

## A survey of the western African millipede genus *Tymbodesmus* Cook, 1899 (Diplopoda: Polydesmida: Gomphodesmidae), with the description of a new species from Cameroon

### Обзор диплопод западно-африканского рода *Tymbodesmus* Cook, 1899 (Diplopoda: Polydesmida: Gomphodesmidae), с описанием нового вида из Камеруна

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КЛЮЧЕВЫЕ СЛОВА: диплопода, Gomphodesmidae, таксономия, новый вид, Камерун.

ABSTRACT. A new species of the oligotypic millipede genus *Tymbodesmus* is described from Cameroon: *T. golovatchi* sp.n. It is distinguished by the presence of a single spine on the gonopod nodus and the absence of a paxillus on body segment 15. New material of the type-species *T. figlinus* Cook, 1899, previously known in Cameroon only from the littoral region (Kumba “Mundame”), is also illustrated.

РЕЗЮМЕ. Описан новый вид диплопод олиготипического рода *Tymbodesmus* из Камеруна: *T. golovatchi* sp.n. Он отличается наличием лишь одного шипа на узле гонопода и отсутствием колышка на 15-м туловищном сегменте. По новому материалу приведены иллюстрации типового вида *T. figlinus* Cook, 1899, прежде известного в Камеруне лишь из приморского района (Kumba “Mundame”).

#### Introduction

The Afrotropical family Gomphodesmidae is a clearly defined and homogeneous group of polydesmidan Diplopoda that currently encompasses 146 species or subspecies in 54 genera [Hoffman, 2005]. The genus *Tymbodesmus* Cook, 1899 is known to contain five recognized and one dubious species, the former keyed. The generic distribution ranges across Sub-Saharan Central Africa, covering an area bounded by the Niger Uele and Nile rivers [Hoffman, 2005]. The only species definitely known to occur in Cameroon has hitherto been *T. figlinus* Cook, 1899, the type-species of the genus, whereas *T. viadus* Cook, 1899, also reported from Cameroon, remains dubious. The present paper puts on record a new species of *Tym-*

*bodesmus* from Cameroon, which is markedly distinct from congeners in gonopod conformation and several somatic characters. In addition, fresh material of *T. figlinus* coming from a rainforest region of Cameroon is illustrated.

#### Material and methods

Most of the material treated here derives from the collection of the Laboratory of Zoology of the University of Yaoundé 1, Cameroon (LZUYC) and the Musée Royal de l'Afrique Centrale (MRAC), Tervuren, Belgium, with only a few duplicates donated to the Zoological Museum, State University of Moscow (ZMUM), Russia. The samples are stored in 70% ethanol. Specimens for scanning electron microscopy (SEM) were air-dried, mounted on aluminium stubs, coated with gold and studied using a JEOL JSM-6480LV scanning electron microscope. Photographs were taken with a Leica digital camera Leica DFC 500 mounted on a Leica MZ16A stereo microscope. Images were processed with Leica Application Suite software.

Abbreviations: AMNH — American Museum of Natural History, New York; BMNH — Natural History Museum, London; CAS — California Academy of Sciences, San Francisco; LZUYC — Laboratory of Zoology, University of Yaoundé, Cameroon; MRAC — Musée royal de l'Afrique Centrale, Tervuren; VMNH — Virginia Museum of Natural History, Martinsville; ZMB — Zoologisches Museum der Humboldt-Universität, Berlin; ZMH — Zoologisches Museum, Universität Hamburg; ZMUC — Zoologisk Museum, Universitet København; ZMUM — Zoological Museum, University of Moscow.

