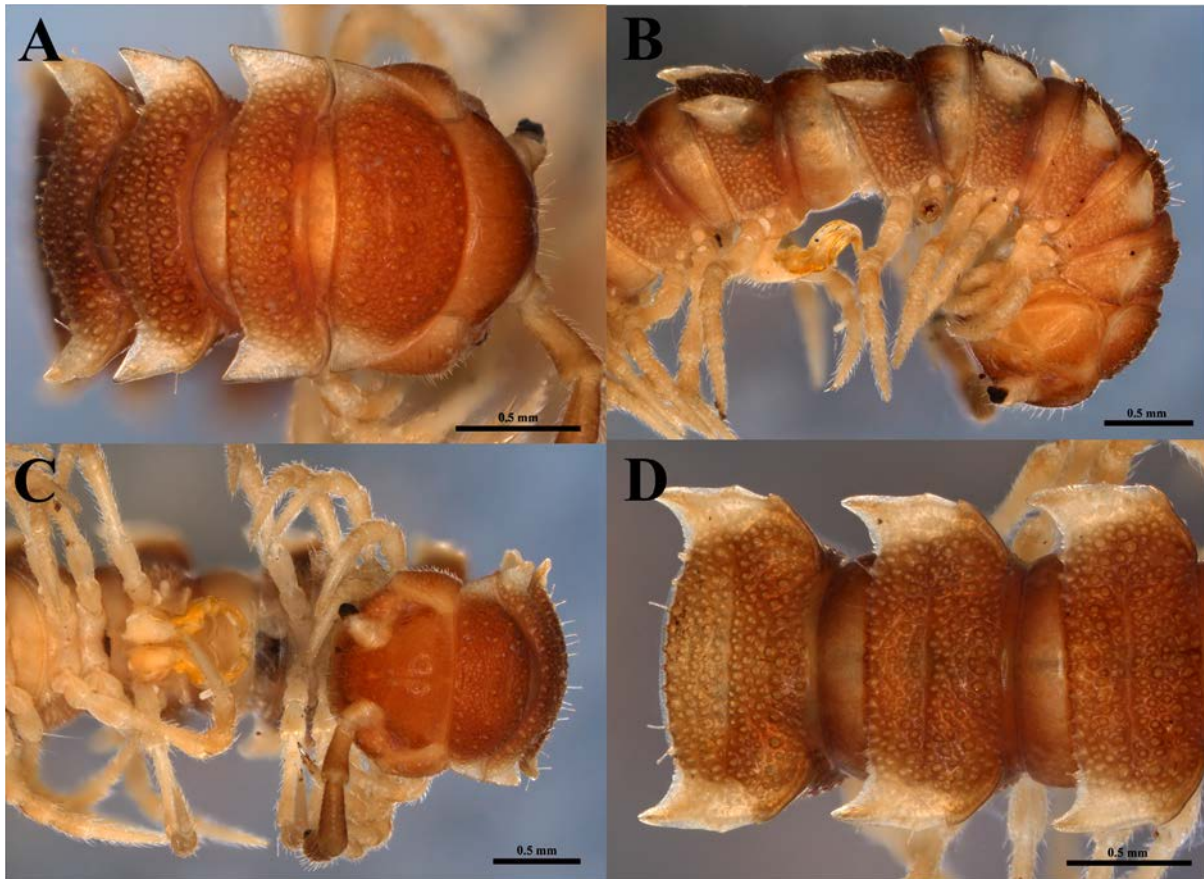


Fig. 1. *Chondromorpha xanthotricha* (Attems, 1898) (FMNH-843). Anterior part of body, A, dorsal view; B, lateral view; C, ventral view; D, segments 8–10, dorsal view. Scale bar = 0.5 mm.

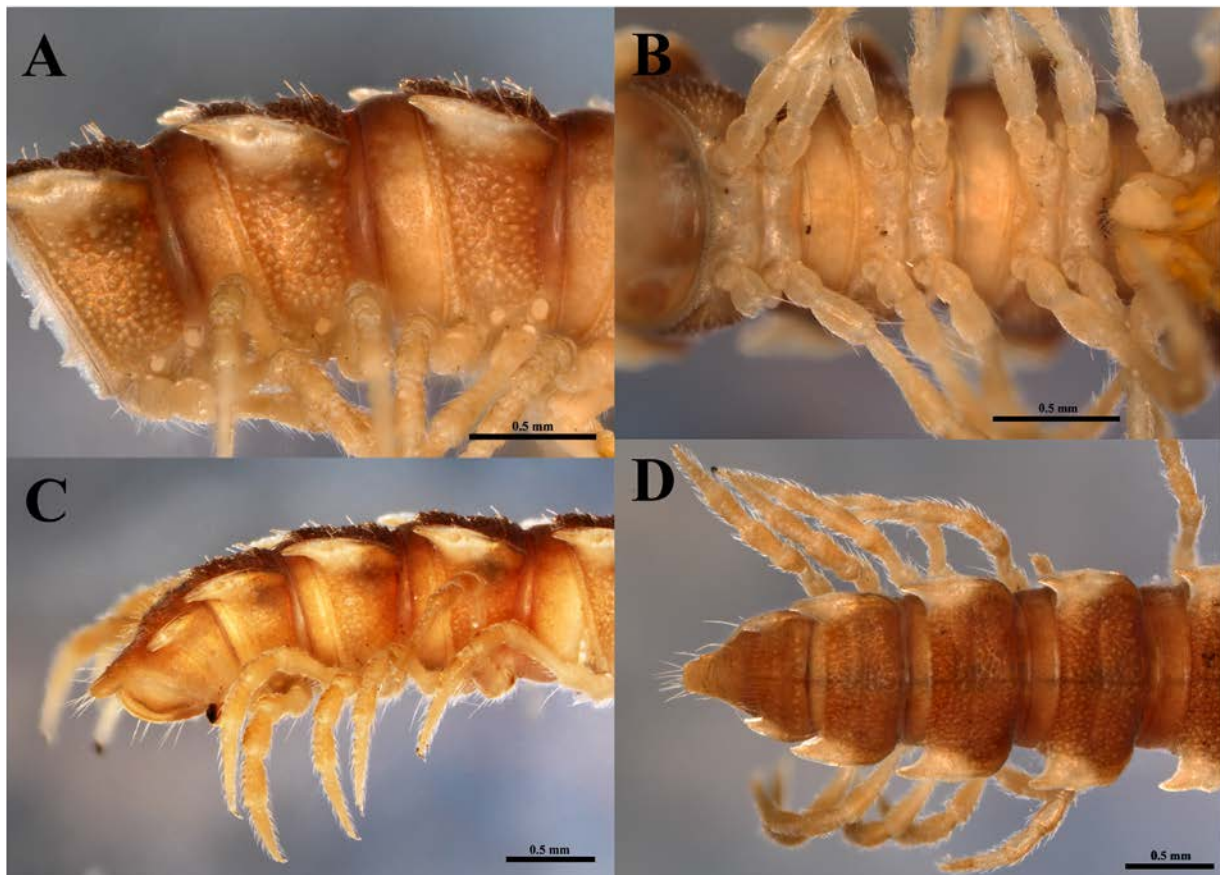


Fig. 2. *Chondromorpha xanthotricha* (Attems, 1898) (FMNH-843). Segments 8–10, A, lateral view; B, ventral view. Posterior part of body, C, lateral view; D, dorsal view. Scale bar = 0.5 mm.



Fig. 3. *Chondromorpha xanthotricha* (Attems, 1898) (FMNH-843). A, telson, ventral view. B, sternum 5, subventral view. Scale bar = 0.1 mm.

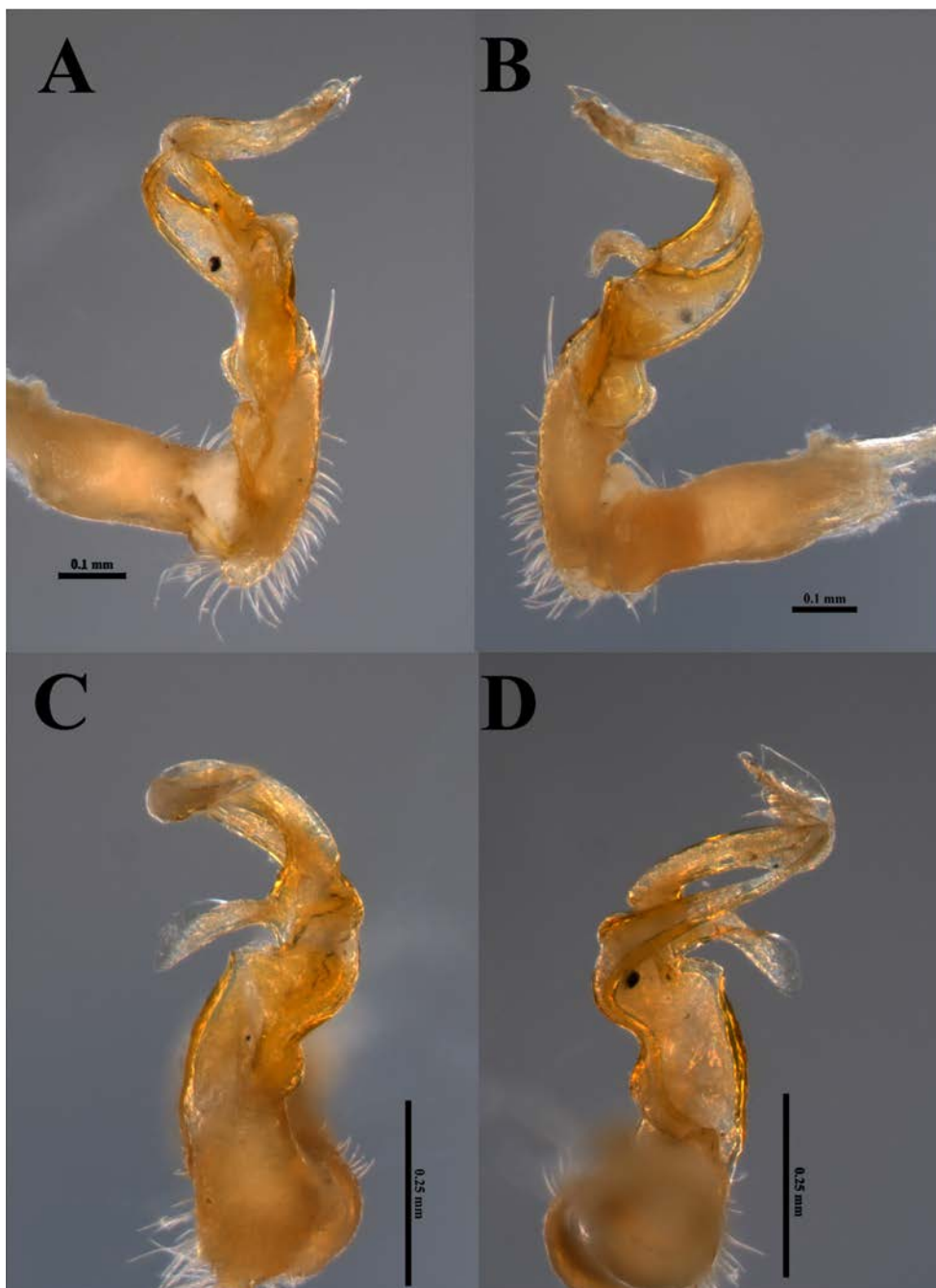


Fig. 4. *Chondromorpha xanthotricha* (Attems, 1898) (FMNH-843). A, left gonopod, mesal view; B, lateral view; C, ventral view; D, dorsal view. Scale bar = 0.1 mm for A and B, 0.25 mm for C and D.

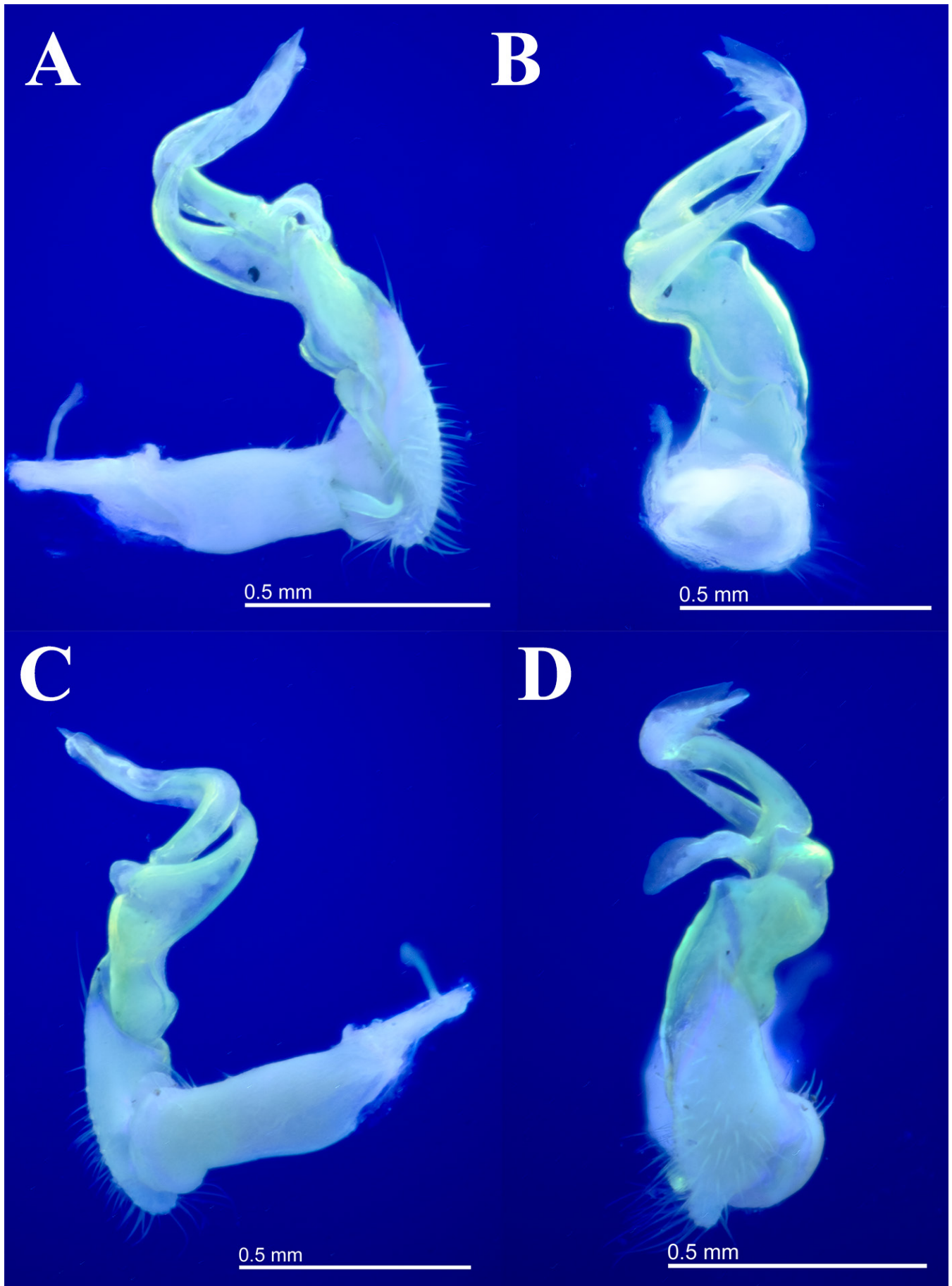


Fig. 5. *Chondromorpha xanthotricha* (Attems, 1898) (FMNH-843). A, left gonopod, mesal view; B, lateral view; C, ventral view; D, dorsal view. Scale bar = 0.1 mm for A and B, 0.25 mm for C and D.

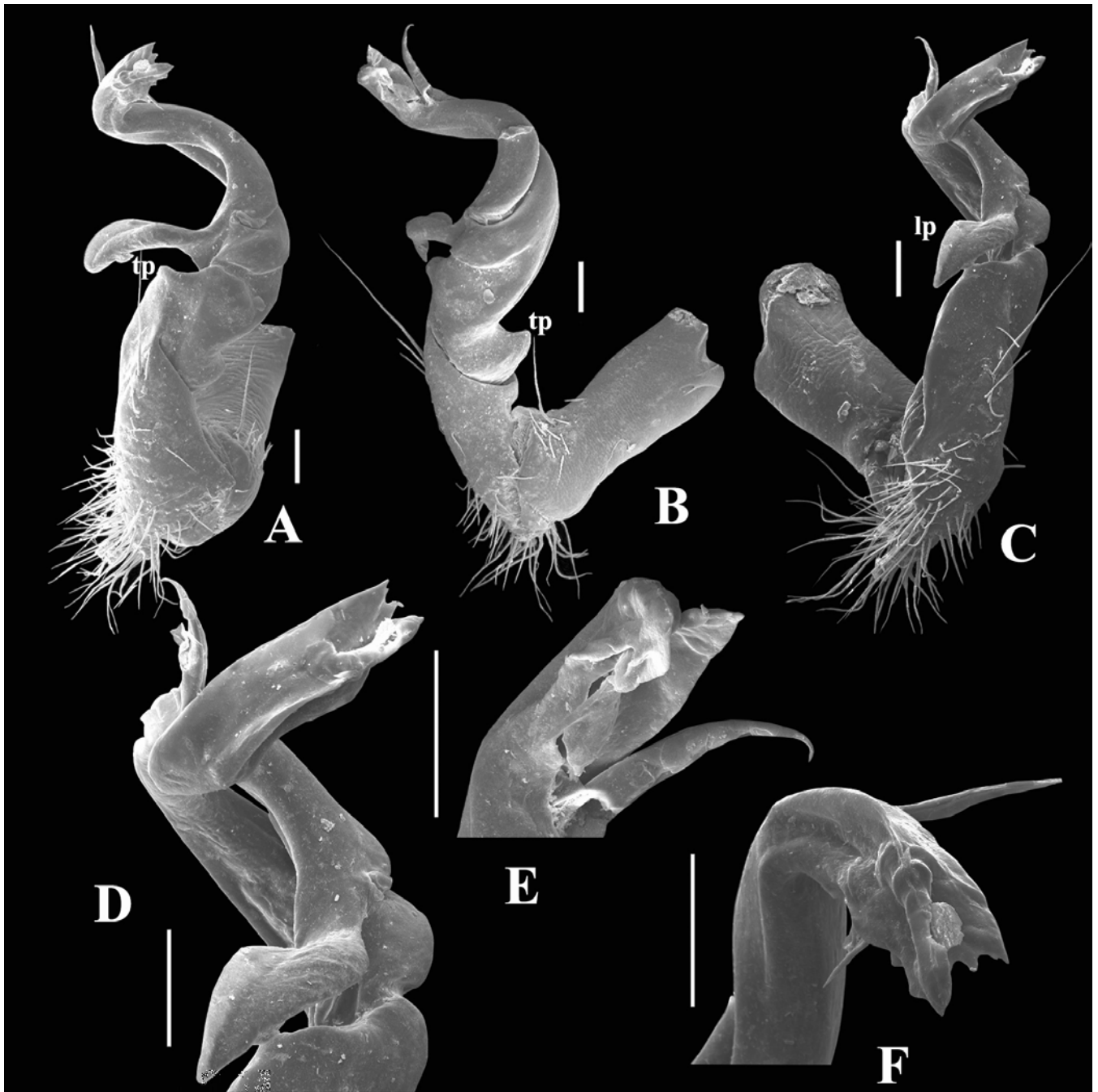


Fig. 6. *Chondromorpha xanthotricha* (Attems, 1898) (FMNH-825). A, right gonopod, ventral view; B, lateral view; C, mesal view; D, postfemoral region, mesal view; E, lateral view; F, ventral view. Scale bar = 0.1mm.

Heyneman D.; **FMNH-825** • 2 males, 1 female; Mindanao Island, Cotabato Province, Busyan, Corel; open forest; elev. 100 ft (= 30 m a.s.l.); 10 December 1946, leg. Hoogstraal H.; **FMNH-843** (#PNM).

Diagnosis. The species can be recognised by having metaterga with numerous setiferous knobs (Figs. 1, 2); paraterga well developed (Figs. 1, 2); male sternum 5 with a medially concave trapeziform process between coxae 4 (Fig. 3B); gonopod femorite very short, with evidence of weak torsion at base; distodorsal part with a small, subtriangular; solenophore spiral, with a leaf-shaped process at base (Figs. 4–6).

Remarks. This is a pantropical species known to occur in synanthropic habitats in the Mascarene Islands, India, Sri Lanka, Thailand, Singapore, Indonesia, Taiwan, Japan (Okinawa Island), Oceania, Fiji Islands, Samoa, the Philippines, New Guinea, United States, Mexico, Costa Rica, Panama, the Greater and Lesser Antilles, Venezuela, etc. (Shelley & Lehtinen, 1998; Shelley & Cupul-Magaña, 2007; Korsós, 2012; Nguyen & Sierwald, 2013; Likhitrakarn et al., 2017). The origin centre is presumed to have lain somewhere in Sri Lanka or southern India (Nguyen & Sierwald, 2013). In the Philippines, it was recorded from Luzon Island (Wang, 1953).

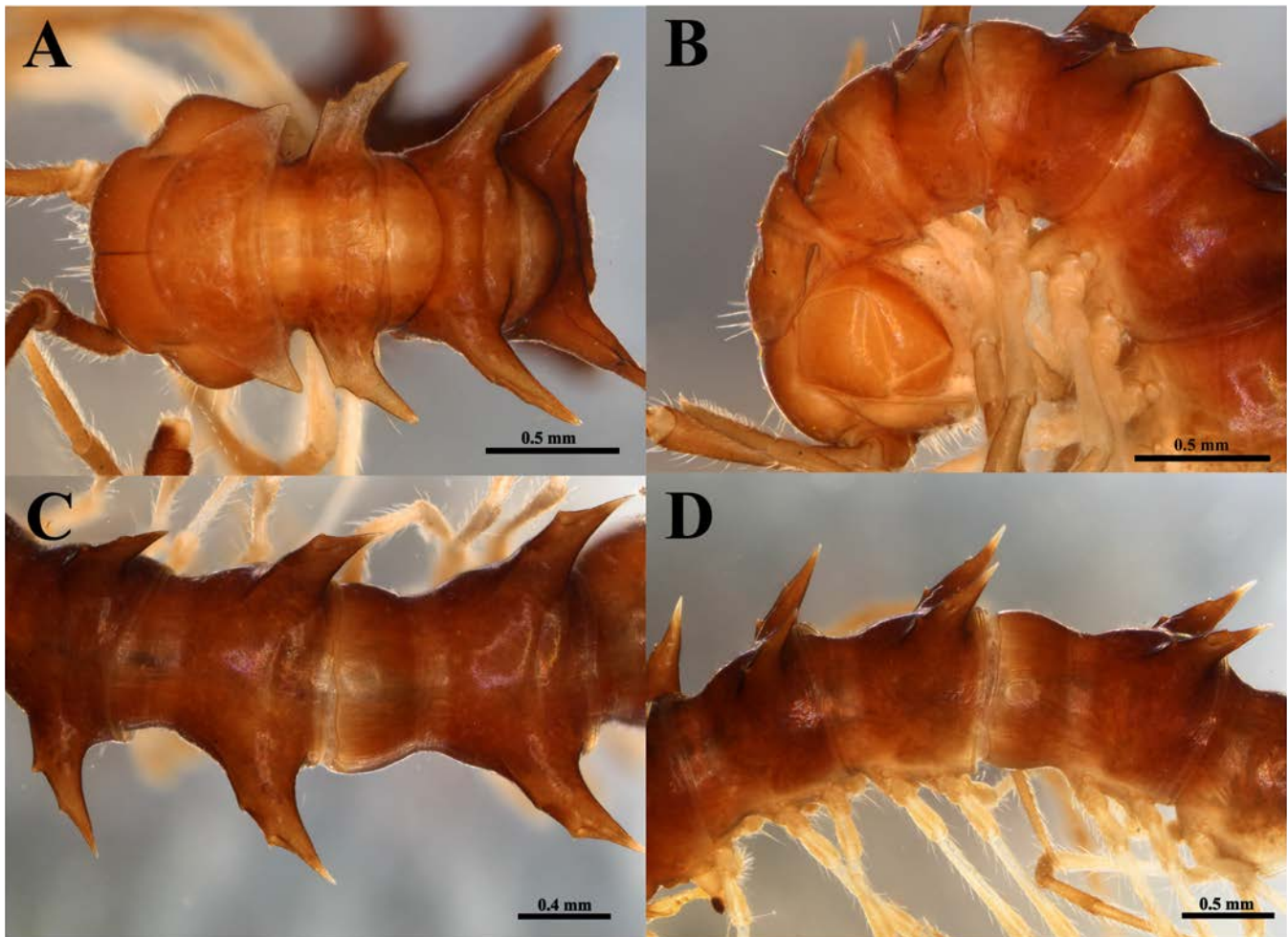


Fig. 7. *Euphyodesmus philippina* (Nguyen & Sierwald, 2010) (FMNH 834). A. anterior part of body, dorsal view; B, lateral view; C, segments 8–10, dorsal view; D, lateral view. Scale bar = 0.5 mm for A, B, and D, 0.4 mm for C.

Genus *Euphyodesmus* Attems, 1931

Euphyodesmus Attems, 1931: Zoologica, Stuttgart, 30(79): 125. Type species: *Euphyodesmus gracilis* Attems, 1931, by original designation

Remarks. The genus *Euphyodesmus* is currently known to comprise nine species mainly distributed in East Malaysia (4 species), Indonesia (7 species), and the Philippines (1 species) (Golovatch & Stoev, 2013; Nguyen & Sierwald, 2013).

Euphyodesmus philippina (Nguyen & Sierwald, 2010) (Figs. 7–9)

Desmoxytes philippina Nguyen & Sierwald, 2010: 173–177, figs 1–11

Euphyodesmus philippina:— Golovatch & Stoev, 2013: 13

Material examined. PHILIPPINES • 3 males, 2 females; southern Palawan Island, Mantalingajan Range, Mount Balabag, South slope; elev. 4,200–4,500 ft (= 1,280–1,371 m a.s.l.); mossy forest; 10–16 May 1947, leg. Werner F.G.; **FMNH 838** • 2 males; southern Palawan Island, Mantalingajan Range, Mount Balabag, South slope; elev. 4,200 ft (= 1,280 m a.s.l.); edge of mossy forest; 10 May 1947, leg. Werner F.G.; **FMNH 824** • 5 males, 3 females; southern Palawan Island, Mantalingajan Range, Mount Balabag, South slope; elev. 4,500 ft (= 1,371 m a.s.l.); beating tree; 10 May 1947, leg. Werner F.G.; **FMNH-INS 011 279 (#PNM)**.

Remarks. The species was described and temporarily assigned to the genus *Desmoxytes* Chamberlin, 1923 because of the spiniform paraterga (Nguyen & Sierwald, 2013). Golovatch & Stoev (2013) later changed its generic position, and provisionally re-allocated it to the genus *Euphyodesmus* Attems, 1931.

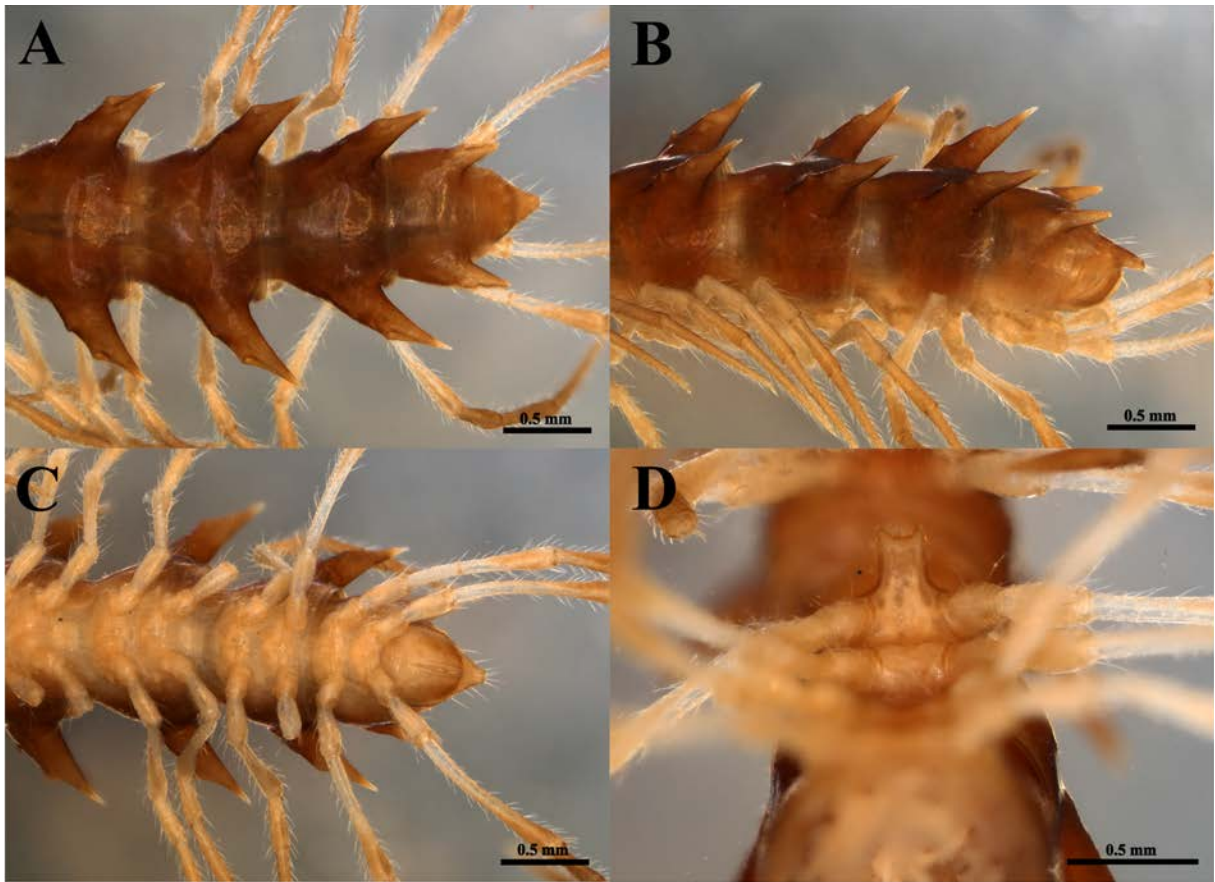


Fig. 8. *Euphyodesmus philippina* (Nguyen & Sierwald, 2010) (FMNH 834). A, posterior part of body, dorsal view; B, lateral view; C, ventral view; D, sternum 5, subventral view.

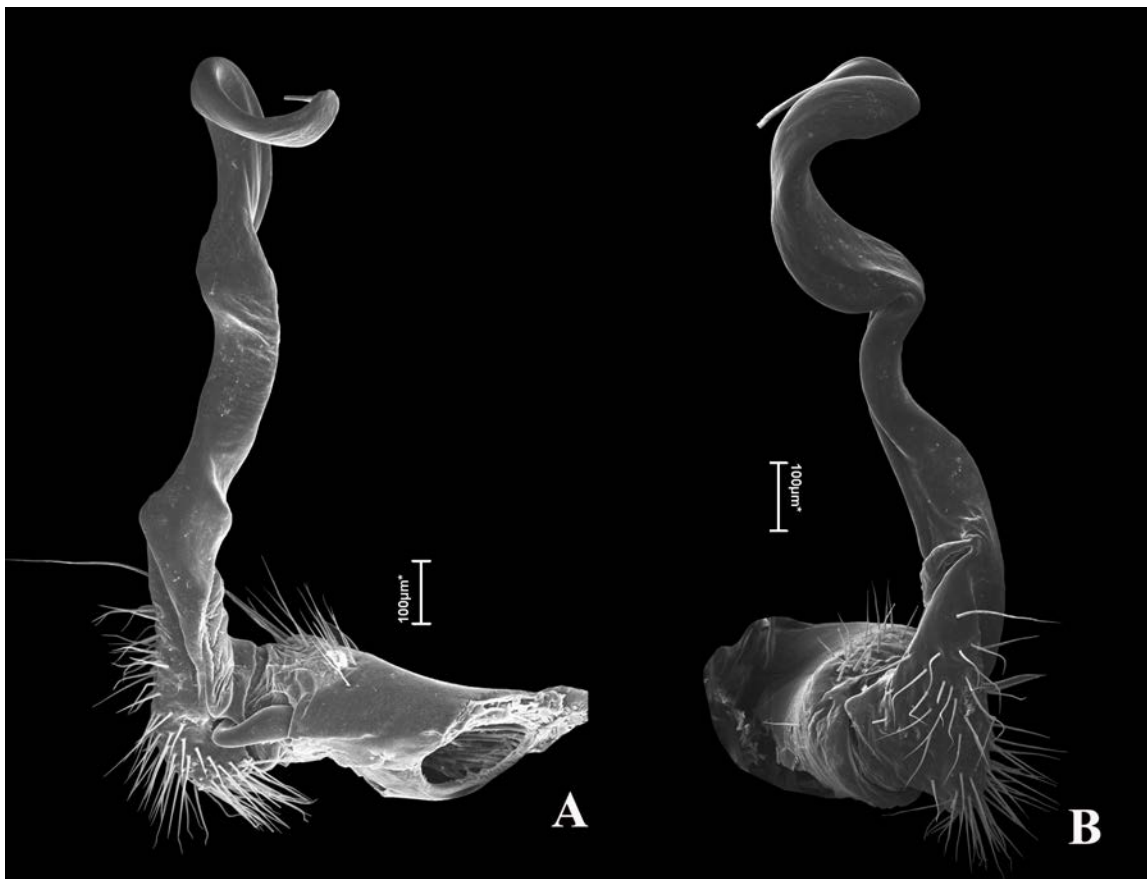


Fig. 9. *Euphyodesmus philippina* (Nguyen & Sierwald, 2010). (FMNH 834). A, right gonopod, mesal view; B, ventral view. Scale bar = 100 μm.

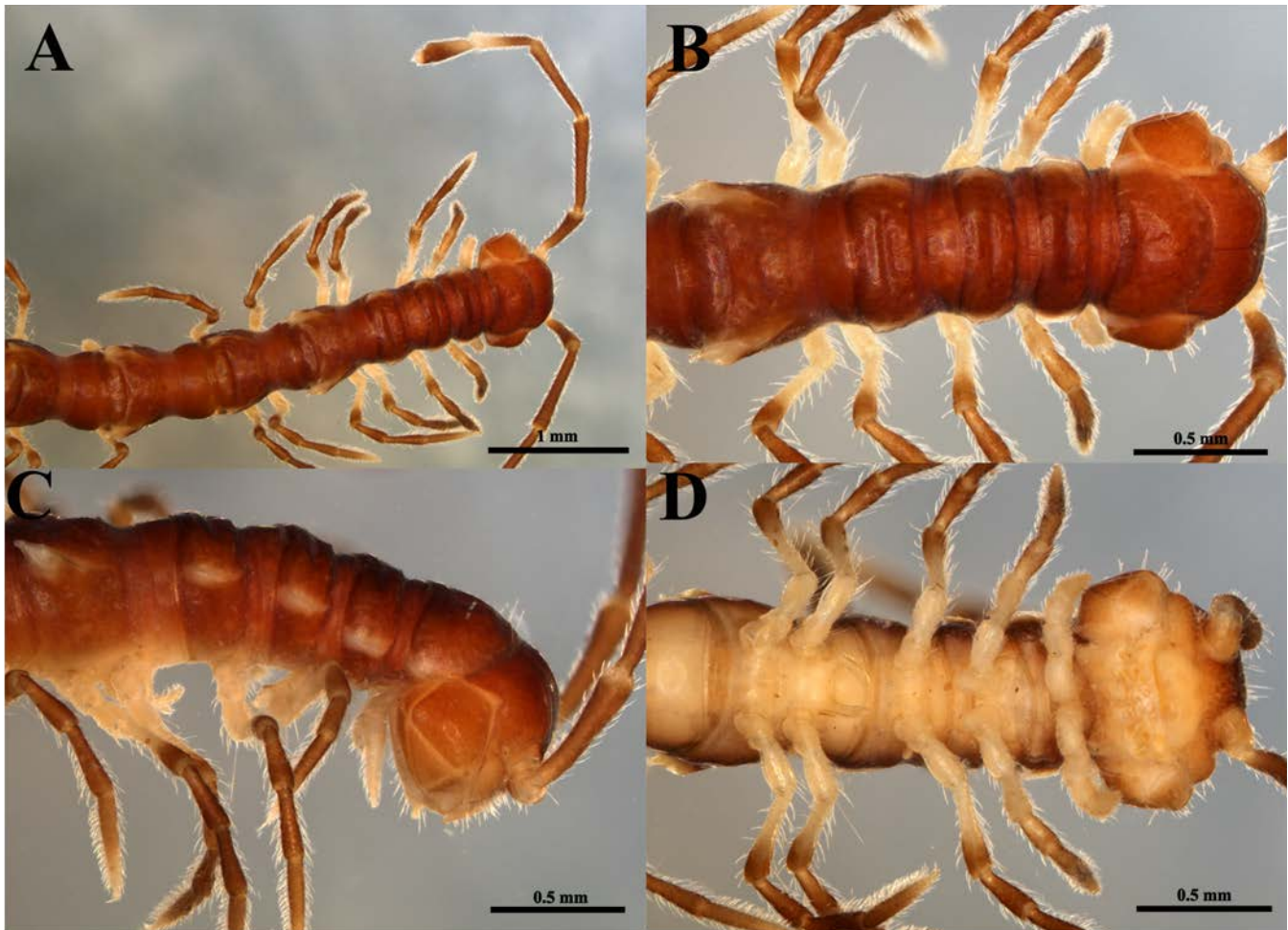


Fig. 10. *Euphyodesmus simplex*, new species (FMNH-INS 4435561). A, B, anterior part of body, dorsal view; C, lateral view; D, ventral view. Scale bar = 1 mm for A, 0.5 mm for B–D.

Euphyodesmus simplex, new species
(Figs. 10–14, 86A)

Material examined. Holotype: PHILIPPINES • 1 male; Palawan Island, Palawan Province, Brooke's Point; near sea level; on leaves of secondary forest near beach; 6 May 1947, leg. Celesting M.; FMNH-INS 011 417.

Paratypes: PHILIPPINES • 2 males, 1 female, 2 juveniles.; same data as for holotype; FMNH-INS 4435561 • 2 males, 2 juveniles; same data as for FMNH-INS 4435561 (#PNM).

Etymology. The species name refers to 'simple' — an adjective used to emphasise the simplicity of the gonopods.

Diagnosis. The species differs from its congeners in having small paraterga, male sternum 5 with two independent finger-shaped processes between coxae 4, gonopod without solenophore, solenomere strongly curved to form a hook.

Description.

Body length ca. 14.2–15.3 mm (male), 15.5 mm (female), width of midbody pro- and metazona ca. 0.6–0.7 mm (male), 0.9 mm (female) and 0.9–1.0 mm (male), 1.2 mm (female), respectively. Holotype: body length ca. 14.2 mm, width of midbody pro- and metazona ca. 0.7 mm and 0.9 mm, respectively.

Body castaneous brown generally, except for lighter sterna and leg coxae, prefemora and tarsi.

Head (Fig. 10) large, much broader than collum in width, clypeolabral region sparsely setose; epicranial suture distinct. Antenna (Fig. 10A) long, slender, reaching body ring 6 if stretched laterally; antennomere 2=3=4=5>6>7>1 in length. Collum (Fig. 10A–C) subequal to body ring 2 in width; surface shining, smooth, oval, with two rows of setae, 4+4 closely near anterior margin, and 3+3 near caudal margin. Paraterga tiny, sub-semicircular, subhorizontal, set lower than collum surface. Transverse sulcus incomplete.

Body (Figs. 10–12) submoniliform until body ring 17, thereafter gradually tapering towards telson. Prozonae and metazonae shining and smooth, sometimes with weak and short wrinkles. Metaterga with 1+1 obvious setae near anterior margin. Transverse sulcus incomplete and starting on metaterga 2–4, but fully developed and reaching the base of paraterga from metatergum 5. Pleurosternal carinae totally absent. Axial line thin, distinct. Constriction between pro- and metazona smooth, neither beaded nor striolate at bottom. Paraterga (Figs. 10–12) smaller on poreless body rings, but more strongly developed on other rings. On pore-bearing rings, caudal part of paraterga modified into high elevated spine. Ozopores located closely to caudal corner of paraterga 5, 7, 9–10, 12–13, 15–19.

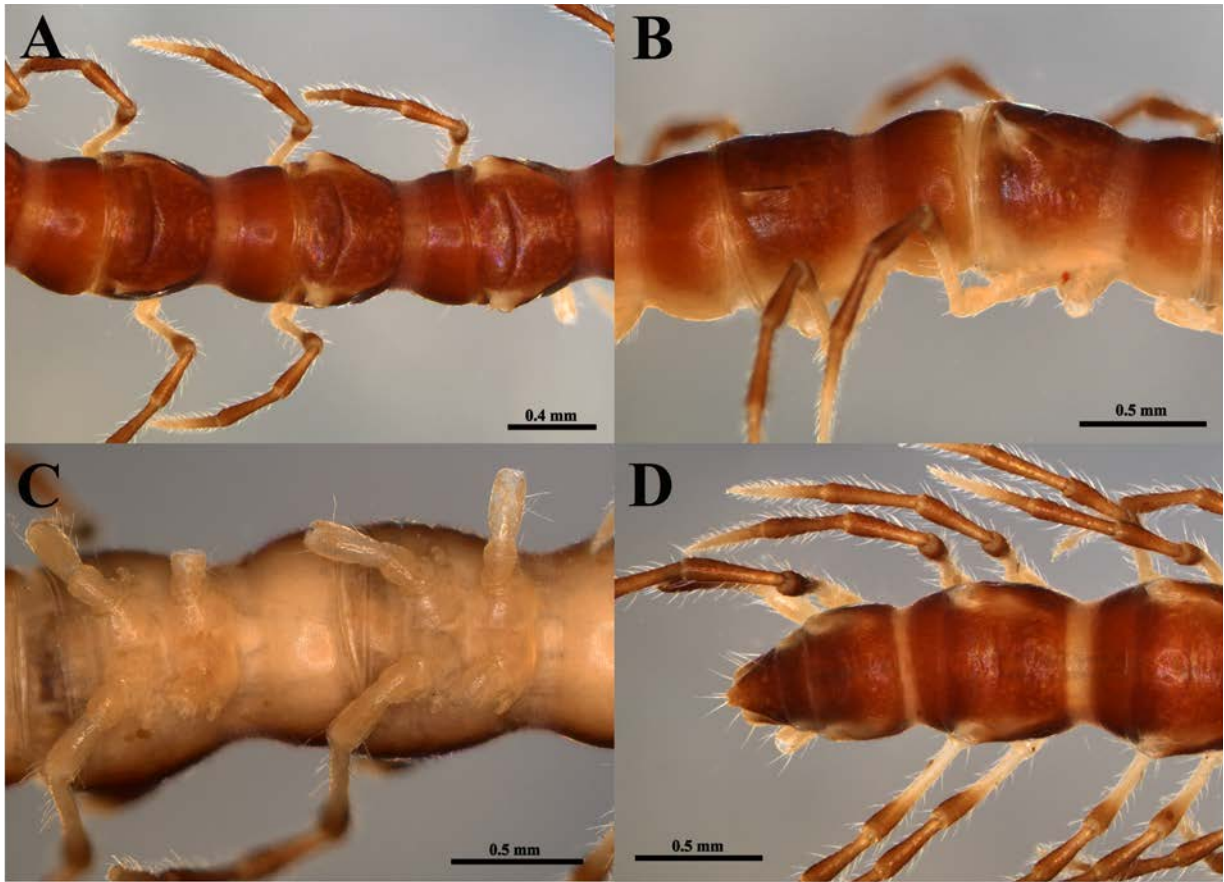


Fig. 11. *Euphyodesmus simplex*, new species (FMNH-INS 4435561). A, segments 9–11, dorsal view; B, lateral view; C, ventral view; D, posterior part of body, dorsal view. Scale bar = 0.4 mm for A, 0.5 mm for B–D.



Fig. 12. *Euphyodesmus simplex*, new species (FMNH-INS 4435561). A, posterior part of body, dorsal view; B, lateral view; C, ventral view; D, sternum 5, subventral view. Scale bar = 0.1 mm for A, C, and D, 0.5 mm for B.

