

Notes on Afrotropical Pyrgodesmidae, 3 (Diplopoda: Polydesmida)

Заметки по афротропическим Pyrgodesmidae, 3
(Diplopoda: Polydesmida)S.I. Golovatch¹, A.R. Nzoko Fiemarpong², D. VandenSpiegel³
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KEY WORDS: millipede, Pyrgodesmidae, taxonomy, new species, new species group, new combination, new synonymy, key, Congo, Cameroon, Tanzania.

КЛЮЧЕВЫЕ СЛОВА: диплопода, Pyrgodesmidae, таксономия, новый вид, новая группа видов, новая комбинация, новая синонимия, ключ, Конго, Камерун, Танзания.

ABSTRACT. Eleven new species of Pyrgodesmidae are described: *Monachodesmus bamboutos* sp.n., *M. bipindi* sp.n., *M. awae* sp.n., *M. yabassi* sp.n., *M. bagam* sp.n., *M. djawara* sp.n. and *M. minutus* sp.n., all from Cameroon, *Cryptocorypha dimorpha* sp.n., *C. monomorpha* sp.n., *C. bocal* sp.n. and *C. leleupi* sp.n., all from the Democratic Republic of the Congo. The former five species, together with *Monachodesmus longicaudatus* Golovatch, Nzoko Fiemarpong et VandenSpiegel, 2015, for which new records from Cameroon and new illustrations of the gonopods are provided, form the *longicaudatus* group characterized by the long paramedian caudal lobes on segment 19 fully concealing the telson from above. A key is given to all six species of the group. Both *Afrocorypha* Loksa, 1967 and *Procoptodesmus* Brolemann, 1920 are formally synonymized with *Cryptocorypha* Attems, 1907, **syn.n.**; the latter genus is reviewed and redefined, with a key provided to all six African species known to date. These include also *C. nympha* Loksa, 1967, a poorly described species from the Republic of the Congo, as well as *C. diffusa* (Brolemann, 1920), **comb.n.** ex *Procoptodesmus*, which is redescribed and richly illustrated, based on unpublished material from Tanzania.

РЕЗЮМЕ. Описаны 11 новых видов Pyrgodesmidae: *Monachodesmus bamboutos* sp.n., *M. bipindi* sp.n., *M. awae* sp.n., *M. yabassi* sp.n., *M. bagam* sp.n., *M. djawara* sp.n. и *M. minutus* sp.n., все из Камеруна, *Cryptocorypha dimorpha* sp.n., *C. monomorpha* sp.n., *C. bocal* sp.n. и *C. leleupi* sp.n., все из Демократической Республики Конго. Первые пять видов вместе с *Monachodesmus longicaudatus* Golovatch, Nzoko Fiemarpong et VandenSpiegel, 2015, для которого даны новые находки из Камеруна и новые иллюстрации гоноподов, образуют группу видов *longicaudatus*, характеризующуюся длинными параме-

диальными задними пластинами на 19-м сегменте, которые полностью скрывают тельсон при виде сверху. Составлен ключ для всех шести видов этой группы. И *Afrocorypha* Loksa, 1967, и *Procoptodesmus* Brolemann, 1920 формально сведены в синонимы к *Cryptocorypha* Attems, 1907, **syn.n.**, а для последнего рода представлены обзор и новый диагноз с ключом для всех шести африканских видов, известных в настоящее время. Среди этих видов есть *C. nympha* Loksa, 1967, плохо описанный вид из Республики Конго, а также *C. diffusa* (Brolemann, 1920), **comb.n.** ex *Procoptodesmus*, вид, который переописан и снабжен многочисленными иллюстрациями по неопубликованному материалу из Танзании.

Introduction

The mainly tropical millipede family Pyrgodesmidae is among the largest, but taxonomically perhaps most confused in the entire class Diplopoda, currently counting about 400 species or subspecies in 170+ genera, nearly 120 of which are monotypic [Minelli, 2015]. The present paper puts on record 11 new species of Pyrgodesmidae from Cameroon or the Democratic Republic of the Congo. The new species represent two genera which seem to be among the most speciose in the region. Two new generic synonyms are also established.

Material and methods

Most of the material treated here derives from the collection of the Musée Royal de l'Afrique Centrale (MRAC), Tervuren, Belgium, with only a few duplicates retained for the collection of the second author

(ARNF), Cameroon or 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. The pictures are taken using the focus stacking setup as described by Brecko *et al.* [2014]. It consists of a Canon EOS 700D, a Canon MPE 65 mm 1:2.8 1-5x Macro Photo Lens, 2 Yongnuo YN560II flash lights, one remote control for the flash lights, a Cognisys StackShot and an Ikea “Metod” kitchen cupboard. Canon EOS Utility software is used to control the camera. Zerene Stacker is used for stacking the individual pictures into one ‘stacked image’.

Taxonomic part

New faunistic records

Nonnodesmus niger Attems, 1953
Figs 1 & 2, Map.

MATERIAL. 1 ♂, 1 ♀, 2 subadult ♀♀ (MRAC 11.949), Congo D. R., Dorsale de Lubero, Mt Kasongwere versant N.W., S 00°06′, E 029°06′, 2500 m a.s.l., 6.VII.1963; 3 ♂♂, 2 ♀♀, 1 juv. (MRAC 12.139), 1 ♂ (SEM, MRAC 724), Congo D. R., Dorsale de Lubero, Mt Muleke, lieu dit Nguayi, versant S. Niss Kanyatsi, S 00°17′, E 029°15′, 1900 m a.s.l., 9.VIII.1963, all leg. R.P.M.J. Celis.