## Taxonomic part

### Genus *Tymbodesmus* Cook, 1899

The genus *Tymbodesmus* is diagnosed within the tribe Aulodesmini by the following characters (adapted from Hoffman [2005]): Antennae with four apical sensory cones. Sternum 6<sup>th</sup> with a large median process. Apical tarsal pads present on ♂ legs 1–6. Hypoproct with small paramedian tubercles, median projection scarcely evident. Elevated posterior rim of gonopod aperture with a broad, deep, postcoxal emargination. Gonopods notably large and robust, coxae with a dorsal and a paracannular setal fields; entire lateral side of prefemoral region deeply excavate; telopodite predominantly endonodal, nodus variable in size, usually with one or two nodal spines on mesal side and a like number on lateral one; process M slender, straight, lateral process L, when present, usually larger and longer, postnodal telopodite merging gradually and only gradually curved, slender and flagelliform, with some apical modification, but no lobes on the length.

### Survey of the species

The following list provides details concerning all known species currently referred to *Tymbodesmus*:

1. *Tymbodesmus barryi* Schiøtz, 1965.

Holotype ♂, 14 ♂♂ paratypes, all from Kwame N’Krumah University, Kumasi, Ghana (ZMUC).

2. *Tymbodesmus falcatus* (Karch, 1881).

Holotype ♂ (ZMB 629), from Seriba Ghattas, Djur (Bahr-el-Ghazal region), Sudan. 1 ♂ (AMNH), from Medje (2.25°N, 27.30°E), Oriental Province, Zaire; Lang-Chapin Expedition. 1 ♂ (AMNH), from Faradje (3.40°N, 29.40°E), Oriental Province, Zaire; Lang-Chapin Expedition. 1 ♂ (CAS), from southwest Segou, Mali. 1 ♂ (ZMH), from Yambio (4.34°S, 28.23°E), Sudan. 1 ♂ (ZMH), from “Ngoupé am Oubangi”, République Centrafricaine. Numerous ♂♂ & ♀♀, from Ougadougou, Burkina Faso (MRAC 12269). 4 ♂♂ (VMNH), from Nigeria.

3. *Tymbodesmus figlinus* Cook, 1899.

Holotype ♂, from Cameroon (ZMB 5562). 1 ♂ (ZMUC), from Idanre Hills (7.06°N, 5.20°E), Oyo State, Nigeria.

NEW MATERIAL: 1 ♂ (MRAC 22682), Cameroon, Ongot, Forest, N 03°51′, E 011°25′, 810 m a.s.l., 24.V.2016. leg. A.R. Nzoko Fiemapong. 2 ♂♂ (LZUYC0017), Cameroon, Buea, forest, pitfall traps, 24.V.2016, leg. Simeu Noutchom.

4. *Tymbodesmus orestes* Hoffman, 2005.

Holotype ♂, 3 ♀♀ paratypes (VMNH), all from Shebshi Mountains, near Ganye, Sardauna, Taraba State, Nigeria.

5. *Tymbodesmus vobekeae* Hoffman, 2005.

Numerous ♂♂ and ♀♀ (BMNH), from Bouar (5.57°N, 15.36°E), République Centrafricaine.

### A sixth species of *Tymbodesmus* from Cameroon

*Tymbodesmus golovatchi* Nzoko Fiemapong et VandenSpiegel, **sp.n.**

Figs 1 & 2.

HOLOTYPE ♂ (MRAC22683), Cameroon, “Mbalmayo Forest Reserve”, Zamakoe, N 03°33′, E 011°31′, forest, 2325 m

a.s.l., 21.III.2015. leg. A.R. Nzoko Fiemapong & C. Oumarou Ngoute.

PARATYPES: 1 ♂ (MRAC 22684), same data, together with holotype; 1 ♂, 1 juv. (MRAC 22686), same locality, 18.IV.2015; 1 ♂ (ZMUM ρ3507), same locality, 20.XI.2015; (LZUYC0001), same locality, 21.III.2015; 2 ♂♂, 4 ♀♀, 4 juv. (LZUYC0002), same locality, 19.IV.2014; 1 ♂ (LZUYC0007), same locality, 21.III.2015; 1 ♂ (LZUYC0008), same locality, 21.III.2015; 1 ♀ (LZUYC 0009), same locality, 18.IV.2015; 1 ♂ (LZUYC0010), same locality, 21.III.2015; 1 ♀ (LZUYC0011), same locality, 20.IX.2014; 1 ♂ (LZUYC0012), same locality, 18.IV.2015; 1 ♂ (LZUYC0013), same locality, 19.IV.2014; 1 ♂ (LZUYC0014), same locality, 18.IV.2015; 1 ♀ (LZUYC0015), same locality, 16.XI.2014; 1 ♀ (LZUYC0016), same locality, 21.III.2015, all leg. A.R. Nzoko Fiemapong & C. Oumarou Ngoute.