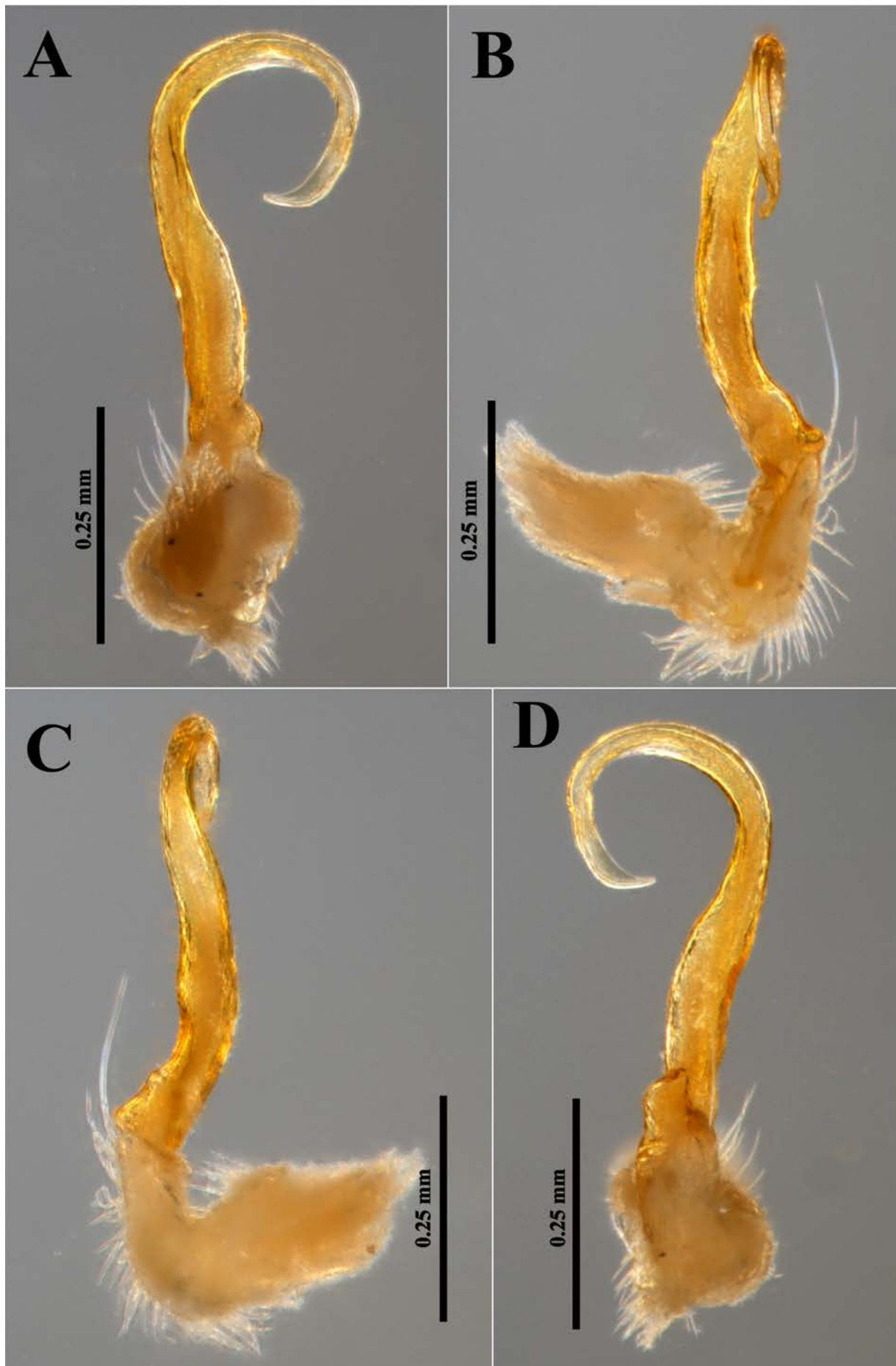


Fig. 13. *Euphyodesmus simplex*, new species (FMNH-INS 4435561). A, left gonopod, dorsal view; B, mesal view; C, lateral view; D, ventral view. Scale bar = 0.25 mm.

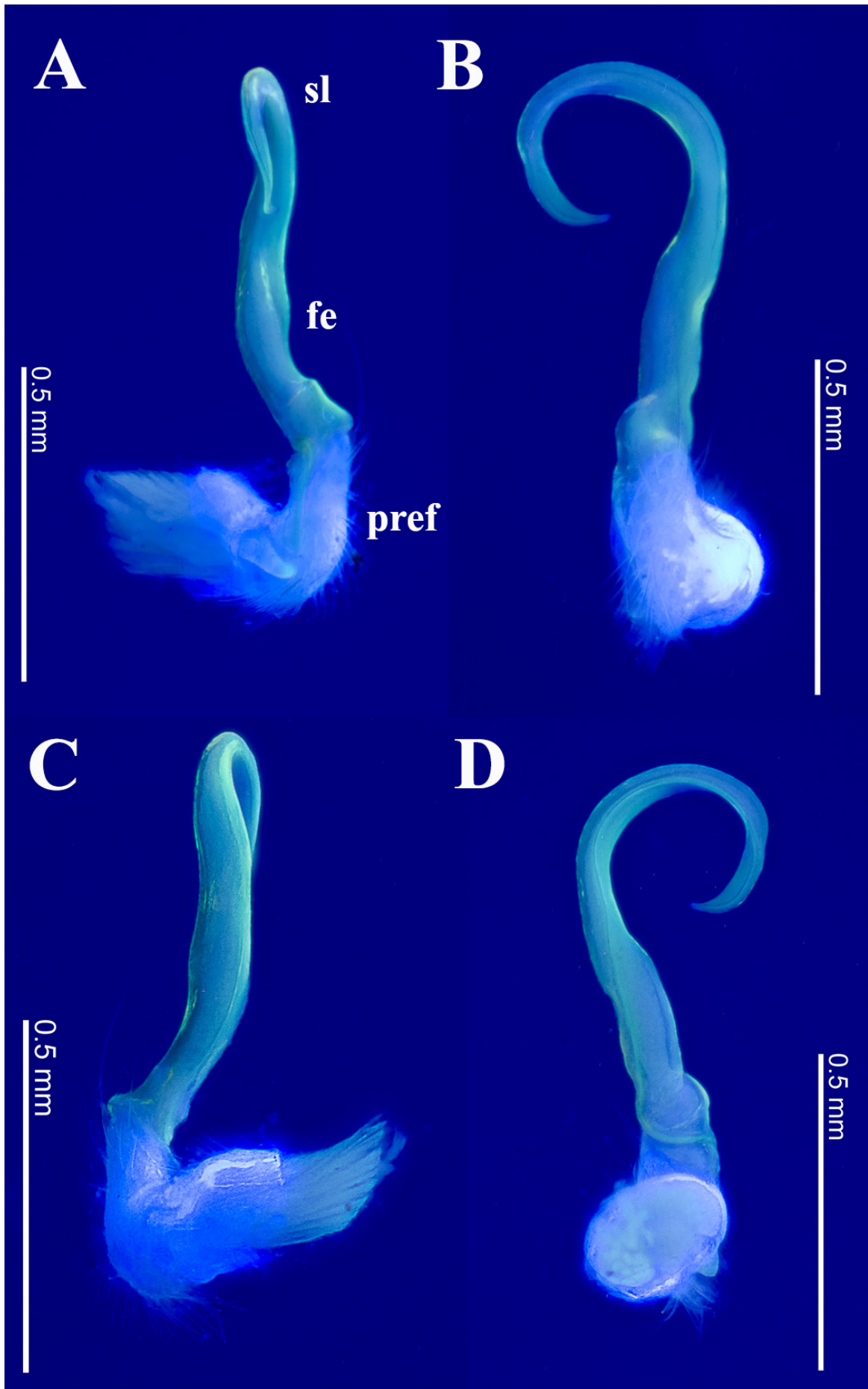


Fig. 14. *Euphyodesmus simplex*, new species (FMNH-INS 4435561). A, left gonopod, mesal view; B, ventral view; C, lateral view; D, dorsal view. Scale bar = 0.5 mm.

Epiproct (Fig. 12A, B) long, broadly truncated, inflated ventrally. Tip with four spinnerets. Hypoproct trapeziform, with two distolateral setae borne on small knobs.

Sterna (Figs. 10D, 11C, 12C) sparsely setose, without modifications except male sternum 5 with two highly elevated, independent finger-form processes directed anteroventrad between coxae 4 (Figs 10D, 12D, 86A).

Legs (Figs. 10, 11) slender and long, ca. 2 times as long as midbody height. Tarsal brushes present only on pregonopodal legs. Prefemora not swollen. Femora without modifications. Each coxa 2 with a large process bearing a gonopore.

Gonopod (Figs. 13, 14) simple, hook-like. Coxite cylindrical; distoventral part sparsely setose. Prefemorite densely setose, separated from femorite by an oblique sulcus laterally. Femorite slightly twisted and slender, with neither modifications nor processes. Demarcation between femorite and postfemoral region absent. Postfemoral region very simple, only consisting of solenomere. Solenophore absent. Solenomere strongly curved to form a hook.

Remarks. The new species may not be a typical *Euphyodesmus* species, because of the gonopod conformation (gonofemorite straight and slender, with neither distal processes nor hypertrophied outgrowth). Regarding gonopod conformation, both *E. philippina* and *E. simplex*, new species, are very similar to *Tholerosoma* species (from Queensland, Australia (Mesibov, 2006)) by having a simple, unbranched gonopod devoid of a solenophore, and male leg 1 with neither a process nor modifications. However, all described *Tholerosoma* species are small and live in soil, their bodies typically tightly encrusted with soil particles (Mesibov, 2006), while the two *Euphyodesmus* species are larger and live on the soil surface as stratobionts.

Within the genus *Euphyodesmus*, the new species is particularly similar to *E. lobatus* Golovatch, 1996 (from Borneo) in having spiniform paraterga and a totally reduced solenophore. However, both species can be distinguished by the gonopod femorite — slender and long in the new species, as opposed to strongly reduced, stout with a distodorsal lobe in *E. lobatus*.

Genus *Eustrongylosoma* Silvestri, 1896

Eustrongylosoma Silvestri, 1896: Annali del Museo Civico di Storia Naturale “Giacomo Doria”, {2}16: 198. Type species: *Strongylosoma fasciatum* Silvestri, 1896 by original designation.

Type species. *Strongylosoma fasciatum* Silvestri, 1896 by original designation

Remarks. The genus currently contains 35 species distributed in Papua New Guinea, Vanuatu, Solomon Islands, the Philippines, and Indonesia (Golovatch & Stoev, 2013; Nguyen & Sierwald, 2013). Members of the genus *Eustrongylosoma* are characterised by the presence of a distinct distolateral lobe on the gonopod femorite and the absence of processes at the base of a long solenomere (Golovatch & Stoev, 2013).

Eustrongylosoma amuyaomontis, new species

(Figs. 15–19, 86B)

Material examined. Holotype: PHILIPPINES • 1 male; Luzon Island, Mountain Province, Barlig Municipality, Mount Amuyao; 2,500 m a.s.l.; on epiphytes on rotting log; March 2007, leg. Balete D.S.; **FMNH-086 488**.

Paratypes: PHILIPPINES • 1 male; same as for holotype; **FMNH-INS 4435567** • 1 male; same as for holotype; **FMNH-086 488 (#PNM)** • 2 males; Luzon Island, Mountain Province, Barlig Municipality, peak of Mount Amuyao; ca. 2,700 m a.s.l.; on epiphytic ferns & orchids, ca. 10 m above ground; March 2007, leg. Balete D.S.; **FMNH-INS 085 778** • 6 males, 4 females; Luzon Island, Mountain Province, Barlig Municipality, Mount Amuyao; 2,500 m a.s.l.; March 2007, leg. Balete D.S.; **FMNH-INS 085 781** • 2 males, 2 females; same data as for **FMNH-INS 085 781 (#PNM)**.

Diagnosis. The species is very similar to *E. penevi* Golovatch & Stoev, 2013 from Luzon Island, but differs in having four rows of 4+4, 3+3, 3+3 and 4+4 setae on metaterga, gonopod with an oblique, long spine at distal part of femorite and gonopod tip pointed, without subterminal lobes.

Etymology. Named after Mount Amuyao where the types were found. A noun in apposition.

Description.

Body length ca. 23.3–26.6 mm (male), 24–30 mm (female); width of midbody pro- and metazona 1.3–1.5 mm (male), 1.7–1.8 mm (female) and 1.5–1.7 mm (male), 2.0–2.1 mm (female), respectively. Holotype body length ca. 24.5 mm, width of midbody pro- and metazona 1.4 mm and 1.6 mm, respectively.

Head, antenna, pleura, major part of metazona and posterior half of prozonae castaneous brown; antennomere 6 & 7 black; legs and sterna yellowish brown except tibia and tarsi darker; anterior half of prozonae yellowish brown.

Head (Fig. 15A, B) slightly larger than collum; clypeolabral region sparsely setose; frons slightly convex, divided into two parts by a distinct epicranial suture. Antenna long and subclaviform; antennomere 2>3>4=5=6>7>1 in length.

Collum (Fig. 15A, B) slightly smaller than body ring 2 in width; surface shining, smooth, oval, with 2 rows of setae, 5+5 close to anterior margin, and 4+4 near caudal margin. Paraterga strongly reduced as tiny ridge.

Body rings (Fig. 15) 4<3<2=5–17 in width, submoniliform, gradually tapering towards telson. Prozonae shining, smooth. Metaterga shining, finely rugulose on posterior margin, with four rows of 4+4, 3+3, 3+3 and 4+4 setae. Third and fourth rows of setae situated posterior to narrow and incomplete transverse sulcus on metaterga 5–19. Axial line thin, distinct. Constriction between pro- and metazona narrow and deep, neither beaded nor striolate at bottom. Pleura shining and smooth. Pleurosternal carinae totally absent.

Paraterga (Figs. 15, 16B, C) poorly developed, present only as tiny ridge on poreless body rings, but more developed on pore-bearing rings. Ozopores located on lateral sides of body rings 5, 7, 9–10, 12–13, 15–19.

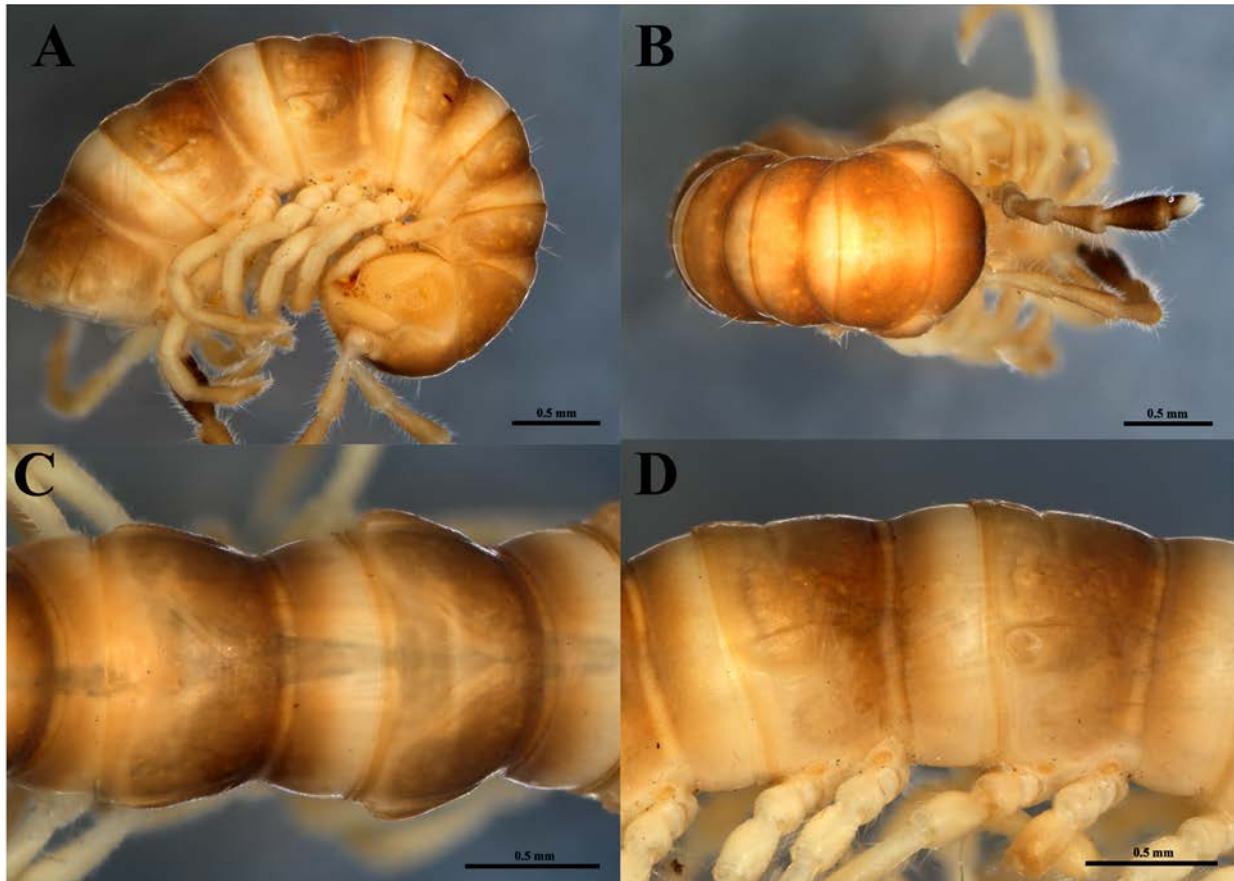


Fig. 15. *Eustrongylosoma amuyaomontis*, new species. Holotype (FMNH-086 488). A, anterior part of body, lateral view; B, dorsal view; C, segments 10–11, dorsal view; D, lateral view. Scale bar = 0.5 mm.

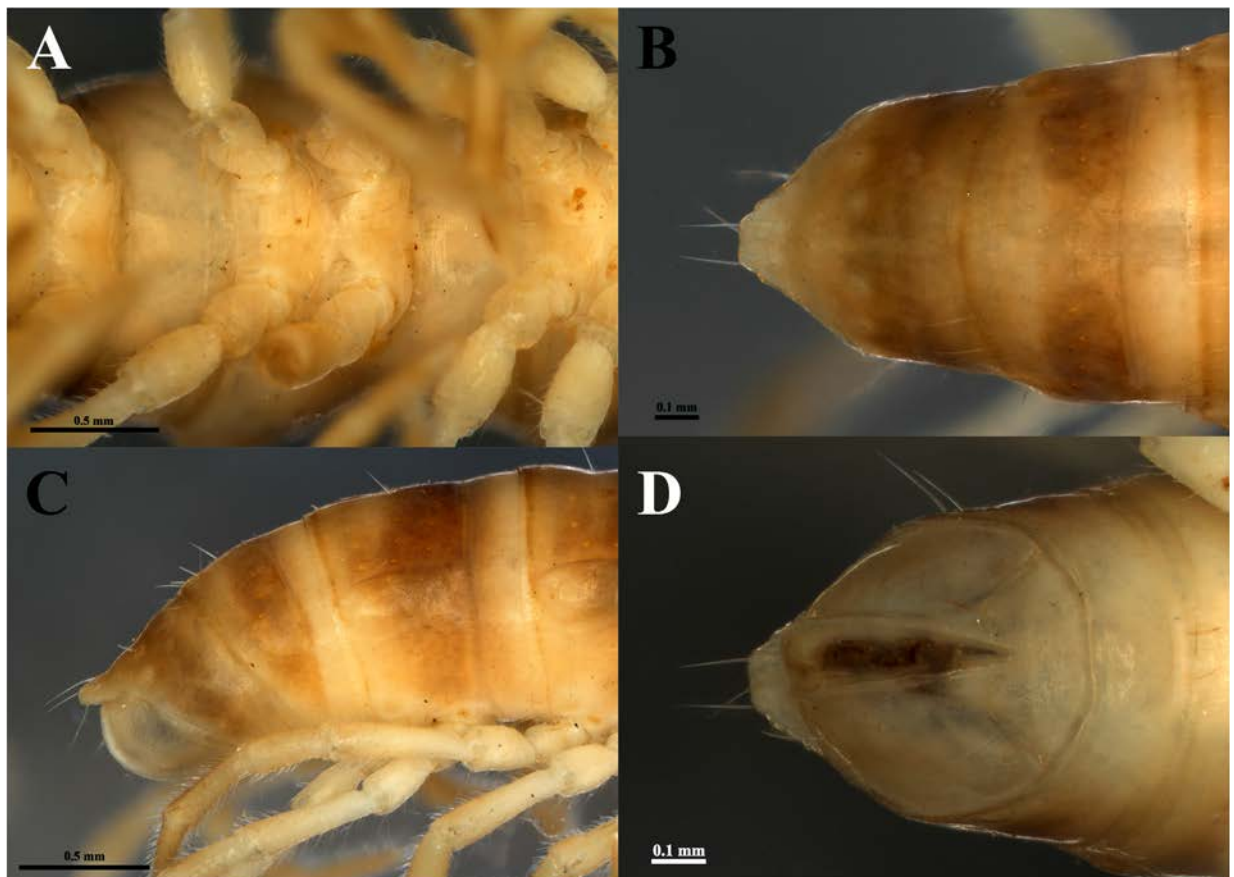


Fig. 16. *Eustrongylosoma amuyaomontis*, new species. Holotype (FMNH-086 488). A, sternum 10, ventral view; B, posterior part of body, dorsal view; C, lateral view; D, telson, ventral view. Scale bar = 0.5 mm for A and C, 0.1 mm for B and D.

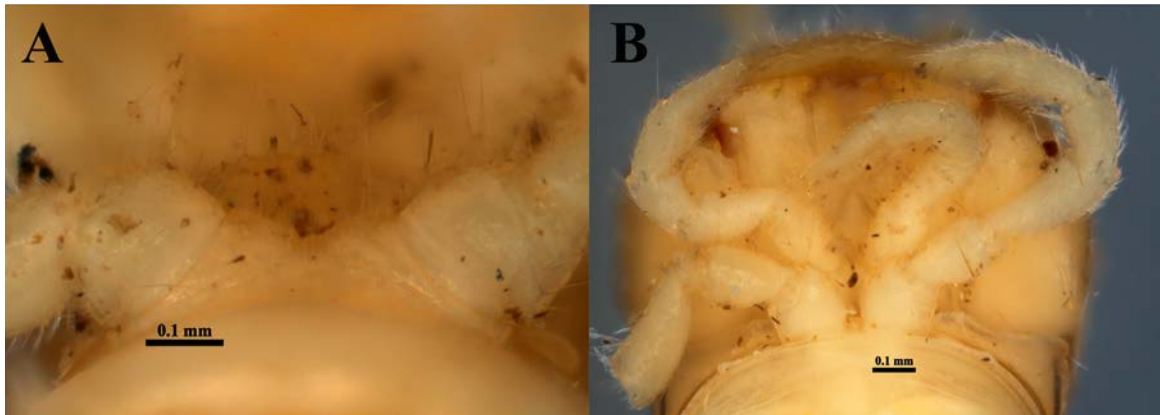


Fig. 17. *Eustrongylosoma amuyaomontis*, new species. Holotype (FMNH-086 488). A, sternum 5, subventral view; B, legs 2–3, subposterior view.

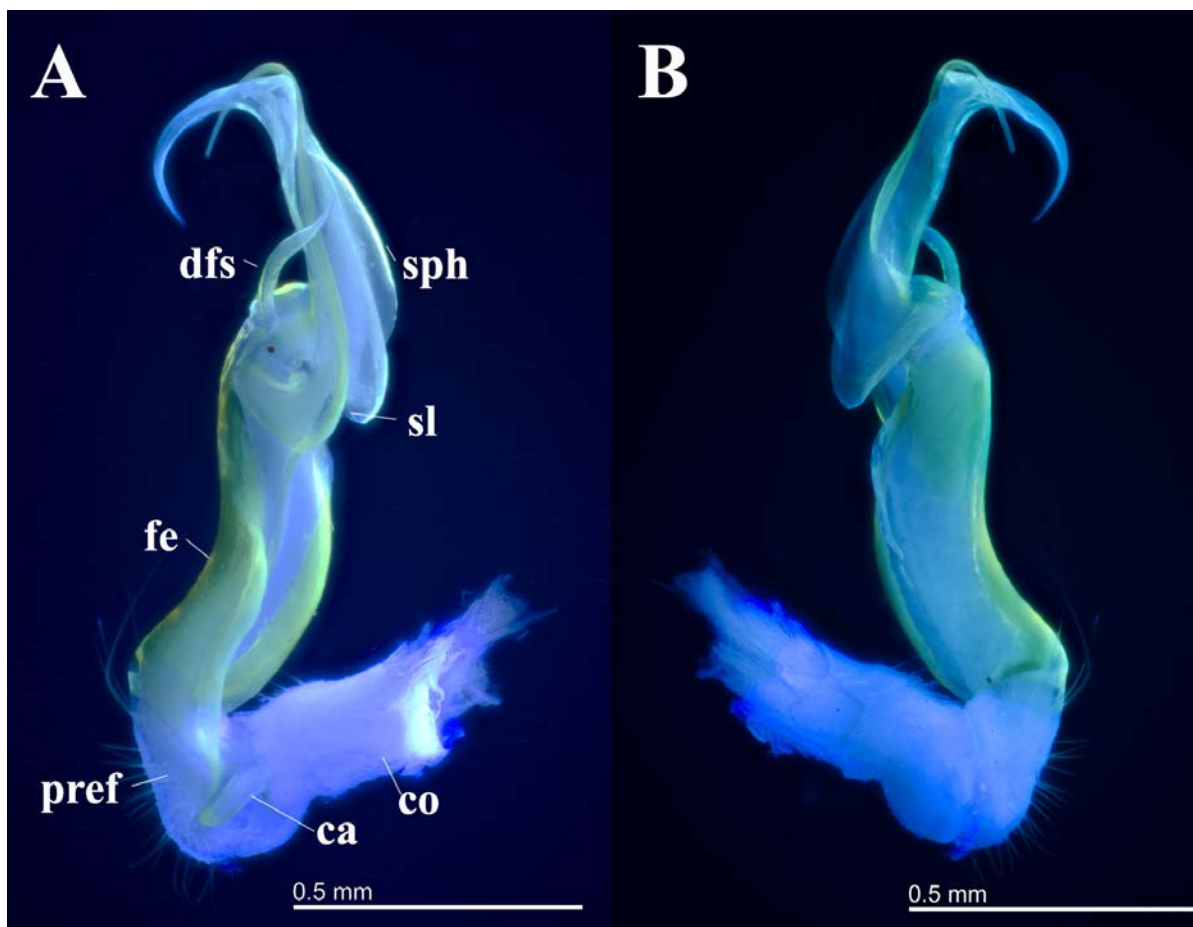


Fig. 18. *Eustrongylosoma amuyaomontis*, new species. Holotype (FMNH-086 488). A, left gonopod, mesal view; B, lateral view. Scale bar = 0.5 mm.

Epiproct (Fig. 16B–D) very short, broadly truncated, dorsoventrally inflated. Tip with four spinnerets. Hypoproct (Fig. 16D) subtrapeziform, with two distolateral setiferous knobs.

Sterna (Figs. 16A, 17A, 86A) sparsely setose without modifications. Cross impression distinct.

Legs long and slender, ca. 2.0 (male), 1.7 (female) times as long as midbody height. Tarsal brushes present on all legs till body ring 16.

Gonopods (Figs. 18, 19) simple; coxite cylindrical, slightly shorter than femorite; distoventral part sparsely setose. Prefemorite suboval, densely setose, set off from femorite by

a subtransverse suture. Femorite long, parallel-sided, grooved dorsally. Postfemoral region falcate, resembling a hook from ventral view, with a basal oblique spiniform process; solenophore as long as solenomere; lamina medialis present only on distal part of solenophore; lamina lateralis well developed, with a distal tooth. Tip of solenophore pointed. Solenomere flagelliform, almost sheathed by solenophore.

Remarks. The new species and *E. penevi* Golovatch & Stoev, 2013, *E. exiguum* Hoffman, 1978, *E. kuekenthali* (Attems, 1898) form a group sharing a prominent distofemoral long spine on the gonopod.

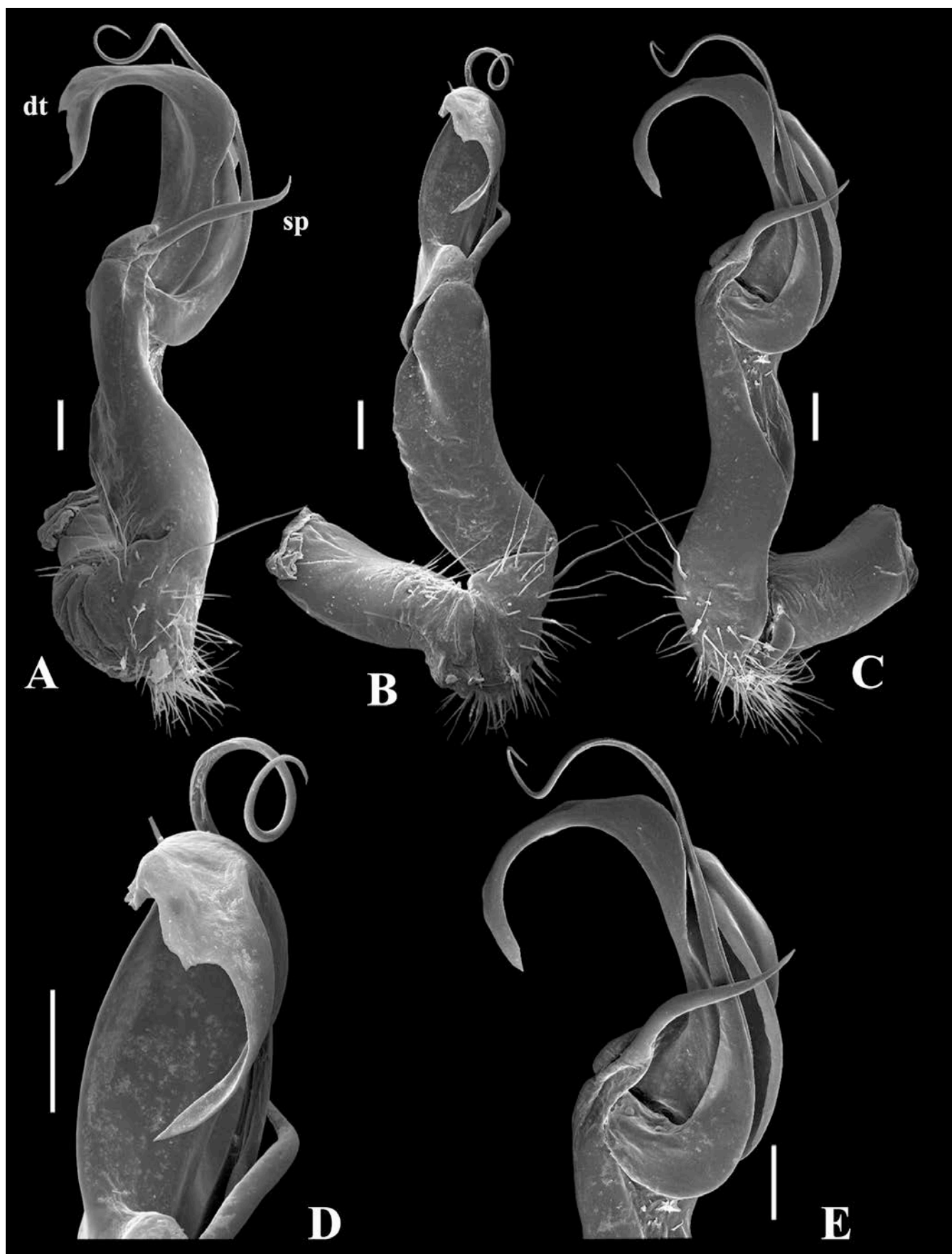


Fig. 19. *Eustrongylosoma amuyaomontis*, new species. Holotype (FMNH-086 488). A, left gonopod, ventral view; B, lateral view; C, mesal view; D, postfemoral region, ventral view; E, mesal view. Scale bar = 0.1 mm.

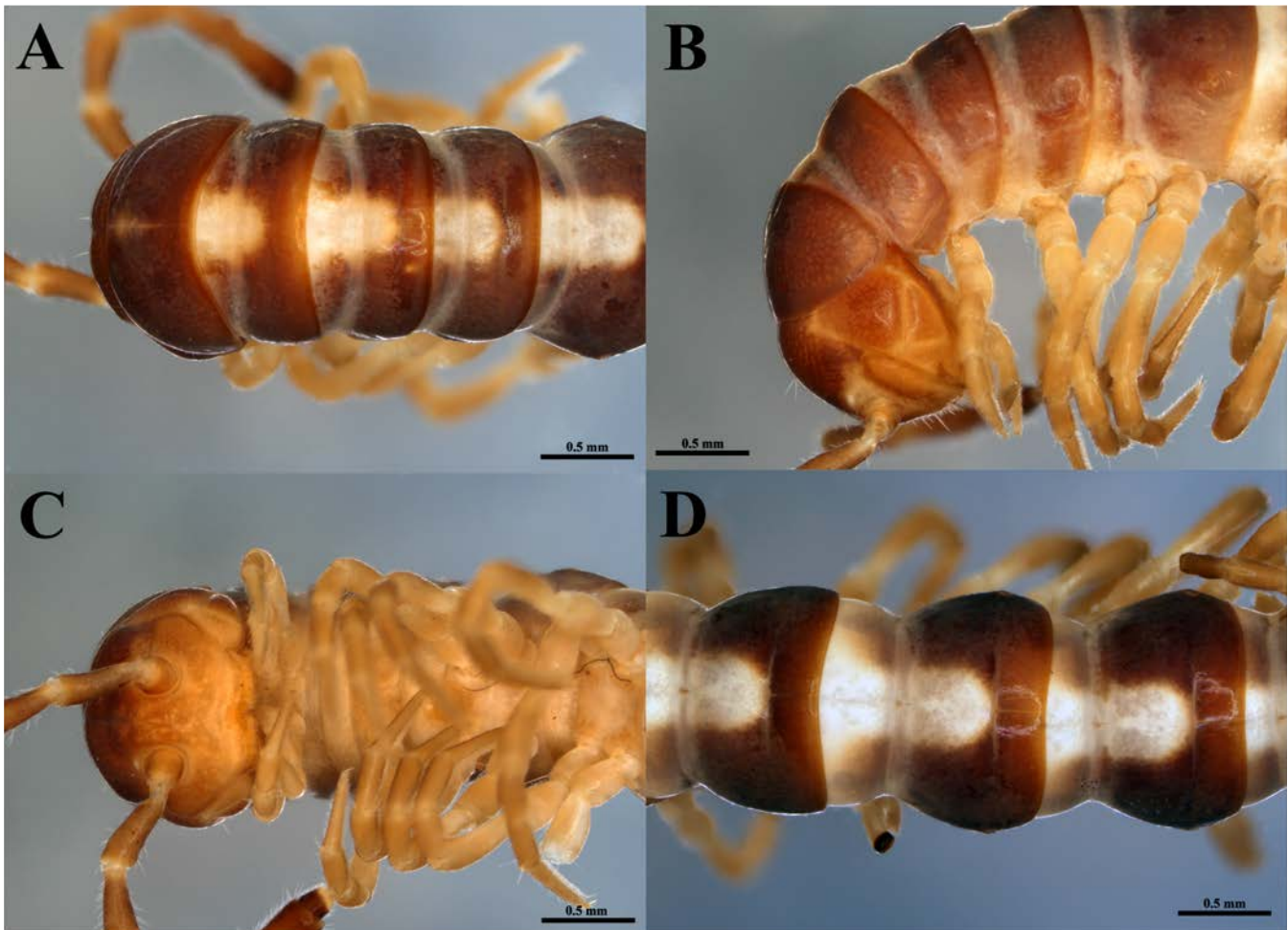


Fig. 20. *Eustrongylosoma erectispinum*, new species (FMMC 6276). A, anterior part of body, dorsal view; B, lateral view; C, ventral view; D, segments 8–10, dorsal view. Scale bar = 0.5 mm.

***Eustrongylosoma erectispinum*, new species**
(Figs. 20–25, 86C)

Material examined. Holotype: PHILIPPINES • 1 male; Mindanao Island, Davao Province, Camp Mainit, East slope of Mount Apo; elev. 4,300 ft (= 1,310 m a.s.l.); original forest, rotting wood; September 1946, leg. Hoogstraal H.; **FMNH-INS 011 962**.

Paratypes: PHILIPPINES • 1 female, 3 juveniles; together with holotype; **FMNH-INS 4435563** • 2 females; Mindanao Island, Davao Province, Camp Meran, East slope of Mount Apo; elev. 6,000 ft (= 1,828 m a.s.l.); original forest, beating tree ferns; 8 September 1946, leg. Werner F.G.; **FMNH-INS 085 776** • 3 females, 3 juveniles; Mindanao Island, Davao Province, Camp Meran, East slope of Mount Apo; elev. 6,000 ft (= 1,828 m a.s.l.); original forest, beating tree ferns; 9 September 1946, leg. Hoogstraal H.; **FMNH-INS 085 777 (#PNM)** • 1 male, 1 female, 3 juveniles; Mindanao Island, Davao Province, Camp Meran, East slope of Mount Apo, elev. 6,000 ft (= 1,828 m a.s.l.); original forest; 5 September 1946, leg. Werner F.G.; **FMMC 6276 (#PNM)**.

Diagnosis. The species differs from other *Eustrongylosoma* species in metaterga with only a row of setae; gonopod femorite with long and broad dorsal lamina and erect blade-shaped process at distal part.

Etymology. The adjective ‘erectispinum’ is used to emphasise a long and erect blade-shaped process at the distal part of the gonopod femorite.

Description.

Body length ca. 25.6–31.9 mm (male), 24.2–32.2 mm (female); width of midbody pro- and metazona 1.4–1.6 mm (male), 1.9–2.3 mm (female) and 1.6–2.0 mm (male), 2.2–2.6 mm (female), respectively. Holotype ca. 31.9 mm in length; width of midbody pro- and metazona 1.6 mm and 2.0 mm, respectively.

Head (Fig. 20A–C) castaneous brown; clypeolabral region sparsely setose; frons slightly convex, divided into 2 parts by a distinct epicranial suture. Antenna castaneous brown, long and slender; antennomere 2>3>4=5=6>7=1 in length. Collum (Fig. 20A, B) slightly smaller than head, suboval; surface shining, smooth, with a row of 4+4 setae near anterior margin. Paraterga strongly reduced, almost missing.

Body (Figs. 20A–C, 21A, D) submoniliform on body rings 2–17, thereafter tapering toward telson. Prozonae with a broad median brownish yellow part; laterodorsal parts darker; lateral side brownish yellow; surface shining and smooth. Metazonae dark brown, with a broad median brownish yellow area in anterior half of metaterga. Transverse sulcus fully developed on metaterga 4–19, narrow and thin, neither striolate nor beaded at bottom. Constriction between pro- and metazona

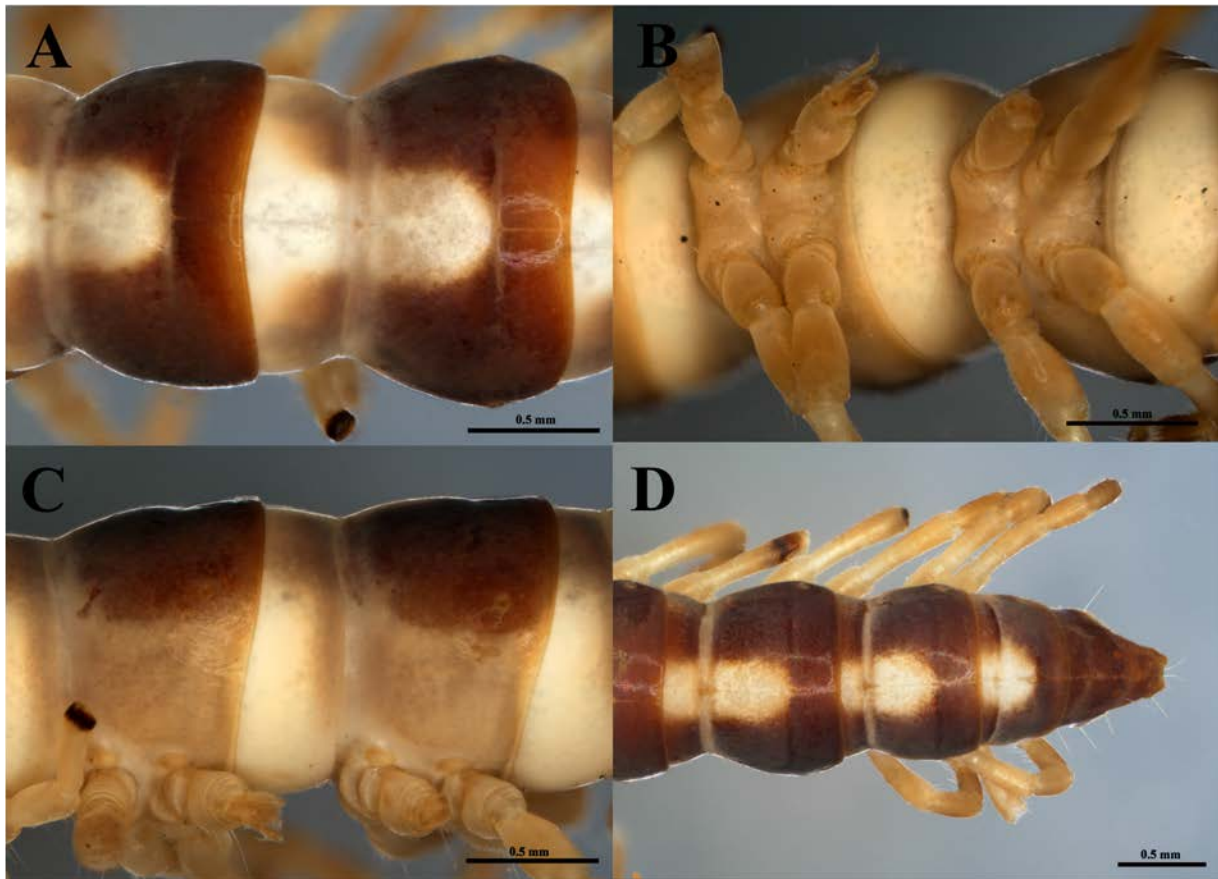


Fig. 21. *Eustrongylosoma erectispinum*, new species (FMMC 6276). A, segments 8–10, dorsal view; B, ventral view; C, lateral view; D, posterior part of body, dorsal view. Scale bar = 0.5 mm.

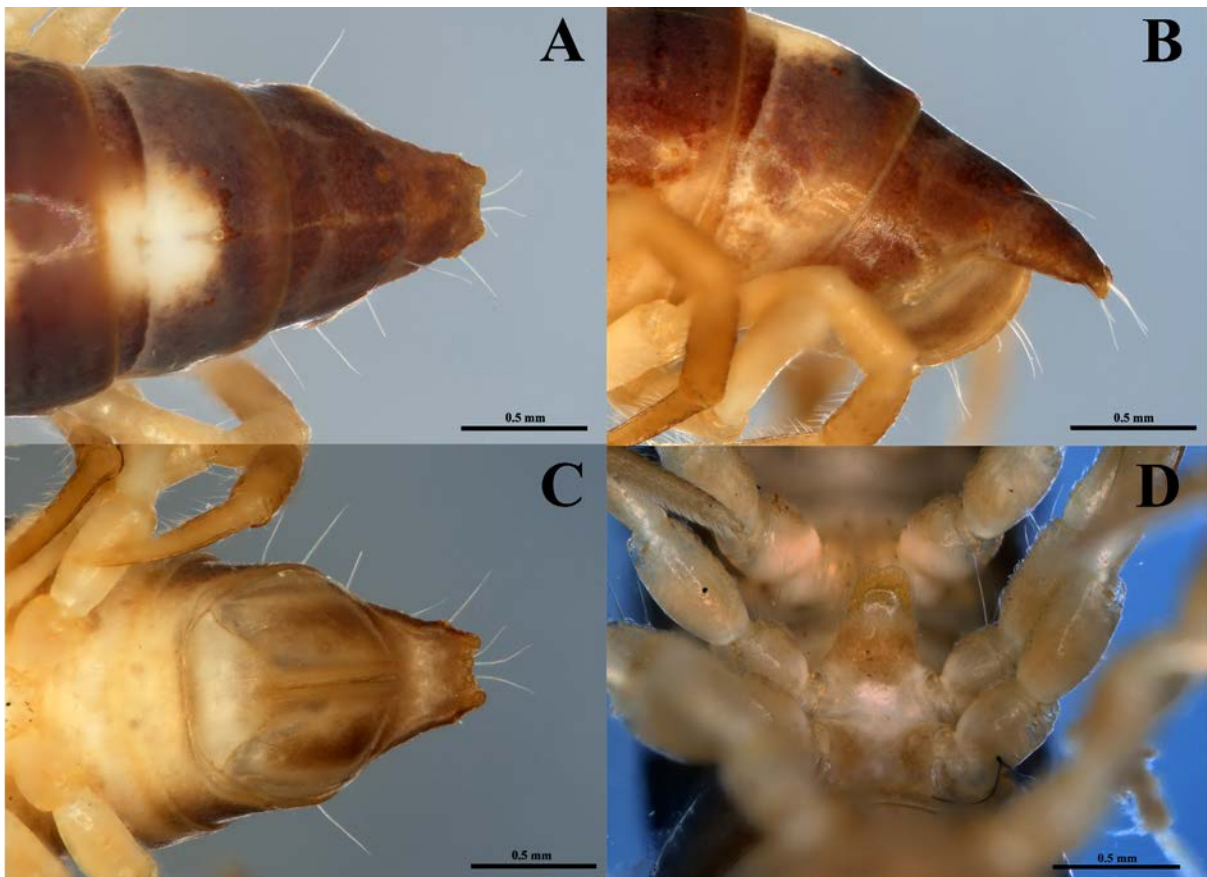


Fig. 22. *Eustrongylosoma erectispinum*, new species (FMMC 6276). A, telson, dorsal view; B, lateral view; C, ventral view; D, sternum 5, subventral view. Scale bar = 0.5 mm.