REMARKS: This species is one of the most common pyrgodesmids in the Congo D. R., well illustrated originally [Attems, 1953], as well as from topotypic or near-topotypic samples [Golovatch, VandenSpiegel, 2014]. In one of the above ♂♂ studied, the gonopodal telopodites show a distinct distomesal hook (**h**) absent from the others. We believe this **h** (Fig. 2D) represents nothing else but individual variation, as in all other respects the specimen fully agrees with the known diagnosis [Attems, 1953; Golovatch, VandenSpiegel, 2014]. New illustrations depicting a typical ♂ are also provided (Figs 1 & 2A–C). Moreover, this species resembles certain *Monachodesmus* spp. so much (see Golovatch *et al.* [2015] and below) that its transfer to the latter genus seems to be quite plausible. However, the problem is deferred for the future because the taxonomy of *Monachodesmus* Silvestri, 1910 is still not settled (see below and Golovatch *et al.* [2015]).

Monachodesmus longicaudatus Golovatch, Nzoko Fiemapong et VandenSpiegel, 2015
Fig. 3, Map.

MATERIAL. 4 ♂♂, 5 ♀♀ (MRAC 22687), 1 ♂, 1 ♀ (ZMUM), Cameroon, South Forest Region, Bipindi, Mt Bidjouka Canton Pygmée, N 3°146′, E 10°497′, near primary forest, under dead leaves, 14.I.2017, leg. A.R. Nzoko Fiemapong & C.N. Oumarou; 8 ♂♂, 17 ♀♀, 3 subadult ♀♀ (MRAC 22688), Cameroon, Central Region, Awae, N 3°3′, E 11°98′, secondary forest near farmland, under dead leaves, 23.II.2014; 10 ♂♂, 13 ♀♀, 38 subadult ♀♀ (MRAC 22689), Cameroon, Littoral Evergreen Forest Region, Wouri Division, Yansoki, N 4°105′, E 9°82′, 4.VIII.2016, all leg. A.R. Nzoko Fiemapong.

REMARKS. This species has recently been described from the Yaoundé University I campus [Golovatch *et al.*, 2015], presently reported from several other localities, all confined to lowland southwestern Cameroon. Moreover, at the moment *M. longicaudatus* is among the most widely distributed species of Pyrgodesmidae endemic to the country (Map 1), occurring mainly in strongly degraded forest habitats.

New illustrations of the gonopods (Fig. 3) are provided not only to document the species’ identity, but also to demonstrate its distinctions versus the other particularly similar congeners which constitute the *longicaudatus* group (see below).

Descriptions of new species

Monachodesmus bamboutos sp.n.
Figs 4(A, B)–7, Map.

HOLOTYPE ♂ (MRAC 22690), Cameroon, West Region, Bamboutos Division, Babajou District, Mt Bamboutos, N 5°41′ 4.97″, E 10°06′22.46″, 2600 m a.s.l., artificial forest, under stones, 3.III.2017, leg. A.R. Nzoko Fiemapong *et al.*

PARATYPES: 1 ♂, 7 ♀♀, 2 subadult ♀♀ (MRAC 22691), 1 ♂, 1 ♀ (ZMUM), 1 ♂, 1 ♀ (ARNF), same data, together with holotype; 1 ♂ (SEM, MRAC 22693), 21 ♀♀, 2 subadult ♀♀ (MRAC 22692), same locality, 9.VII.2016, leg. A.R. Nzoko Fiemapong *et al.*

DIAGNOSIS. Using the latest key to *Monachodesmus* species [Golovatch *et al.*, 2015], this and the following four new species would readily key out to *M. longicaudatus* Golovatch, Nzoko Fiemapong et VandenSpiegel, 2015, also from Cameroon. Given the number of *Monachodesmus* species that show conspicuously elongated caudal lobes of the penultimate segment to fully conceal the telson in dorsal view has grown to six, creation of a separate species group seems warranted. Among the *longicaudatus* group members, *M. longicaudatus* is easily distinguishable through the medially somewhat differentiated fore margin of the collum and the shortest process **x** on the gonopodal telopodite. See also Key below.

NAME. To emphasize the type and sole locality; noun in apposition.

DESCRIPTION. Length 5.0–6.0 mm (♂, ♀), width together with paraterga 1.0–1.1 mm, width of prozonae 0.6 mm (♂, ♀). Holotype ca 6.0 mm long, 1.0 and 0.6 mm wide on metaterga and prozonae, respectively.

General coloration in alcohol light beige to nearly pallid, dorsal surfaces of collum, telson and metaterga sometimes slightly earth-encrusted, faintly pinkish (Fig. 4A, B). Cleaner specimens, usually juveniles, from pallid to yellowish. Vertigial paramedian regions above antennae usually a little infuscate, up to light brownish. Head above antennae finely microgranulate, genae roundish, clypeolabral region very finely and densely setose, epicranial suture very fine, a little better visible in occipital region; interantennal isthmus about 1.5 times as large as diameter of antennal socket (Fig. 5D). Antennae medium-sized, poorly clavate, indistinctly C-shaped, only three basal antennomeres of each lying inside a loose groove, not appressed to head, with