NON-TYPES: 1 ♂ (LZUYC 0003), Cameroon, Egoutadjap, N 02°42′, E 011°03′07″, 2020 m a.s.l., 11.X.2014; 1 ♂ (LZUYC0004), Cameroon, Ongot, N 03°51′, E 011°25′, 810 m a.s.l., 24.VI.2014; 3 juv. (LZUYC 0006) same locality, 26.VI.2014, all leg. A.R. Nzoko Fiemapong & C. Oumarou Ngoute.

DIAGNOSIS. Differs in the absence of a lateral process on the gonopod nodus and of a paxillus on body segment 15.

NAME. Honours S.I. Golovatch, a taxonomist who has contributed to the knowledge of Afrotropical and other Diplopoda.

DESCRIPTION. Length of holotype ca 34 mm, maximum width at midbody 6 mm. Colour in alcohol light grey-brown dorsally, with a pale narrow line in stricture; venter, antennae and legs yellowish to nearly pallid (Fig. 1A, B).

Head smooth and shining, frons and vertex glabrous. Basal part of labrum slightly, clypeus densely, setose. Epicranial suture distinct. Interantennal isthmus ca 2 times as broad as diameter of antennal socket. Antennae of moderate length, slender. In length, antennomeres 2 > 3 = 4 = 5 > 6; antennomere 6 ca 2/3 the length of 2<sup>nd</sup>. The 2<sup>nd</sup>, 3<sup>rd</sup> and 6<sup>th</sup> antennomeres of sub-equal width, both 4<sup>th</sup> and 5<sup>th</sup> slightly narrower. Proximal antennomeres weakly, distal ones more densely, setose. Apex with four cones arranged in two diads (Fig. 2A). Gnathochilarial setae generally short, stipes with long setae apically, merging into a belt of dense short setules running down centre, lingual lamella and basal half of mentum uniformly invested with dense setae (Fig. 2B).

Collum considerably broader than head. Metaterga smooth and polished; paranota depressed, continuing slope of mid-dorsum. Peritrematic areas broad, ozo-pores located about midlength; caudolateral corners acute from 6<sup>th</sup> to 19<sup>th</sup> segments (Fig. 2E).

Terminal segment typical of Gomphodesmidae, strongly telescoped into 19<sup>th</sup>. Ventral tubercles of paraprocts not in contact with rim; hypoproct with small paramedian tubercles. (Fig. 2C). Sternal process of segment 6 with a large median, densely setose process (Fig. 2F); segment 15 without sternal paxillus.

Legs of moderate length, rather incrassate. Length of podomeres: 3 > 6 = 5 > 4 = 2 > 1. Apical tarsal pads, subtending the claws, present on legs 1–6 (Fig. 2D).

Gonopod aperture large, posterior rim elevated adjacent to coxae of 8<sup>th</sup> legs and deeply emarginated medially (Fig. 2G). Telopodite with a pyriform prefemur, base very thick, basal part deeply excavated me-