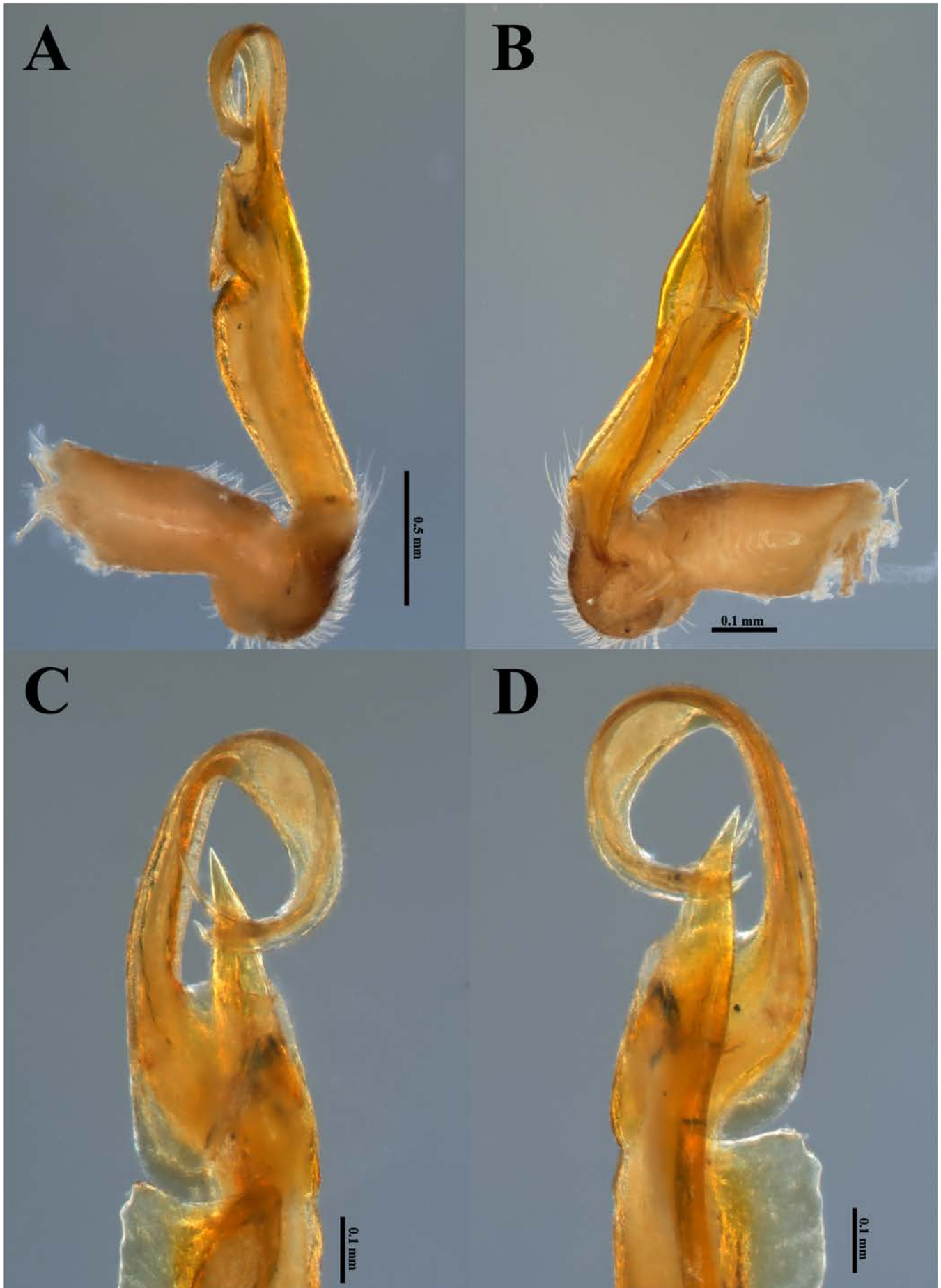


Fig. 23. *Eustrongylosoma erectispinum*, new species (FMMC 6276). A, right gonopod, lateral view; B, mesal view; C, postfemoral region, dorsal view; D, ventral view. Scale bar = 0.1 mm.

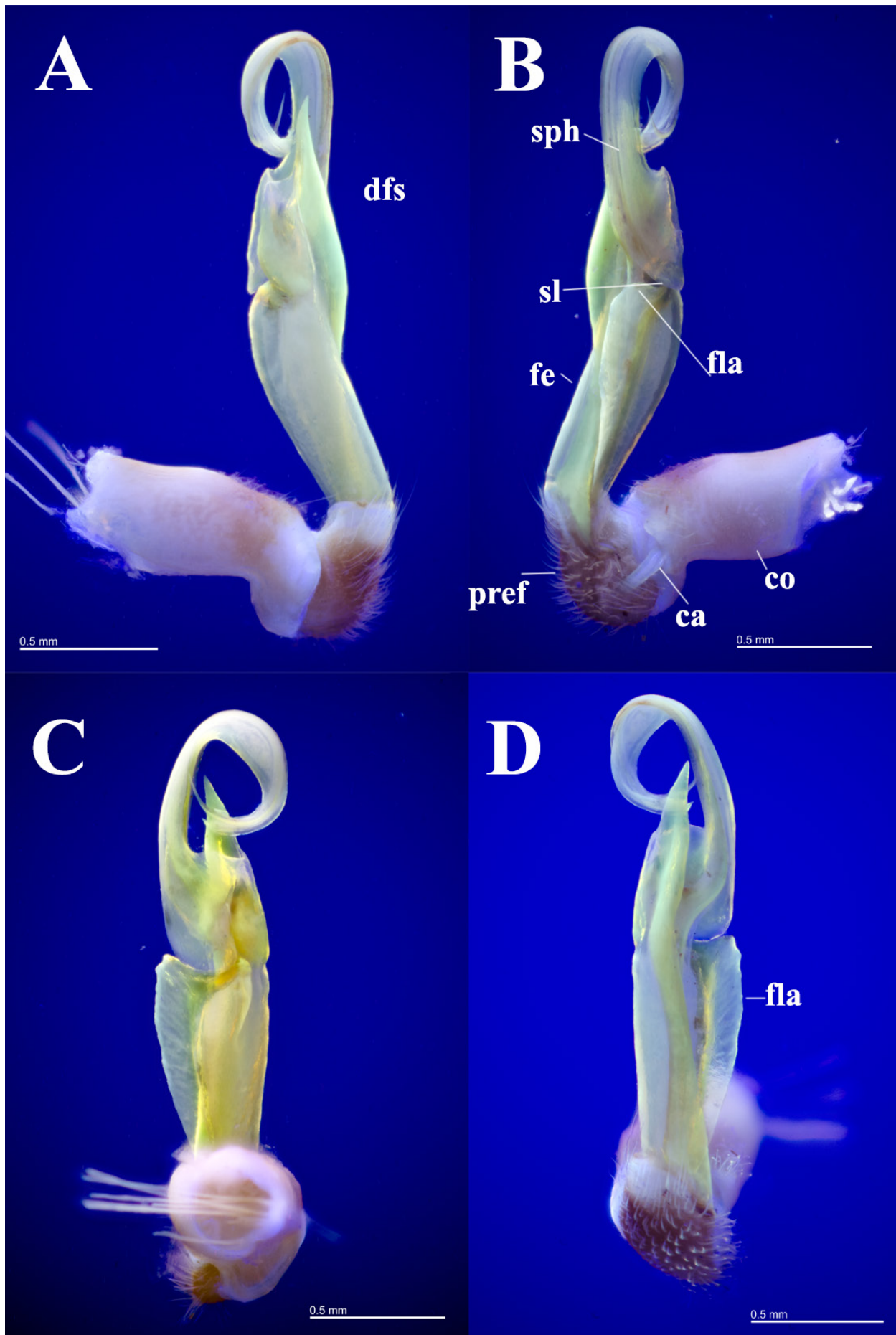


Fig. 24. *Eustrongylosoma erectispinum*, new species (FMMC 6276). A, right gonopod, lateral view; B, mesal view; C, dorsal view; D, ventral view. Scale bar = 0.1 mm.



Fig. 25. *Eustronglysoma erectispinum*, new species. Holotype (FMNH-INS 011 962). A, right gonopod, ventromesal view; B, ventral view; C, lateral view; D, postfemoral region, lateral view; E, ventral view. Scale bar = 0.1mm.

wide, striolate at bottom. Metaterga shining, smooth, with a row of 4+4 setae near posterior margin. Pleura shining, finely rugulose. Pleurosternal carinae totally absent.

Paraterga (Figs. 20 A–C, 21A, D) strongly reduced on poreless body rings, but more developed as a tiny ridge on pore-bearing body rings. Ozopores located on lateral side of paraterga 5, 7, 9–10, 12–13, 15–19.

Epiproct (Figs. 21D, 22A–C) long, broadly truncated, inflated dorsoventrally, tip strongly concave to form two lateral tubercles, with four spinnerets. Hypoproct (Fig. 22C) subtrapeziform, with two distolateral setiferous knobs.

Sterna sparsely setose, without modifications except for male sternum 5 with a highly elevated, triangular, setiferous process directed anteroventrad between coxae 4 (Figs. 22D, 86C). Legs long and slender, ca. 1.4–1.5 (male), 1.2–1.4 (female)

times as long as midbody height. Tarsal brushes present only on pregonopodal legs. Prefemora not swollen. Femora without modifications.

Gonopod (Figs 23–25) simple. Coxite cylindrical, shorter than femorite; distoventral part sparsely setose. Prefemorite densely setose, separated from femorite by a transverse sulcus laterally. Femorite long, somewhat slender, but slightly expanded distad, with a long and broad lamina dorsally, and with a well-developed, erect, distal knife-shaped process. Demarcation between femorite and postfemoral region absent. Postfemoral region suberect, except spiral distal part. Solenophore with both well-developed lamina medialis and lamina lateralis, without additional processes. Solenomere flagelliform, completely sheathed by solenophore. Tip of solenophore divided into 3 subequal, small prongs.

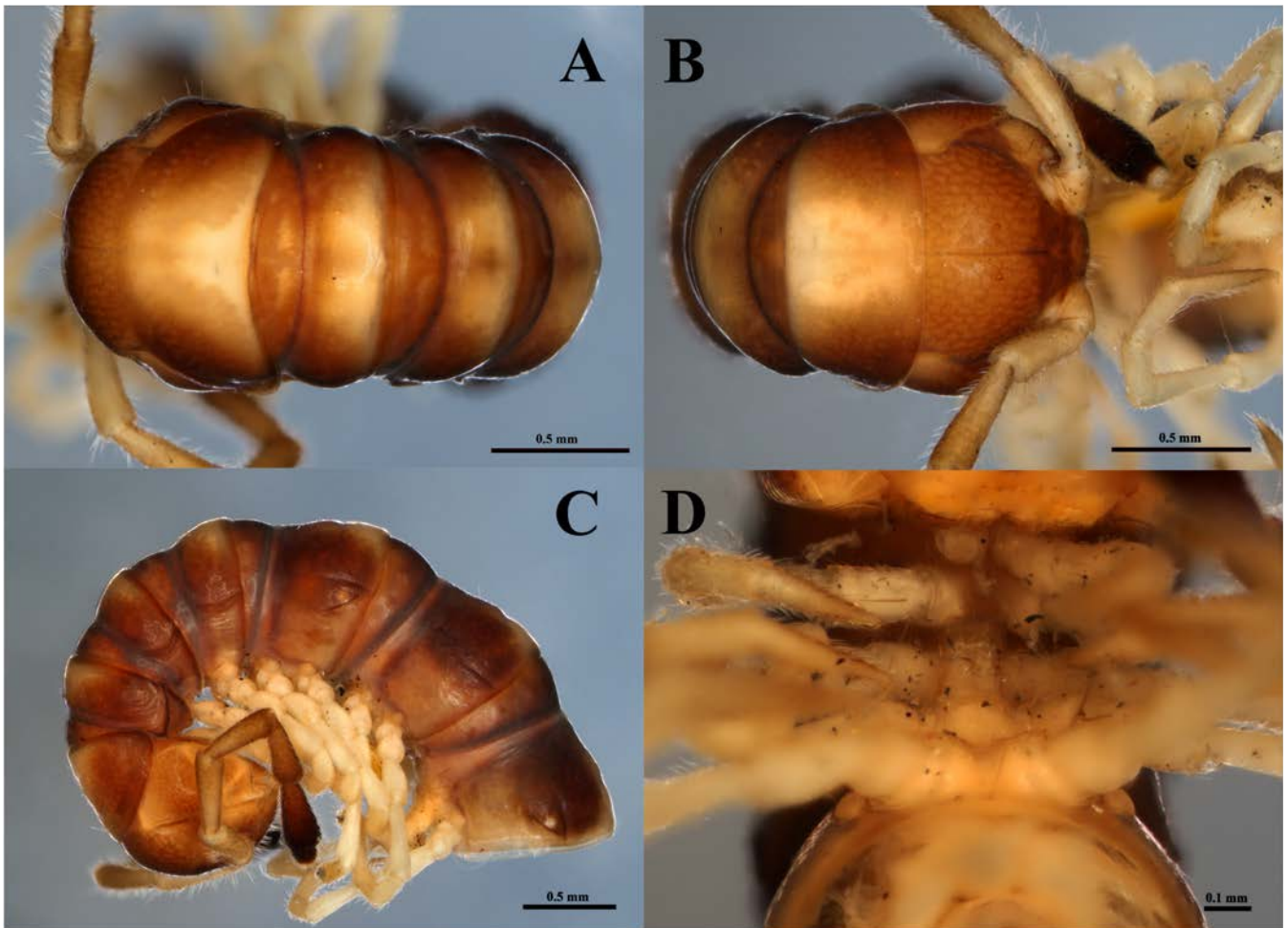


Fig. 26. *Eustrongylosoma peniculum*, new species. Holotype (FMNH-086 486). A, anterior part of body, dorsal view; C, lateral view. B, head and collum, dorsal view. D, sternum 5, submesal view. Scale bar = 0.5 mm for A–C, and 0.1 mm for D.

***Eustrongylosoma peniculum*, new species**
(Figs. 26–31, 86D)

Material examined. Holotype: PHILIPPINES • 1 male; Luzon Island, Mountain Province, Barlig Municipality, near peak of Mount Amuyao; elev. 2,600m a.s.l.; on rotting pine trunk; March 2007, leg. Balete D.S.; **FMNH-086 486**. Paratypes: PHILIPPINES • 1 female; same data as holotype; **FMNH-INS 4435564** • 1 male; Luzon Island, Mountain Province, Barlig Municipality, Mount Amuyao; elev. 2,500m a.s.l.; March 2007, leg. Balete D.S.; **FMNH-INS 085 780 (#PNM)**.

Diagnosis. The species differs from its congeners in gonopod femorite being expanded laterad, solenophore with finely setose brush marginally.

Etymology. Named after the presence of a setose brush on the margin of the gonopod solenophore.

Description.

Body length ca. 22.8mm (male), 22.4mm (female); width of midbody pro- and metazona 1.3mm (male), 1.7mm (female) and 1.6mm (male), 2.0mm (female), respectively. Head castaneous brown; frons blackish brown; pleura castaneous brown; prozonae, lateral parts of metazonae

black; metazonal dorsa with a broad median brownish yellow; axial line black; leg and sterna whitish yellow, but tarsi and postfemora brownish yellow; antennomeres 6 & 7 black, other antennomeres castaneous brown.

Head (Fig. 26A–C) somewhat larger than collum; frons convex, divided into 2 parts by a distinct epicranial suture. Antenna long, slender; antennomere 2=3=4=5=6>1>7 in length, but antennomere 6 largest.

Collum (Fig. 26A–C) slightly smaller than body ring 2 in width, oval; surface shining, smooth, with a row of 4+4 setae near anterior margin. Paraterga reduced and almost absent. Body (Figs. 26A, 27A) submoniliform; prozonae and metazonae shining, smooth; Constriction between pro- and metazona broad, finely striolate at bottom; metaterga with a row of 2+2 setae before transverse sulcus which present on body rings 5–19, short, thin, neither striolate nor beaded at bottom. Axial line thin, distinct. Pleura smooth and shining. Pleurosternal carinae totally absent.

Paraterga (Figs. 26C, 27A, B & D) strongly reduced as a tiny ridge on poreless body rings, but more developed on pore-bearing rings. Ozopores located on lateral side of body ring 5, 7, 9–10, 12–13, 15–19.

Epiproct (Figs. 27D, 28) short, broadly truncated, inflated dorsoventrally. Hypoproct (Fig. 41D) subtrapeziform, with two distolateral setiferous knobs.

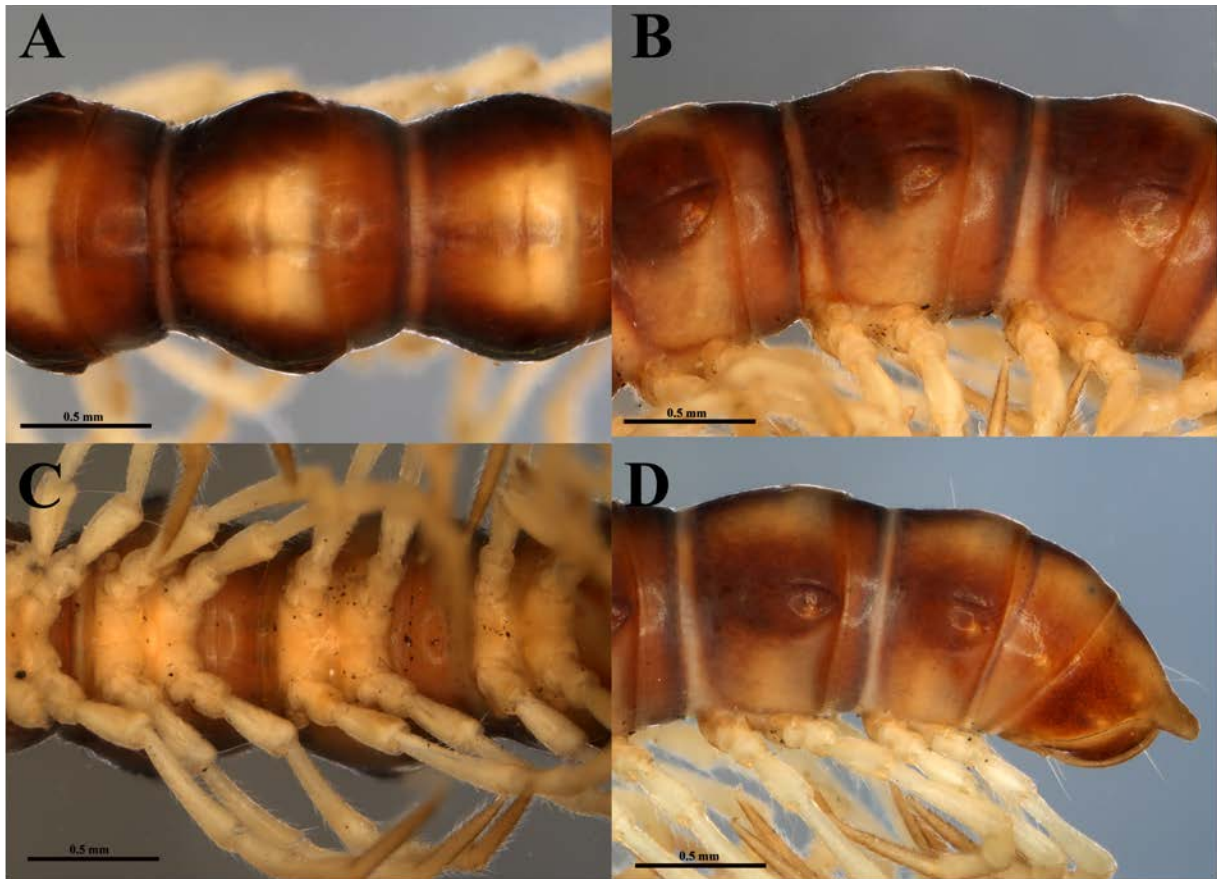


Fig. 27. *Eustrongylosoma peniculum*, new species. Holotype (FMNH-086 486). A, segments 8–10, dorsal view; B, lateral view; C, ventral view. D, posterior part of body, lateral view. Scale bar = 0.5 mm.

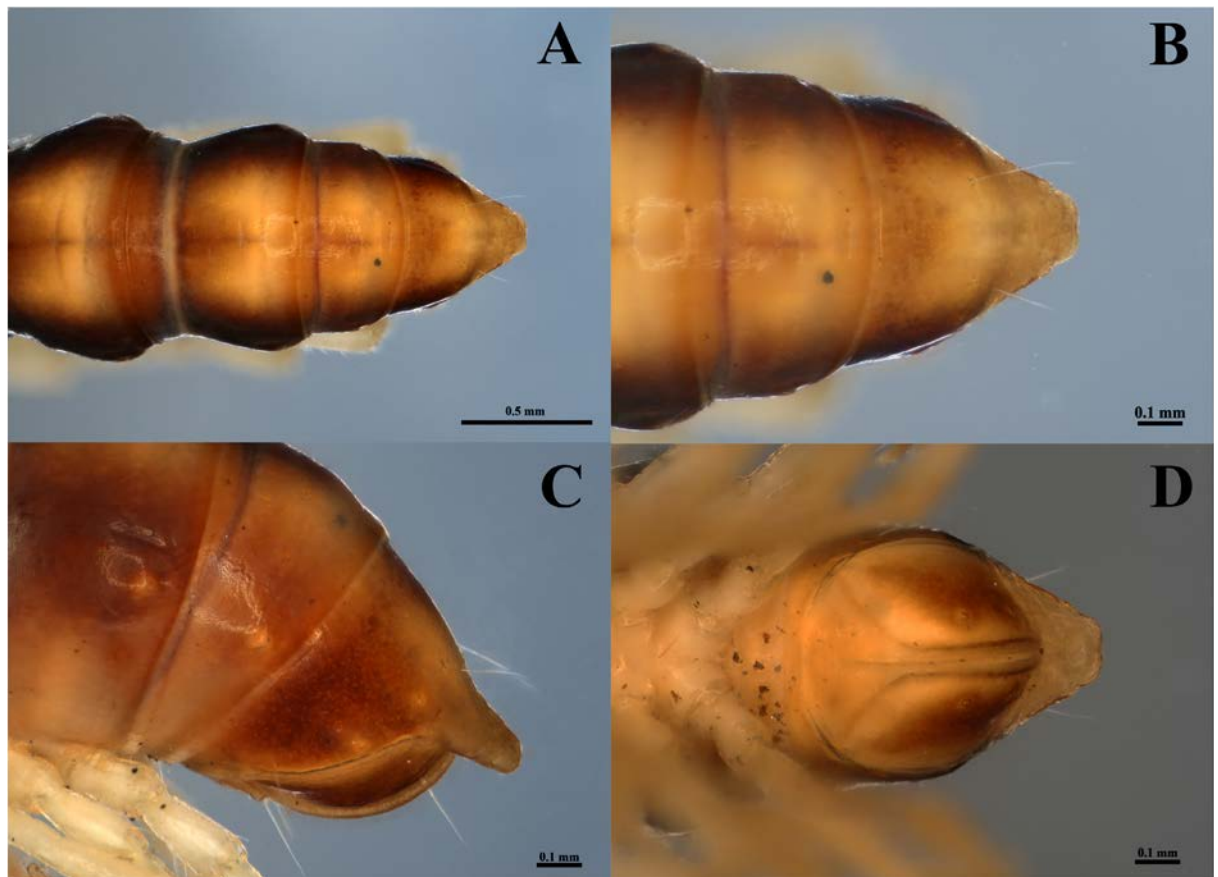


Fig. 28. *Eustrongylosoma peniculum*, new species. Holotype (FMNH-086 486). A, posterior part of body, dorsal view; B, telson, dorsal view; C, lateral view; D, ventral view. Scale bar = 0.5 mm for A, and 0.1 mm for B–D.

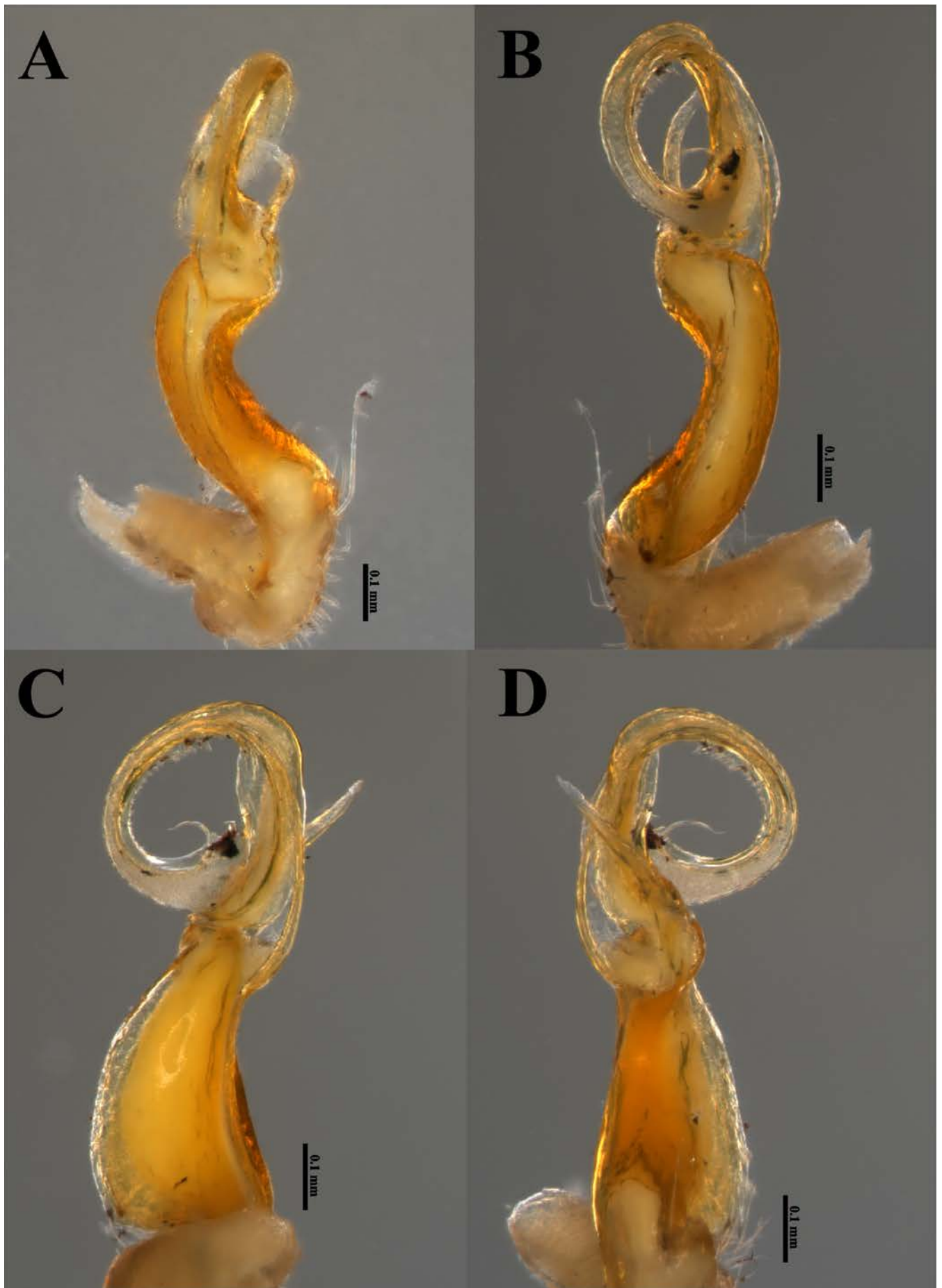


Fig. 29. *Eustrongylosoma peniculum*, new species. Holotype (FMNH-086 486). A, right gonopod, mesal view; B, lateral view; C, dorsal view; D, ventral view. Scale bar = 0.1 mm.

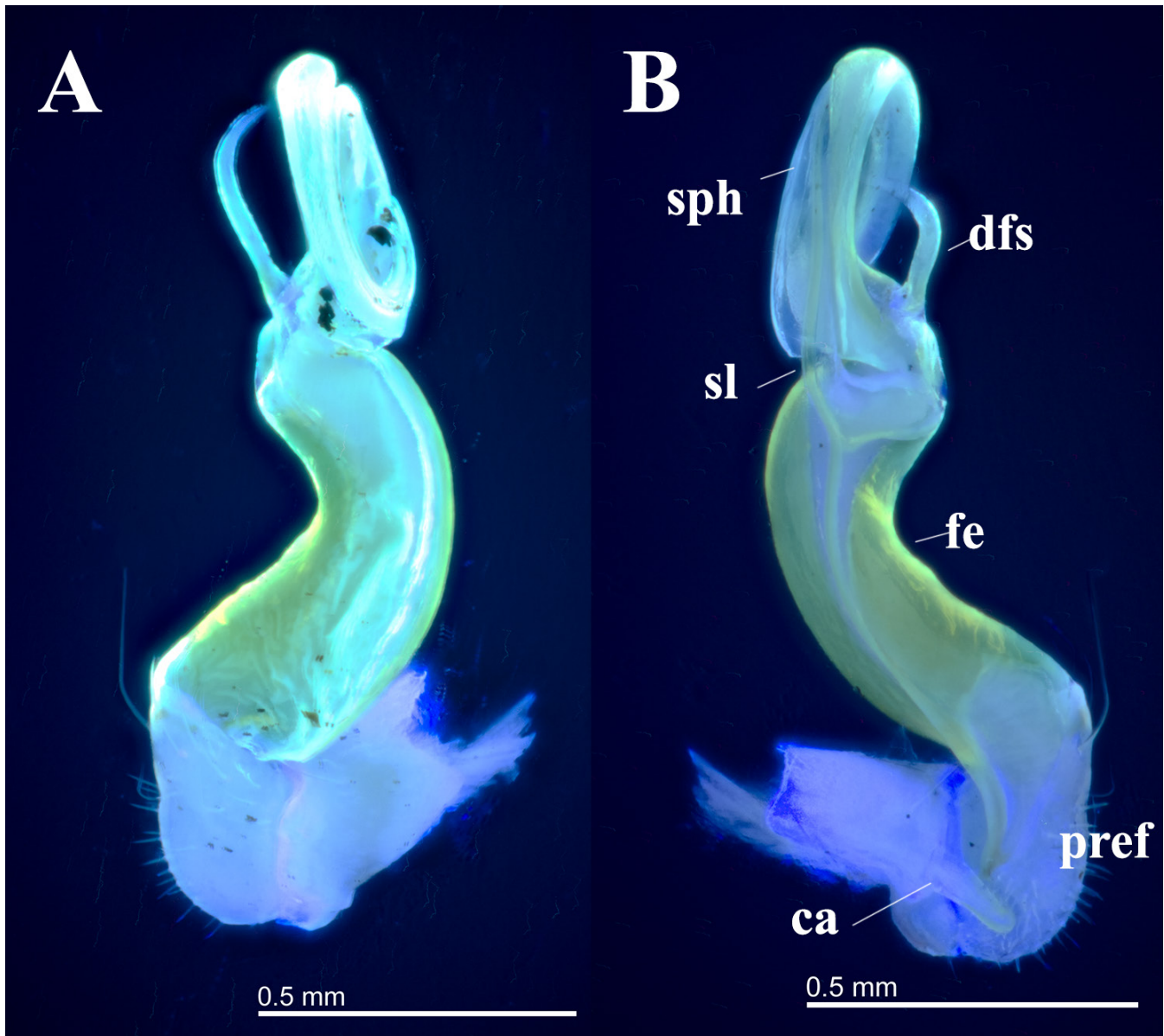


Fig. 30. *Eustrongylosoma peniculum*, new species. Holotype (FMNH-086 486). A, right gonopod, lateral view; B, mesal view. Scale bar = 0.5 mm.

Sterna (Fig. 27C) sparsely setose, without modification except for male sternum 5 with a highly elevated, strongly bifid, process directed anteroventrad between coxae 4 (Figs. 26D, 86D). Cross impression distinct.

Legs very long, slender, ca. 2.0 times as long as midbody height. Tarsal brushes present till leg 9 (male). Prefemora not swollen; femora without modifications.

Gonopod (Figs. 29–31) rather simple. Coxite cylindrical, about $\frac{2}{3}$ femorite in length; distoventral part sparsely setose. Prefemorite densely setose, separated from femorite by an

oblique sulcus laterally. Femorite strong, slightly curved ventrad, expanded laterad, with evidence of weak torsion. Demarcation between femorite and postfemoral region absent. Postfemoral region with a basal suberect, long, slender spiniform process. Solenomere flagelliform, completely sheathed by a spiral solenophore. Both lamina medialis and lamina lateralis present, well developed, without modification. Lamina lateralis with finely setose brush marginally. Tip of gonopod divided into three prongs: a long terminal spiniform prong and two small subterminal prongs.

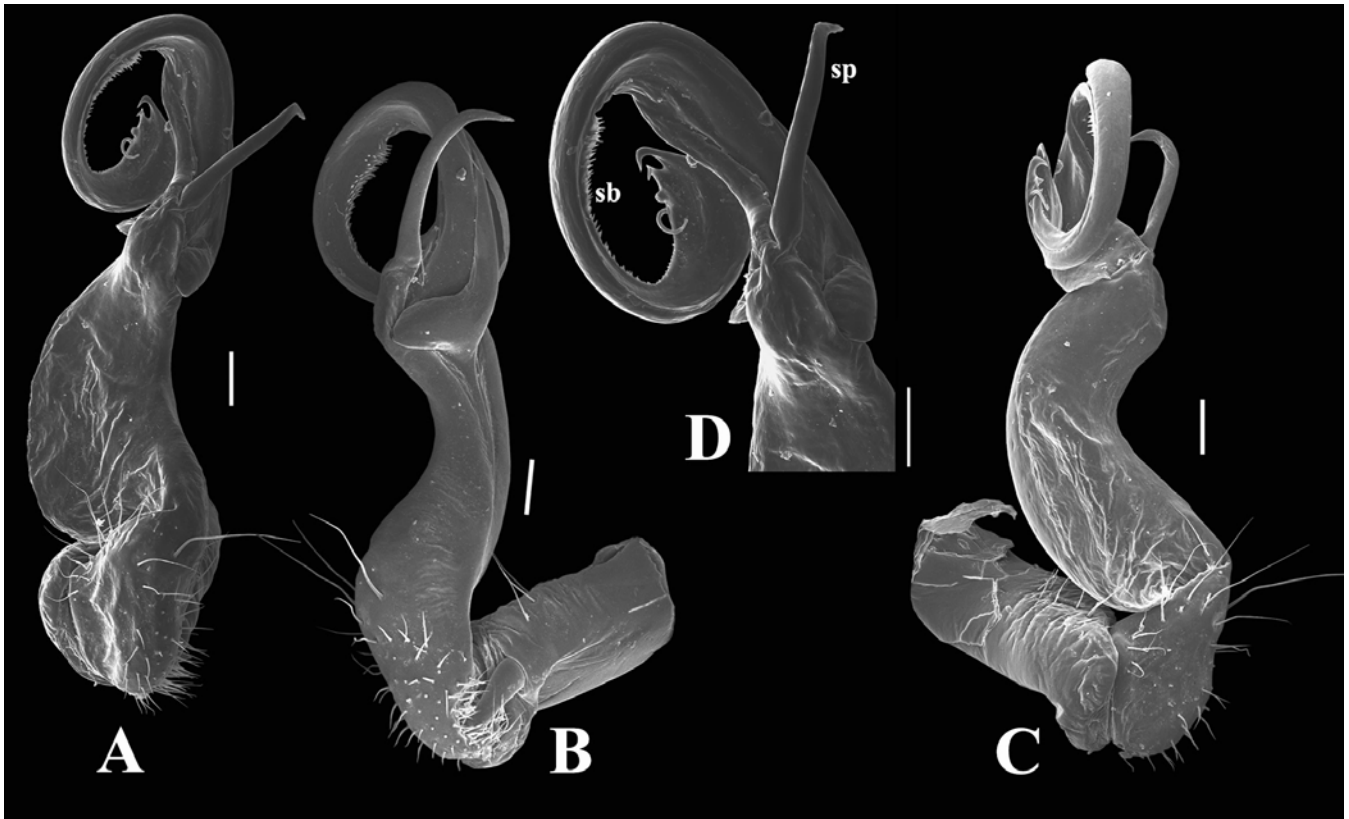


Fig. 31. *Eustrongylosoma peniculum*, new species. Holotype (FMNH-086 486). A, left gonopod, ventral view; B, mesal view; C, lateral view; D, postfemoral region, ventral view. Scale bar = 0.1 mm.

***Eustrongylosoma pterygotum*, new species**
(Figs. 32–37, 86E)

Material examined. Holotype: PHILIPPINES • 1 male; Luzon Island, Mountain Province, Barlig Municipality, Mount Amuyao; elev. 2,500 m a.s.l.; March 2007, leg. Balet D.S.; **FMNH INS 086 495**.

Paratypes: PHILIPPINES • 3 males, 2 females; Luzon Island, Mountain Province, Barlig Municipality, Mount Amuyao; elev. 2,500 m a.s.l.; March 2007, leg. Balet D.S.; **FMNH-INS 4435566** • 2 males, 2 females, 1 male juvenile; same data as for FMNH-INS 4435566; (**#PNM**) • 1 female; Luzon Island, Mountain Province, Barlig Municipality, 1 km N, 1 km W, peak of Mount Amuyao; elev. 2,150 m a.s.l.; 17.02213°N–12.11791°E; March 2007, leg. Balet D.S.; **FMNH-INS 086 479**.

Diagnosis. The species differs from its congeners in the following characters: paraterga well developed, wing-shaped; gonopod femorite with a long spiniform distal process.

Etymology. An adjective in apposition to emphasise the wing-shaped paraterga.

Description. Body ca. 24.5–26.8 mm (male), 29.7–32.9 mm (female) in length; width of midbody pro- and metazona 1.6–1.8 mm (male), 2.2–2.4 mm (female) and 2.8–3.1 mm (male), 3.0–3.4 mm (female), respectively. Holotype length ca. 24.5 mm; width of midbody pro- and metazona 1.8 mm and 2.8 mm, respectively.

Body generally reddish brown, but dorsa with a broad, castaneous brown, median stripe. Head, pleura somewhat paler than metaterga. Antenna and legs reddish brown except for black antennomere 7; sterna brownish yellow. For female paratypes, dorsal side of metazonae darkish brown or black, prozonae paler; median stripe only present on prozonae. Head somewhat smaller than collum in width; clypeolabral region sparsely setose; epicranial suture distinct. Antenna long, more or less claviform; antennomere 2>3=4=5=6>1>7 in length.

Collum (Fig. 32B) smaller than ring 2 in width, strongly convex dorsally; surface shining, smooth, with 2 rows of 5+5 and 4+4 setae, the first row located closely at anterior margin, the second located at middle. Paraterga well developed, triangular, subhorizontal, set lower than collum surface; caudal corner not acute, somewhat rounded; lateral side with 2 setae at $\frac{1}{3}$ and $\frac{1}{2}$ length.

Body ring (Figs. 32B, D, 33C) 4 <3<2=5–17 in width, thereafter gradually tapering towards telson. Prozonae and metazonae shining, smooth. Constriction between pro- and metazona wide, deep, neither striolate striated nor beaded at bottom. Transverse sulcus fully developed on metaterga 5–19, reaching the base of paraterga, thin and narrow, not beaded at bottom.

Paraterga (Figs. 32, 33) well-developed, highly elevated, set higher than surface of metaterga. Paraterga 2 wing-shaped; caudal corner acute; lateral side with 4 incisions. Paraterga 3–4 narrowly wing-shaped; caudal corner pointed; lateral side with 5 incisions. Paraterga 5–19 spine-shaped; caudal corner strongly pointed; lateral side with 3–5 incisions. Ozopores located on lateral side of paraterga 5, 7, 9–10,

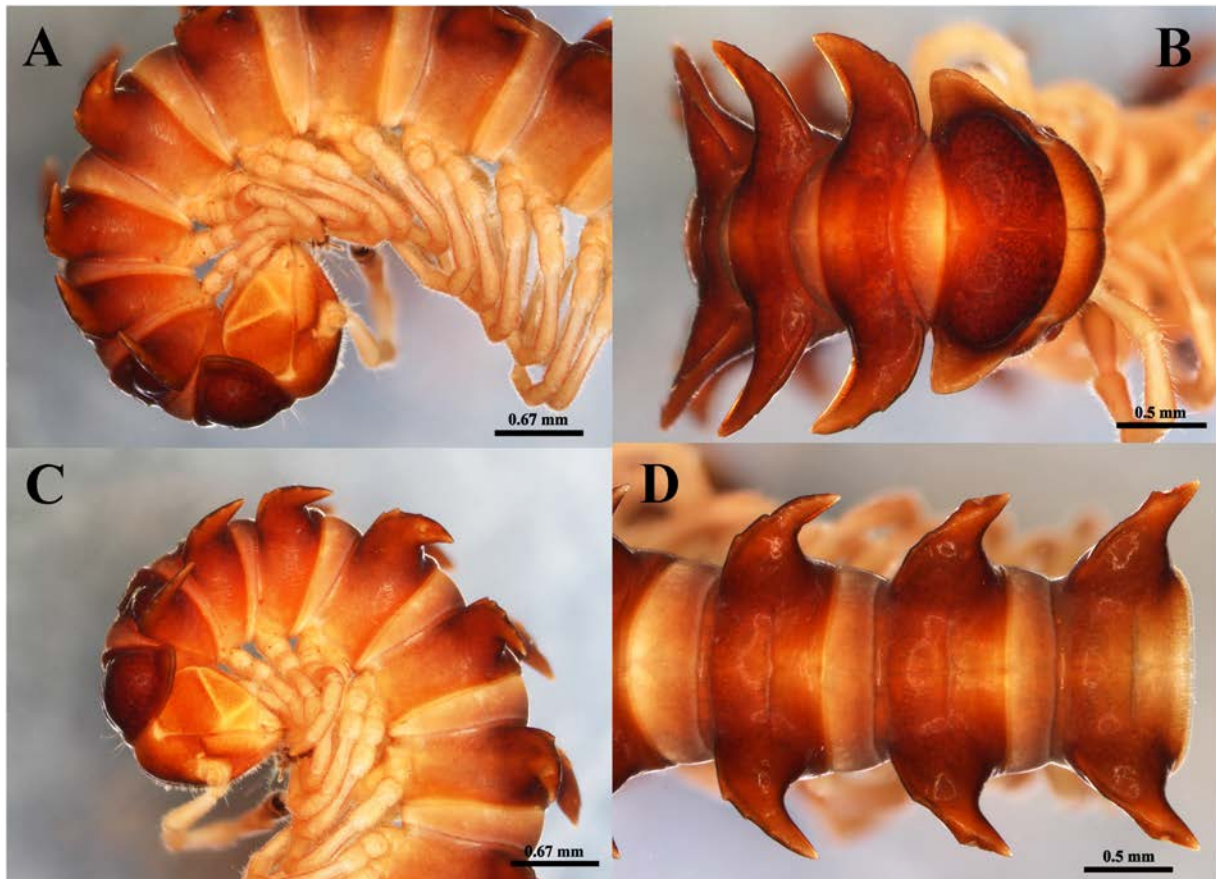


Fig. 32. *Eustrongylosoma pterygotum*, new species. Holotype (FMNH-086 495). A, C, anterior part of body, lateral view; B, dorsal view. D, segments 8–10, dorsal view. Scale bar = 0.67 mm for A and C, 0.5 mm for B and D.

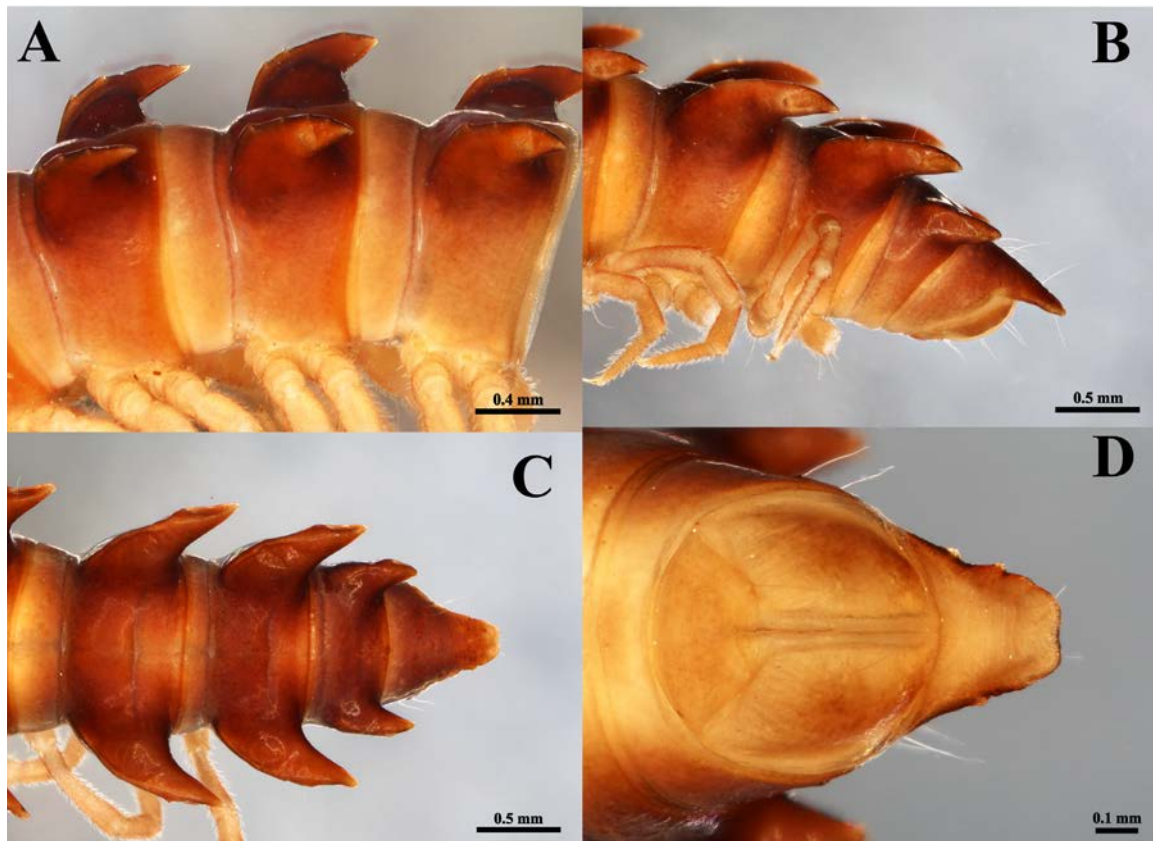


Fig. 33. *Eustrongylosoma pterygotum*, new species. Holotype (FMNH-086 495). A, segments 8–10, lateral view. B, posterior part of body, lateral view; C, dorsal view. D, telson, ventral view. Scale bar = 0.4 mm for A, 0.5 mm for B and C, and 0.1 mm for D.