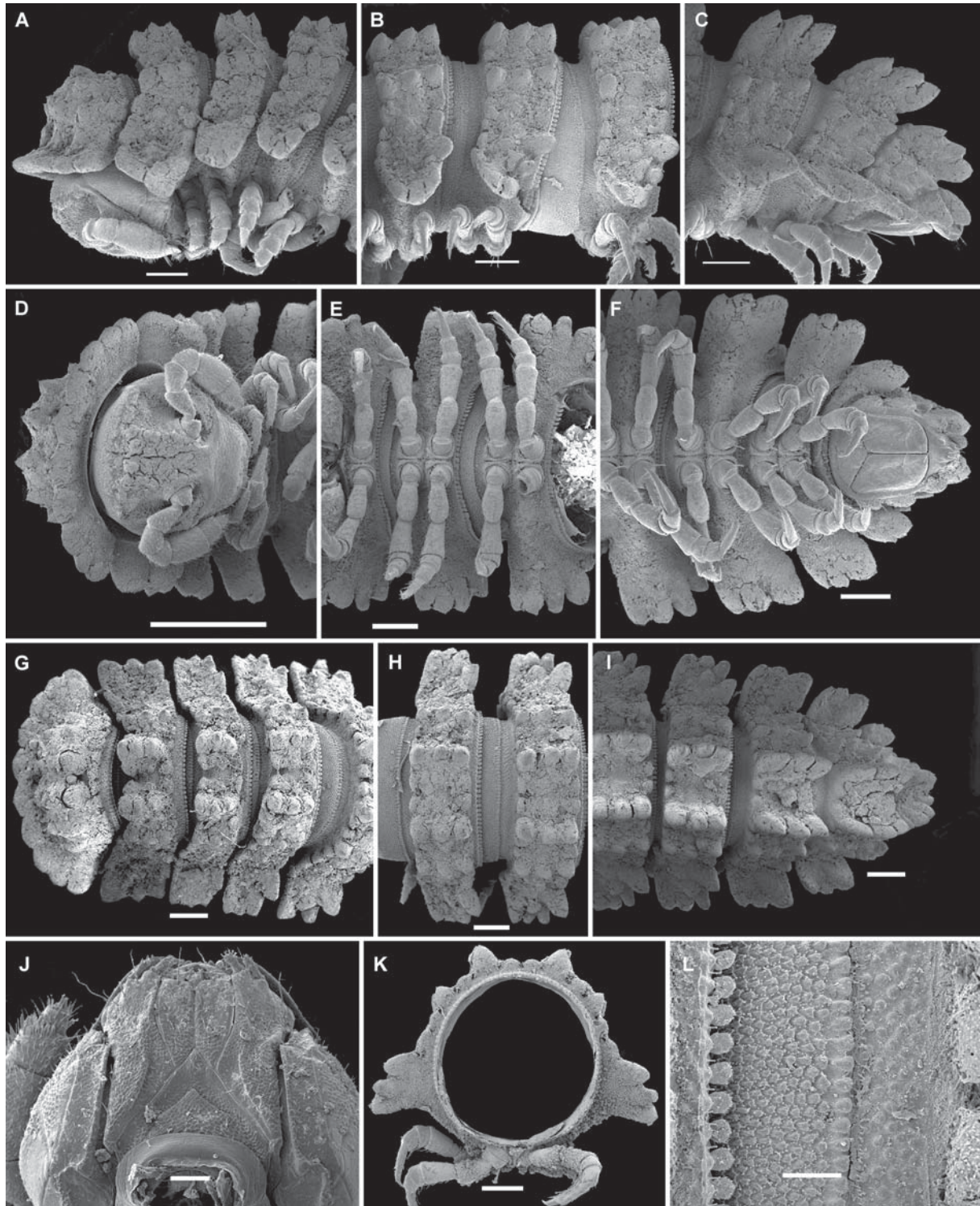


Fig. 1. *Nonnodesmus niger* Attems, 1953, ♂ from Mt Muleke. A, D, G — anterior part of body, lateral, ventral and dorsal views, respectively; B, E, H — midbody segments, lateral, ventral and dorsal views, respectively; C, F, I — caudal part of body, lateral, ventral and dorsal views, respectively; J — gnathochilarium, ventral view; K — cross-section of a midbody segment, caudal view; L — limbus and adjacent fine structures of tergal tegument, dorsal view. Scale bars: 0.5 (D), 0.2 (A–C, E–I, K), 0.1 (J) & 0.05 mm (L).

Рис. 1. *Nonnodesmus niger* Attems, 1953, ♂ с горы Muleke. A, D, G — передняя часть тела, соответственно сбоку, снизу и сверху; B, E, H — среднетуловищные сегменты, соответственно сбоку, снизу и сверху; C, F, I — задняя часть тела, соответственно сбоку, снизу и сверху; J — гнатохиларий, снизу; K — поперечный срез через среднетуловищный сегмент, сзади; L — лимбус и соседние микроструктуры тергальных покровов, сверху. Масштаб: 0,5 (D), 0,2 (A–C, E–I, K), 0,1 (J) и 0,05 мм (L).