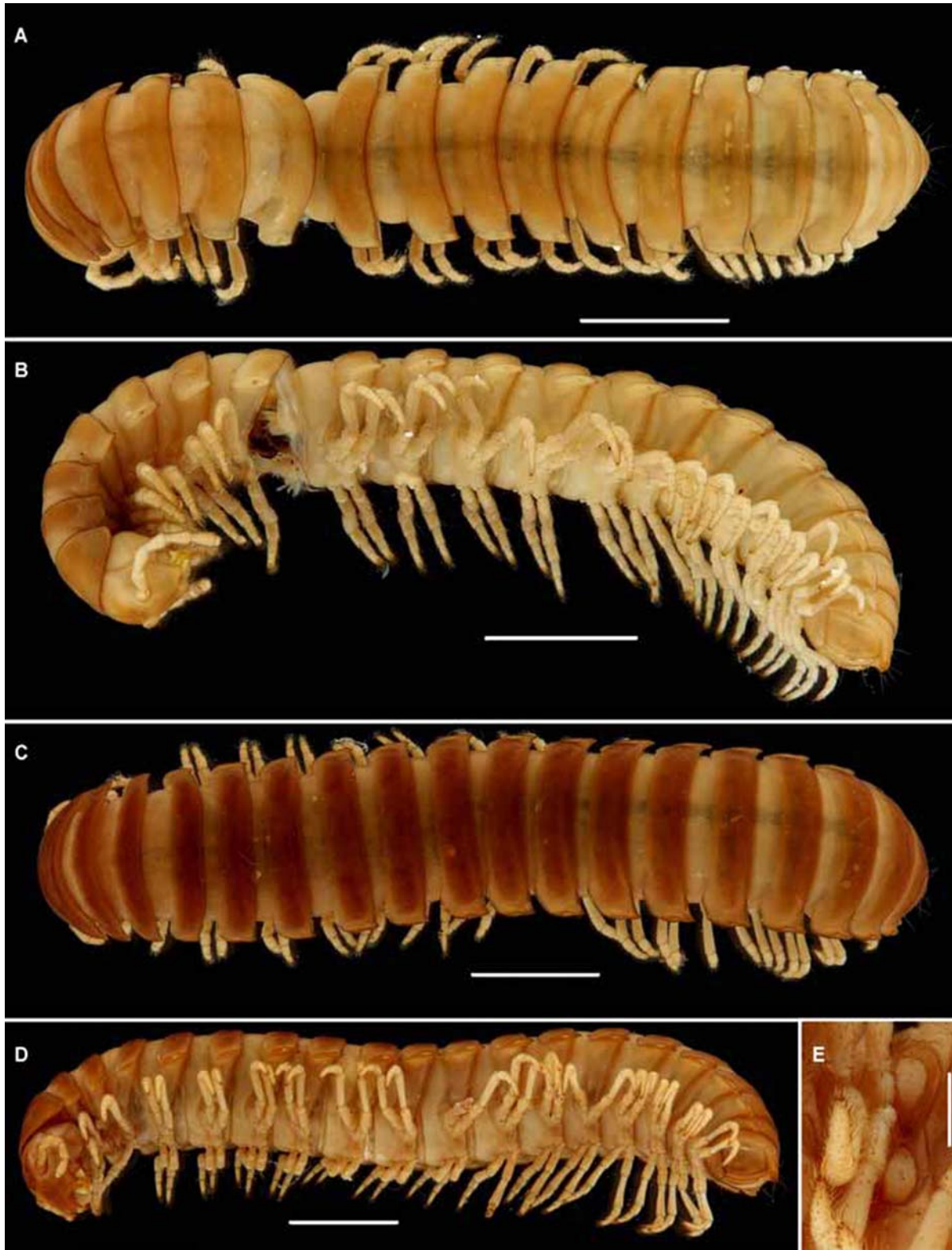


Fig. 1. *Tymbodesmus golovatchi* sp.n., ♂ (A–B) and ♀ (C–E) paratypes: A & B — habitus, dorsal and lateral views, respectively; C & D — habitus, dorsal and lateral views, respectively; E — cyphopods, ventral view. Scale bars: 5.0 mm.

Рис. 1. *Tymbodesmus golovatchi* sp.n., паратипы ♂ (А–В) и ♀ (С–Е): А и В — общий вид, соответственно сверху и сбоку; С и D — общий вид, соответственно сверху и сбоку; Е — вульвы, снизу. Масштаб: 5,0 мм.