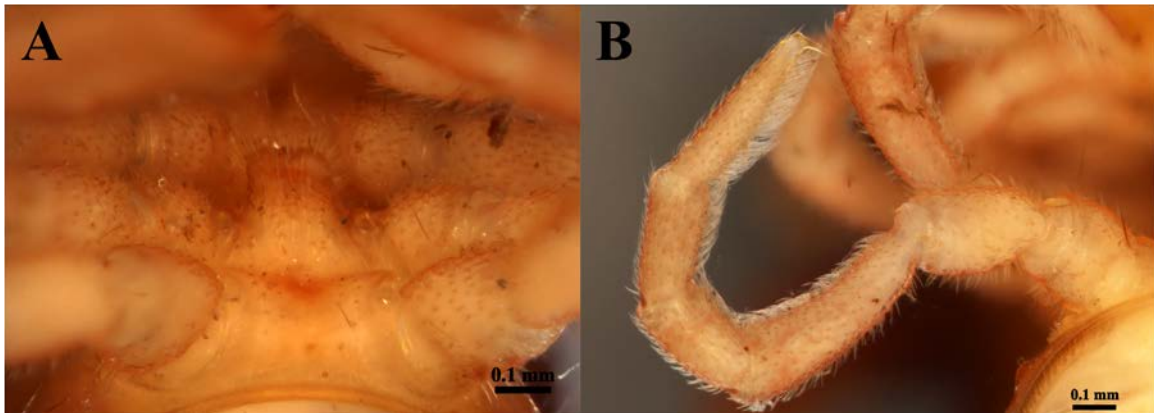


Fig. 34. *Eustrongylosoma pterygotum*, new species. Holotype (FMNH-086 495). A, sternum 5, subventral view. B, leg 7, lateral view. Scale bar = 0.1 mm.

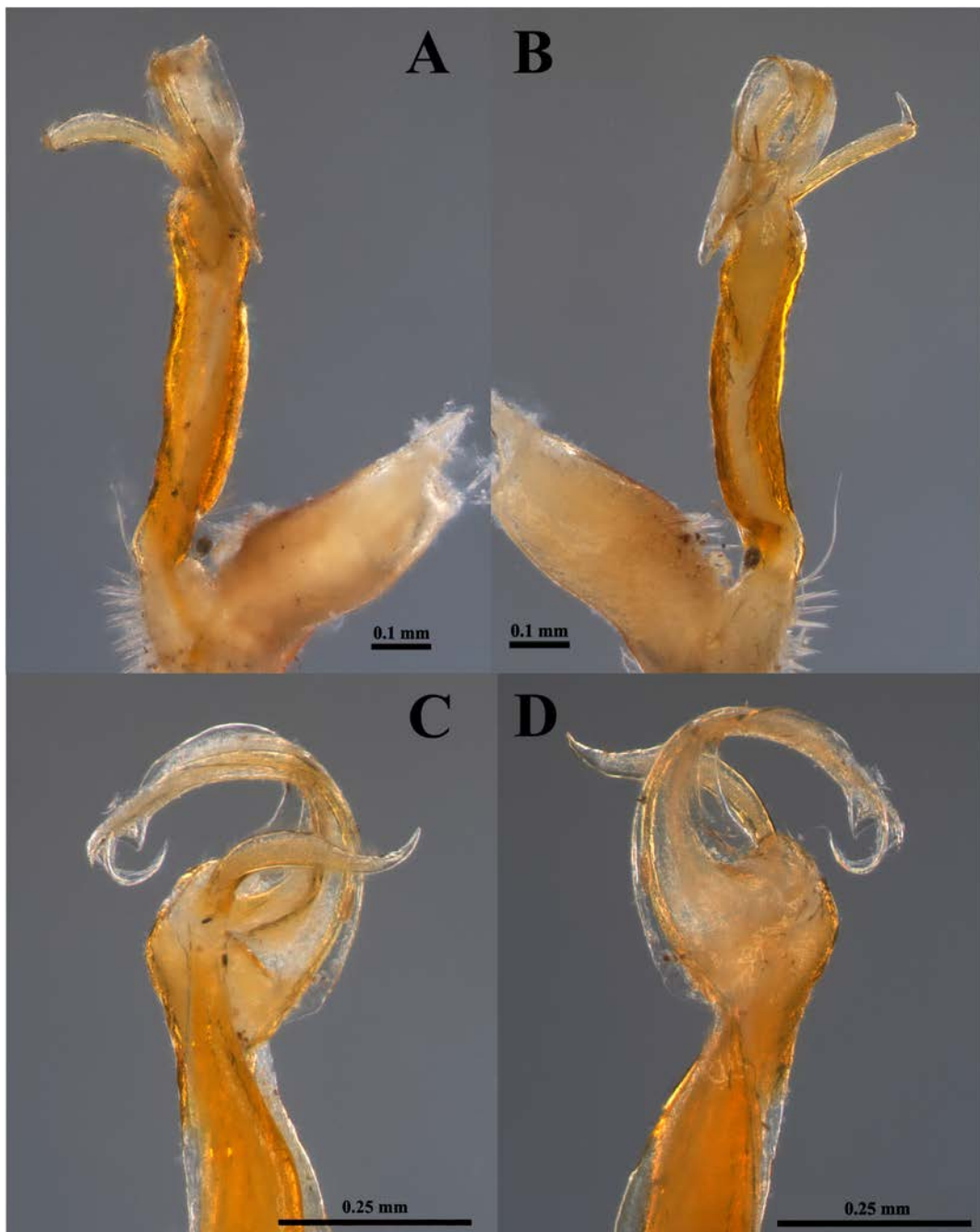


Fig. 35. *Eustrongylosoma pterygotum*, new species. Holotype (FMNH-086 495). A, right gonopod, mesal view; B, lateral view; C, ventral view; D, dorsal view. Scale bar = 0.1 mm for A and B, 0.25 mm for C and D.

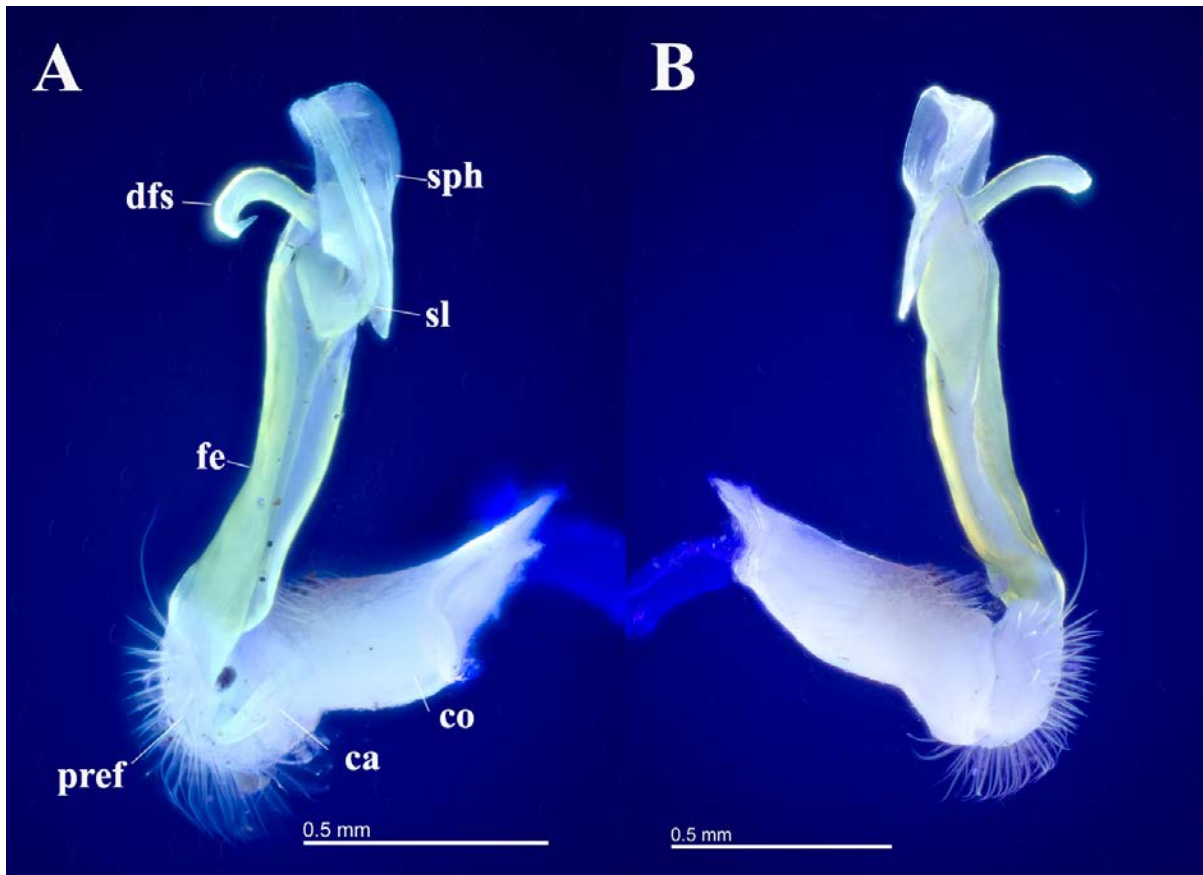


Fig. 36. *Eustrongylosoma pterygotum*, new species. Holotype (FMNH-086 495). A, right gonopod, mesal view; B, lateral view. Scale bar = 0.5 mm.

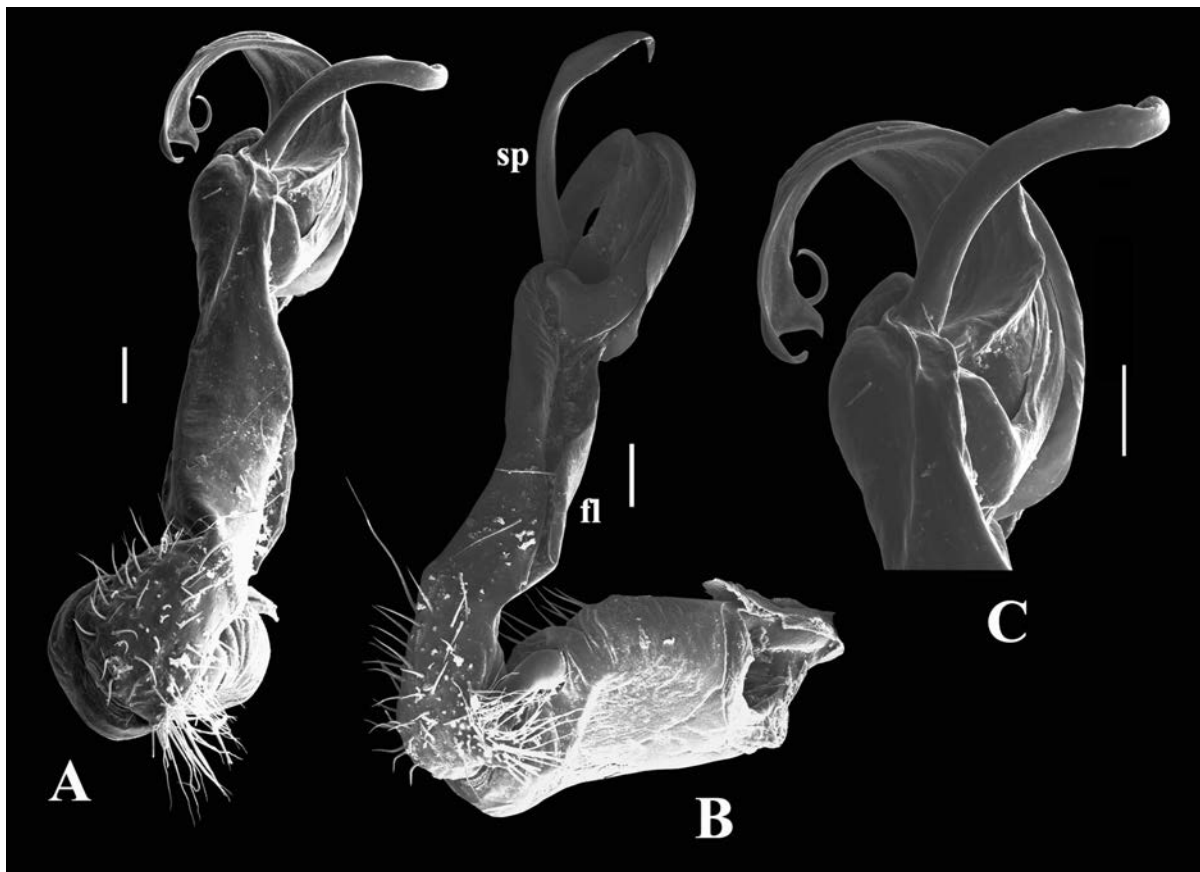


Fig. 37. *Eustrongylosoma pterygotum*, new species. Holotype (FMNH-086 495). A, right gonopod, ventral view; B, submesal view; C, postfemoral region, ventral view. Scale bar = 0.1 mm.

12–13, 15–19., near caudal corner. Pleurosternal carinae totally absent.

Epiproct (Fig. 33B–D) long, shovel-shaped, dorsum with 3+3, 1+1 and 2+2 setae. Hypoproct (Fig. 33D) trapeziform, with two distolateral setae borne on small knobs.

Sterna sparsely setose, without modifications except for male sternum 5 with a highly elevated, bifid process directed ventrad between coxae 4 (Figs. 34A, 86E).

Legs long and slender, ca. 1.8 (male), 1.5 (female) times as long as midbody. Tarsal brushes present until leg 12–13 (Fig. 34B). Prefemora not swollen. Femora without modifications. Gonopod (Figs. 35–37) simple. Coxite cylindrical, about a half of femorite in length; distoventral part sparsely setose. Prefemorite densely setose, separated from femorite by a subtransverse sulcus laterally. Femorite erect, somewhat slender, cylindrical, with weak torsion basally, and lamina (**fl**) mesodorsally. Demarcation between postfemoral region and femorite absent. Postfemoral region short, with a suberect, long, thin, spiniform basal process (**sp**). Solenophore strongly spiral, with both well-developed lamina medialis and lamina lateralis, without additional processes. Solenomere flagelliform, completely sheathed by solenophore. Tip of solenophore divided into two triangular prongs from ventral view.

***Eustrongylosoma reductum*, new species**
(Figs. 38–44, 86F)

Material examined. Holotype: PHILIPPINES • 1 male; Mindanao Island, Davao Province, East slope of Mount McKinley; elev. 7,800 ft (= 2,377 m a.s.l.); shrubs, mossy forest; 20 September 1946, leg. Hoogstraal H.; **FMNH-INS 011 419 (#PNM)** • 1 male, 1 female; Mindanao Island, Cotabato Province, Burungkot; elev. 1,500 ft (= 457 m a.s.l.); from under bark of decaying smooth barked soft wood logs; 1–6 January 1947, leg. Werner F.G.; **FMNH-837** • 1 male, 1 female; Luzon Island, Mountain Province, Barlig Municipality, Mount Amuyao; 2,500 m a.s.l.; March 2007, leg. Balete D.S.; **FMNH-INS 085 779 (#PNM)** • 1 male; Mindanao Island, Davao Province, Camp Meran, East slope of Mount Apo; elev. 6,000 ft (= 1,828 m a.s.l.); 5 November 1946, leg. Werner F.G.; **FMNH-INS 085 775 (#PNM)** • 1 male, 2 females; Mindanao Island, Davao Province, Camp Meran, East slope of Mount Apo, elev. 6,000 ft (= 1,828 m a.s.l.); original forest, rotting logs; 8 November 1946, leg. Werner F.G.; **FMNH-INS 011 963** • 10 males, 2 females, 8 juvenile; Mindanao Island, Davao Province, Camp Baclayan, East slope of Mount Apo; elev. 6,500 ft (= 1,981 m a.s.l.); original forest, under moss on bark of tree; 12 September 1946, leg. Werner F.G.; **FMNH-INS 011 426** • 4 males, 2 females, 3 juvenile; Mindanao Island, Davao Province, Camp Meran, East slope of Mount Apo; elev. 6,000 ft (= 1,828 m a.s.l.); original forest, beating tree ferns; 9 November 1946, leg. Hoogstraal H.; **FMNH 850 (#PNM)** • 6 males, 6 females, 13 juveniles; Mindanao Island, Davao Province, East slope of Mount McKinley; elev. 7,200 ft (= 2,194 m a.s.l.);

under moss on logs; 22 September 1946, leg. Hoogstraal H.; **FMNH-INS 011 951 (#PNM)** • 1 male; Mindanao Island, Davao Province, East slope of Mount McKinley; elev. 6,500 ft (= 1,981 m a.s.l.); dead tree-fern petioles; 13 September 1946, leg. Werner F.G.; **FMNH 842** • 3 males, 1 female; Mindanao Island, Davao Province, North slope of Mount Apo, Lake Linau; elev. 7,900 ft (= 2,407 m a.s.l.); mossy forest; 2 November 1946, leg. Hoogstraal H.; **FMNH 826** • several males; Mindanao Island, Davao Province, North slope of Mount Apo, Lake Linau; elev. 7,900 ft (= 2,407 m a.s.l.); mossy forest, under bark; 3 November 1946, leg. Hoogstraal H.; **FMNH-INS 011 958** • 3 males, 5 females; Mindanao Island, Davao Province, North slope of Mount Apo, Lake Linau; elev. 7,900 ft (= 2,407 m a.s.l.); from moss on tree trunk, mossy forest; 25 October–4 November 1946, leg. Werner F.G.; **FMNH 836** • 1 male, 1 female, 3 juveniles; Mindanao Island, Davao Province, East slope of Mount McKinley; elev. 6,400 ft (= 1,950 m a.s.l.); mossy forest, beating trees; 7 September 1946, leg. Hoogstraal H. & Meynaman D.; **FMNH 845**.

Diagnosis. The species differs from other *Eustrongylosoma* species in colour pattern and gonopod without distofemoral process.

Etymology. The adjective ‘reductum’ is used to emphasise the reduction of the postfemoral process on the gonopod.

Description.

Body length ca. 18.4–21.8 mm (male); width of midbody pro- and metazona ca. 1.3–1.4 mm (male) and 1.6–1.7 mm (female), respectively. Holotype ca. 18.4 mm in length; width of midbody pro- and metazona ca. 1.4 mm and 1.7 mm, respectively.

Body castaneous brown with yellow median areas on prozonae and yellow triangular spots on anterior halves of metazonae. Legs, antenna and sterna yellowish brown. Head (Fig. 38A–C) subequal to collum in width; clypeolabral region modestly setose; epicranial suture clearly distinct. Antenna short and claviform, reaching body ring 2 if stretched laterally; antennomere 2=6>3>4>5>7=1 in length.

Collum (Fig. 38A–C) slightly broader than body ring 2 in width; surface shining, smooth, with a row of 3+3 setae near anterior margin. Paraterga totally missing.

Body (Fig. 38A–C) submoniliform, body ring 4<=3<=2=17, thereafter gradually tapering towards telson. Prozonae and metazonae shining and smooth. Metaterga 2–18 with two rows of 1+1 and 2+2 setae before and behind transverse sulcus, which starts from metatergum 5. Metatergum 19 with a row of 2+2 setae. Constriction between pro- and metazona narrow, beaded at bottom. Axial line thin and distinct. Pleurosternal carinae absent.

Paraterga (Figs. 38A, B, D, 39A, C, D) strongly reduced as tiny ridges on body ring 2–4 and pore-bearing ones, but totally missing on other body rings. Ozopores located on lateral side of body rings 5, 7, 9–10, 12–13, 15–19.

Epiproct (Figs. 39C, D, 40A) broadly truncated, inflated dorsally; tip slightly concave medially, with four spinnerets. Hypoproct (Fig. 40A) subtrapeziform, with two distolateral setiferous knobs.

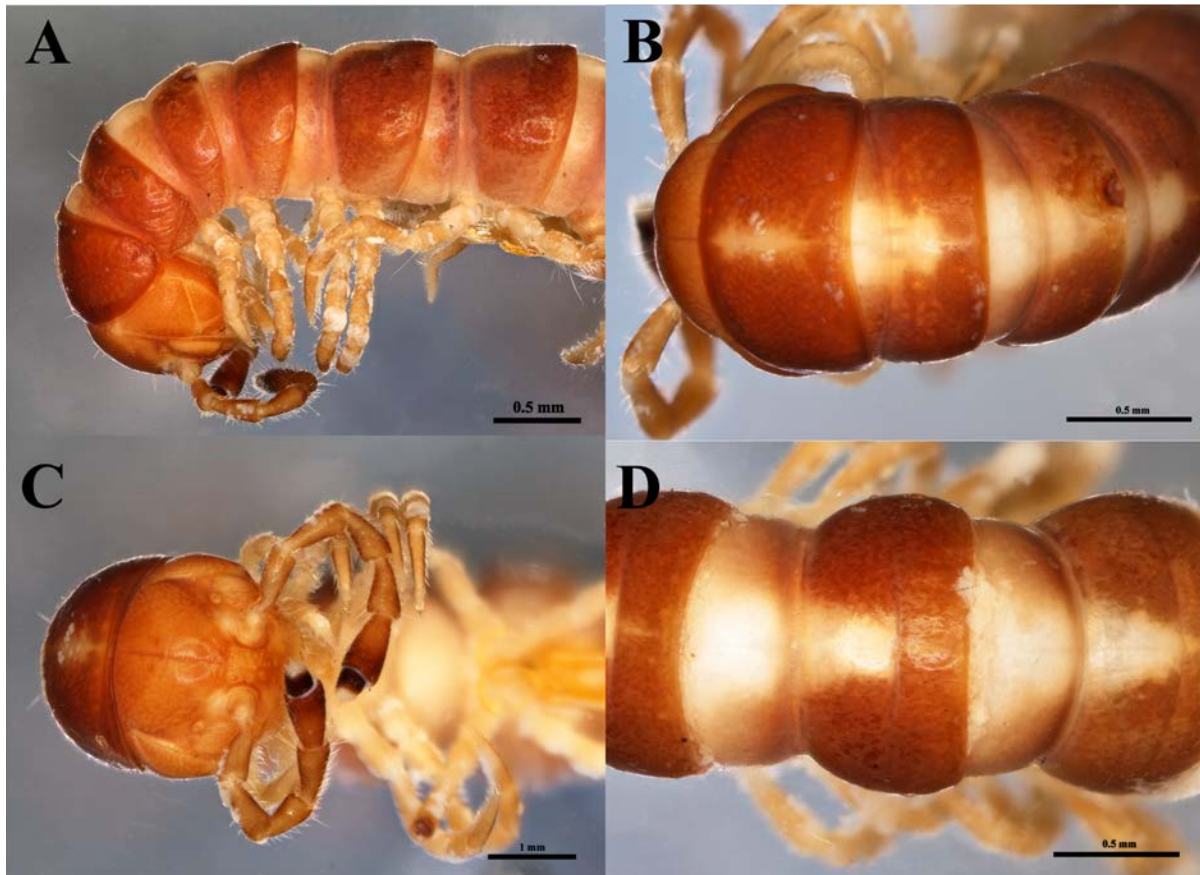


Fig. 38. *Eustrongylosoma reductum*, new species (FMNH 842). A, anterior part of body, lateral view; B, dorsal view; C, ventral view. D, segments 8–10, dorsal view. Scale bar = 0.5 mm.

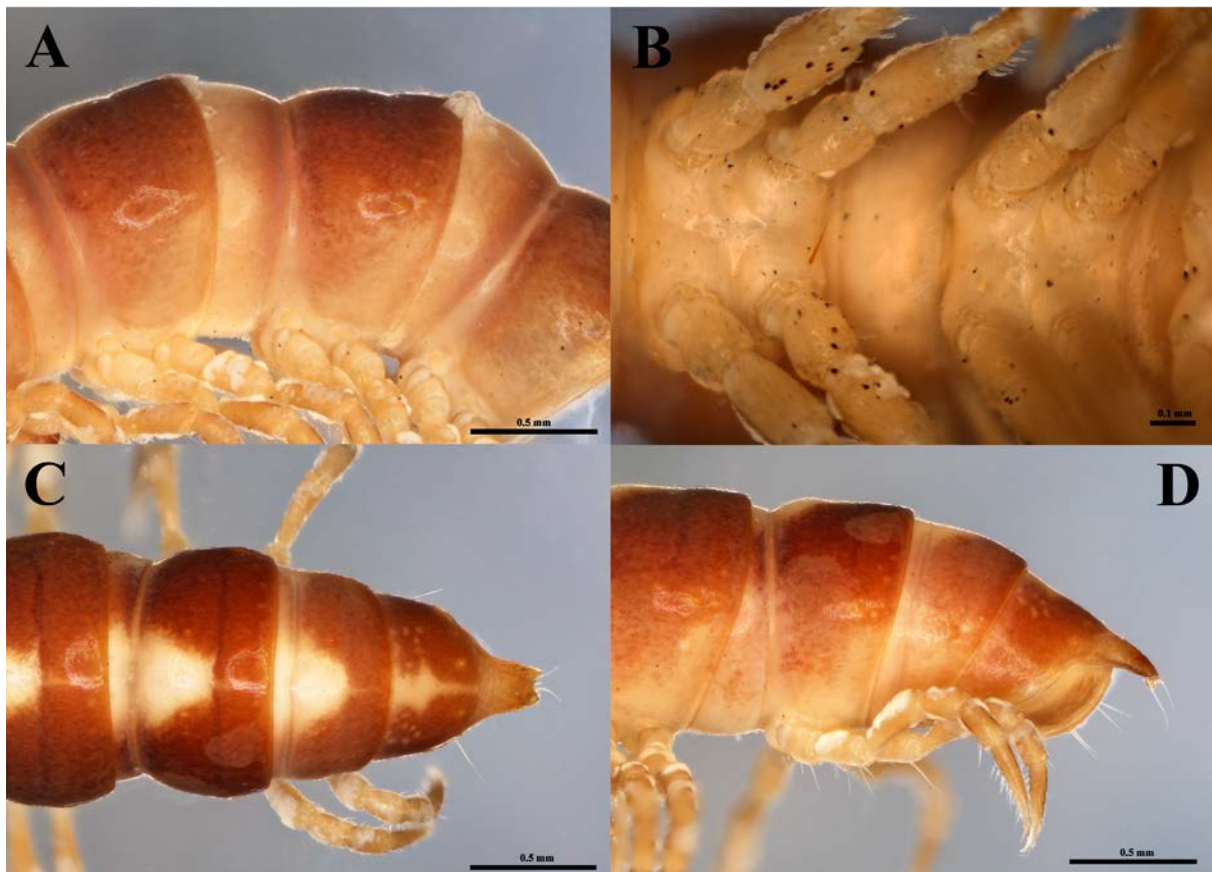


Fig. 39. *Eustrongylosoma reductum*, new species (FMNH 842). A, segments 8–10, lateral view. B, sterna 8–9, ventral view. C, posterior part of body, dorsal view; D, lateral view. Scale bar = 0.5 mm for A, C and D, 0.1 mm for B.

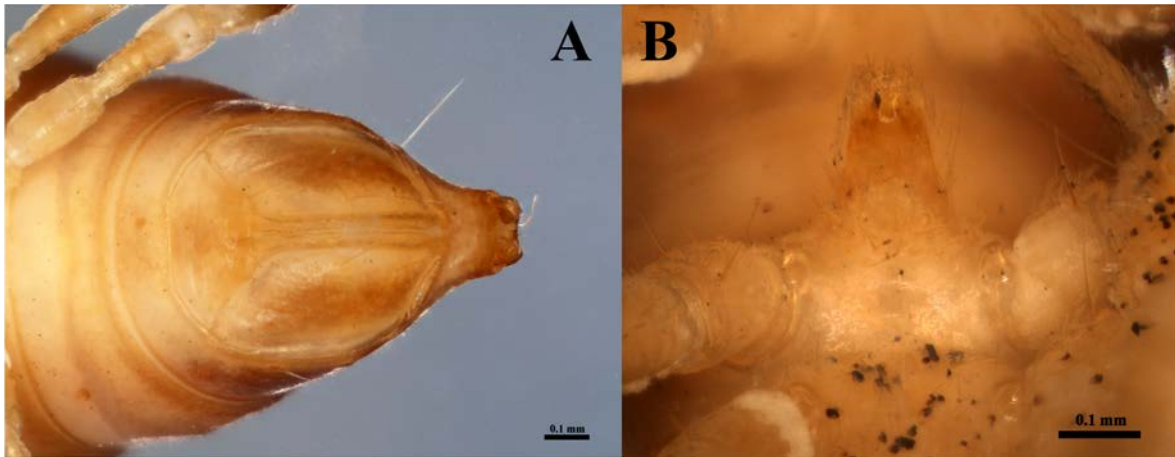


Fig. 40. *Eustrongylosoma reductum*, new species (FMNH 842). A, telson, ventral view. B, sternum 5, subventral view. Scale bar = 0.1 mm.

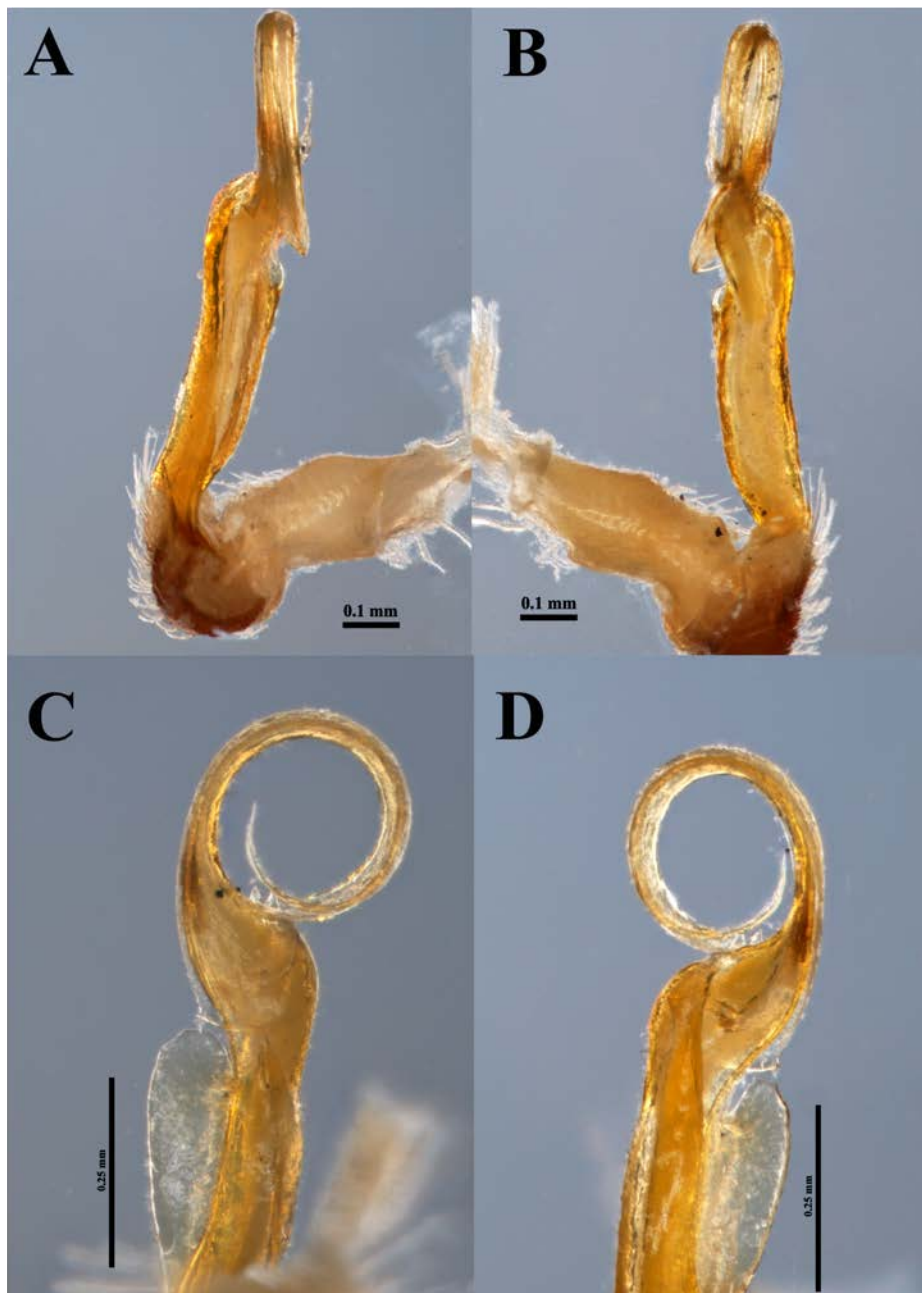


Fig. 41. *Eustrongylosoma reductum*, new species (FMNH 842). A, right gonopod, mesal view; B, lateral view; C, ventral view; D, dorsal view. Scale bar = 0.1 mm for A and B, 0.25 mm for C and D.

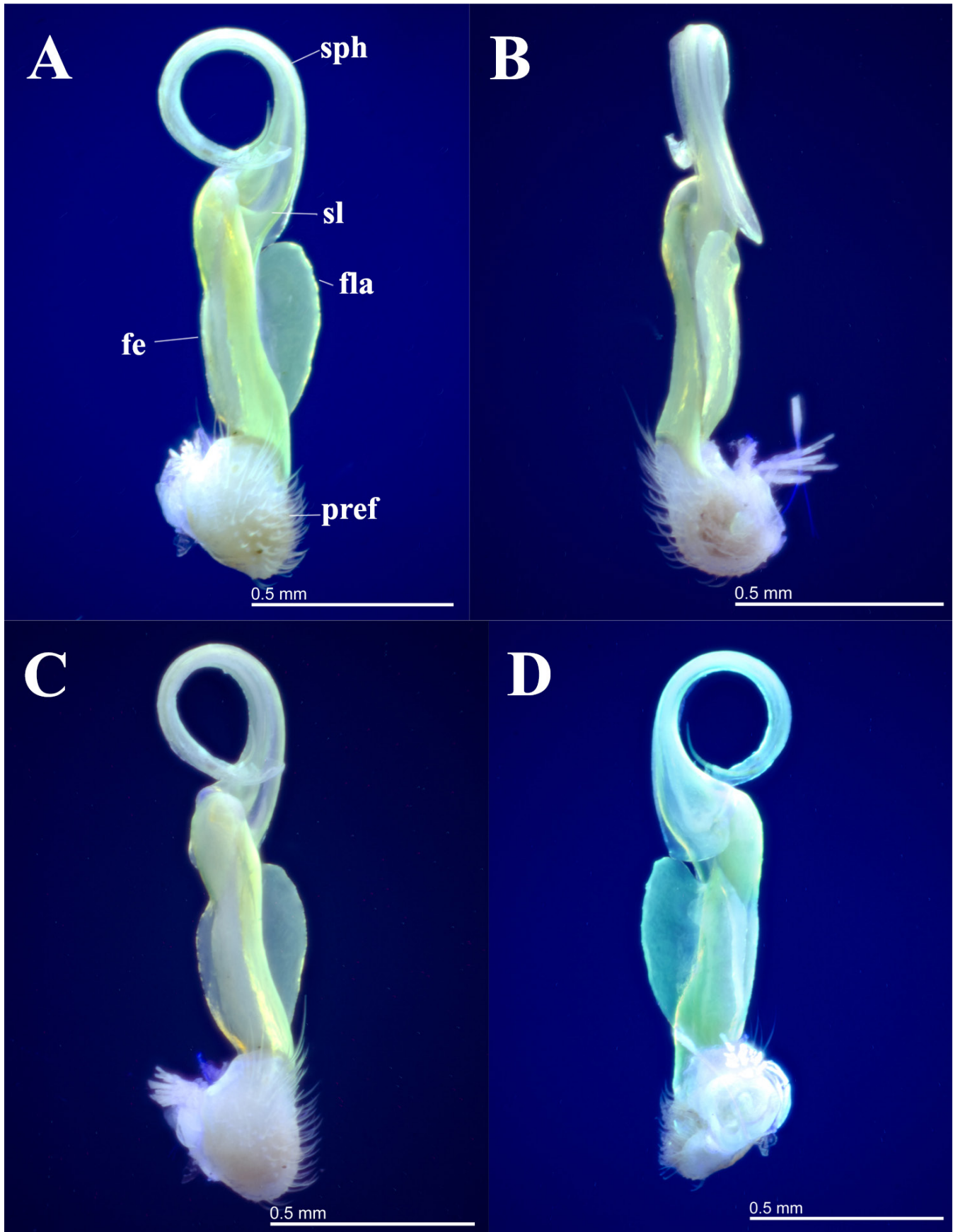


Fig. 42. *Eustrongylosoma reductum*, new species (FMNH 826). A, right gonopod, ventral view; B, mesal view; C, lateral view; D, dorsal view. Scale bar = 0.5 mm.

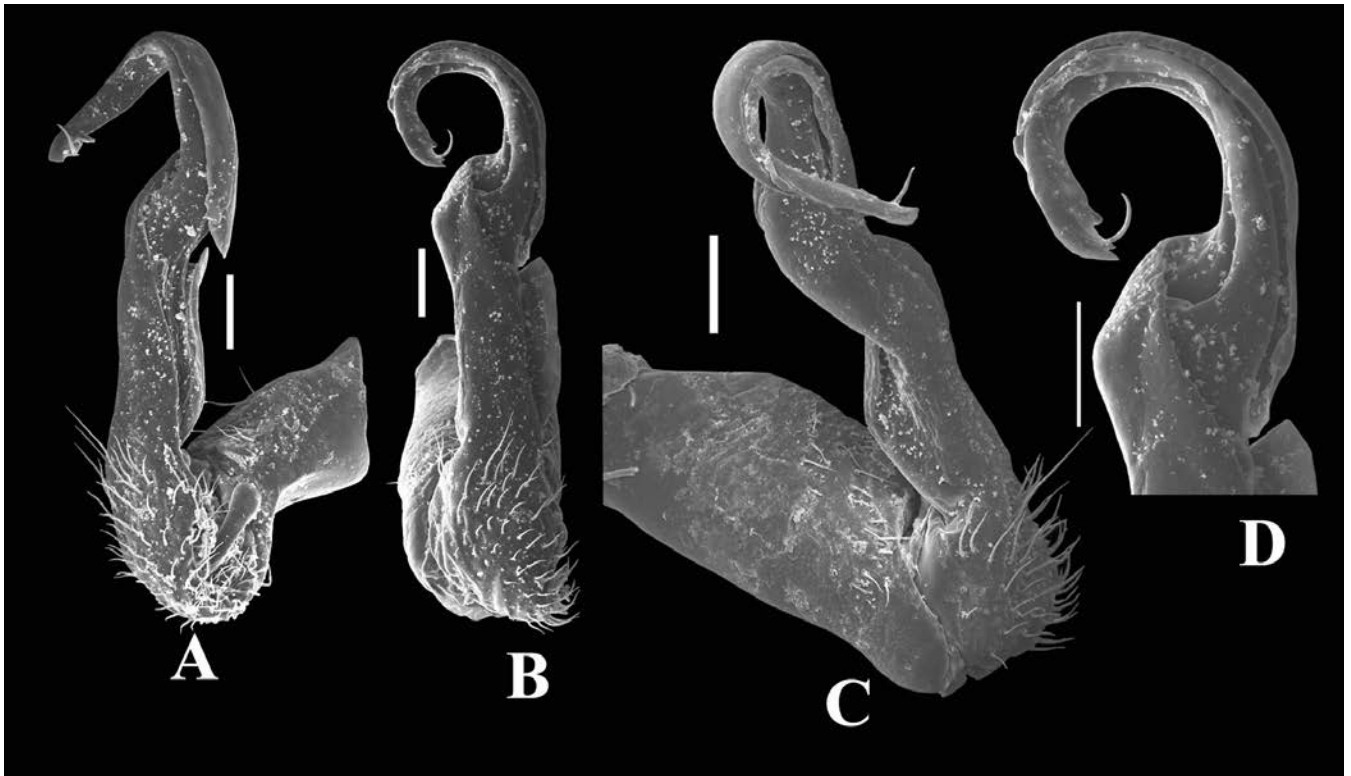


Fig. 43. *Eustrongylosoma reductum*, new species. Holotype (FMMC 6263). A, left gonopod, mesal view; B, ventral view; C, lateral view; D, postfemoral region, ventral view. Scale bar = 0.1mm.

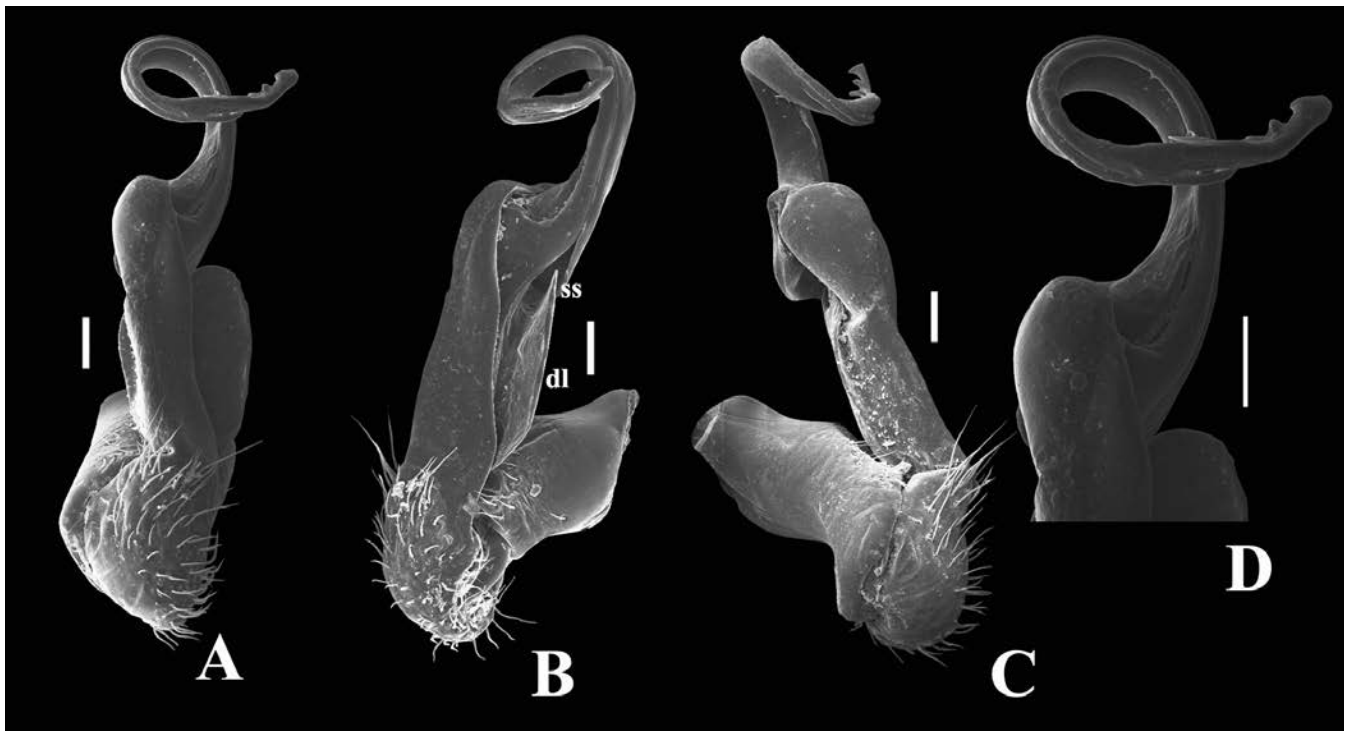


Fig. 44. *Eustrongylosoma reductum*, new species (FMNH-837). A, left gonopod, ventral view; B, mesoventral view; C, lateral view; D, postfemoral region, ventral view. Scale bar = 0.1mm.