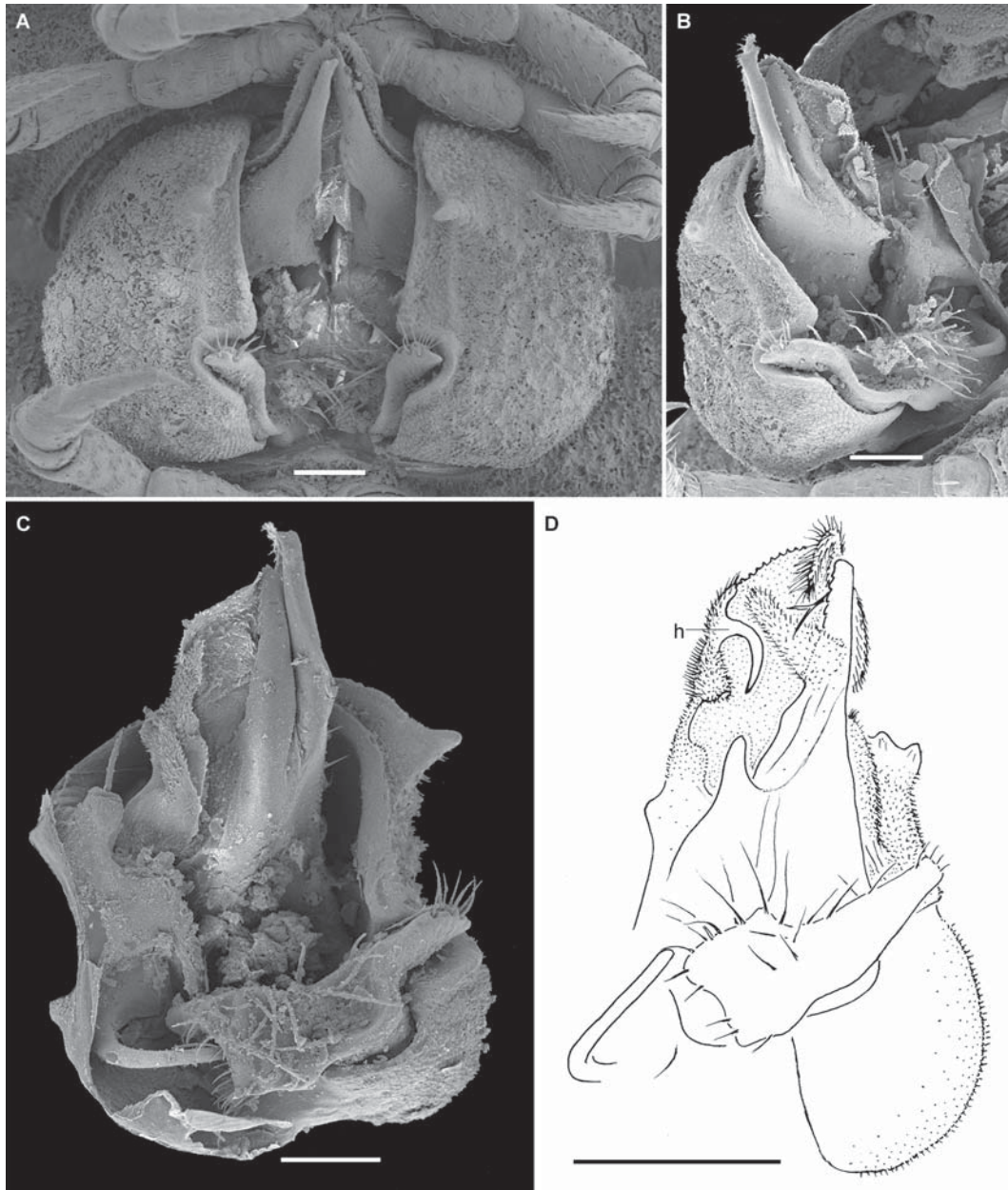
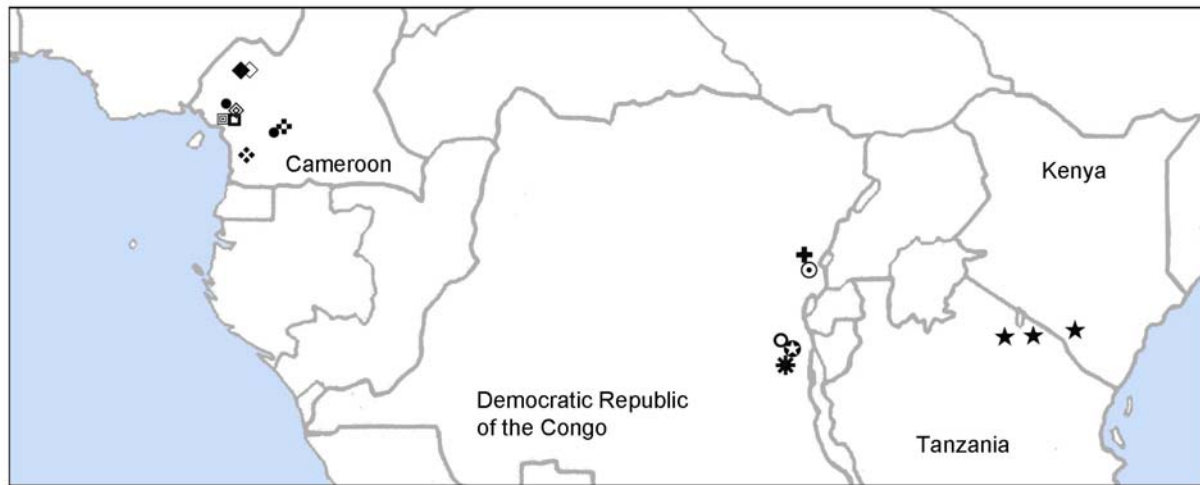


Fig. 2. *Nonnodesmus niger* Attems, 1953, ♂♂ from Mt Muleke. A — both gonopods in situ, ventral view; B–D — right gonopod, caudomesal, mesal and mesal views, respectively. Scale bars: 0.1 (A–C) & 0.2 mm (D). Designation explained in text.