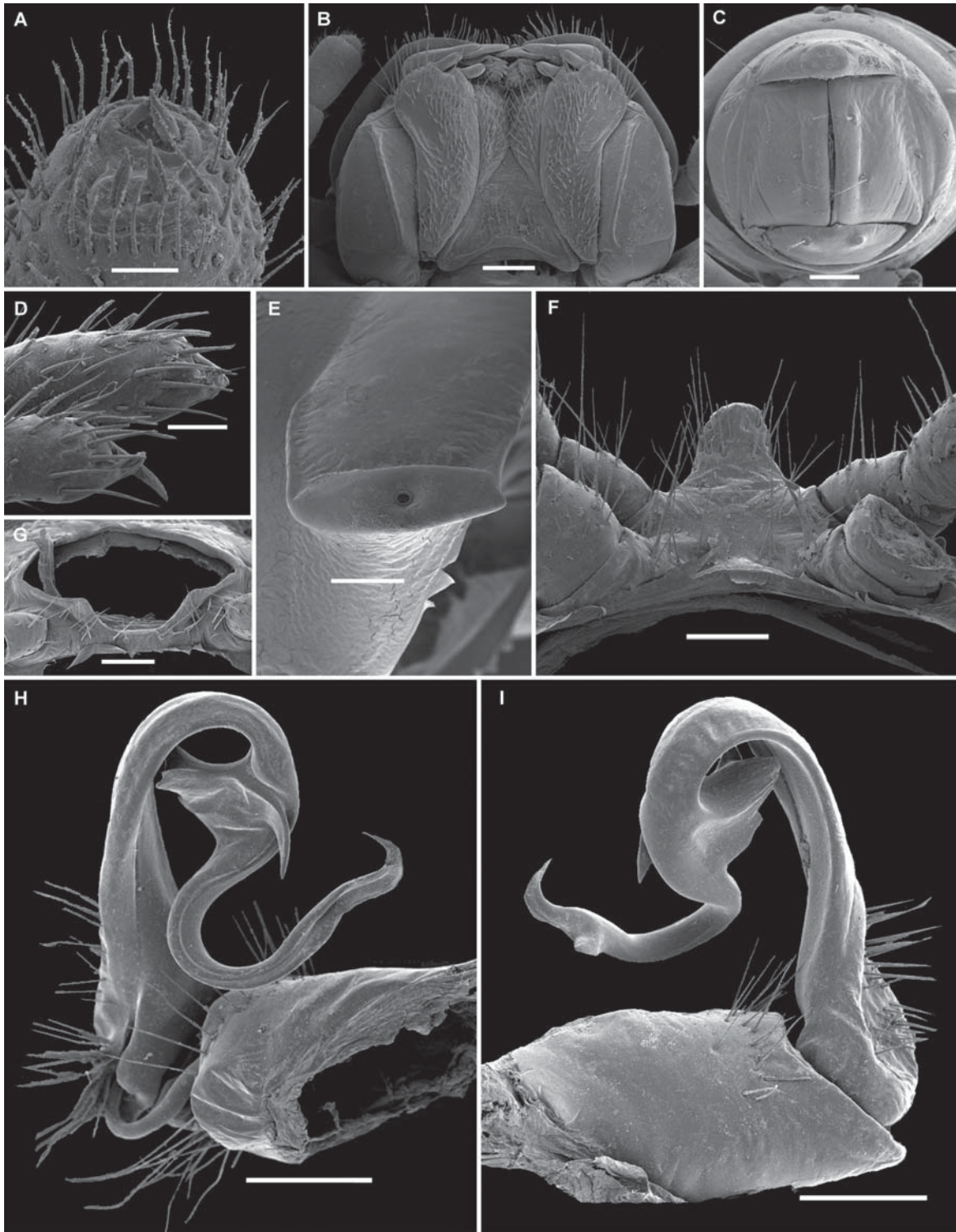


Fig. 2. SEM micrographs of *Tymbodesmus golovatchi* sp.n., ♂ paratype. A — apical antennomere; B — gnathochilarium, ventral view; C — posterior part of body, caudal view; D — tarsal pads; E — ozopore region, lateral view; F — sternal process of body segment 6; G — gonopod aperture, ventral view; H–I — right gonopod, mesal and lateral views, respectively. Scale bars: 0.5 (B, C, G–I) and 0.05 mm (A).