Sterna sparsely setose; cross-impression deeply distinct, without modification except for a large, highly elevated, densely setose, tongue-like process directed ventrad between male coxae 4 (Figs. 40B, 86F).

Legs stout, as long as midbody height; brushes present on femora and tibia on pregonopodal legs; tarsal brushes present

until leg 22, thereafter gradually thinner and missing on subsequent legs.

Gonopod (Figs. 41–44) simple. Coxite long, cylindrical; distoventral part sparsely setose. Prefemorite densely setose, separated from femorite by an oblique sulcus laterally. Femorite straight, slightly twisted ventrad, with

two menbraneous lamellae ventrally and dorsally, without additional processes. Demarcation between postfemoral region and femorite absent. Postfemoral region only consisting of solenophore and solenomere. Solenophore strongly spiral, tip with a tiny spine. Solenomere flagelliform, and completely sheathed by solenophore.

Remarks. Within the genus *Eustrongylosoma*, the new species shares the presence of a femoral membranous lamella with *E. tumbuna* Golovatch & Stoev, 2011 and *E. maculatum* Golovatch & Stoev, 2011, but it differs in lacking a femoral process.

***Eustrongylosoma tuberculatum*, new species**
(Figs. 45–50, 86G)

Material examined. Holotype: PHILIPPINES • 1 male; Luzon Island, Mountain Province, Barlig Municipality, peak of Mount Amuyao; elev. 2,700 m a.s.l.; on epiphytic ferns & orchids, 10m above ground; March 2007, leg. Balet D.S.; **FMNH-086 496**.

Paratype: 1 female; together with holotype; **FMNH-INS 4435562**.

Diagnosis. This species is especially similar to *E. penevi* Golovatch & Stoev, 2013, but differs in having more setae on metaterga of posteriormost rings, prefemora with big distoventral tubercle, gonopod femorite with a distal suberect long spine, lamina lateralis of solenophore with distal process, and tip of gonopod strongly divided into two long spiniform prongs.

Etymology. An adjective used to emphasise the distoventral tubercle of each prefemur.

Description.

Body size ca. 22.5 mm (male), 25.1 mm (female); width of midbody pro- and metazona 1.3 mm (male), 1.7 mm (female) and 1.6 mm (male), 2.1 mm (female), respectively. Body (Figs. 45–47) uniformly dark brown or black; pleura, antenna, tibia and tarsi castaneous brown; coxae to postfemora sterna brownish yellow; antennomeres 6 & 7 dark brown. Head (Fig. 45A, B) slightly larger than collum; clypeolabral region sparsely setose, labrum more setose; frons slightly convex, divided into two parts by a distinct epicranial suture. Antenna long, slender except for claviform antennomere 6; antennomere 2>3=4=5=6>7>1 in length. Collum (Fig. 45A, C) smaller than body ring 2; surface shining, smooth, somewhat convex, with two rows of 4+4 closely near anterior margin and 2+2 setae near caudal margin. Paraterga strongly reduced, almost missing. Body ring 4<3<2=5–17 in length, gradually tapering towards telson. Prozonae shining, smooth. Metazona (Figs. 45A, C, D, 46A, B, D, 47A–C) smooth, shining, with two rows of setae: 2+2 and 2+2 on body rings 2–14, 3+2 and 4+5 setae on body ring 15, 3+3 and 4+4 setae on body ring 16, 3+3 and 5+5 setae on body rings 17–18, 3+3 and 6+6 setae on body ring 18. Transverse sulcus completely developed on body rings 4–19, thin, distinct, neither beaded nor striolate at bottom

(Figs. 45A, 46B). Axial line vague, present only on anterior half of metaterga. Constriction between pro- and metazona wide, distinct and striolate at bottom. Pleurosternal carinae totally absent.

Paraterga (Figs. 45A, C, D, 46A, B, D, 47A, B) poorly developed on poreless body rings, but more obvious on pore-bearing rings. Calluses tiny, but more developed on pore-bearing rings; lateral side with seta at ½ length; caudal corner broadly rounded on pore-bearing rings, but gradually becoming acute on rings 17–19. Ozopores located on lateral side of body rings 5, 7, 9–10, 12–13, 15–19.

Epiproct (Fig. 47) short, broadly truncated, inflated dorsoventrally. Tip with four spinnerets. Hypoproct (Fig. 17D) trapeziform, with two distolateral setiferous knobs.

Sterna (Fig. 46C) sparsely setose without modifications except for male sternum 5 with a highly elevated, setiferous tongue-like process directed anteroventrad between coxae 4 (Figs. 48A, 86G). Cross impression distinct.

Legs long and slender, about 1.6 (female), 1.9 (male) times as long as midbody height. Tarsal brushes present on all legs except for last two legs. Prefemora not swollen, with a distoventral big tubercle (Fig. 48B–D). Femora without modifications.

Gonopods (Figs. 49, 50) simple; coxite cylindrical, shorter than femorite; distoventral part sparsely setose. Prefemorite densely setose, separated from femorite by an oblique sulcus laterally. Femorite slender, long, about 1.5 times as long as coxite, slightly curved ventrad, somewhat folded laterally at distal region; with a distal suberect, long spiniform process. Demarcation between femorite and postfemoral region absent. Postfemoral region only consisting of solenophore and solenomere. Solenophore spiral; both lamina medialis and lamina lateralis well developed, lamina lateralis with an additional process at distal part. Tip of solenophore strongly divided into two long spiniform prongs.

Remarks. The new species and *E. penevi* Golovatch, 2013, *E. exiguum* Hoffman, 1978, and *E. kuekenhali* (Attems, 1987) form a group sharing a prominent distofemoral long spine on the gonopod.

Key to *Eustrongylosoma* species in the Philippines

1. Paraterga well developed, wing-shaped. Male sternum 5 with a bifid process between coxae 4. Gonopod with distofemoral process *E. pterygotum*, new species
 - Paraterga poorly developed, keel-shaped. Sternum 5th with a trapeziform process or without sternal process between coxae 4. Gonopod with or without distofemoral process 2
2. Legs with a prefemoral tubercle ventrally. Distofemoral process of gonopod long and spine-shaped *E. tuberculatum*, new species
 - Legs without a prefemoral tubercles ventrally. Distofemoral process of gonopod absent/present; if present, different shape (not long spine) 3
3. Gonopod without distofemoral process *E. reductum*, new species
 - Gonopod with distofemoral process 4
4. Distofemoral process straightly elevated, blade-shaped *E. erectispinum*, new species
 - Distofemoral process not straightly elevated, long spiniform. 5

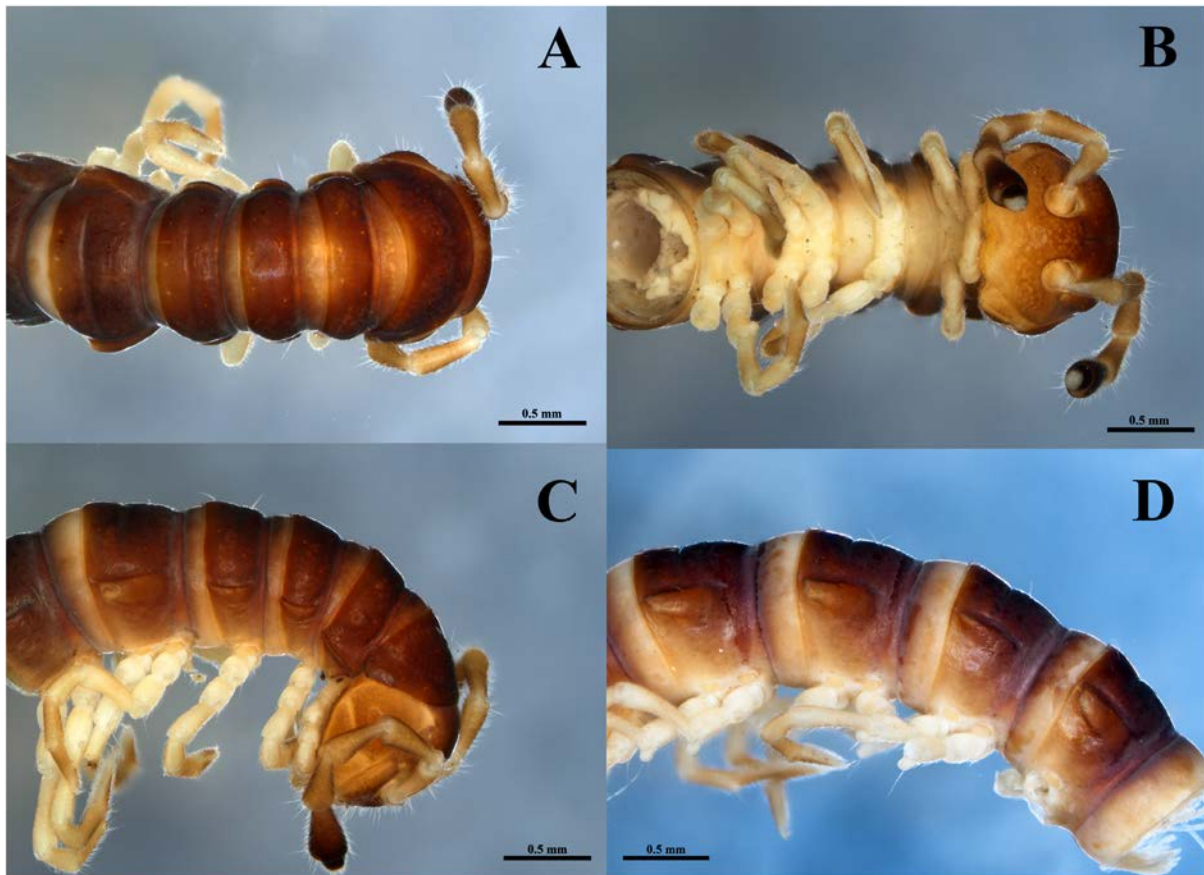


Fig. 45. *Eustrongylosoma tuberculatum*, new species. Holotype (FMNH-086 496). A, anterior part of body, dorsal view; B, ventral view; C, lateral view. D, segments 7–10, lateral view. Scale bar = 0.5 mm.

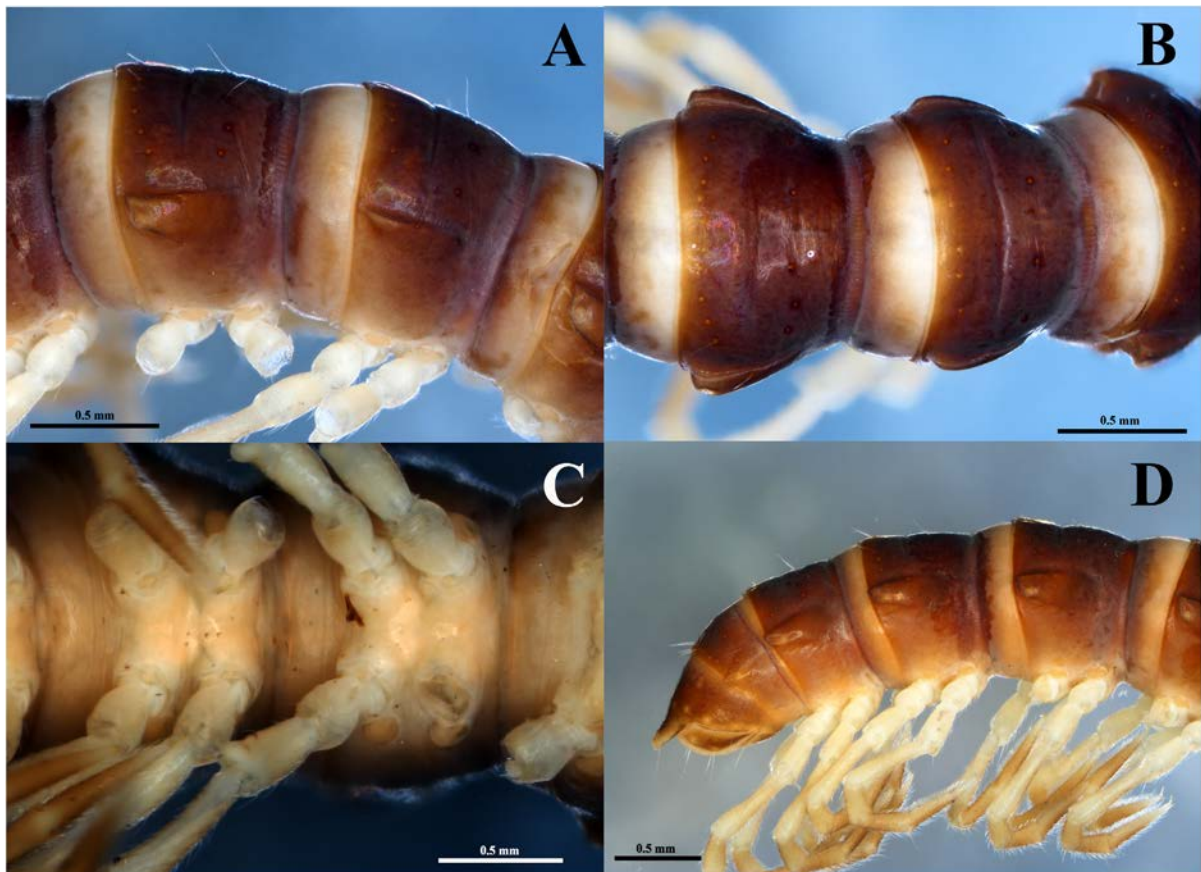


Fig. 46. *Eustrongylosoma tuberculatum*, new species. Holotype (FMNH-086 496). A, segments 8–9, lateral view, B, dorsal view; C, ventral view. D, posterior part of body, lateral view. Scale bar = 0.5 mm.

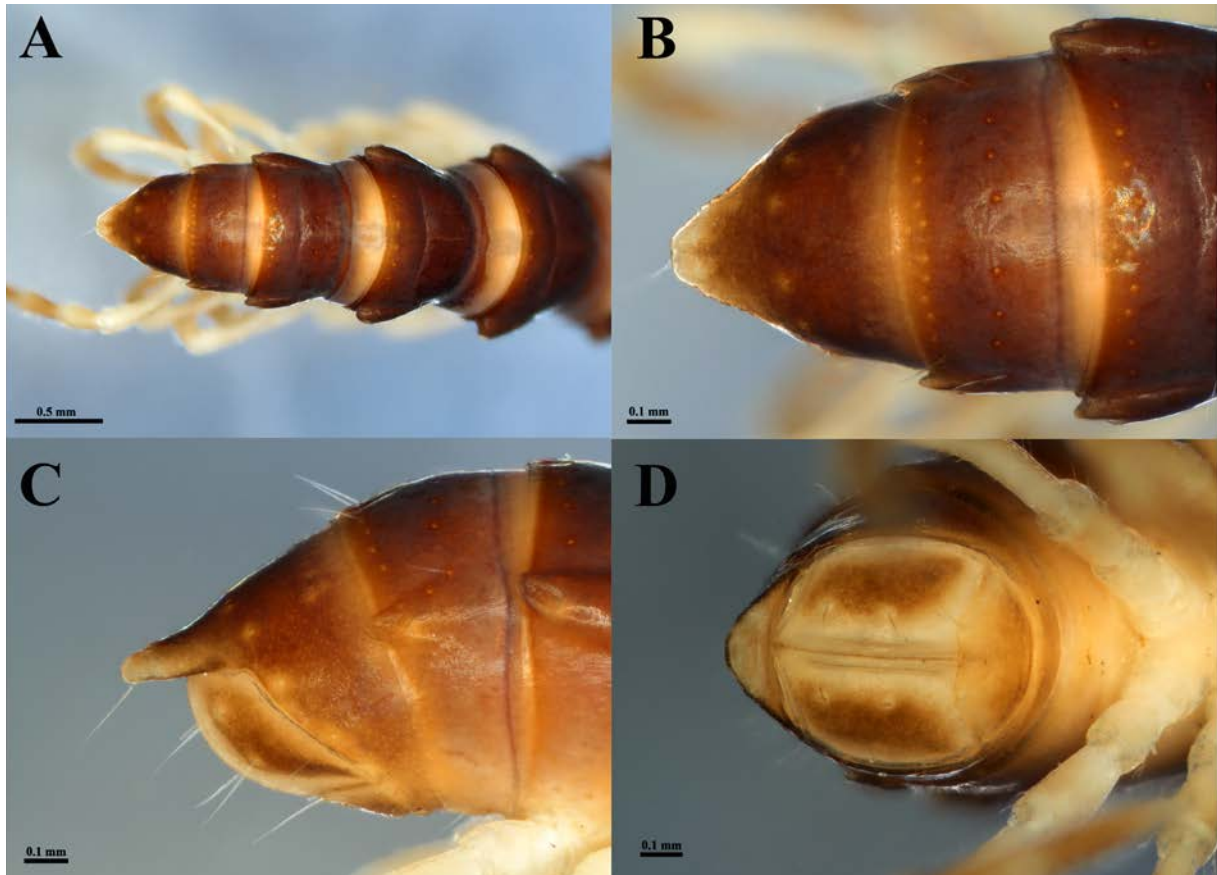


Fig. 47. *Eustrongylosoma tuberculatum*, new species. Holotype (FMNH-086 496). A, posterior part of body, dorsal view. B, telson, dorsal view; C, lateral view; D, ventral view. Scale bar = 0.5 mm for A, 0.1 mm for B–D.

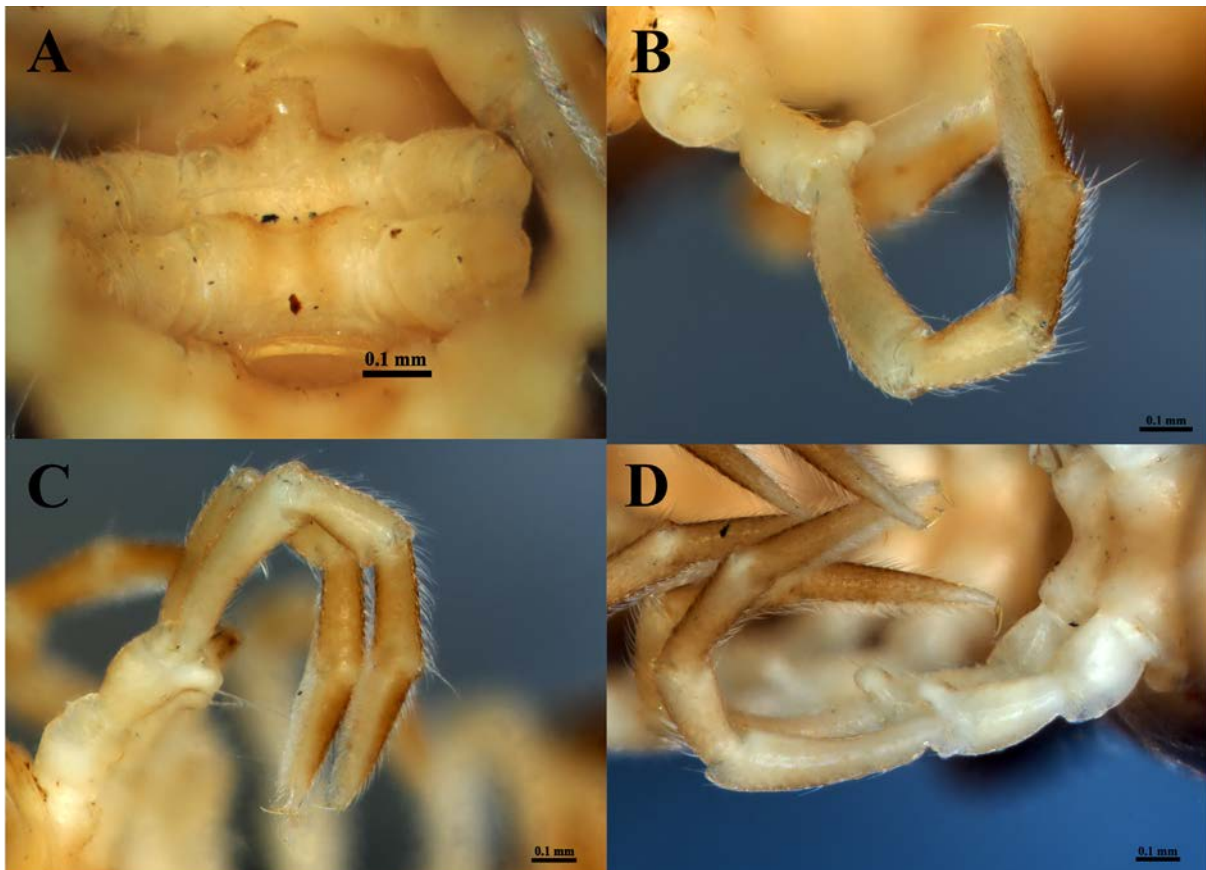


Fig. 48. *Eustrongylosoma tuberculatum*, new species. Holotype (FMNH-086 496). A, sternum 5, subventral view; B, leg 6, right; C, leg 6, left; D, leg 22–23. Scale bar = 0.1 mm.

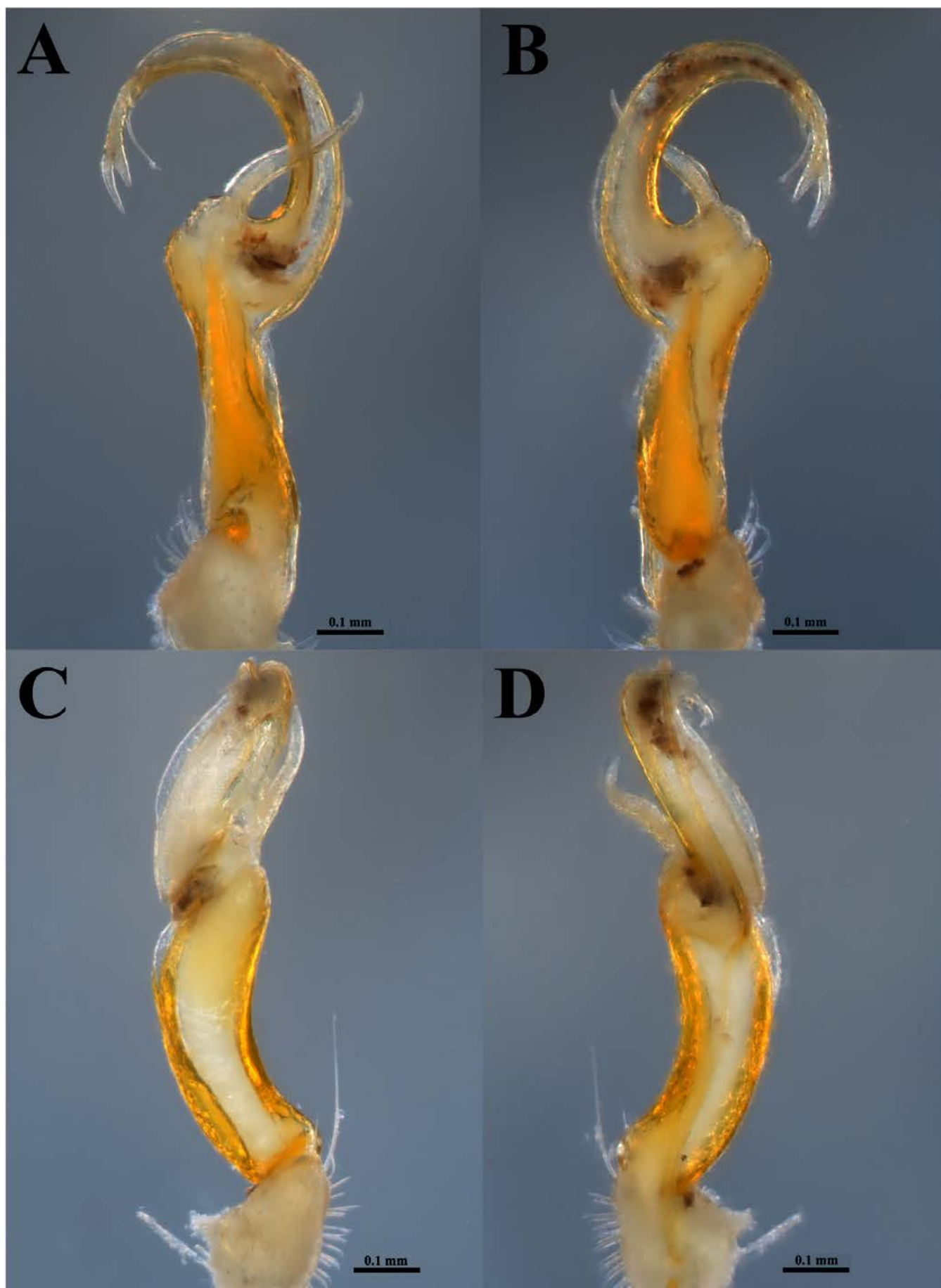


Fig. 49. *Eustrongylosoma tuberculatum*, new species. Holotype (FMNH-086 496). A, right gonopod, ventral view, B, dorsal view; C, lateral view; D, mesal view. Scale bar = 0.1 mm.

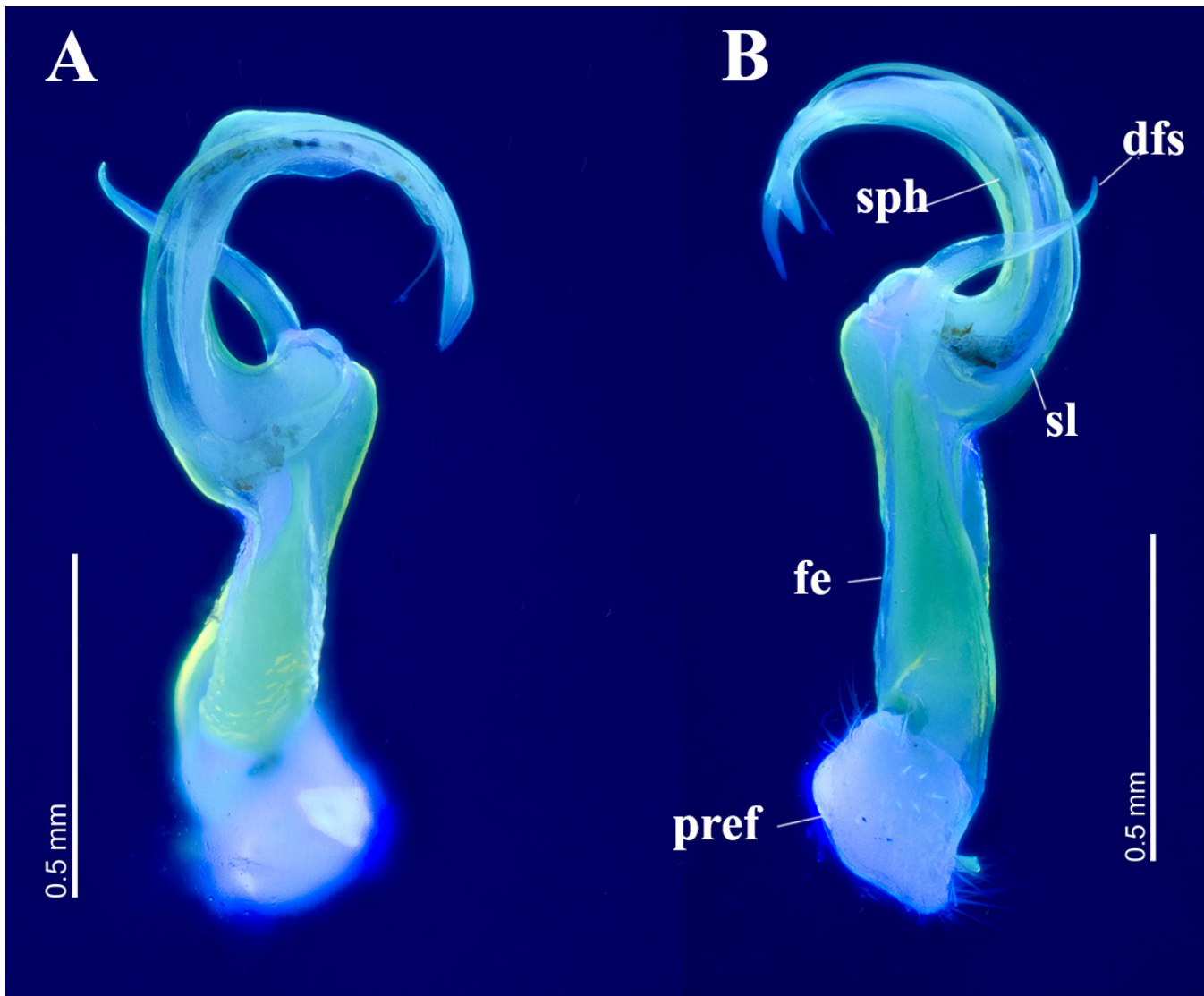


Fig. 50. *Eustrongylosoma tuberculatum*, new species. Holotype (FMNH-086 496). A, right gonopod, dorsal view; B, ventral view. Scale bar = 0.5 mm.

5. Gonopod solenophore with a distal setose brush.....
.....*E. peniculatum*, new species
- Gonopod solenophore without brushe.....6
6. Metaterga shining, finely rugulose on posterior margin, with four rows of 4+4, 3+3, 3+3 and 4+4 setae. Sternum 5 without sternal process between coxae 4. Gonofemorite with a long, oblique, distal spine; gonopod tip pointed, without subterminal lobes.....*E. amuyaomontis*, new species
- Metaterga shining and smooth, with two rows of 2+2 and 2+2 setae. Sternum 5 with sternal process between coxae 4. Gonofemorite with a long, transverse, distal spine; gonopod tip subcircular with a subterminal lobule.....
.....*E. penevi* Golovatch & Stoev, 2013

Genus *Helicorthomorpha* Attems, 1914

Helicorthomorpha Attems, 1914: Archiv für Naturgeschichte, 80A(4): 197, proposed as subgenus of *Orthomorpha* by Attems, 1914: 197, elevated to full genus rank by Attems, 1929: 271. Type species: *Strongylosoma holstii* Pocock, 1895, by original designation.

Helicorthomorpha luzoniensis (Peters, 1864) (Figs. 51–55)

Material examined: PHILIPPINES • 14 males, 20 females; Palawan Island, Palawan Province, Puerto Princesa; near sea level; 12 April 1947, leg. Hoogstraal H.; **FMNH-849 (#PNM)** • 21 males, 14 females; Palawan Island, Palawan Province, Puerto Princesa; near sea level; 12 April 1947, leg. Werner F.G.; **FMNH-846** • 1 male; Mindanao Island, Cotabato, 1,500 ft (= 457 m a.s.l.), Burungkot, Upi; 1 January 1947, leg. Werner F.G.; **FMNH-818** • 1 male; Palawan Island, Palawan Province; 22 March 1947, leg. Werner F.G.; **FMNH-822** • 1 male, 2 females; Mindanao, Davao Province, Todaya, East slope of Mount Apo; elev. 2,800 ft (= 853 m a.s.l.); November 1946, leg. Hoogstraal H.; **FMNH-INS 011 433** • 1 male; Palawan Island, Palawan Province, Puerto Princesa; near sea level; under logs in 2nd growth forest; 26 April 1947, leg. Hoogstraal H.; **FMNH-INS 011 422** • 2 males, 1 female; Mindanao Island, Davao Province, Mount McKinley, East slope; elev. 7,000 ft (= 2,133 m a.s.l.); mossy forest; 6 September 1946, leg. Hoogstraal H.; **FMNH-852** • 1 male, 6 juveniles; Mindanao Island, Davao Province, Mount

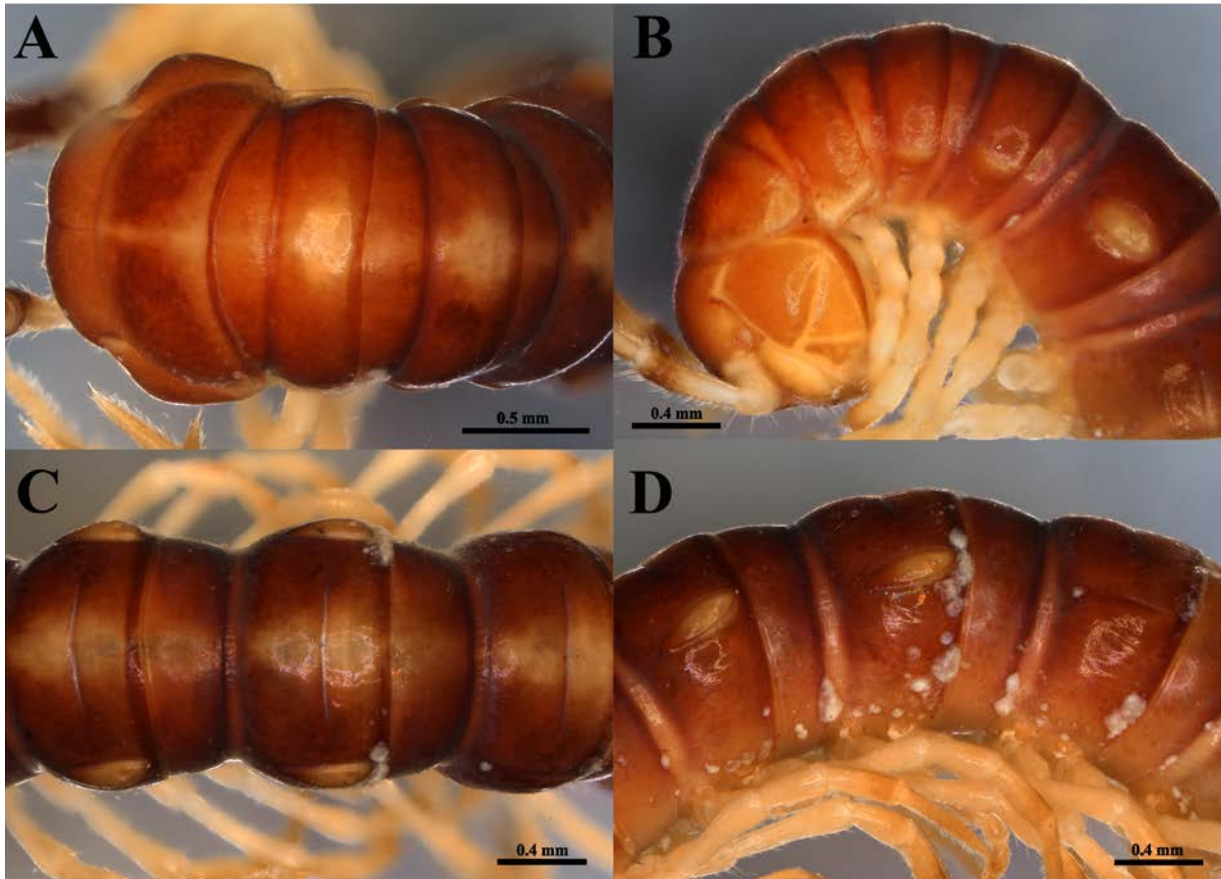


Fig. 51. *Helicorthomorpha luzoniensis* (Peters, 1864) (FMNH 853). A, anterior part of body, dorsal view; B, lateral view; C, segments 9–11, dorsal view; D, lateral view. Scale bar = 0.5 mm for A, 0.4 mm for B–D.

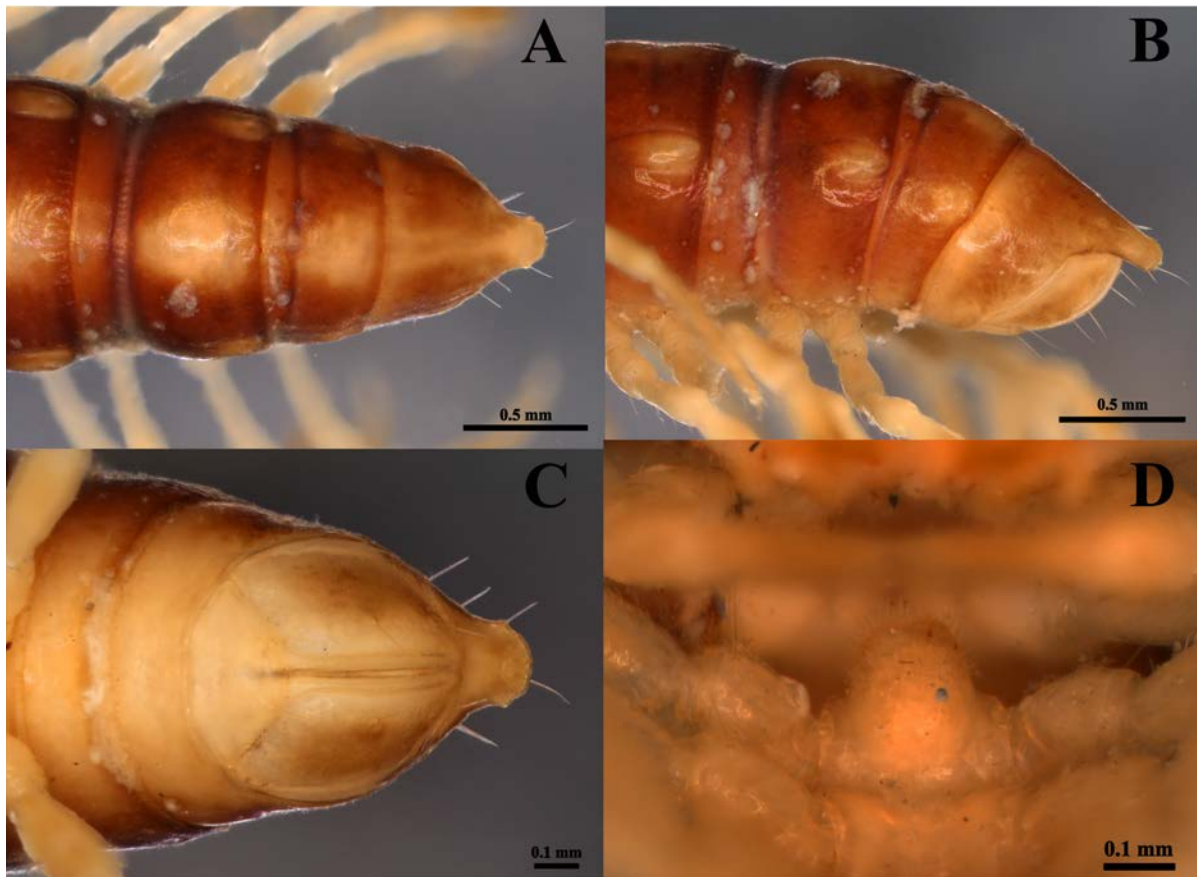


Fig. 52. *Helicorthomorpha luzoniensis* (Peters, 1864) (FMNH 853). A, posterior part of body, dorsal view; B, lateral view; C, telson, ventral view. D, sternum 5, subventral view. Scale bar = 0.5 mm for A and B, 0.1 mm for C and D.

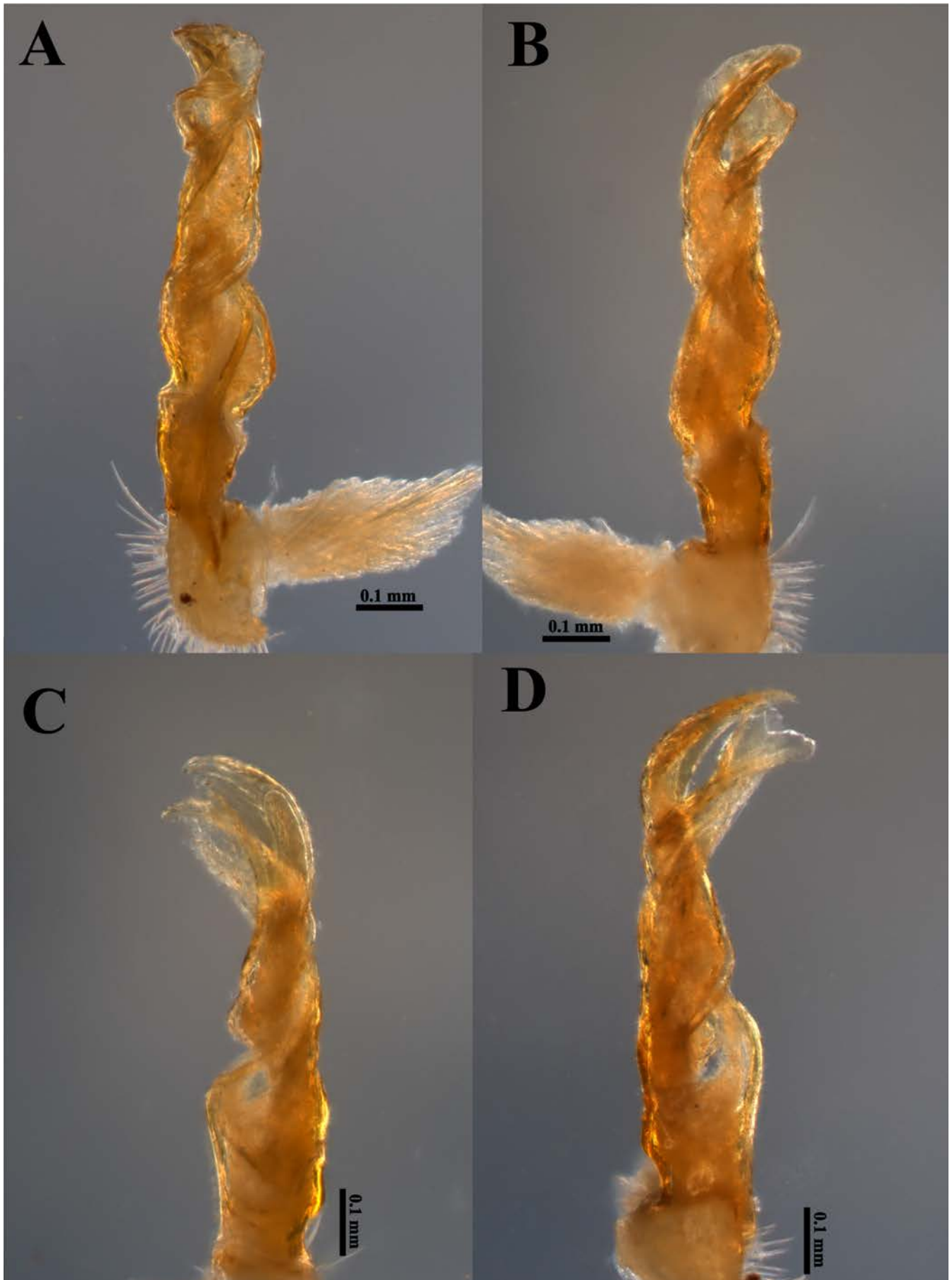


Fig. 53. *Helicorthomorpha luzoniensis* (Peters, 1864) (FMNH 853). A, right gonopod, mesal view; B, lateral view; C, dorsal view; D, ventral view. Scale bar = 0.1 mm

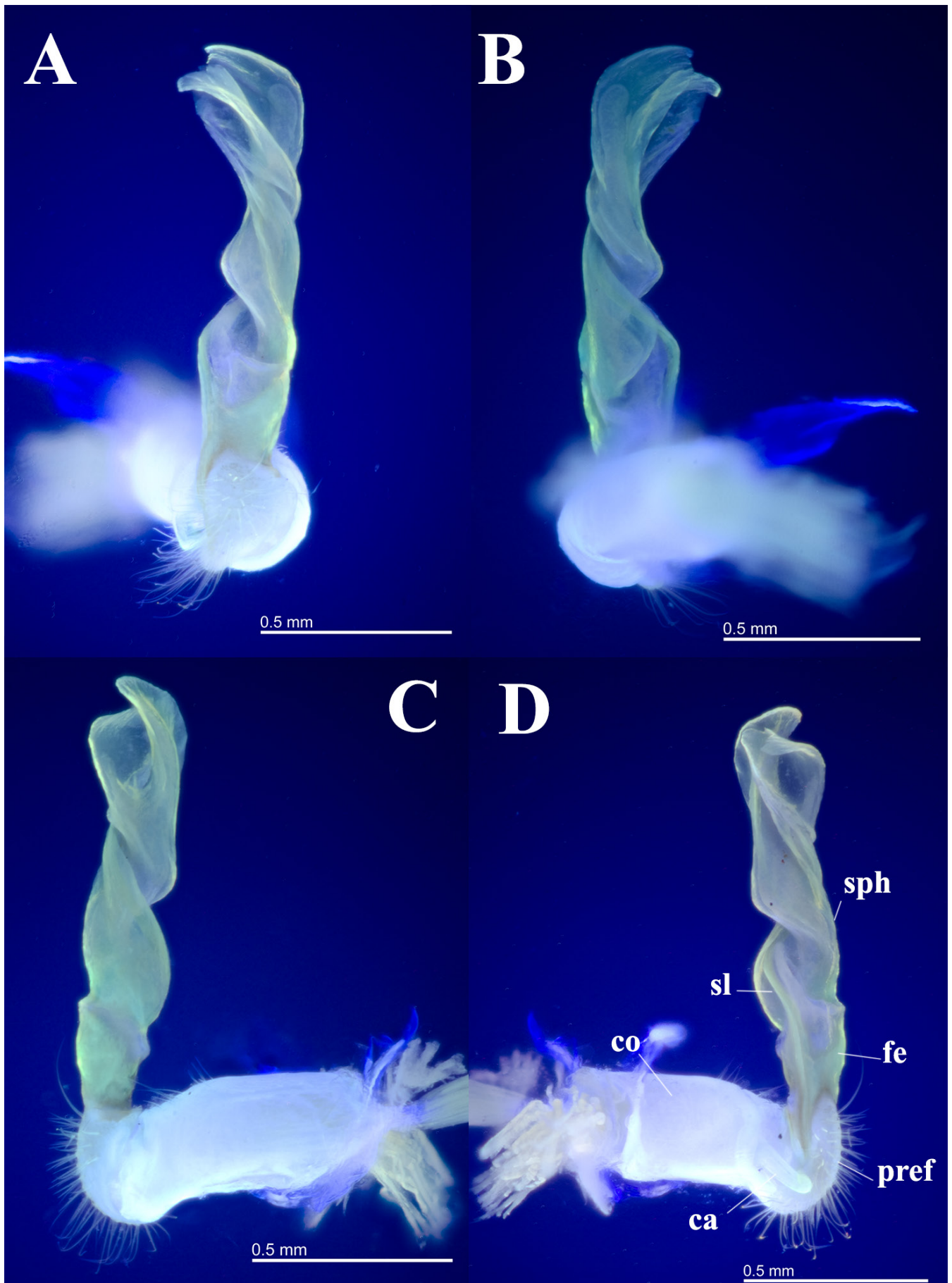


Fig. 54. *Helicorthomorpha luzoniensis* (Peters, 1864) (FMNH 852). A, right gonopod, mesal view; B, lateral view; C, dorsal view; D, ventral view. Scale bar = 0.1 mm

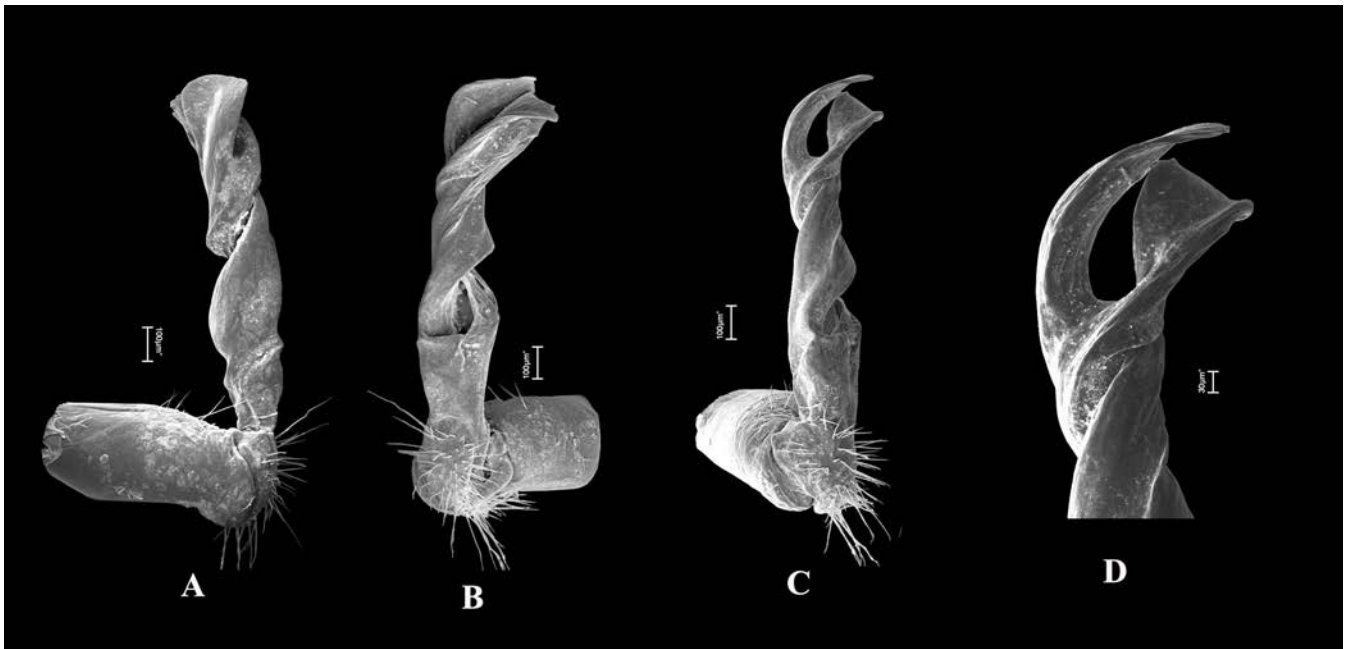


Fig. 55. *Helicorthomorpha luzoniensis* (Peters, 1864) (FMNH 853). A, right gonopod, subdorsal view; B, lateral view; C, submesal view. D, postfemoral region, subdorsal view. Scale bar = 0.1 mm.