Рис. 2. *Nonnodesmus niger* Attems, 1953, ♂♂ с горы Muleke. А — оба гонопода на месте, снизу; В–Д — правый гонопод, соответственно одновременно сзади и изнутри, изнутри и изнутри. Масштаб: 0,1 (А–С) и 0,2 мм (D). Объяснение обозначения дано в тексте.

small compact apicodorsal groups of bacilliform sensilla on antennomeres 5 and 6; the former antennomere clearly the longest and largest (Fig. 5D). Body with 20 segments (♂, ♀). In width, head \ll collum = segment 2 = 3 = 4 < 5–16; thereafter body gradually tapering towards telson. Body polydesmoid, with broad, moderately declivous, wing-shaped paraterga set very low (nearly level with venter) (Figs 5A–C, G–I, K). Collum flabellate, very wide, fully covering the head from above; anterior margin clearly and regularly convex,

with 5+5 equal and distinct lobulations; central region with two evident transverse rows of high, conical tubercles, 2+2 and 3+3 in front and caudal rows, respectively (Fig. 5A, D, G). Lateral margin of paraterga 2 trilobate, following ones until segment 16 bilobate (regardless of porosteles on poriferous segments), again quite clearly trilobate on segments 17–19. Each post-collum metatergum until 18th with three transverse rows of distinct tubercles and two or more rows of small granulations in-between. MD tubercles/crests growing



* *Cryptocorypha bocal*, ★ *Cryptocorypha diffusa*, ○ *Cryptocorypha dimorpha*, ⊕ *Cryptocorypha leleupi*, ⊙ *Cryptocorypha monomorpha*, ✦ *Monachodesmus awae*, ◆ *Monachodesmus bamboutos*, ◇ *Monachodesmus bagam*, ✧ *Monachodesmus bipindi*, ⊠ *Monachodesmus djawara*, ● *Monachodesmus longicaudatus*, ◻ *Monachodesmus minutus*, ⊠ *Monachodesmus yabassi*, ⊕ *Nonnodesmus niger*

Map. Distribution of the new and old records of *Nonnodesmus niger* Attems, 1953, *Monachodesmus* spp, and *Cryptocorypha* spp. as given in the present paper.

Карта. Распространение новых и старых находок *Nonnodesmus niger* Attems, 1953, *Monachodesmus* spp, и *Cryptocorypha* spp. по данным этой работы.

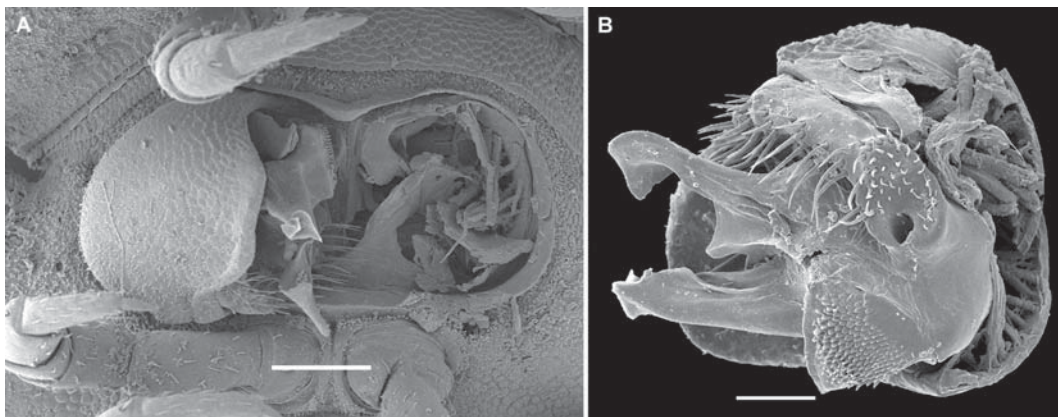


Fig. 3. *Monachodesmus longicaudatus* Golovatch, Nzoko Fiemapong et VandenSpiegel, 2015, ♂ from Yansoki. A & B — right gonopod in situ and dissected, ventral and mesal views, respectively. Scale bars: 0.1 (A) & 0.05 mm (B).

Рис. 3. *Monachodesmus longicaudatus* Golovatch, Nzoko Fiemapong et VandenSpiegel, 2015, ♂ из Yansoki. А и В — правый гонопод на месте и отдельно, соответственно снизу и изнутри. Масштаб: 0,1 (А) и 0,05 мм (В).

increasingly and gradually high towards segment 18, also inclined increasingly caudad on segments 16–18. MD mostly higher than dorsolateral crests (DL), the latter increasingly small towards segment 15, replaced by smaller granulations further caudad much like background ones. Lateral margins of paraterga mostly subrectangular at anterior and posterior corners, but clearly inclined caudad on segments 16–18; neither visible caudolateral nor anterolateral lobulations, nor tergal setae (Fig. 5). Metatergum 19 very special in showing particularly small and vaguely trilobate paraterga, coupled with unusually long, rounded, contiguous, caudal lobes with traces of MD crests (Fig. 5C, F, I). Metater-

ga strongly convex (Fig. 5K), with a usual ceratogenous layer on top of microvilli (Fig. 5L, M). Pore formula nearly normal: 5, 7, 9, 10, 12, 13, 15, 16, clearly traceable due to very evident, coniform, simple porosteles (Fig. 5M). Limbus very finely crenulate (Fig. 5L). Epiproct completely and very strongly concealed from above between medially fused ultimate crests (Fig. 5C, F). Hypoproct subtriangular, with 1+1 caudal setae, the latter being devoid of knobs at base.

Sterna narrow, deeply impressed along axis, without modifications (Fig. 5E). Epigynal ridge behind ♀ coxae 2 very low, rounded on sides. Legs relatively short and stout, not or barely extending beyond lateral



Fig. 4. Habituses of *Monachodesmus bamboutos* sp.n., ♂ paratype (A, B), and *Cryptocorypha bocal* sp.n., ♂ paratype (C), dorsal, ventrolateral and dorsolateral views, respectively. Scale bars: 1.0 mm.