Рис. 2. SEM-микрофотографии *Tymbodesmus golovatchi* sp.n., паратип ♂. А — верхний членик усика; В — гнатохиларий, снизу; С — задняя часть тела, сзади; D — подушки на лапке; E — район поры защитных желез, сбоку; F — стернальный отросток 6-го сегмента тела; G — отверстие для гоноподов, снизу; H–I — правый гонопод, соответственно изнутри и сбоку. Масштаб: 0,5 (B, C, G–I) и 0,05 мм (A).

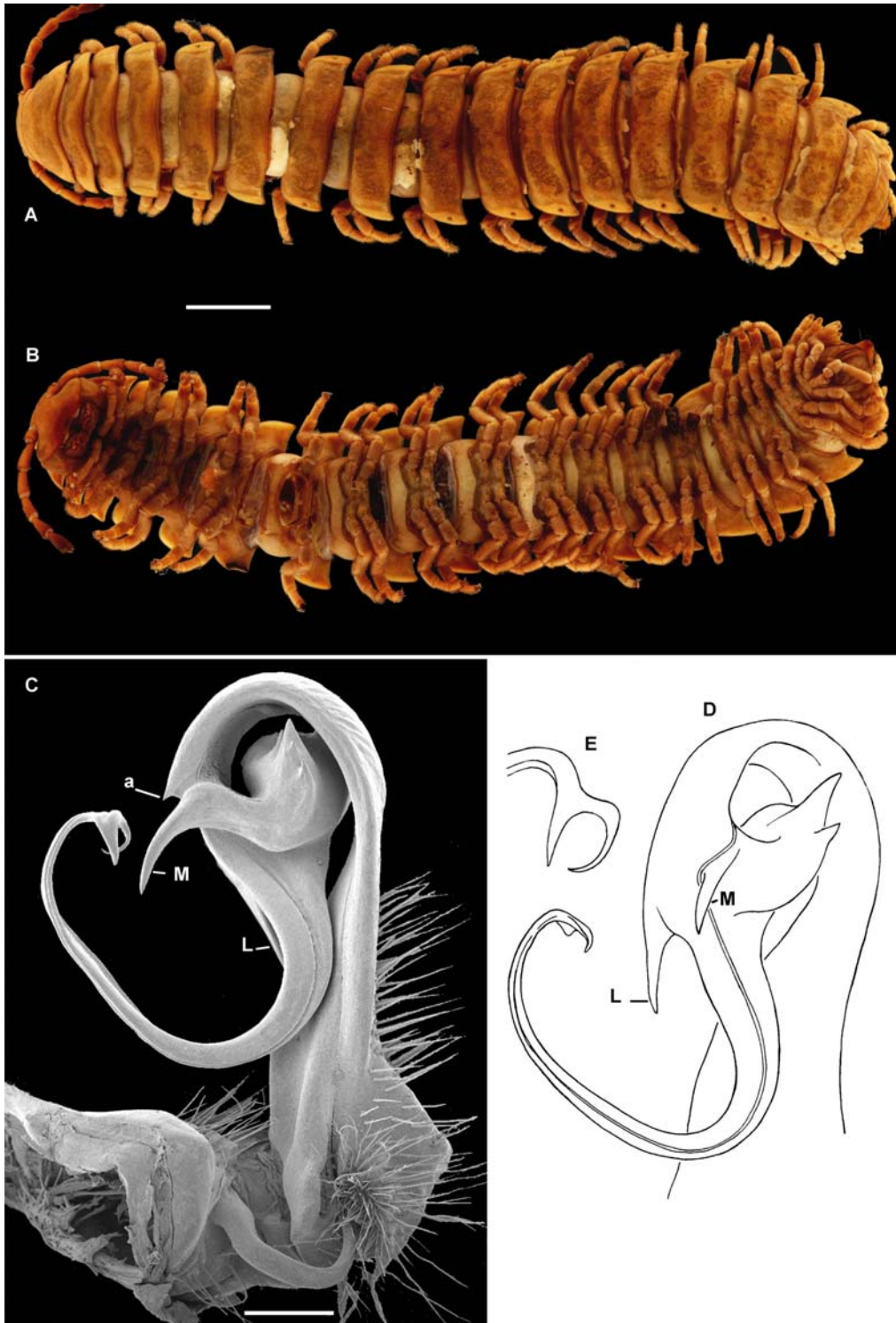
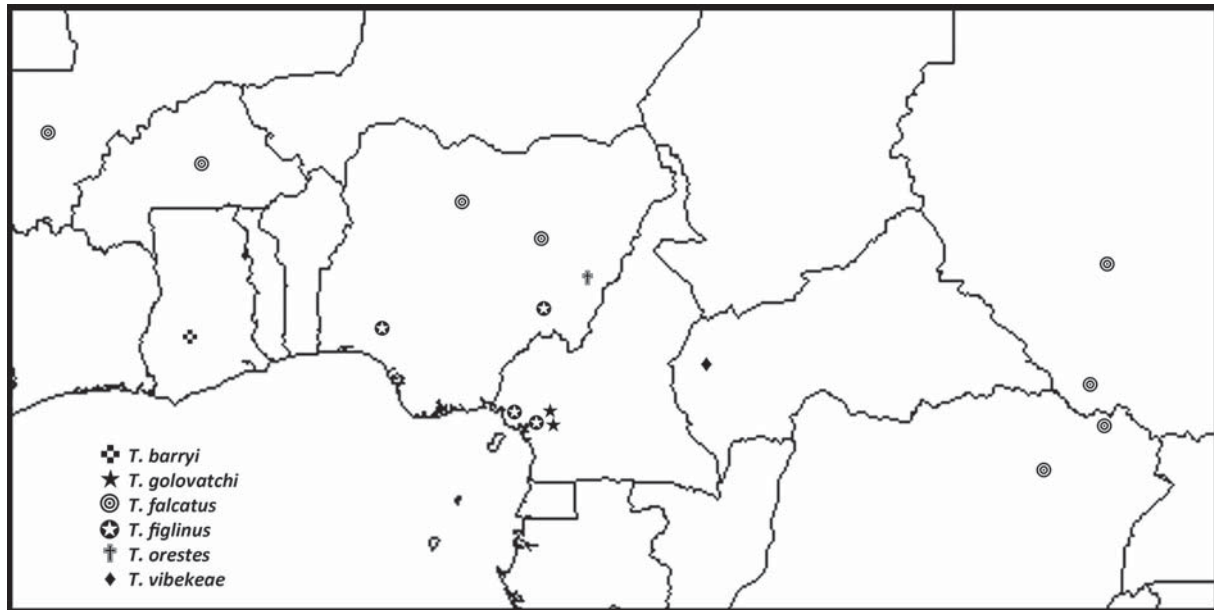