McKinley, East slope; elev. 6,500 ft (= 1,981 m a.s.l.); 3 September 1946, leg. Werner F.G.; **FMNH-INS 013 427** • 1 male; Mindanao, Davao Province, Mount McKinley, East slope; elev. 6,400 ft (= 1,950 m a.s.l.); 2 September 1946, leg. Werner F.G.; **FMNH-853**.

Remarks. This species is widely distributed in the Philippines. Golovatch & Stoev (2013) considered this species to be a senior subjective synonym of *H. orthogona* (Silvestri, 1898), which is known to occur from China to New Guinea (Korsós, 2004; Nguyen & Sierwald, 2013).

Genus *Luzonomorpha* Hoffman, 1973

Luzonomorpha Hoffman, 1973: Journal of Natural History, 7: 366–367. Type species: *Prionopeltis montanus* Chamberlin, 1921, by original designation.

Remarks. The endemic Filipino genus, *Luzonomorpha* Hoffman, 1973, currently comprises nine species (see the below list) including a new one described herein. All species are distributed only in Luzon, Mindanao, and the Pollio islands. Of the nine species, *L. acutangula* is very dubious, and more likely to be a synonym of *L. montana* (Hoffman, 1973; Jeekel, 2000).

1. *Luzonomorpha acutangula* (Newport, 1844) from Luzon Island.
2. *Luzonomorpha infulata* (Wang, 1951) from Mindanao Island.
3. *Luzonomorpha luzoniensis* (Peters, 1864) from Luzon Island.

4. *Luzonomorpha montana* (Chamberlin, 1921) from Luzon and Mindanao Islands.
5. *Luzonomorpha pallidula* Jeekel, 2000 from Mindoro Island.
6. *Luzonomorpha picea* (Brandt, 1841) from Manila, Luzon Island.
7. *Luzonomorpha polilloensis* (San Juan & Lit, 2010) from Pollio Island.
8. *Luzonomorpha quatuorputus* (Wang, 1951) from Mindanao Island.
9. *Luzonomorpha wernereri*, new species, from Palawan Island.

Luzonomorpha infulata (Wang, 1951) (Figs. 56–59)

Prionopeltis infulatus Wang, 1951: 20, figs 59–62

Pratinus infulatus: – Wang, 1961: 111, figs 59–62.

Orthomorpha infulata: – Jeekel, 1968: 67.

Luzonomorpha infulata: – Hoffman, 1973: 370.

Material examined. PHILIPPINES • 1 male; Luzon Island, Ifugao, Myoyao; 15°58'22"N, 121°13'14"E; 9 March 2000, leg. Gerdeman B.S.; AL006090, BSG 00–0303–3/4; **FMNHINS 2772 (FMNH-072167)**.

Remarks. The species is clearly distinguished from its congeners by light yellowish posterior halves of metaterga. It has been recorded from its type locality (Mindanao Island), which is about more than 1,500 km south from the new locality. The species was originally described from only one male, and no other specimens have been examined so far except for a male in this paper.

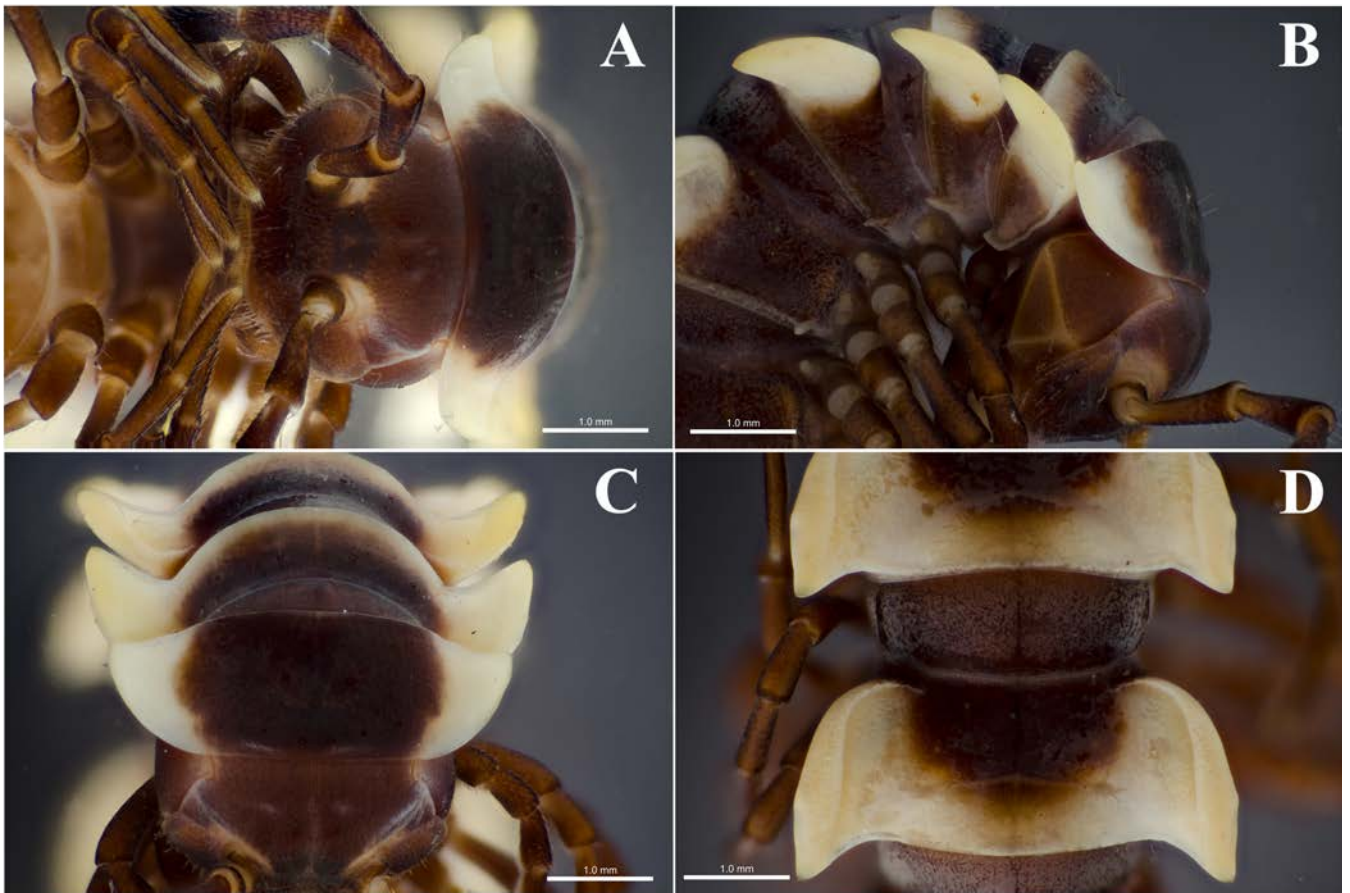


Fig. 56. *Luzonomorpha infulata* (Wang, 1951) (FMNH-072167). A, anterior part of body, dorsal view, B, lateral view; C, collum, dorsal view. D, segments 10–11, dorsal view. Scale bar = 1 mm.

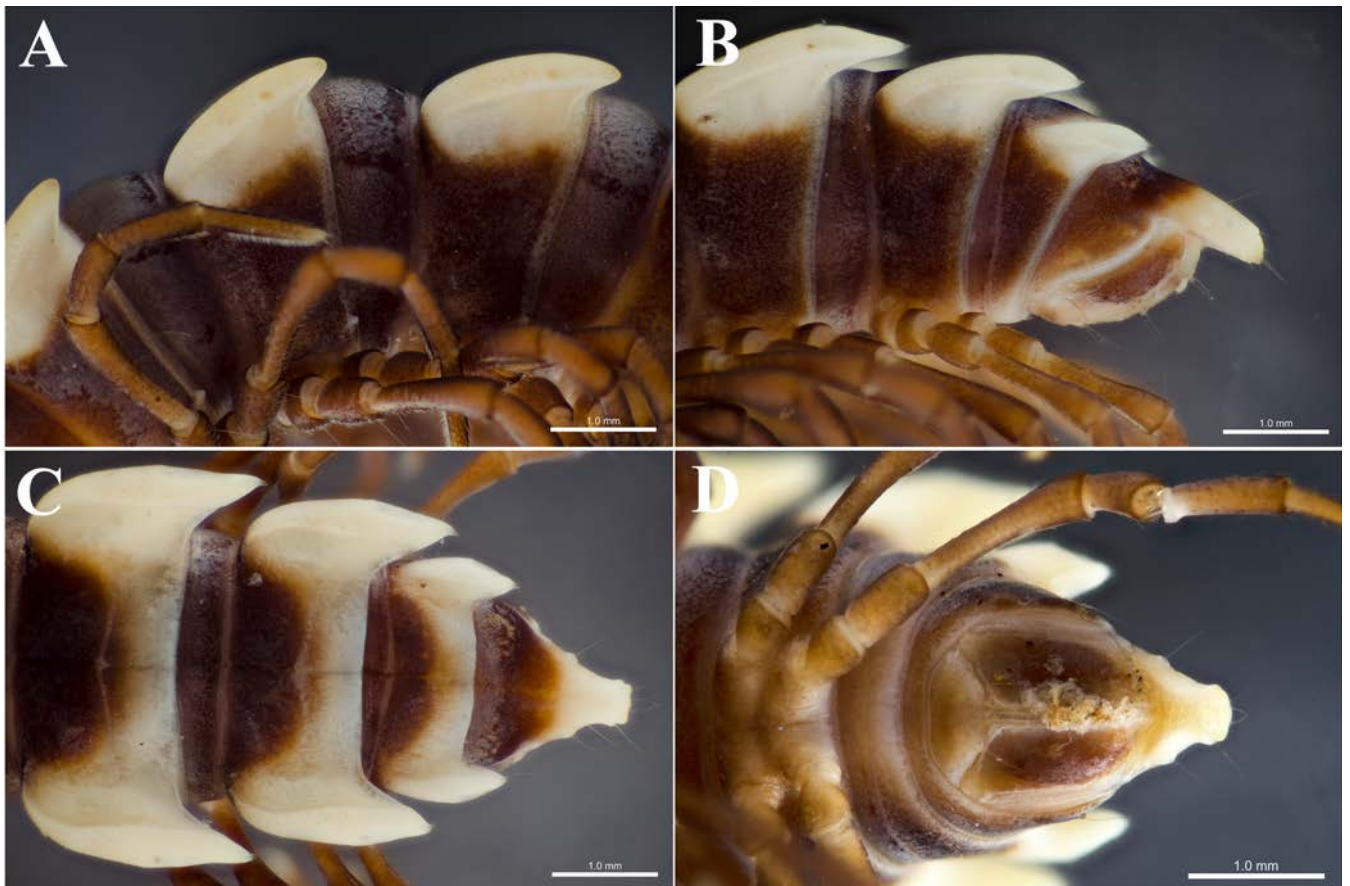


Fig. 57. *Luzonomorpha infulata* (Wang, 1951) (FMNH-072167). A, Segments 9–10, lateral view; B, posterior part of body, lateral view; C, dorsal view; D, ventral view. Scale bar = 1 mm.

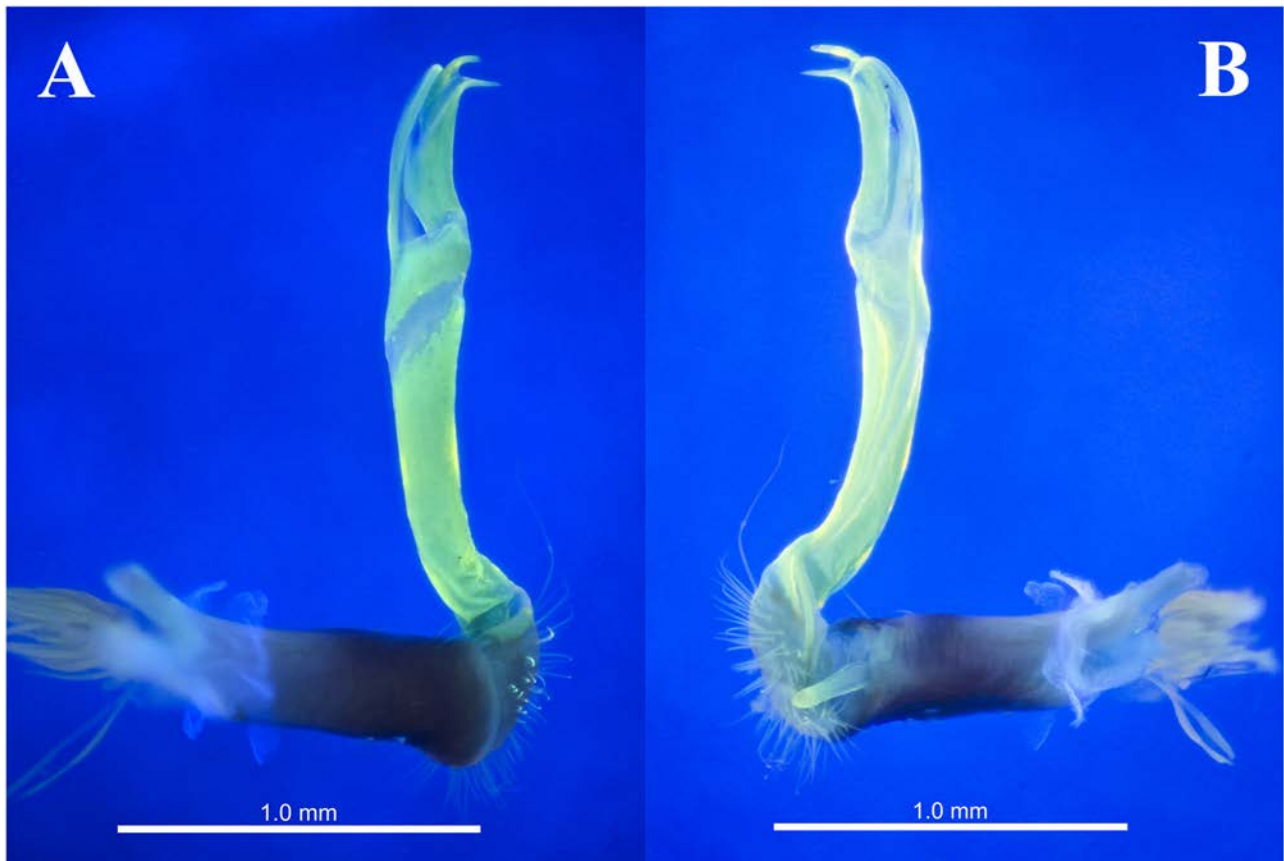


Fig. 58. *Luzonomorpha infulata* (Wang, 1951) (FMNH-072167). A, right gonopod, lateral view; B, mesal view. Scale bar = 1 mm.

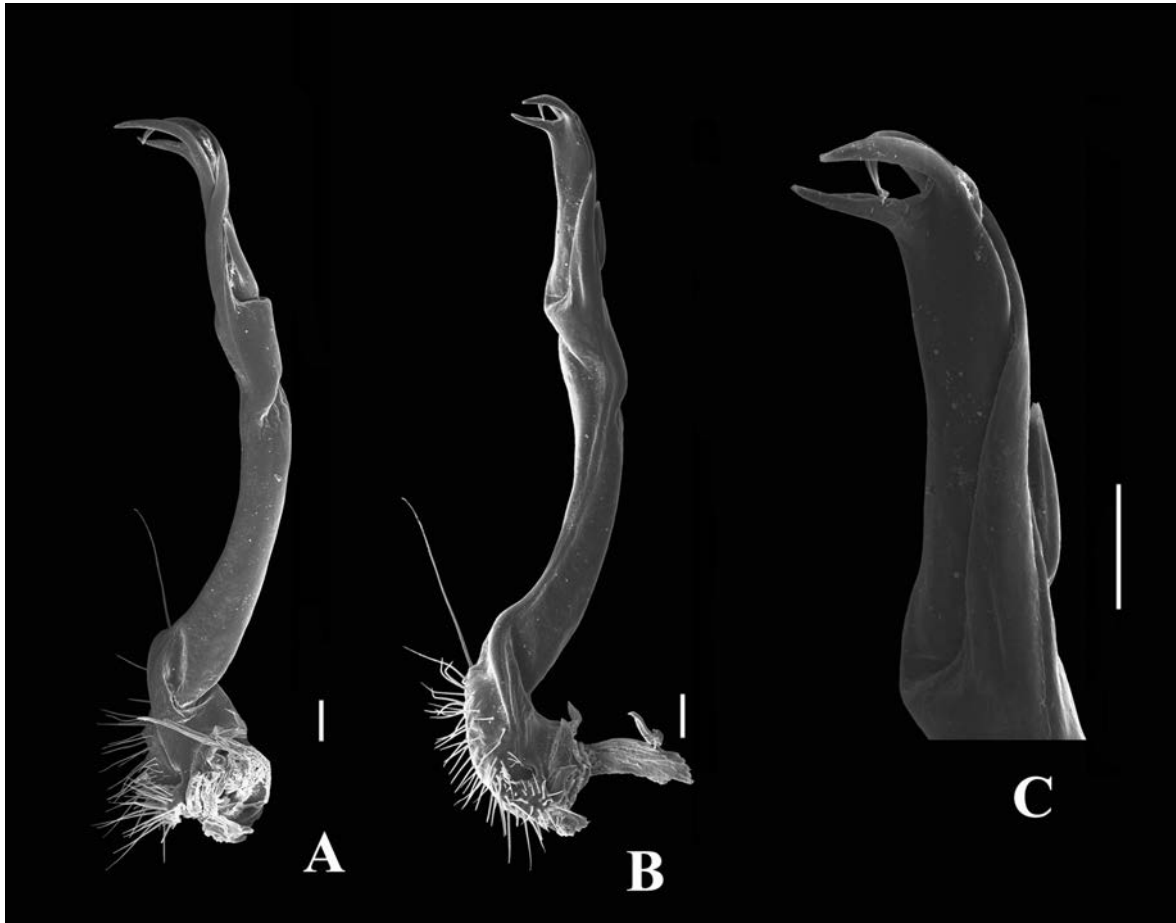


Fig. 59. *Luzonomorpha infulata* (Wang, 1951) (FMMC 2772). A, right gonopod, ventromesal view; B, mesal view; C, postfemoral region, mesal view. Scale bar = 0.1mm.

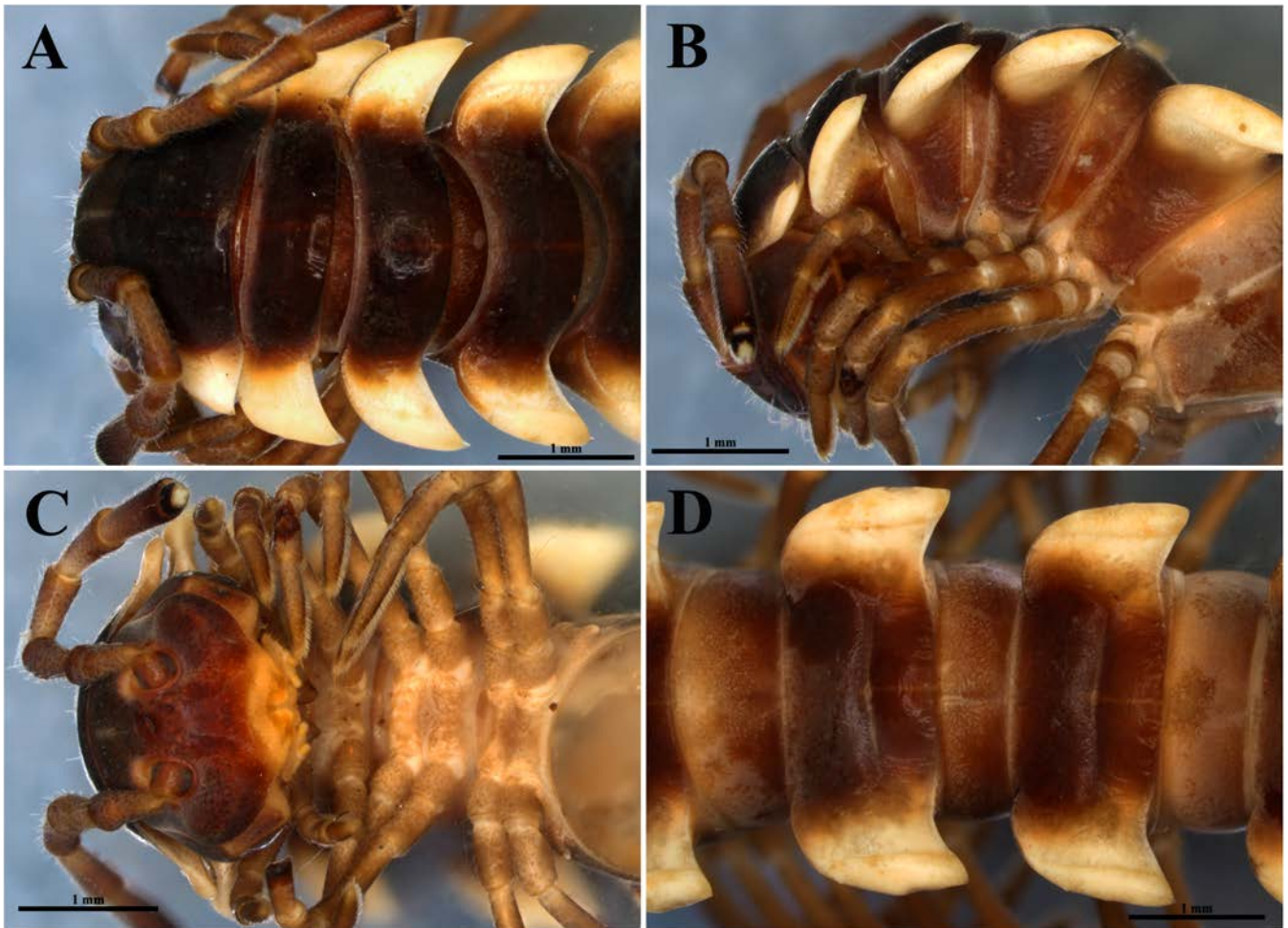


Fig. 60. *Luzonomorpha montana* (Chamberlin, 1921) (FMMC 2797). A, anterior part of body, dorsal view; B, lateral view; C, ventral view. D, segments 10–11, dorsal view. Scale bar = 1 mm

***Luzonomorpha montana* (Chamberlin, 1921)**
(Figs. 60–65)

Priomopeltis montana Chamberlin, 1921: 81

Pratinus montanus: – Attems, 1937: 122, “uncertain genus”; Wang, 1953: 3; Wang, 1961: 109–110, figs 50–53.

Orthomorpha montana: – Jeekel, 1963: 265; Jeekel, 1968: 67.

Luzonomorpha montana: – Hoffman, 1973: 367–369, figs 5–9

Material examined. PHILIPPINES • 1 male; Leyte, Visca, Hubasan, Creek; 9 June 2000, leg. Gerdeman B.S & Garcia R.; ex. litter, AL006137, BSG 00–0609–1; **FMMC 2797.**

Remarks. The newly recorded locality is quite far from the type locality. The new material agrees with all descriptive characters mentioned in Chamberlin (1921) and Hoffman (1973) except for the male sternum 5 with a ridge of two distinct rounded, elevated tubercles between coxae 4. The species has also been found in Mount Maquiling, Luzon (Hoffman, 1973).

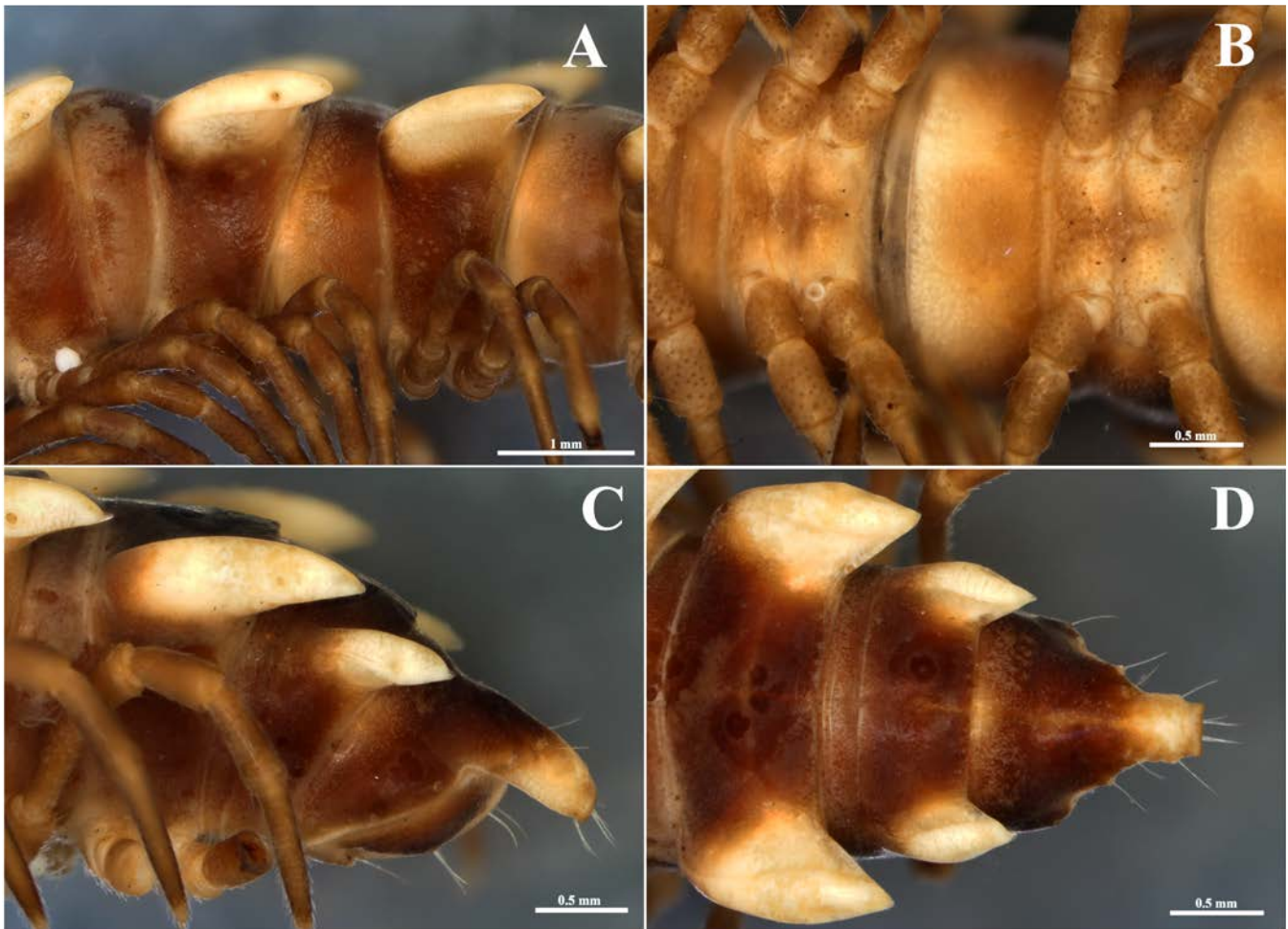


Fig. 61. *Luzonomorpha montana* (Chamberlin, 1921) (FMMC 2797). A, segments 10–11, lateral view; B, ventral view; C, posterior part of body, lateral view; D, dorsal view. Scale bar = 1 mm for A, 0.5 mm for B–D.

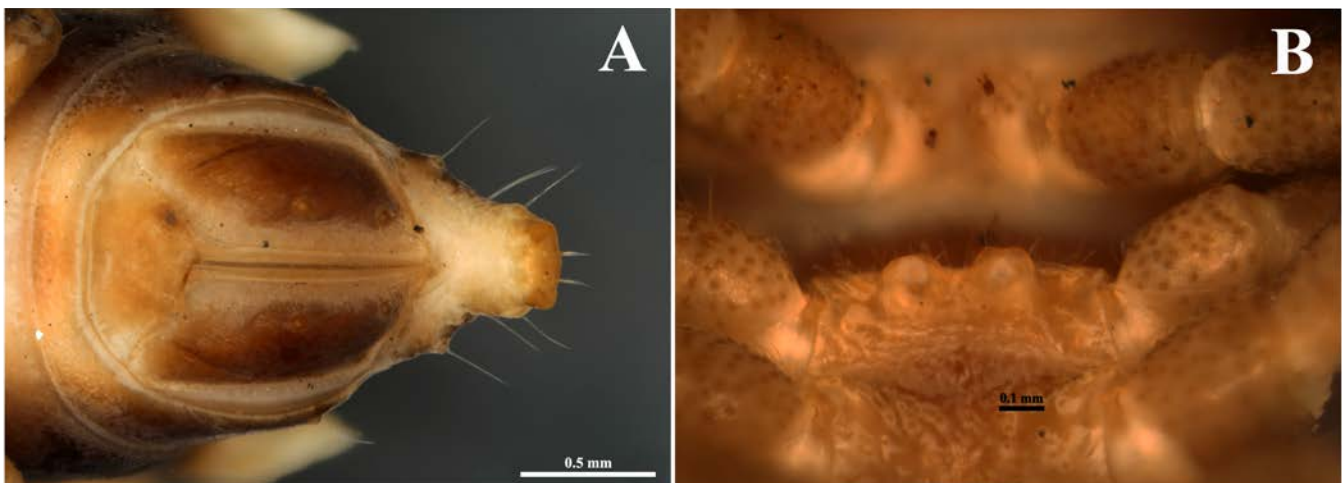


Fig. 62. *Luzonomorpha montana* (Chamberlin, 1921) (FMMC 2797). A, posterior part of body, lateral view; B, sternum 5, subventral view. Scale bar = 0.5 mm for A, 0.1 mm for B.

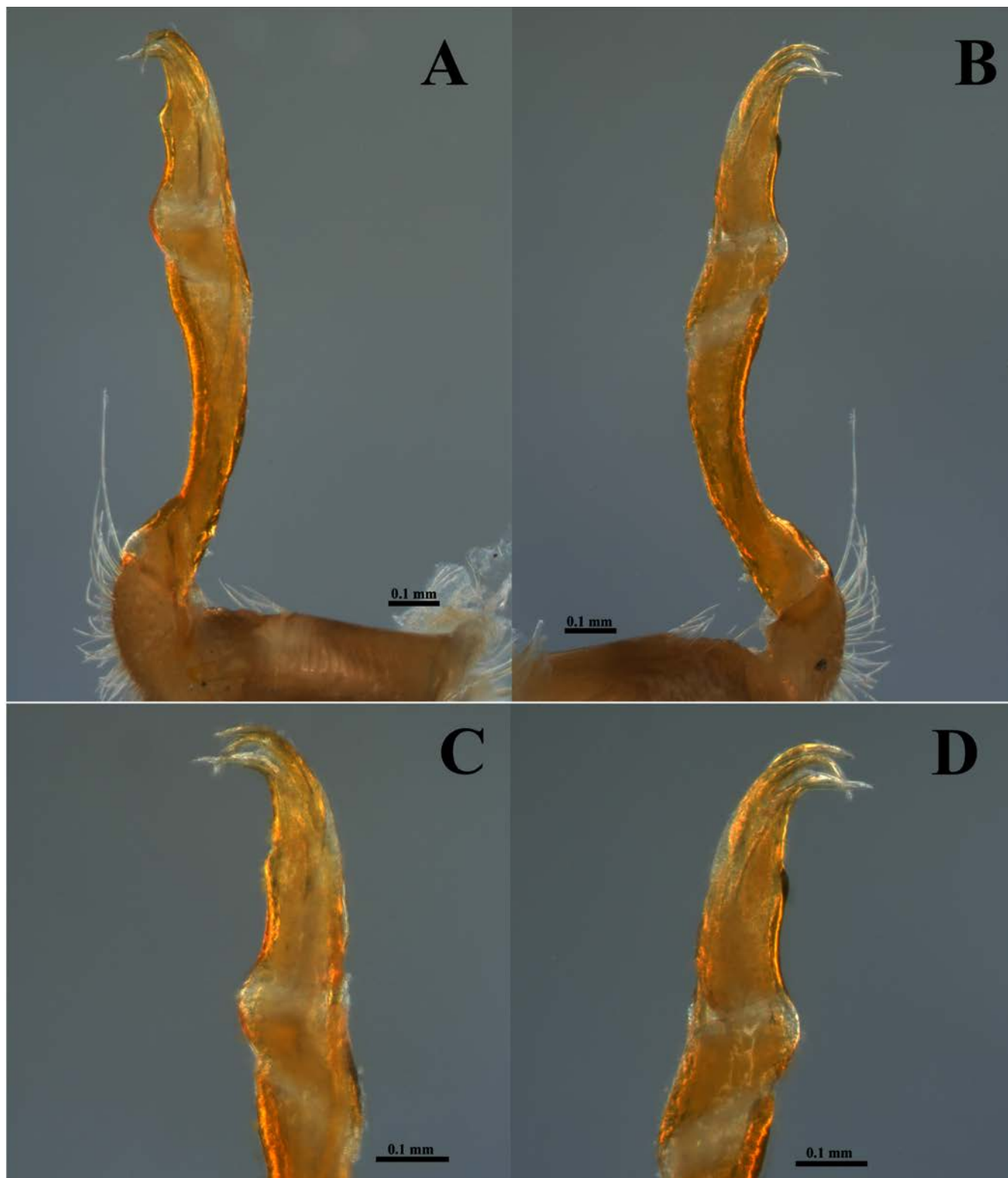


Fig. 63. *Luzonomorpha montana* (Chamberlin, 1921) (FMMC 2797). A, right gonopod, mesal view; B, lateral view; C, postfemoral part of gonopod, mesal view; D, lateral view. Scale bar = 0.1 mm.

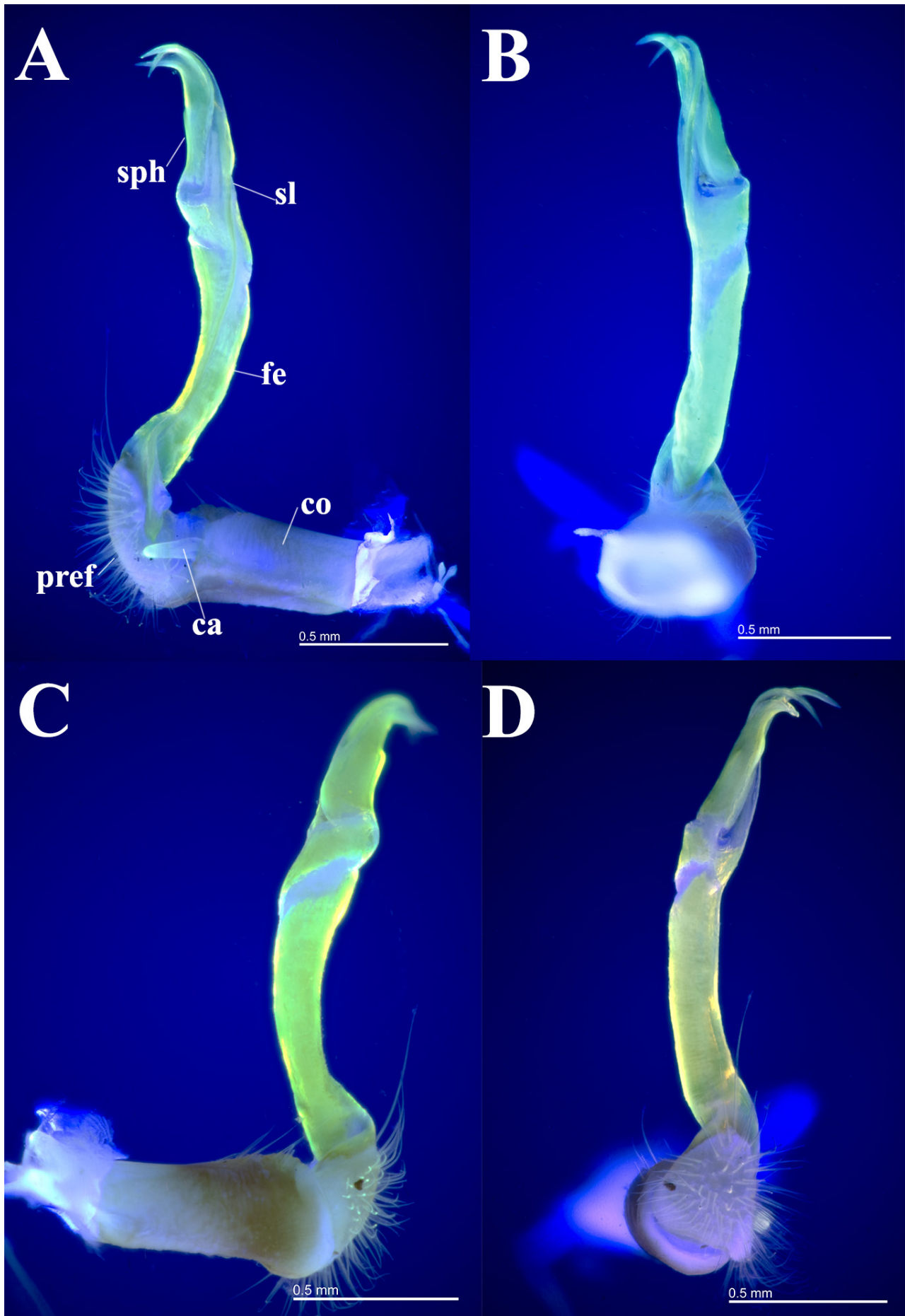


Fig. 64. *Luzonomorpha montana* (Chamberlin, 1921) (FMMC 2797). A, right gonopod, mesal view; B, dorsal view; C, lateral view; D, ventral view. Scale bar = 0.5 mm.

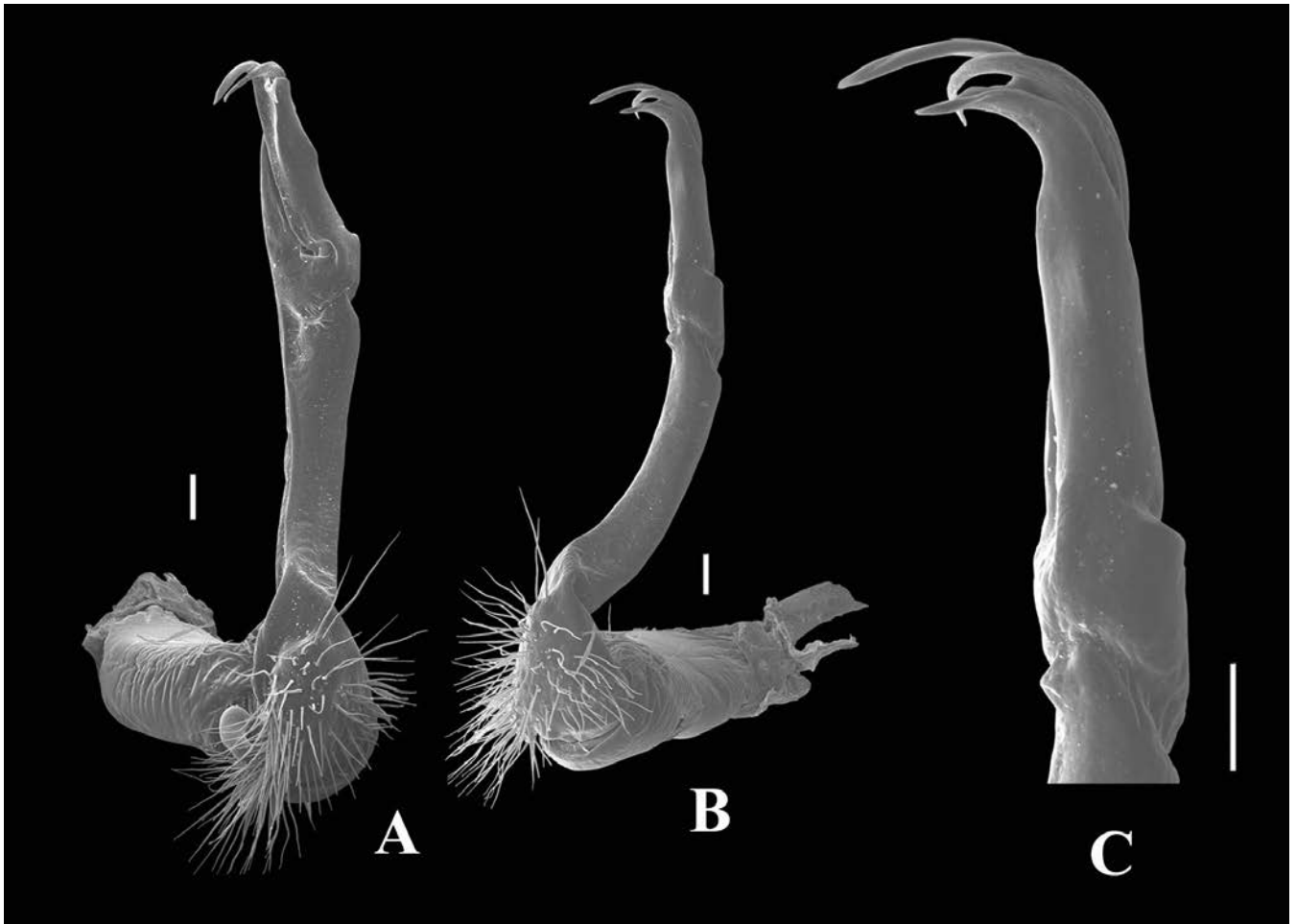


Fig. 65. *Luzonomorpha montana* (Chamberlin, 1921) (FMMC 2797). A, left gonopod, mesoventral view; B, lateroventral view; C, postfemoral region, lateroventral view. Scale bar = 0.1 mm.