Рис. 4. Общий вид *Monachodesmus bamboutos* sp.n., паратип ♂ (A, B), и *Cryptocorypha bocal* sp.n., паратип ♂ (C), соответственно сверху, одновременно снизу и сбоку и одновременно сверху и сбоку. Масштаб: 1,0 мм.

edges of paraterga, only tarsi particularly slender; larger setae on ♂ coxae modified, ribbed. Gonapophyses on ♂ coxae 2 vestigial. Gonopod aperture subcordiform, broad, nearly as wide as prozona 7.

Gonopods (Figs 6 & 7) rather simple; coxae subglobose, large, microgranulate and micropilose laterally, with usual long cannulae and a moderately deep

gonocoel; each telopodite mostly exposed, tripartite, with the largest, mesal, sac-shaped part (**a**) bearing a very short solenomere tooth (**sl**) on top, a rounded, hyaline, lateral lobe (**l**) at base of **a**, and a slender, similarly long, strongly sclerotized, truncated process (**x**) caudolaterally.

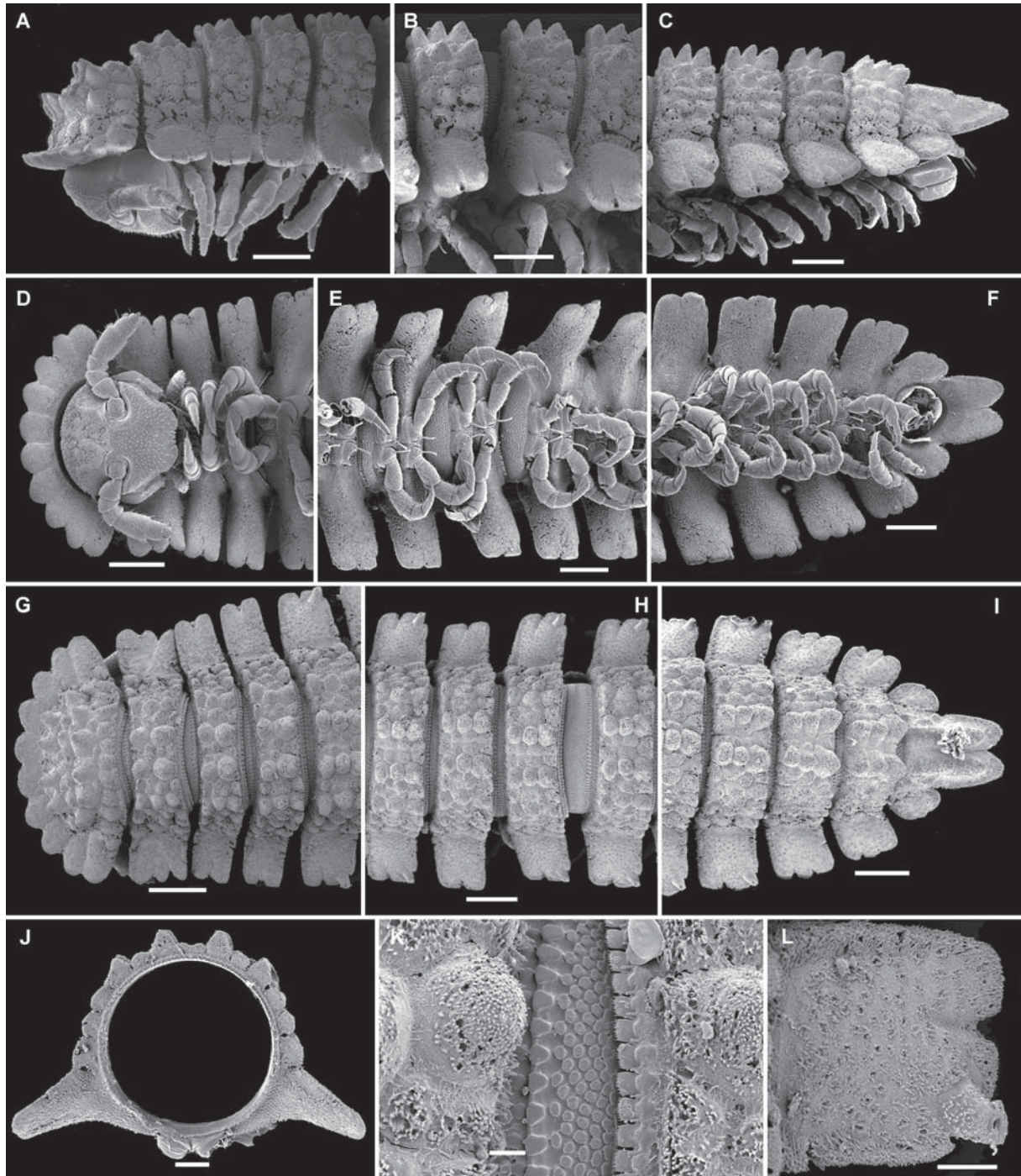


Fig. 5. *Monachodesmus bamboutos* sp.n., ♂ paratype. A, D, G — anterior part of body, lateral, ventral and dorsal views, respectively; B, E, H — midbody segments, lateral, ventral and dorsal views, respectively; C, F, I — caudal part of body, lateral, ventral and dorsal views, respectively; J — cross-section of a midbody segment, caudal view; K — limbus and adjacent fine structures of tergal tegument, dorsal view; L — poriferous paratergum, dorsal view. Scale bars: 0.2 (A–I), 0.1 (J), 0.05 (K) & 0.02 mm (L).