Fig. 3. *Tymbodesmus figlinus* Cook, 1899, ♂ from Ongot (A–C) and ♂ holotype (D & E). A–B — habitus, dorsal and ventral views, respectively; C — SEM micrograph of left gonopod, mesal view; D — telopodite of left gonopod, mesal view; E — apex of gonopod telopodite, enlarged. Scale bars: 5.0 (A & B) and 0.5 mm (C), drawn not to scale (D & E, after Hoffman [2005]).

Рис. 3. *Tymbodesmus figlinus* Cook, 1899, ♂ из Ongot (A–C) и голотип ♂ (D и E). A–B — общий вид, соответственно сверху и снизу; C — SEM-микротографии левого гонопода, изнутри; D — телоподит левого гонопода, изнутри; E — верхняя телоподита гонопода, увеличено. Масштаб: 5,0 (A и B) и 0,5 мм (C), без масштаба (D и E, по: Hoffman [2005]).



Map. Distribution of the genus *Tymbodesmus*.

Map. Распространение рода *Tymbodesmus*.

dially. Prefemoral setae grouped in two areas: one a densely setose area on a rounded cushion at base of spermal channel, the other an elongate and more sparsely setose area on posterior side of prefemur. Nodus relatively massive, entirely on inner side of curvature with only one mesal spine (M); inner lobe of nodus crenulated or with very short spines. Postnodal telopodite slender, simple, with a small subterminal projection; prostatic groove visible in mesal aspect along most of telopodite length (Fig. 2H, I).

PARATYPES. ♂♂ similar to holotype; ♀♀: length 24–38 mm, maximum width 8 mm. Generally similar in peripheral characters to ♂ but darker (Fig. 1C, D). Sternum of leg-pair 2 unmodified; cyphopods well visible on large specimens, sclerotized regions merging into a clear membrane (Fig. 1E).

VARIATION. Specimens from Engout'adjap, 170 km away from the type locality, show slight differences in details of the gonopod nodal region. This material differs from the types only in the presence on the mesal process of the nodus of one acute spine and 3–4 denticulations. At present, however, these deviations seem to be too minor to warrant the recognition of a separate taxon, even a subspecific category.

REMARKS. During this study, the first author was able to collect three new specimens of *T. figlinus* from a forest at Ongot, a place quite close to the type locality (Fig 3 A, B). The characteristics of the new material fit closely with the original description of *T. figlinus*, except for the gonopods. A comparison of our Figure 3C with Hoffman's excellent drawings (Fig. 3D, E) shows that the gonopods of the freshly collected specimens have a small accessory medial spine (a) immediately before the mesal spine (M). As we do not have enough material to show if this difference is sufficiently stable,

no special status is being allotted to distinguish those specimens taxonomically.

#### KEY TO SPECIES OF *TYMBODESMUS* (AFTER HOFFMAN [2005], MODIFIED):

- 1(4) Sternal process of 6<sup>th</sup> segment cuneate, broadest at base, distally narrowed; sterna without transverse carinae, 15 without paxillae; postnodal telopodite broad nearly to apex, distal sixth notably narrowed ..... 2
- 2(3) Lateral nodal process (L) absent .... *T. golovatchi* sp.n.
- 3(2) lateral nodal process (L) present ..... *T. barryi*
- 4(1) Sternal process of 6<sup>th</sup> segment elongated, narrowed near midlength, broadest at apex; sterna with four conspicuous carinae and a triangular paxillus ..... 5
- 5(6) Postnodal telopodite relatively short, very abruptly recurved at base of nodus, thence curved laterad with apex on ventrolateral side of nodal region .. *T. vibikeae*
- 6(5) Postnodal region of telopodite longer and more slender, at base nearly coaxial with nodus, thence curved ventrad with apex on median side of nodus ..... 7
- 7(8) Endonodus produced ventrad into a simple acute cone, at most with one small accessory spine ..... *T. figlinus*
- 8(7) Endonodus more massive, armed with several subequal spines ..... 9
- 9(10) Distal half of postnodal telopodite relatively broad; solenomere with a small triangular process at base .....  
..... *T. orestes*
- 10(9) Distal half of telopodite slender; solenomere with neither a triangular process nor a lobe at base .....  
..... *T. falcatus*

#### Distribution

The distribution of *Tymbodesmus* is purely tropical western African (Map). As all of the species tend to largely be restricted to forest habitats, woodland frag-

mentation through human activities renders a severe impact on the survival of some congeners. This primarily concerns *T. barryi*, *T. orestes* or *T. vikekeae*, each of which has only been described from a single, type locality. The range of *T. golovatchi* sp.n. is barely larger, being restricted to a few insular forests in western Cameroon.

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## References

- Hoffman R.L. 1980. Classification of the Diplopoda. Muséum d'histoire naturelle, Genève. 237 p. (for 1979).
- Cook O.F. 1899. African Diplopoda of the family Gomphodesmidae // Proceedings of the U.S. National Museum. Vol.21. P.677–739.
- Hoffman R.L. 2005. Monograph of the Gomphodesmidae, a family of African polydesmoid millipeds. Naturhistorisches Museum Wien. 537 p.

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