***Luzonomorpha weneri*, new species**
(Figs. 66–70, 86H)

Material examined. Holotype: PHILIPPINES • 1 male; Palawan Island, Palawan Province, Puerto Princesa; near sea level; second growth forest; 9 May 1947, leg. Hoogstraal H.; **FMNH 827**.

Paratypes: PHILIPPINES • 1 male, 1 female; Palawan Island, Palawan Province, Puerto Princesa; second growth forest; 12 April 1947, leg. Werner F.G.; **FMNH-INS 085 784** • 1 male; southern Palawan Island, Mantalingajan Range, Mount Balabag, South slope; elev. 2,500 ft (= 762 m a.s.l.); 5 May 1947, leg. Werner F.G.; **FMNH 847 (#PNM)** • 1 male; Palawan Island, Palawan Province, Puerto Princesa; near sea level; second growth forest; 3 May 1946, leg. Hoogstraal H.; **FMNH 851 (#PNM)** • 1 male; southern Palawan, Mantalingajan Range, Mount Balabag, South slope; elev. 4,200 ft (= 1,280 m a.s.l.); 10 May 1947, leg. Werner F.G.; **FMNH-INS 011 277 (#PNM)** • 1 male; Palawan Island, Palawan Province, Puerto Princesa; near sea level second growth forest; 12 April 1947, leg. Hoogstraal H.; **FMNH-INS 085 783** • 1 male; southern Palawan, Mantalingajan Range, Mount Balabag, South slope; elev. 2,500–4,000 ft (= 762–1,219 m a.s.l.); “natives”; 12 May 1947, leg. Werner F.G.; **FMNH-INS 011 954**

Diagnosis. The species differs from *Luzonomorpha quatuorputeus* (Wang, 1951) in having a second row of 3+3 setae close to posterior margin of metaterga, from *L. montana* (Wang, 1951) in having marginal setiferous incisions in paraterga, and from other *Luzonomorpha* species in having different colour pattern (the new species has castaneous brown body and yellow or brownish yellow paraterga, but other *Luzonomorpha* species have different colouration of body and paraterga).

Etymology. Named in honor of Dr. Werner E. G., a German entomologist, for his great expedition in 1946–1947 to the Philippines.

Description. Body length ca. 29.6–32.2 mm; width of midbody pro- and metazona 2.2–2.6 mm and 3.1–3.4 mm. Holotype ca. 32.2 mm in length; width of midbody pro- and metazona 2.6 mm and 3.4 mm, respectively.

Colouration: body generally castaneous brown; metaterga and pleura darkish brown; prozonae, legs, sterna, head and antenna castaneous brown; paraterga yellow or brownish yellow.

Head (Fig. 66A, B) slightly narrower than collum; clypeolabral region densely setose; frons somewhat convex, divided into two parts by a distinct epicranial suture. Antenna

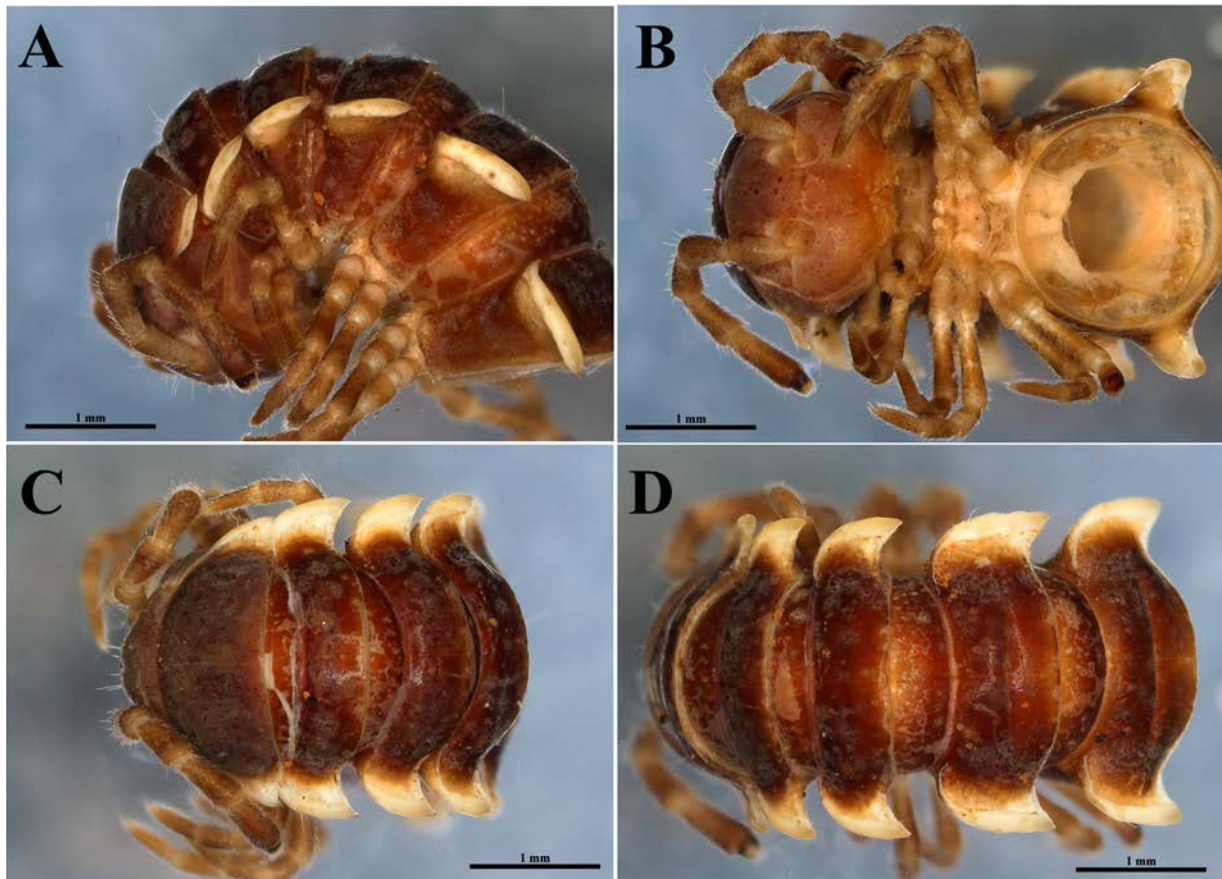


Fig. 66. *Luzonomorpha weneri*, new species. Holotype (FMNH 827). A, anterior part of body, lateral view; B, ventral view; C, dorsal view. D, segments 3–5, dorsal view. Scale bar = 1 mm.



Fig. 67. *Luzonomorpha weneri*, new species. Holotype (FMNH 827). A, segments 9–11, dorsal view. B, segments 10–11, lateral view. C, sterna 9–11, ventral view. D, posterior part of body, dorsal view. Scale bar = 1 mm for A, and 0.5 mm for B–D.

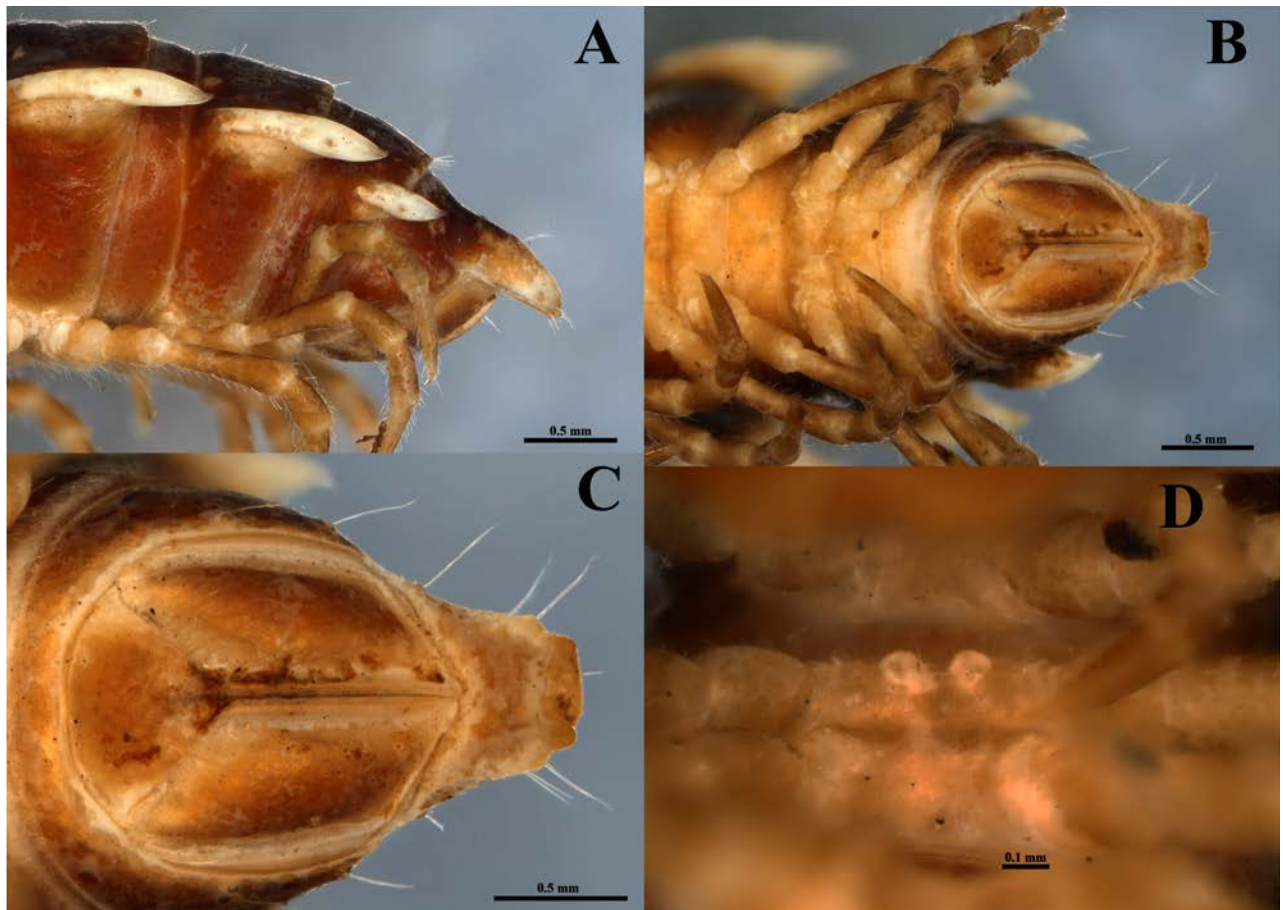


Fig. 68. *Luzonomorpha weneri*, new species. Holotype (FMNH 827). A, posterior part of body, lateral view; B, ventral view. C, telson, ventral view. D, sternum 5, subventral view. Scale bar = 0.5 mm for A–C, and 0.1 mm for D.

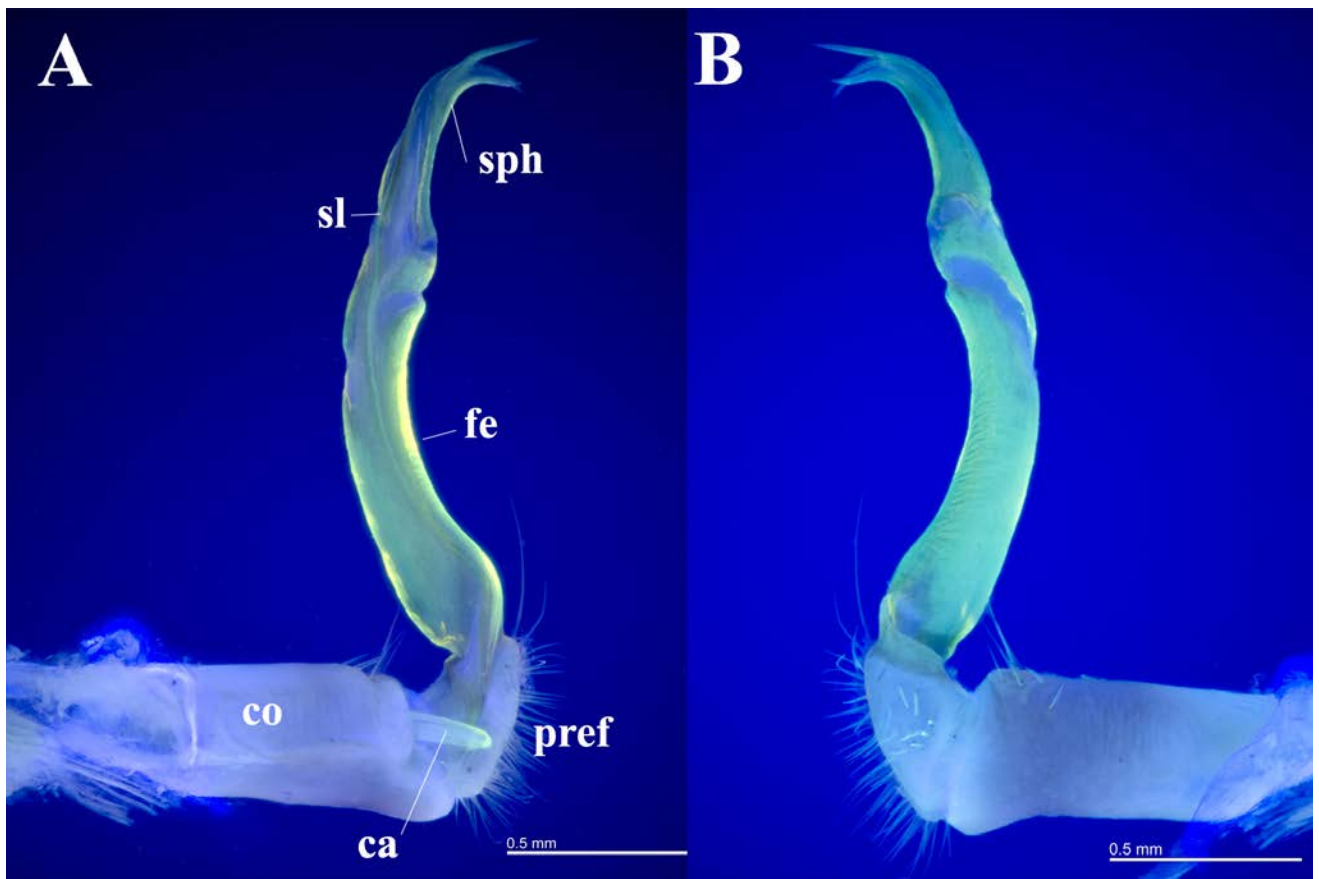


Fig. 69. *Luzonomorpha weneri*, new species. Paratype (FMNH 847). A, left gonopod, mesal view; B, lateral view. Scale bar = 0.5 mm.

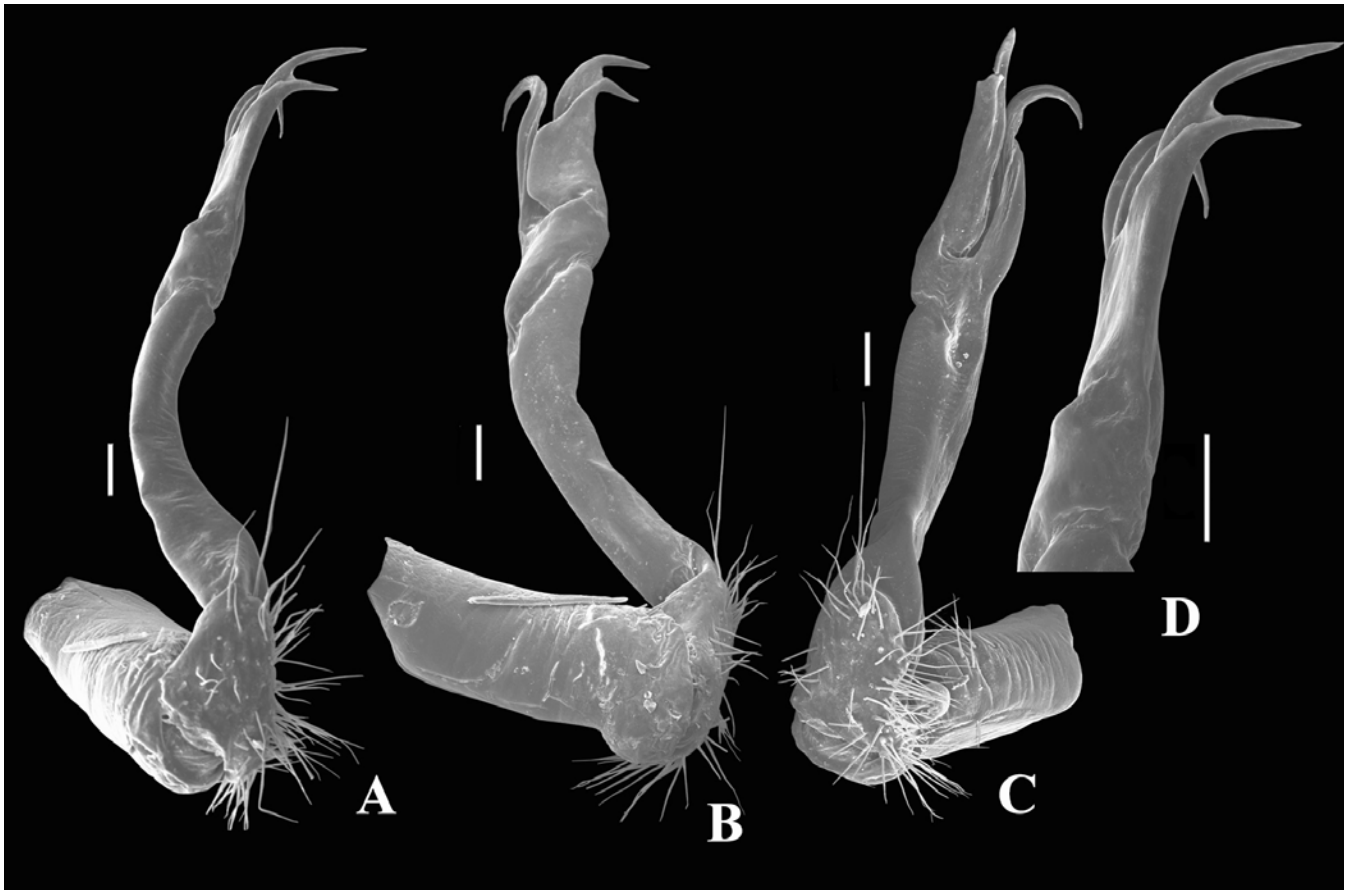


Fig. 70. *Luzonomorpha wernerii*, new species. Holotype (FMNH 827). A, right gonopod, lateroventral view; B, lateral view; C, mesoventral view; D, postfemoral region, lateroventral view. Scale bar = 0.1 mm.

long and slender, reaching metaterga 3 if stretched dorsally; antennomere 7 < 1 < 2=6 in length, antennomere 7 black. Collum (Fig. 66A, C) somewhat smaller than body ring 2 in width; surface shining, finely rugulose, with three rows of setae: 4+4 in anterior row, 2+2 in middle row and 1+1 in posterior row. Paraterga well developed, subtriangular; anterior corner broadly rounded; posterior corner pointed, slightly projected into a small spine; lateral side with a small median setiferous incision.

Body ring (Figs. 66A, 66C, D, 67 A, 67D) $3 < 4 < 2 = 5 - 16$ in width, thereafter gradually tapering towards telson. Prozonae smooth, shining. Metaterga shining, finely rugulose. Transverse sulcus poorly incomplete on metatergum 4, but well developed on metaterga 5–19. Metaterga 2–19 with two rows of setae: one of 2+2 setae before transverse sulcus, the second of 3+3 setae located close to posterior margin on metaterga 2–16, and 4+4 setae on metaterga 17–19. Setae of the second row mostly broken on anteriormost body rings. Axial line thin, distinct. Pleura shining, finely rugulose. Pleurosternal carinae present as large ridge with a caudal denticle on body rings 2–6, but reduced as only caudal tooth on body rings 7–10, then absent on subsequent body rings. Constriction between pro- and metazona deep, neither beaded nor striolate at bottom.

Paraterga (Figs. 66, 67A, B, D, 68A) well developed, subhorizontal, set lower than metatergal surface; thin, blunt blade-like, but thicker on pore-bearing body rings in lateral

view. Paraterga 2–3 narrower than others, caudal corner acute, beak-like, protruding as long pointed projections. Paraterga exceeding posterior contour, but not reaching anterior margin of following metaterga. Calluses well developed; lateral side of poreless rings with two small setiferous incisions at $\frac{1}{2}$ and $\frac{3}{4}$ length, pore-bearing rings with only one incision at $\frac{1}{2}$ length. Ozopores located on small hollow at $\frac{3}{4}$ length of paraterga 5, 7, 9–10, 12–13, 15–19, near caudal corner. Epiproct (Figs. 67D, 68A–C) long, broadly truncated, inflated dorsoventrally, with a row of 2+2 setae; lateral side with 2 setae. Tip with four spinnerets. Hypoproct (Fig. 68B, C) subtriangular, with two completely separated, distolateral setiferous knobs.

Sterna sparsely setose, without modifications except for male sternum 5 with a pair of separated, elevated tubercles directed ventrad between coxae 4 (Figs. 68D, 86H). High ridge present in front of gonopod aperture.

Leg long and slender, ca. 1.4–1.5 times as long as midbody height. Tarsal brushes present only on pregonopodal legs. Prefemora not swollen. Femora without modifications.

Gonopods (Figs. 69, 70) very simple. Coxite long, cylindrical, about $\frac{1}{2}$ length of telopodite; distoventral part sparsely setose. Prefemorite densely setose, separated from femorite by a subtransverse sulcus laterally. Femorite long, slender, slightly curved ventrad, demarcated from postfemoral region by an oblique sulcus laterally. Solenomere flagelliform, partly sheathed by solenophore. Lamina lateralis small,

short, about $\frac{1}{2}$ length of solenophore, lamina medialis fully developed. Tip of solenophore strongly divided into two long spiniform prongs.

Remarks. The genus *Luzonomorpha* was established for endemic orthomorphinine species of the Philippines based on Jeekel's suggestions (1968: p.68) and Hoffman (1973). However, the true relationship between *Luzonomorpha* and other congeners, e.g., *Gigantomorpha*, *Antheromorpha*, and *Orthomorpha* remains unknown. The genus is very similar to *Gigantomorpha*, a Bornean endemic genus, in gonopod conformation and having well developed paraterga. Although eight *Luzonomorpha* species have been described, some of them are still questionable. For example, Hoffman (1973) suggested that *L. acutangula* and *L. montana* are synonyms.

Genus *Tectoporus* Carl, 1902

Tectoporus Carl, 1902: Revue Suisse de Zoologie, 10(2): 576–577. Type species: *Tectoporus gracilipes* Carl, 1902, by monotypy.

Remarks. The genus currently contains 30 species mainly distributed in Indonesia, New Guinea and Papua New Guinea (Nguyen & Sierwald, 2013). This is the first record of the genus in the Philippines.

Tectoporus lobus, new species (Figs. 71–75, 86I)

Material examined. Holotype: PHILIPPINES • 1 male; Mindanao Island, Davao Province, Camp Meran, East slope of Mount Apo; elev. 4,300 ft (= 1,310 m a.s.l.); original forest, rotting wood; November 1946, leg. Werner F.G.; FMNH-INS 085 782

Diagnosis. The species differs from other congeners in the following characters: paraterga poorly developed; metaterga with two rows of setae; gonopod coxite subequal to femorite in length; postfemoral region short, strongly twisted; lamina lateralis with a well-developed, triangular, basal process; tip of gonopod with two large, broadly rounded lobes.

Etymology. An adjective in apposition to emphasise two broadly rounded lobes at tip of gonopod.

Description.

Body length ca. 15.2 mm; width of midbody pro- and metazona 0.7 mm and 1.0 mm, respectively.

Body generally uniformly castaneous brown; legs, antennomeres 6, 7 and sterna paler.

Head (Fig. 71A, C) slightly larger than collum in width; clypeolabral region modestly setose; frons slightly convex, divided into two parts by a distinct epicranial suture. Antenna long, slender except for largest, claviform antennomere 6; antennomere $2=3>4=6>5>7>1$ in length.

Collum (Fig. 71A–C) slightly smaller than body ring 2 in width, suboval; surface shining, smooth, with three rows of 5+5, 1+1 and 3+3 setae. Paraterga almost missing; lateral side of collum with a seta.

Body ring (Figs. 71A, B, D, 72A, C) $4<3<2=5-17$, thereafter tapering towards telson. Prozonae and pleura smooth, shining. Constriction between pro- and metazona wide, deep, neither striolate nor beaded at bottom. Metaterga smooth, shining, with two rows of 3+3 and 3+3 setae on anterior rings, of 4+4 and 4+4 on posterior rings, and of 5+5 and 5+5 setae on body ring 19. Transverse sulcus incomplete on metatergum 4, and fully developed on metaterga 5–19, medioanteriorly, neither beaded nor striolate at bottom. Pleurosternal carinae totally absent. Axial line vague.

Paraterga (Figs. 71A, B, D, 72A, C) poorly developed, but more developed as ridges on pore-bearing rings; lateral side with a seta at $\frac{1}{3}$ length; caudal corner broadly rounded on pore-bearing rings, not becoming acute on body rings 17–19. Ozopores located on lateral side of body ring 5, 7, 9–10, 12–13, 15–19.

Epiproct (Fig. 72C) very short, broadly truncated, inflated dorsoventrally. Tip with four spinnerets. Hypoproct (Fig. 72D) trapeziform, with two distolateral setiferous knobs.

Sterna (Fig. 72B) sparsely setose without modifications except for male sternum 5 with a pair of separated, elevated tubercles directed ventrad between coxae 4 (Fig. 86I). Cross impression distinct.

Legs long and slender. Tarsal brushes absent. Prefemora not swollen. Femora without modifications.

Gonopod (Figs. 73–75) complicated. Coxite cylindrical, as long as femorite; distoventral part sparsely setose. Prefemorite, densely setose, separated from femorite by a transverse sulcus laterally. Femorite long, slender, slightly enlarged distally, without modifications. Demarcation between femorite and postfemoral region absent. Postfemoral region short, strongly twisted twice, only consisting of solenophore and solenomere. Lamina lateralis well developed, with a short, triangular process at base. Tip of gonopod with two broadly rounded lobes. Solenomere flagelliform, completely sheathed by solenophore, only exposed at tip.

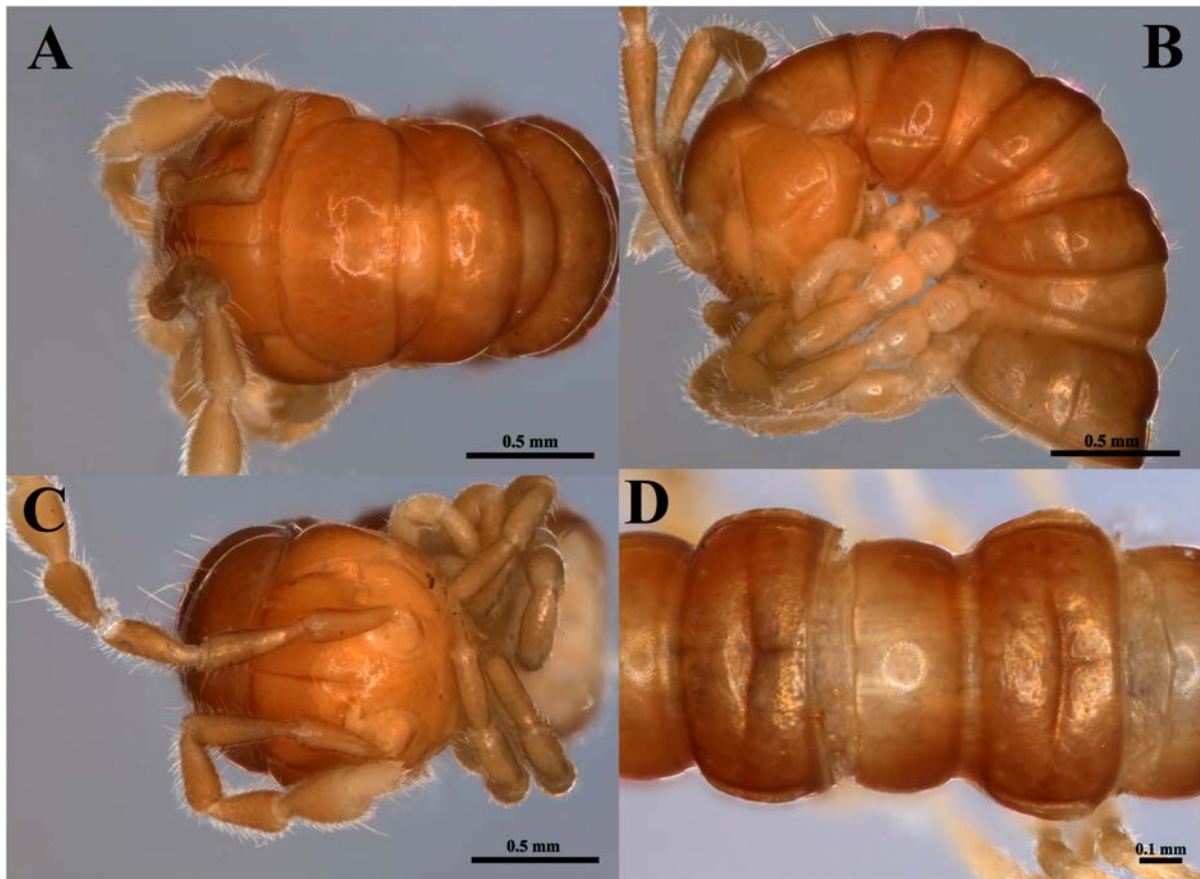


Fig. 71. *Tectoporus lobus*, new species. Holotype (FMNH-INS 085 782). A, anterior part of body, dorsal view; B, lateral view; C, ventral view; D, segments 8–9, dorsal view. Scale bar = 0.5 mm for A–C, 0.1 mm for D.

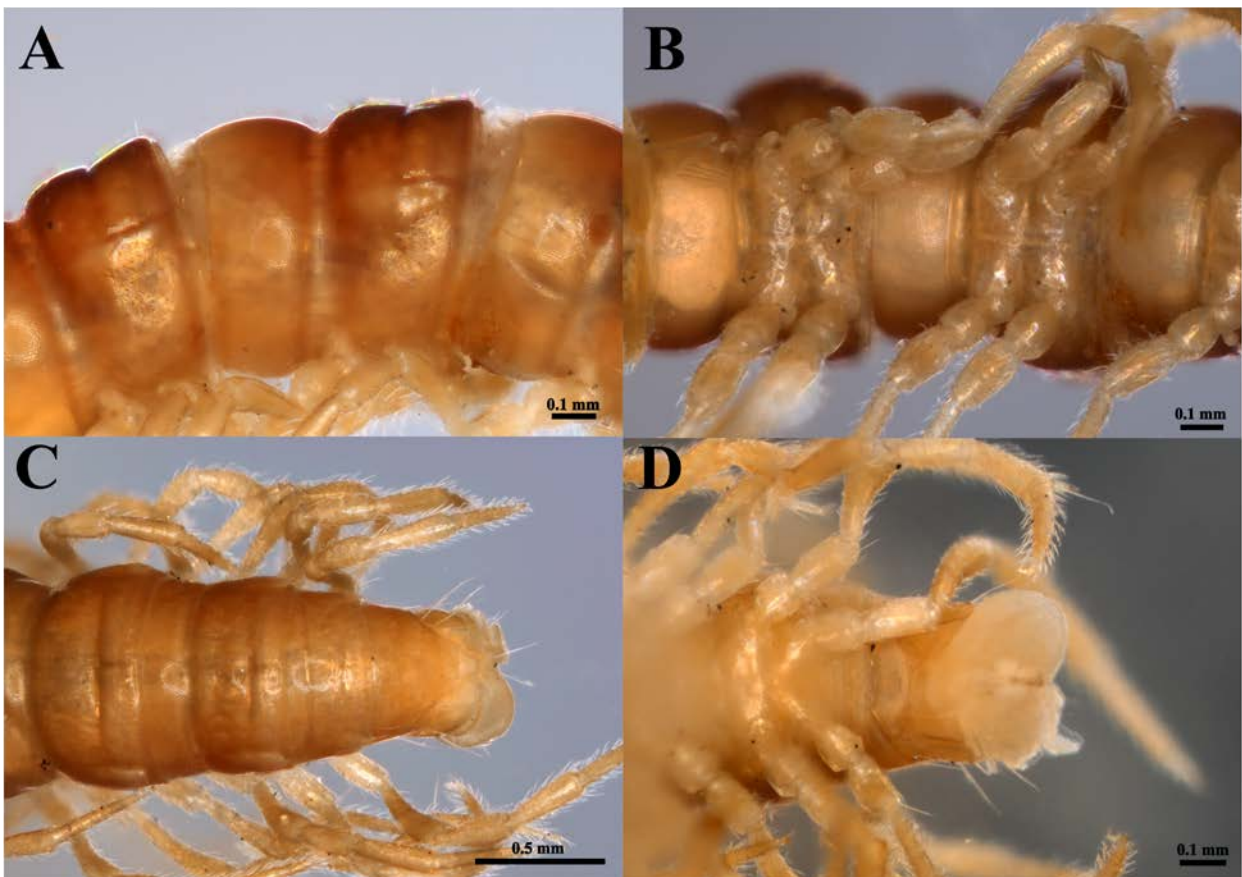


Fig. 72. *Tectoporus lobus*, new species. Holotype (FMNH-INS 085 782). A, segments 8–9, lateral view; B, ventral view; C, posterior part of body, dorsal view; D, ventral view. Scale bar = 0.1 mm for A, B and D, 0.5 mm for C.

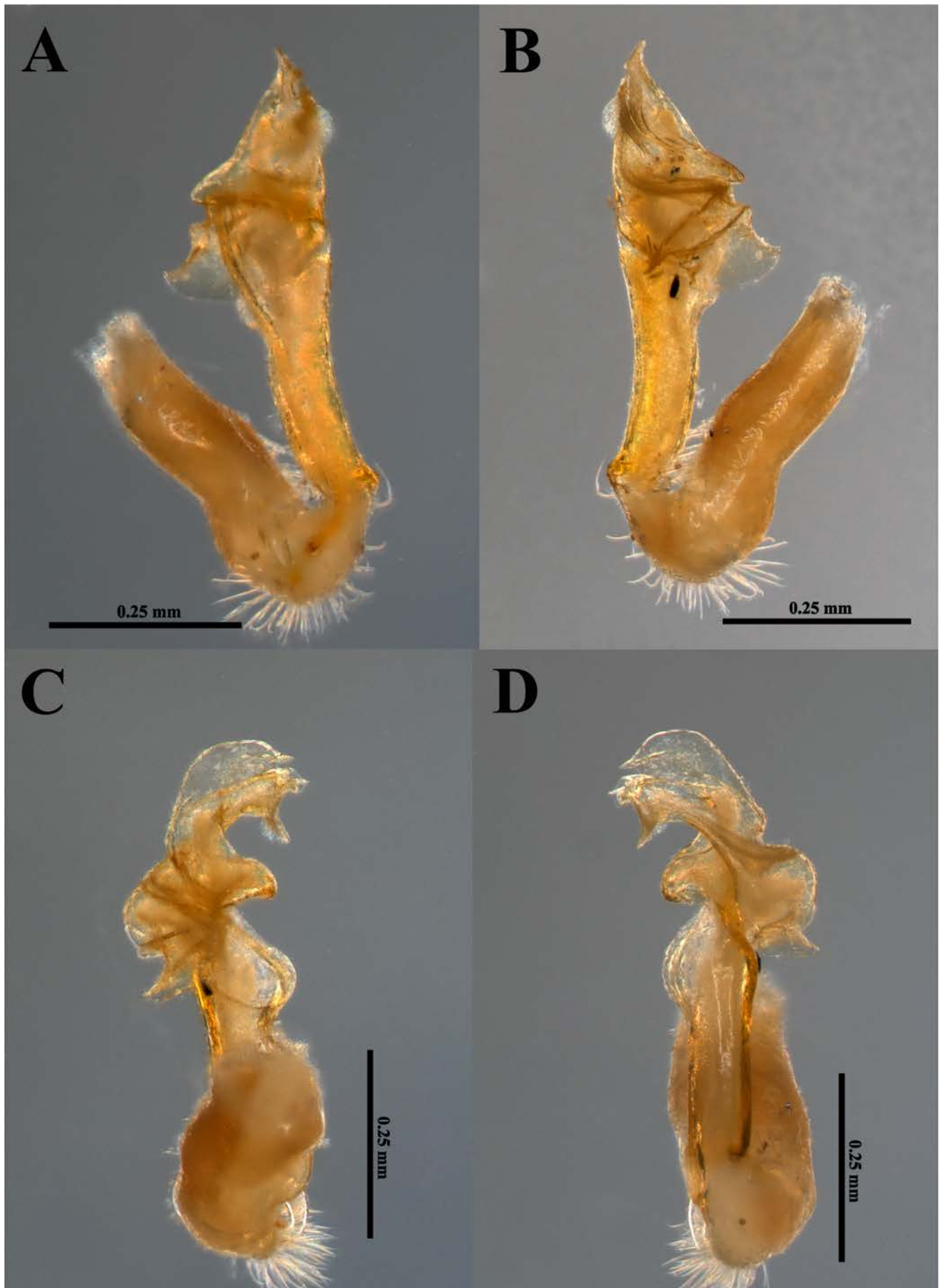


Fig. 73. *Tectoporus lobus*, new species. Holotype (FMNH-INS 085 782). A, right gonopod, lateral view; B, mesal view; C, dorsal view; D, ventral view. Scale bar = 0.25 mm.

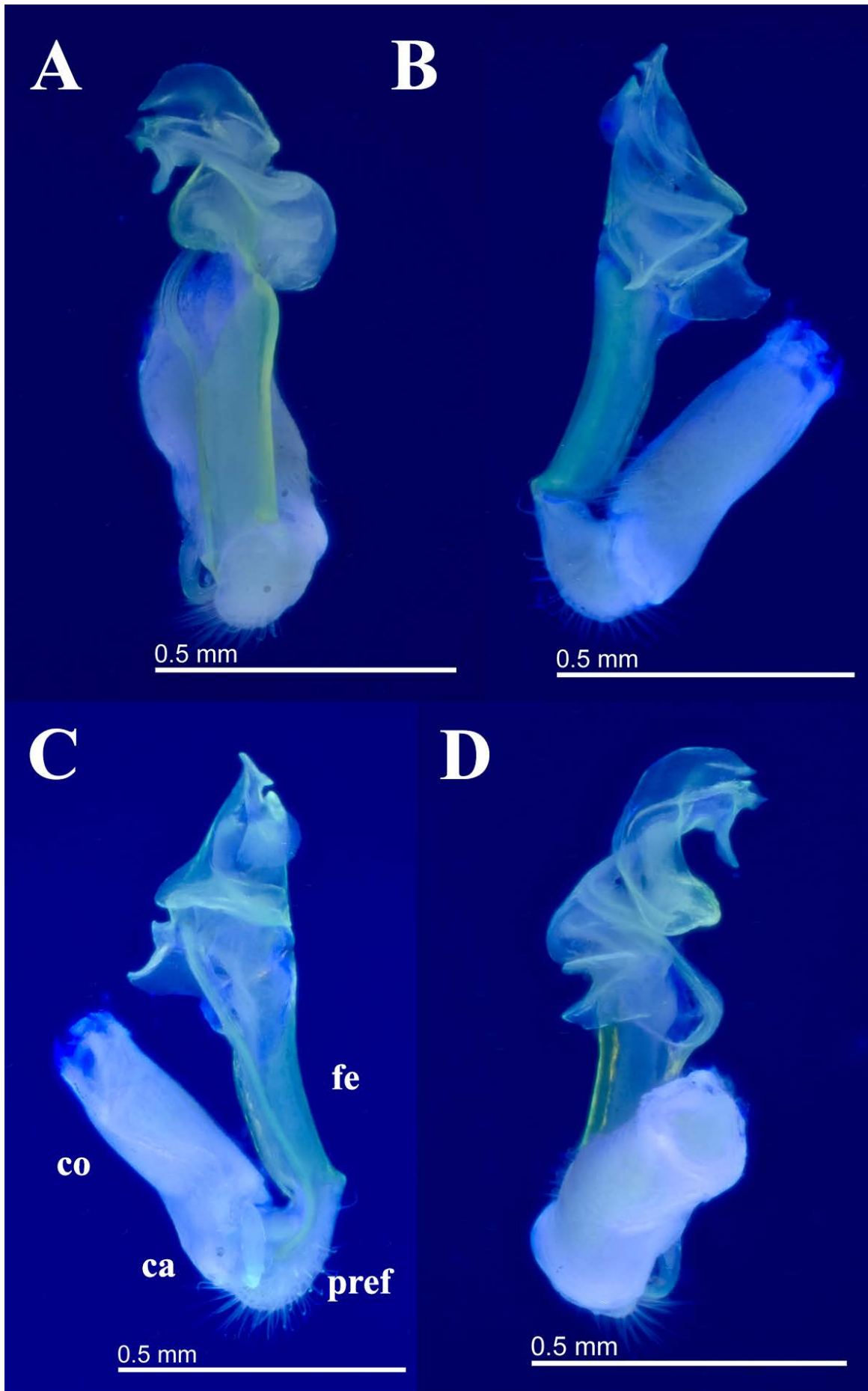


Fig. 74. *Tectoporus lobus*, new species. Holotype (FMNH-INS 085 782). A. right gonopod, ventral view; B, lateral view; C, mesal view; D, dorsal view. Scale bar = 0.5 mm.

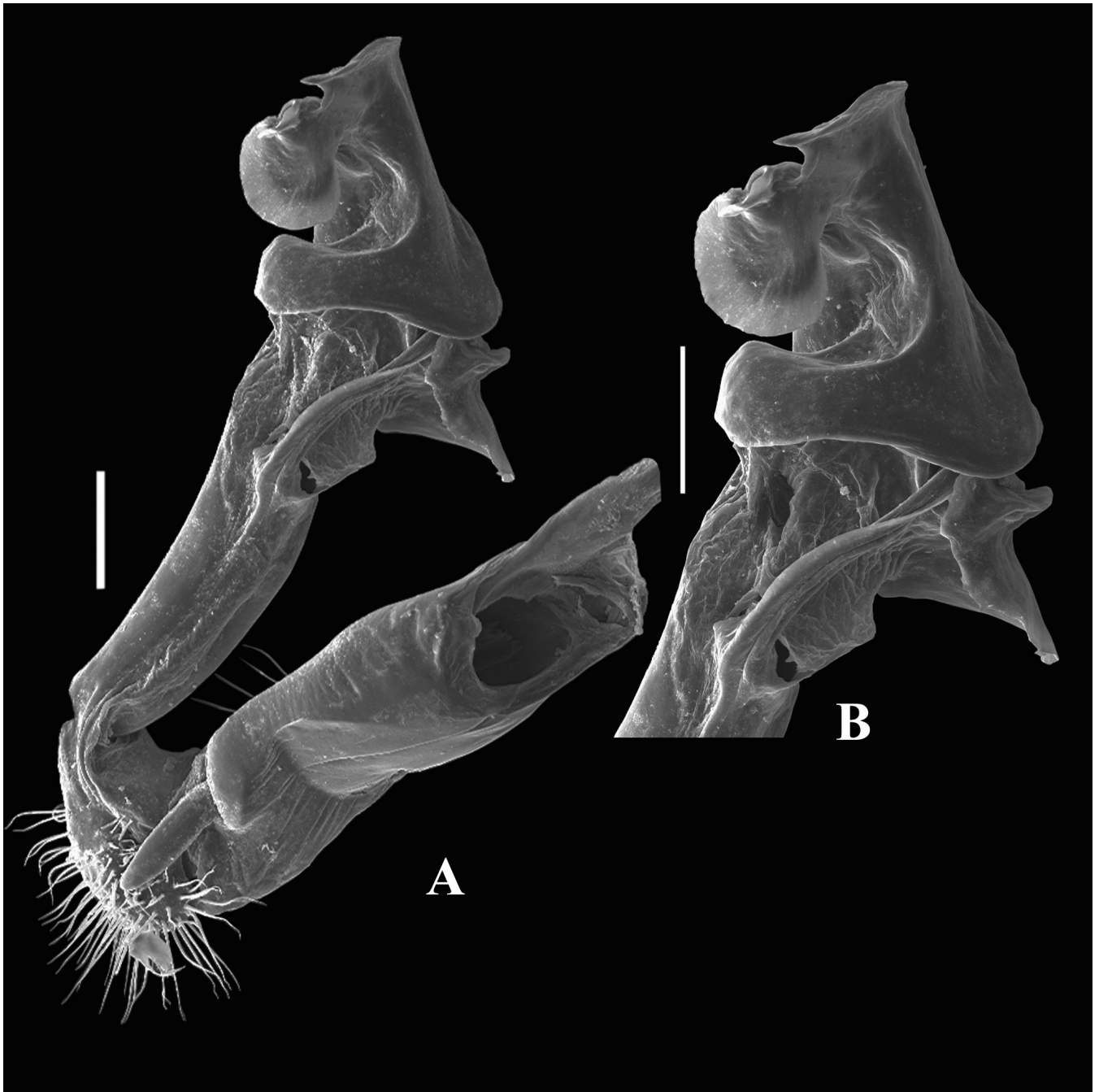


Fig. 75. *Tectoporus lobus*, new species. Holotype (FMNH-INS 085 782). A, left gonopod, mesal view; B, postfemoral region, mesal view. Scale bar = 0.1mm.