Рис. 5. *Monachodesmus bamboutos* sp.n., паратип ♂. А, D, G — передняя часть тела, соответственно сбоку, снизу и сверху; B, E, H — среднетуловищные сегменты, соответственно сбоку, снизу и сверху; C, F, I — задняя часть тела, соответственно сбоку, снизу и сверху; J — поперечный срез через среднетуловищный сегмент, сзади; K — лимбус и соседние микроструктуры тергальных покровов, сверху; L — несущий озопору паратергит, сверху. Масштаб: 0,2 (А–I), 0,1 (J), 0,05 (K) и 0,02 мм (L).



Fig. 6. *Monachodesmus bamboutos* sp.n., ♂ paratype. A & B — both gonopods in situ, ventral and lateral views, respectively; C & D — right gonopod, ventrocaudal and ventral views, respectively. Scale bars: 0.05 mm.

Рис. 6. *Monachodesmus bamboutos* sp.n., паратип ♂. А и В — оба гонопода на месте, соответственно снизу и сбоку; С и D — правый гонопод, соответственно одновременно снизу и сзади и снизу. Масштаб: 0,05 мм.

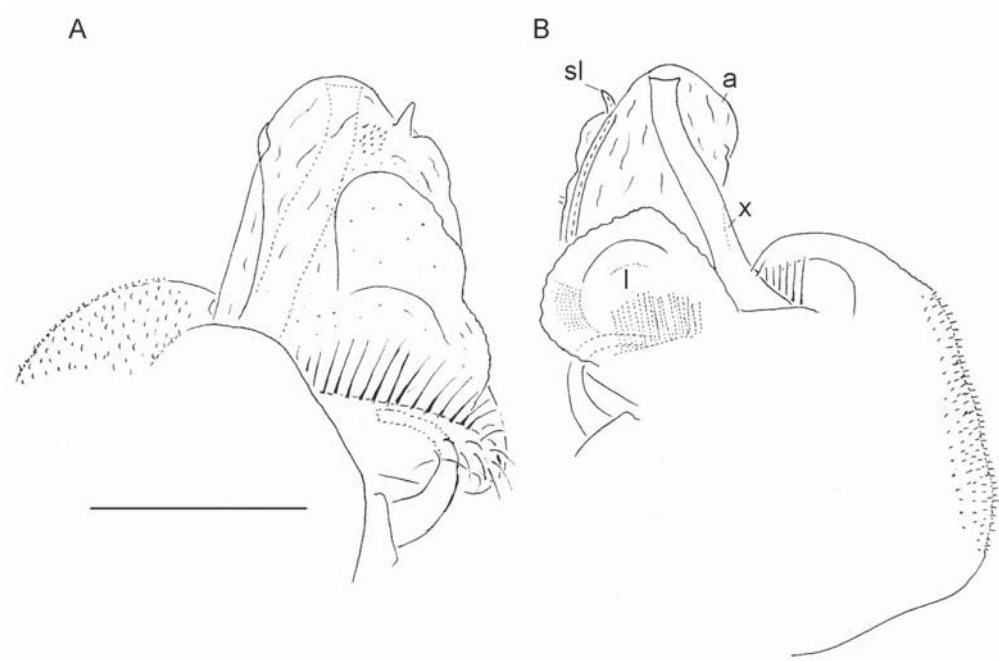


Fig. 7. *Monachodesmus bamboutos* sp.n., ♂ paratype. A & B — left gonopod, submesal and sublateral views, respectively. Scale bar: 0.1 mm. Designations explained in text.

Рис. 7. *Monachodesmus bamboutos* sp.n., паратип ♂. А и В — левый гонопод, соответственно почти изнутри и почти сбоку. Масштаб: 0,1 мм. Объяснение обозначений дано в тексте.

REMARKS. The genus *Monachodesmus* Silvestri, 1910, presently contains 20 species ranging across tropical Africa. Of them, five are known to occur in Cameroon [Golovatch et al., 2015], including *M. bamboutos* sp.n. which seems to be restricted to the well-isolated Bamboutos Mountains lying far away to the west from the nearest localities that support any other congener. Even considering the presently extended distribution of the apparently most similar *M. longicaudatus* (see above), all species of *Monachodesmus* other than *M. bamboutos* sp.n. are confined to Cameroon's littoral and/or central parts.

Monachodesmus bipindi sp.n.
Figs 8 & 9, Map.

HOLOTYPE ♂ (MRAC 22694), Cameroon, South Forest Region, Bipindi, Mt Bidjouka Canton Pygmée, N 3°146', E 10°497', near primary forest, under dead leaves, 14.I.2017, leg. A.R. Nzoko Fiemapong & C.N. Oumarou.

PARATYPES: 1 ♂, 15 ♀♀ (MRAC 22695), 1 ♂ (SEM, MRAC 22696), same data, together with holotype.

DIAGNOSIS. This new species seems to come especially close to *M. longicaudatus* in sharing the longest caudal lobes on segment 19 and the shortest, non-flagelliform, apically truncated process **x** on the gonopodal telopodite, but the two species differ in the non-differentiated fore margin of the collum and a slightly longer **x** in *M. bipindi* sp.n. See also Key below.

NAME. To emphasize the type and sole locality; noun in apposition.

DESCRIPTION. Length of holotype and ♂ paratypes ca 6.0 mm, width together with paraterga 1.0 mm, width of prozonae 0.6 mm. Length of ♀ paratypes 6.2–7.0 mm, width of metazonae together with paraterga 0.9–1.2 mm, width of prozonae 0.6–0.8 mm.