***Tectoporus pilosus*, new species**
(Figs. 76–79, 86J)

Material examined. Holotype. PHILIPPINES • 1 male; Mindanao Island, Davao Province, East slope of Mount McKinley; elev. 3,000 ft (= 914 m a.s.l.); humus, original forest; 29 August 1946, leg. Hoogstraal H.; **FMMC 6262**.

Etymology. To emphasise the densely pilose metaterga.

Diagnosis. The species differs from its congeners in having densely setose metaterga; lamina lateralis of gonopod solenophore with a basal triangular process; tip of gonopod strongly divided into two processes: a beak-shaped process and a pointed lobuliform one.

Description.

Body length ca. 10.68 mm; width of midbody pro- and metazona 0.72 mm and 0.85 mm, respectively

Colouration: body uniformly light brown, except sterna and legs light brownish yellow.

Head (Fig. 76A–C) slightly broader than collum in width; labrum densely setose; clypeus densely setose; frons densely setose, divided into two parts by a thin, distinct epicranial suture. Antenna claviform, reaching body ring 4 if stretching laterally; antennomere 2=3>4>5=6>7>1.

Collum (Fig. 76A, B) slightly narrower than body ring 2 in width, triangular; surface densely setose. Paraterga strongly reduced.

Body ring (Figs. 76, 77) 3<4<2=5–17 in width, thereafter gradually tapering towards telson. Prozonae, metazonae,

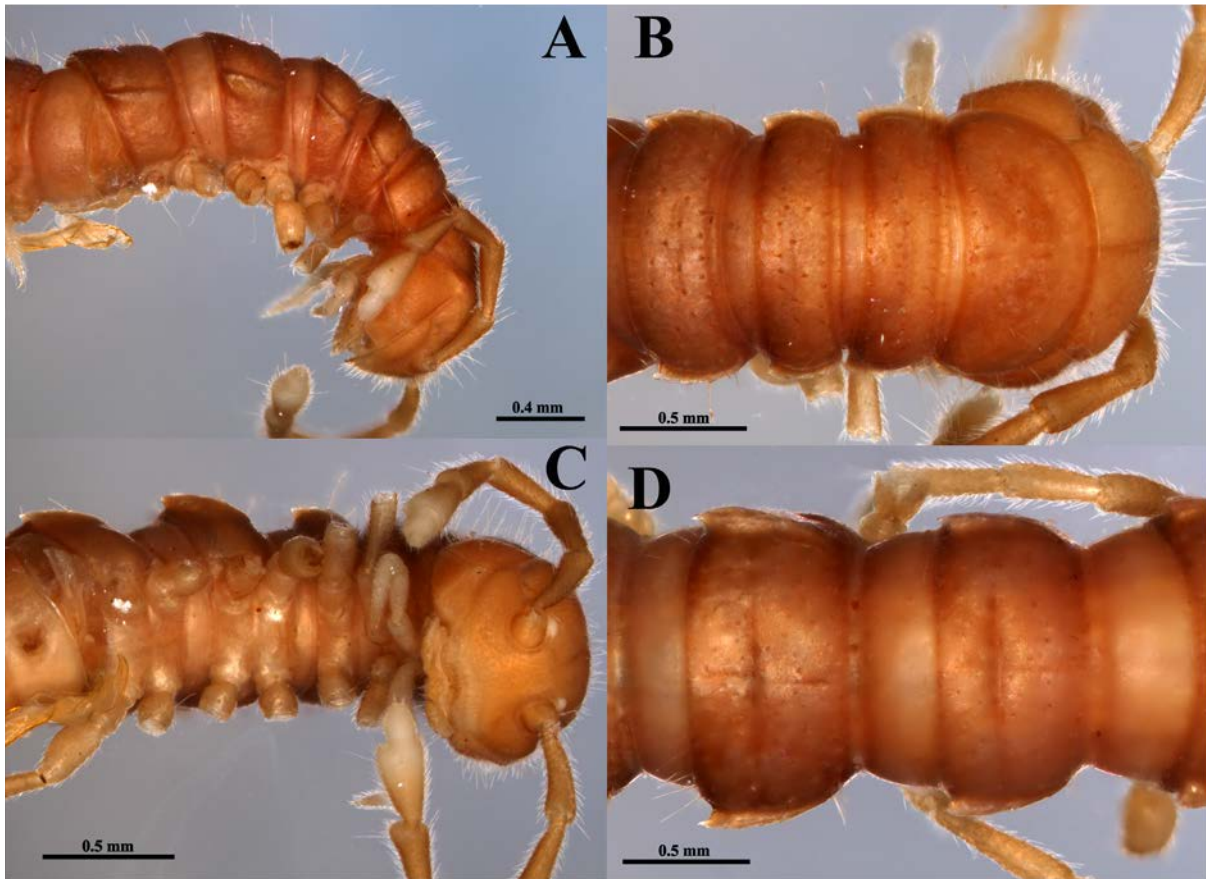


Fig. 76. *Tectoporus pilosus*, new species. Holotype (FMMC 6262). A, anterior part of body, lateral view; B, dorsal view; C, ventral view; D, segments 8–9, dorsal view. Scale bar = 0.4 mm for A, 0.5 mm for B–D.

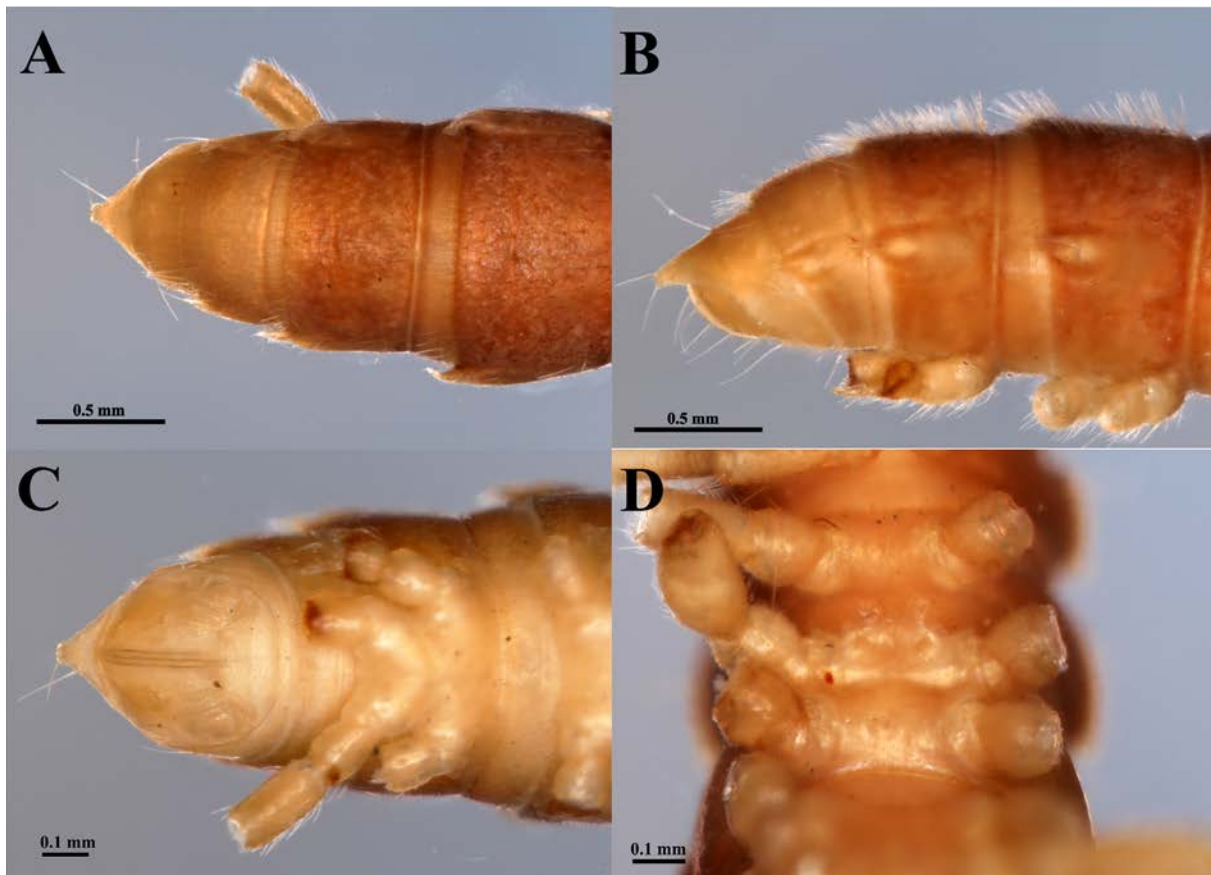


Fig. 77. *Tectoporus pilosus*, new species. Holotype (FMMC 6262). A, posterior part of body, dorsal view; B, lateral view; C, ventral view; D, sternum 5, subventral view. Scale bar = 0.5 mm for A and B, 0.1 mm for C and D.

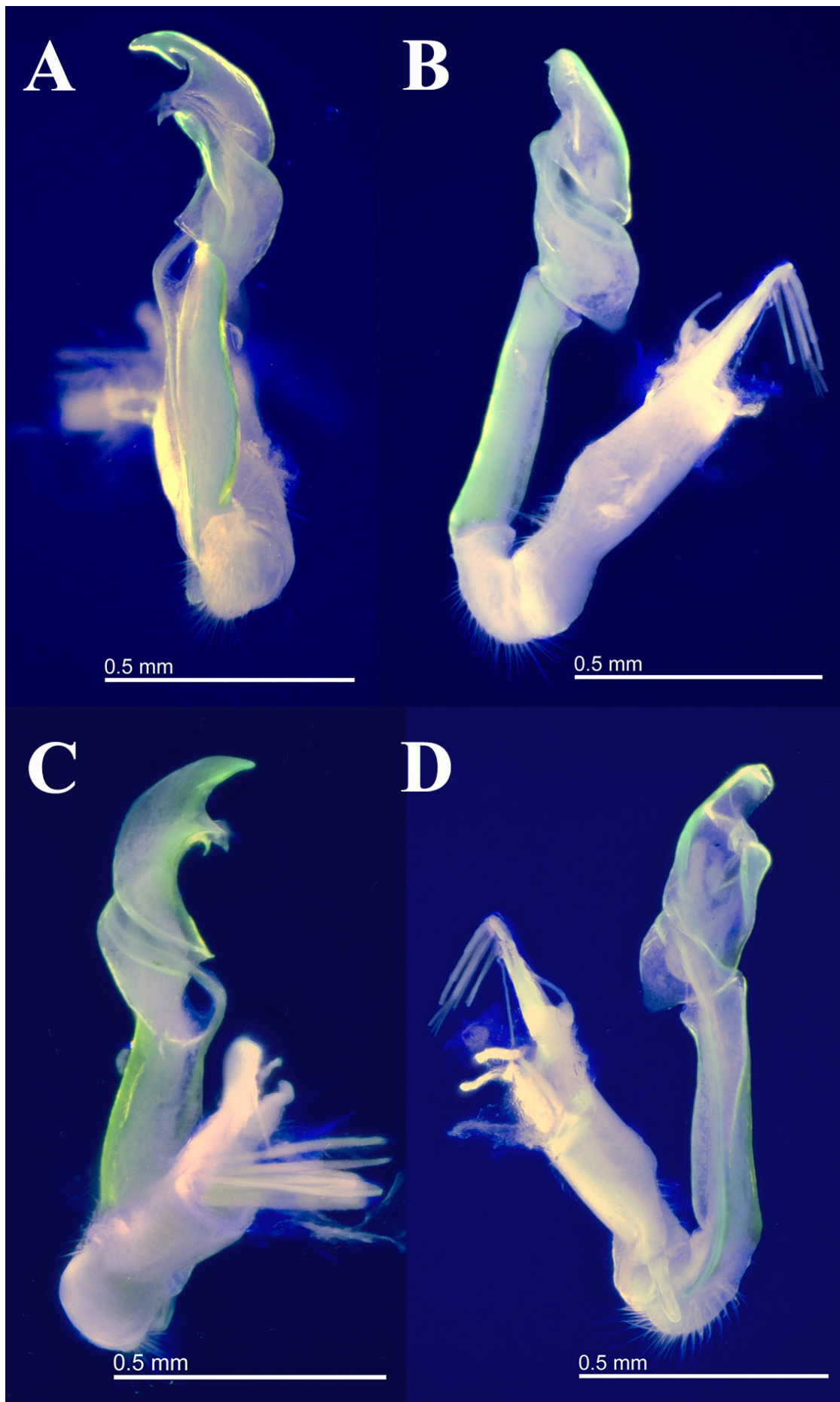


Fig. 78. *Tectoporus pilosus*, new species. Holotype (FMMC 6262). A, right gonopod, ventral view; B, lateral view; C, ventral view; D, mesal view. Scale bar = 0.5mm.

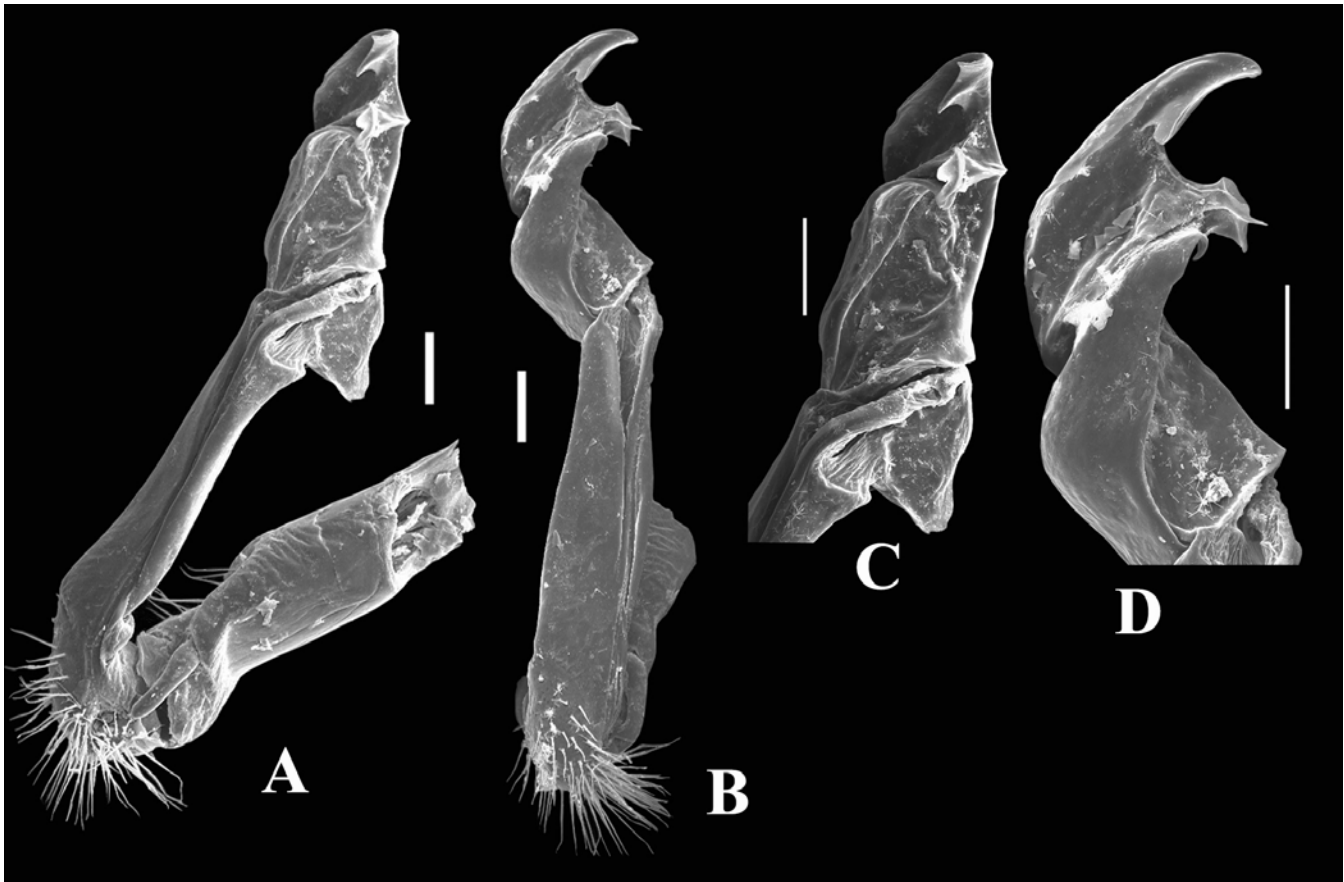


Fig. 79. *Tectoporus pilosus*, new species. Holotype (FMMC 6262). A, left gonopod, mesal view; B, ventral view; C, postfemoral region, mesal view; D, ventral view. Scale bar = 0.1mm.

and pleura shining, smooth, neither rugulose nor wrinkles. Metaterga densely setose; all setae irregularly arranged on metaterga. Transverse sulcus incomplete on metatergum 4, but fully developed and reaching the base of paraterga on metaterga 5–19, distinct, neither beaded nor striolate. Axial line distinct on metaterga, but absent on prozonae. Constriction between pro- and metazona narrow, deep, neither beaded nor striolate at bottom. Pleurosternal carinae totally missing.

Paraterga (Figs. 76, 77A, B) small, blunt blade-shaped; anterior corner broadly round, caudal corner triangular, even producing into a pointed spine from body ring 7. Ozopores located on lateral side of body ring 5, 7, 9–10, 12–13, 15–19. Epiproct (Fig. 77A–C) short, broadly truncated, inflated dorsoventrally; tip concave, with four spinnerets. Hypoproct (Fig. 77C) triangular, with two distolateral, separated, setiferous knobs.

Sterna (Fig. 76A) sparsely setose, without modifications except for male sternum 5 with a highly elevated, bi-fid, trapeziform process directed anteroventrad between coxae 4 (Figs. 77D, 86J). Cross impression distinct.

Legs slender and long, ca. 2.3 times as long as midbody height. Tarsal brushes present only on pregonopodal legs. Prefemora not swollen. Femora without modifications.

Gonopod (Figs. 78, 79) complicated. Coxite long, cylindrical; distoventral part sparsely setose. Prefemorite densely setose, separated from femorite by an oblique sulcus. Femorite long, slender, without modifications or additional processes.

Demarcation between femorite and postfemoral region absent. Postfemoral region slightly twisted, consisting only of solenophore and solenomere. Solenophore well developed; lamella lateralis and lamina medialis well developed, especially lamina lateralis with a basal triangular process. Tip of gonopod strongly divided into two processes, one beak-form, other pointed lolube. Solenomere flagelliform, partly sheathed by solenophore. Seminal groove entirely running mesally on femorite before entering solenomere.

***Tectoporus retrospinosus*, new species**
(Figs. 80–85, 86H)

Material examined. Holotype: PHILIPPINES • 1 male; Luzon Island, Naga city (4km N, 21.5km E); 1,550 m a.s.l.; 13°40'N, 123°22'E; mossy forest; 26 September 1994; sifted from 1 m² forest leaf litter, leg. Balete D.S.; **FMMC 6261** Paratypes: PHILIPPINES • 5 males, 3 females; same data as holotype; **FMNH-INS 4435565** • 4 males, 3 females; same data as holotype; (#PNM).

Diagnosis. The species differs from its congeners in the following characters: paraterga poorly developed, small or tiny; gonopod femorite with a distofemoral retrose large spine; lamina medialis of solenophore well developed, with a large, subtransverse, serrated laminate process, and a fold at distal part; lamina lateralis well developed, with two small acute processes near distal part, tip of gonopod serrated.

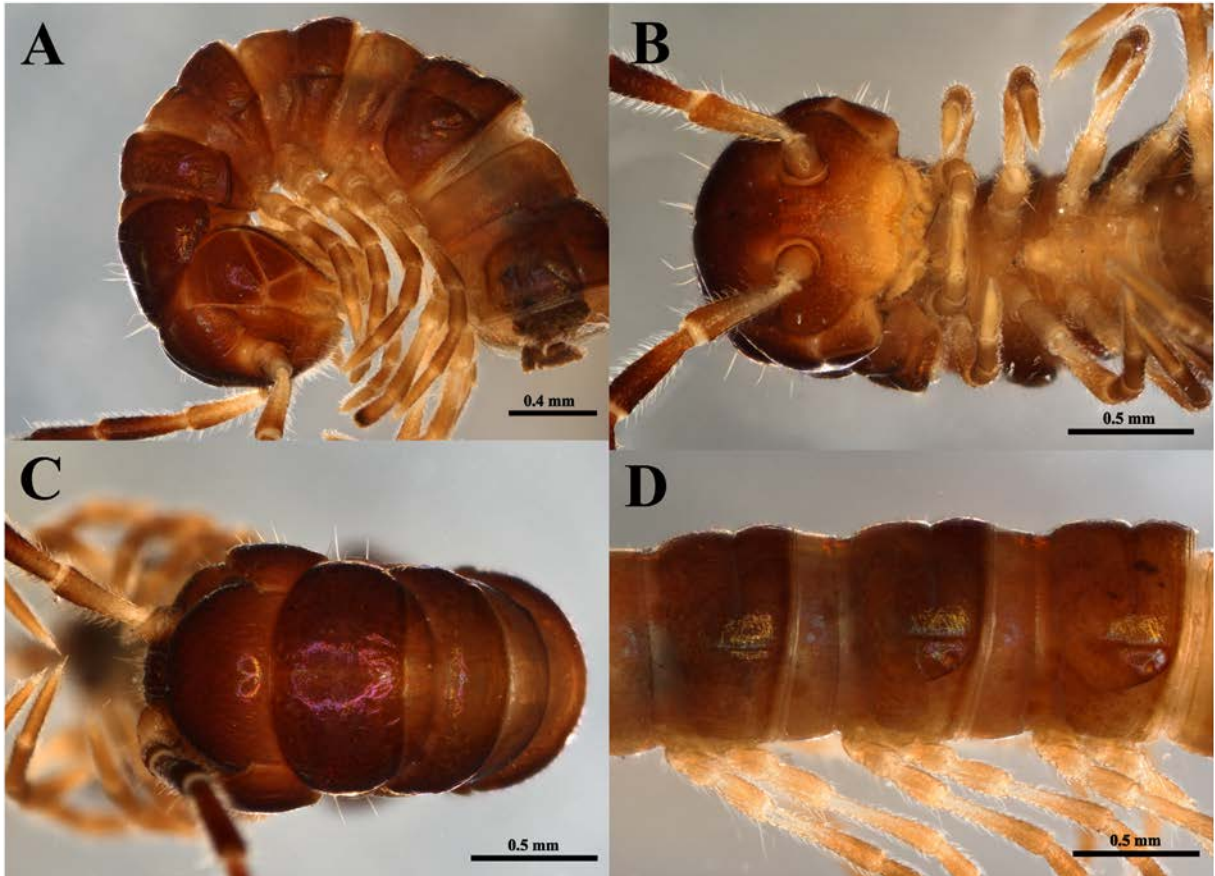


Fig. 80. *Tectoporus retrospinosus*, new species. Holotype (FMMC 6261). A, anterior part of body, lateral view; B, ventral view, C, dorsal view. D, segments 8–10, lateral view. Scale bar = 0.4 mm for A, 0.5 mm for B–D.

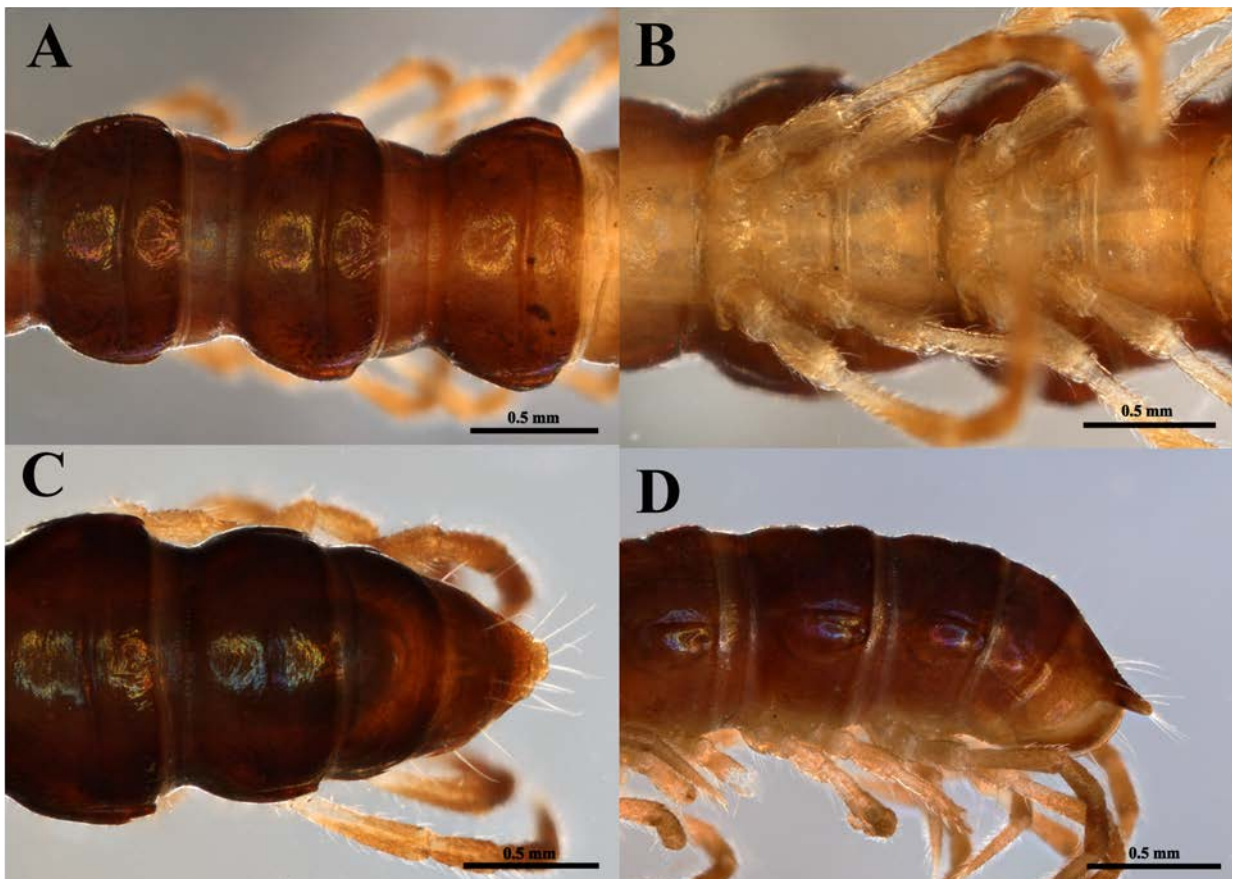


Fig. 81. *Tectoporus retrospinosus*, new species. Holotype (FMMC 6261). A, segments 8–10, dorsal view; B, ventral view. C, posterior part of body, dorsal view; D, lateral view. Scale bar = 0.5 mm.



Fig. 82. *Tectoporus retrospinosus*, new species. Holotype (FMMC 6261). A, telson, ventral view. B, sternum 5, subventral view. Scale bar = 0.1 mm.

Etymology. An adjective in apposition to emphasise a large, retrose, distofemoral process.

Description.

Body length ca. 18.2–19.9 mm (male), 19 mm (female); width of midbody pro- and metazona 1.1–1.2 mm (male), 1.4 mm (female) and 1.3–1.5 mm (male), 1.6 mm (female), respectively. Holotype length ca. 19.9 mm; width of midbody pro- and metazona 1.2 mm and 1.5 mm, respectively.

Colouration: body uniformly dark brown; prozonae, pleura, legs & sterna castaneous brown.

Head (Fig. 80A–C) slightly larger than collum in width; clypeolabral region modestly setose; frons slightly convex, divided into two parts by a distinct epicranial suture. Antenna long, somewhat claviform; antennomere 2=6>3=4=5>7>1 in length.

Collum (Fig. 80C) somewhat smaller than body ring 2 in width, suboval; surface shining, smooth, with two rows of 4+4 and 3+3 setae. Paraterga almost missing.

Body ring (Figs. 80, 81) 4<3<2=5–17 in width, thereafter tapering towards telson. Prozonae and pleura smooth, shining. Constriction between pro- and metazona wide, deep, neither striolate nor beaded at bottom. Metaterga smooth, shining, with two rows of 2+2 and 4+4 setae on body rings 2–17, of 3+3 and 5+5 setae on body rings 18–19. Transverse sulcus incomplete on metatergum 4, and fully developed on metaterga 5–19, medioanteriorly, neither beaded nor striolate at bottom. Axial line vague. Pleurosternal carinae only present as full crests on body rings 2–4, absent on subsequent body rings.

Paraterga (Figs. 80A, C, D, 81A, C, D) poorly developed, but more developed on pore-bearing body rings; lateral side with a seta at 1/3 length; caudal corner broadly rounded on pore-bearing body rings. Ozopores located on lateral side of body rings 5, 7, 9–10, 12–13, 15–19.

Epiproct (Figs. 81C, D, 82A) very short, broadly truncated, inflated dorsoventrally. Tip with four spinnerets. Hypoproct (Fig. 82A) trapeziform, with two distolateral setiferous knobs. Sterna sparsely setose without modifications except for male sternum 5 with a highly elevated, tongue-shaped process directed anteroventrad between coxae 4 (Figs. 82D, 86K). Cross impressions distinct.

Legs slender, long, ca. 1.7 (male), 1.5 (female) times as long as midbody height. Tarsal brushes present until body ring 10. Prefemora not swollen. Femora without modifications. Gonopods (Figs. 83–85) relatively complicated. Coxite short, stout; distoventral part sparsely setose. Prefemorite densely setose, separated from femorite by a subtransverse sulcus laterally. Femorite subcylindrical, with evidence of weak torsion, grooved mesally, with a retrose, large, distofemoral spine. Demarcation between postfemoral region and femorite absent. Postfemoral region erect, with a small, erect, basal spine. Lamina medialis well developed, with a large, subtransverse, serrated laminate process, and a fold at distal part; lamina lateralis well developed, with two small acute processes near distal part. Tip of gonopod serrated. Solenomere flagelliform, longer than solenophore, and partly sheathed by solenophore.

Remarks. All three new *Tectoporus* species fall well into the Group 1 of Jeekel (1951), characterised by the lack of a large spiniform process on the lateral side (lamina lateralis) of the solenophore. The group contains 10 species, *T. gracilipes* Carl, 1902, *T. castaneus* Attems, 1930, *T. pictus* (Carl, 1912), from Indonesia; *T. spiniger* Golovatch & Stoev, 2010, *T. bispinosus* Golovatch & Stoev, 2010, *T. fugilil* Golovatch & Stoev, 2009, *T. wilhelmicus* Golovatch & Stoev, 2010, *T. moniliformis* Golovatch & Stoev, 2010, *T. jeekeli* Golovatch & Stoev, 2009, *T. telnovi* Golovatch, 2016, from Papua New Guinea.

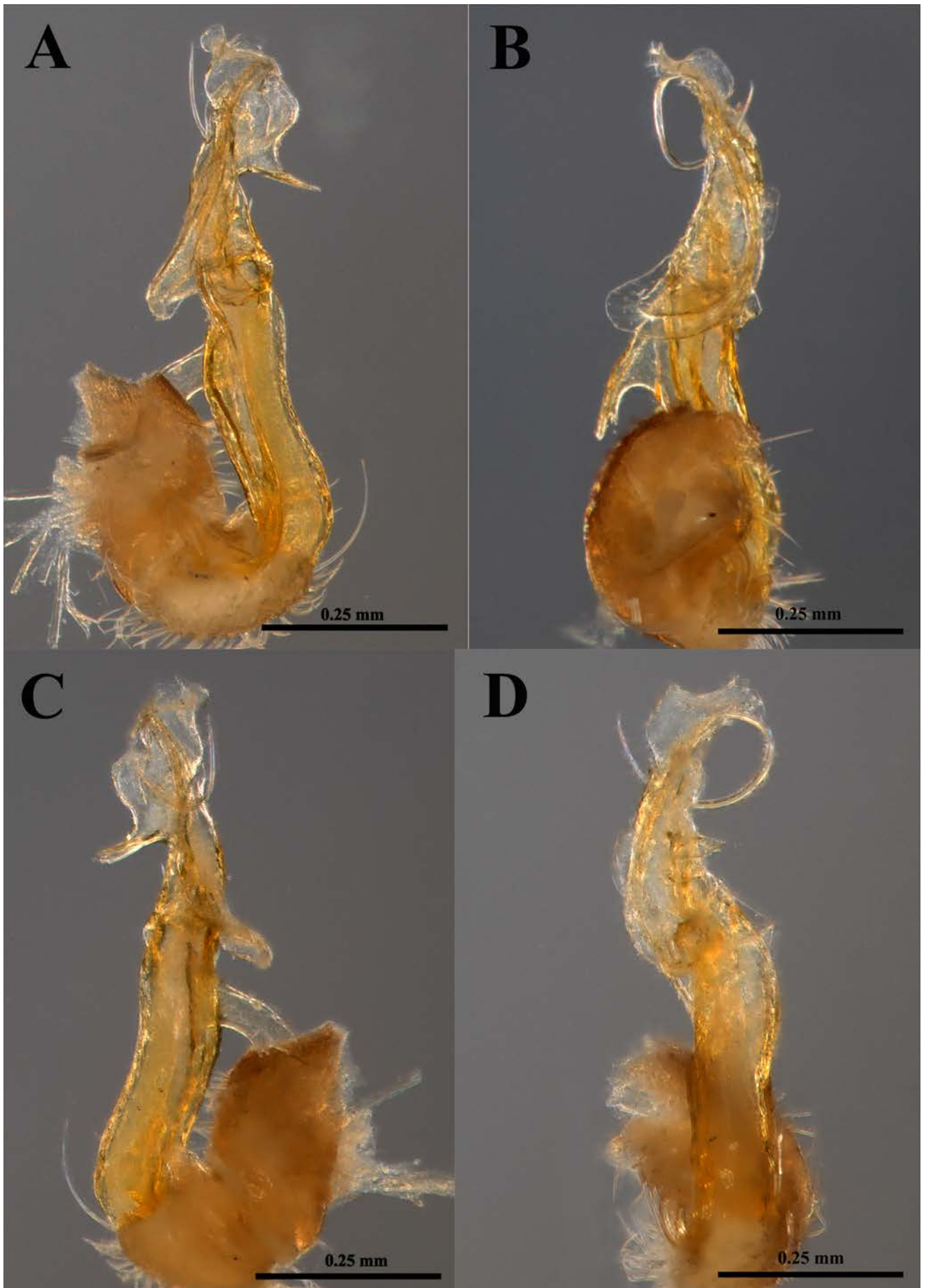


Fig. 83. *Tectoporus retrospinosus*, new species. Holotype (FMMC 6261). A, right gonopod, mesal view; B, dorsal view; C, lateral view; D, ventral view. Scale bar = 0.25 mm.

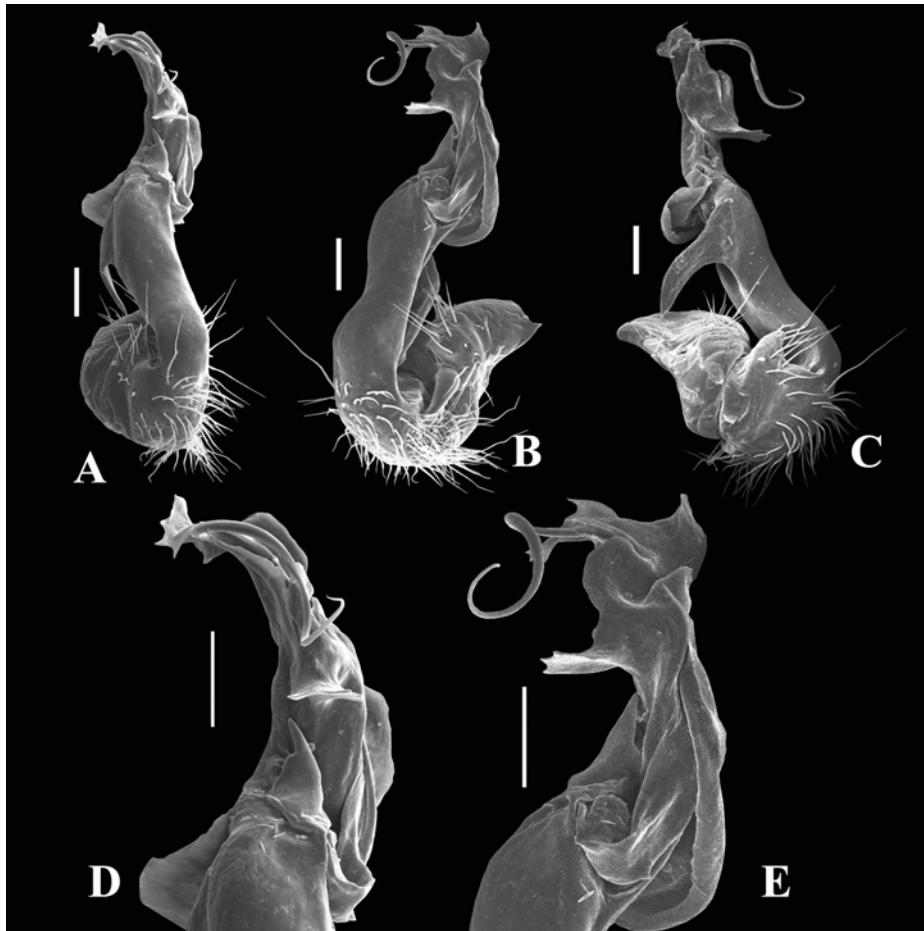


Fig. 84. *Tectoporus retrospinosus*, new species. Holotype (FMMC 6261). A, right gonopod, lateral view; B, mesal view. Scale bar = 0.5 mm.

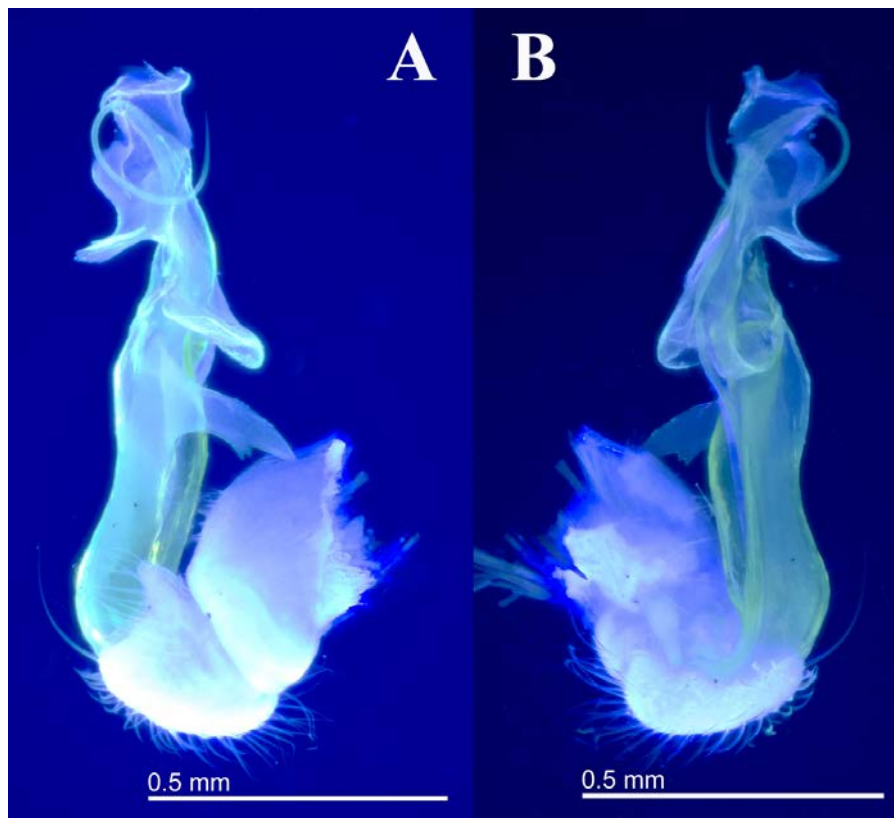


Fig. 85. *Tectoporus retrospinosus*, new species. Holotype (FMMC 6261). A, left gonopod, ventral view; B, mesoventral view; C, lateral view; D, postfemoral region, ventral view; E, mesoventral view. Scale bar = 0.1mm.

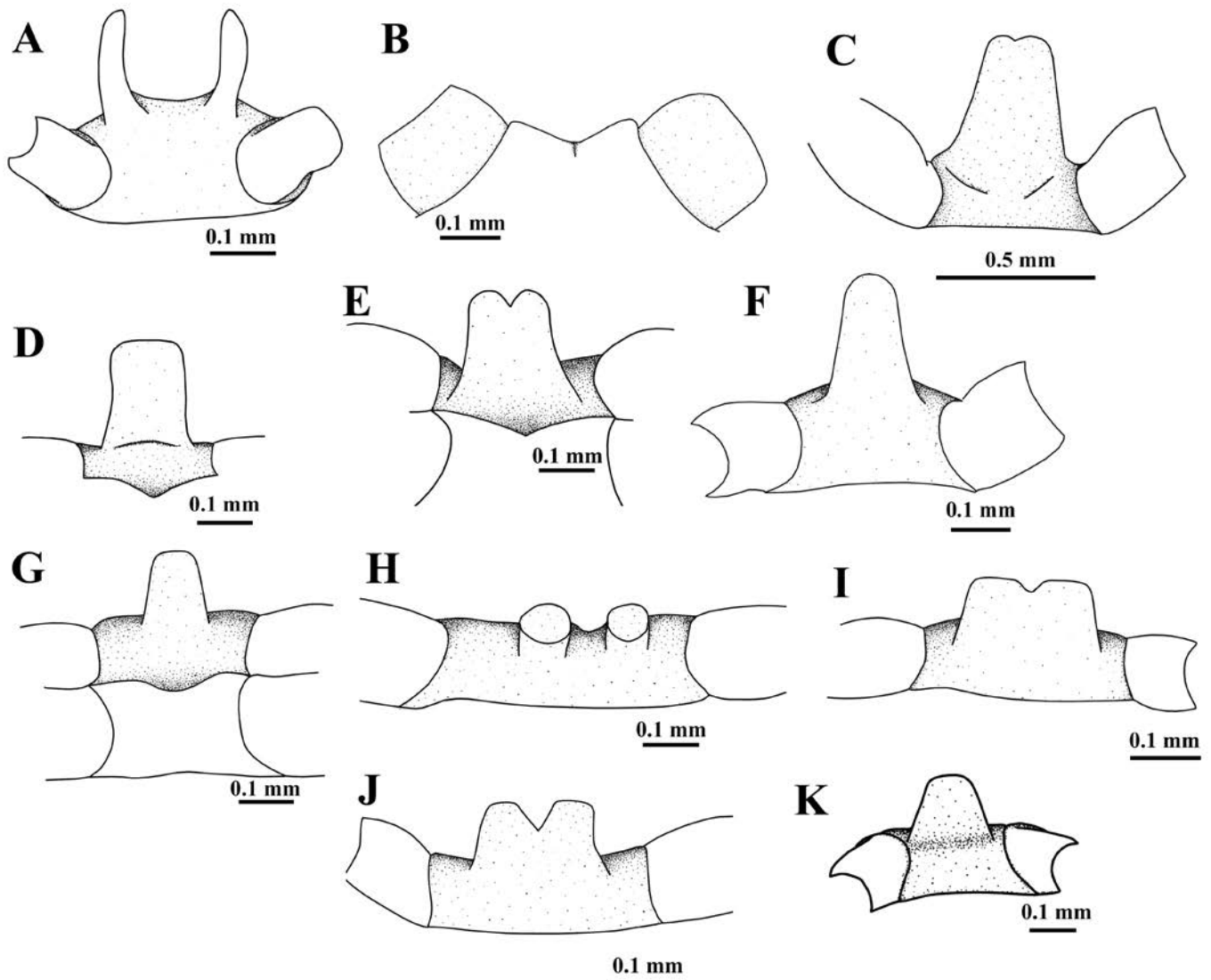


Fig. 86. Sternal process between coxae 4. A, *Euphyodesmus simplex*, new species; B, *Eustrongylosoma amuyaomontis*, new species; C, *Eustrongylosoma erectispinum*, new species; D, *Eustrongylosoma peniculum*, new species; E, *Eustrongylosoma pterygotum*, new species; F, *Eustrongylosoma reductum*, new species; G, *Eustrongylosoma tuberculatum*, new species; H, *Luzonomorpha weberi*, new species; I, *Tectoporus lobus*, new species; J, *Tectoporus pilosus*, new species; K, *Tectoporus retrospinosus*, new species. Scale bar = 0.1 mm for A and B, D–K, and 0.5 mm for C.

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