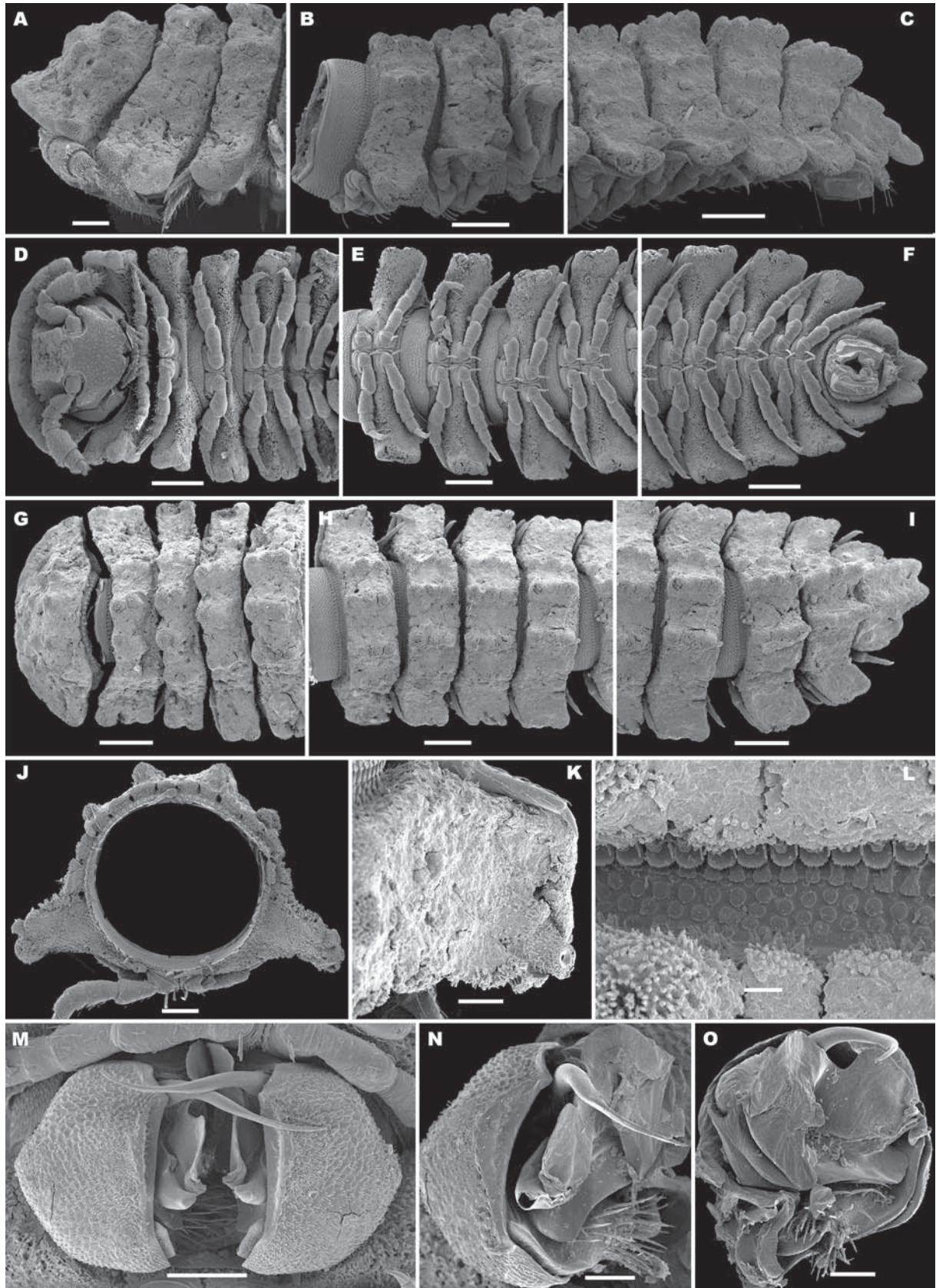
General coloration in alcohol light yellowish brown, but collum, metaterga and telson usually dirty brown to brown due to an earth crust. Vertex and ventral sides of paraterga usually light brown, cleaner specimens light yellow-brown; antennae, clypeolabral region, venter and legs pallid to almost pallid. Head above antennae finely microgranulate, genae roundish, clypeolabral region very finely and densely setose, epicranial suture fine, a little better visible in occipital region; interantennal isthmus about 2.0 times as large as diameter of antennal socket. Antennae short, poorly C-shaped, three basal antennomeres lying inside a groove. Antennomeres 1–4 and 7 shortest and subequal in length. Antennomere 5 largest, but only a little longer than 6th, both latter with a small, compact, apicodorsal group of bacilliform sensilla (Fig. 8D).

Body with 20 segments (♂, ♀). In width, head << collum = segment 2 < 3 < 4 < 5–15; thereafter body gradually tapering towards telson. Body polydesmoid, with broad, moderately declivous, wing-shaped paraterga set very low (nearly level with venter) (Fig. 8A–J). Collum flabellate, very wide, fully covering the head from above; anterior margin clearly and regularly con-

vex, with 5+5 equal and indistinct lobulations; central region with two evident, transverse rows of high, conical, roundish tubercles, 2+2 and 3+3 in front and caudal rows, respectively (Fig. 8A, D, G). Lateral margin of paraterga 2 trilobate, following ones until segment 16 bilobate (regardless of porosteles on poriferous segments), again rather indistinctly tri- or more evidently bilobate on segments 17–19. Each postcollum metatergum until 18th with three transverse rows of distinct tubercles and two or more rows of small granulations in-between. MD tubercles/crests growing increasingly and gradually high towards segment 18, also inclined increasingly caudad on segments 17 and 18. MD mostly higher than dorsolateral crests (DL), the latter increasingly small towards segment 16, replaced by smaller granulations further caudad much like background ones. Lateral margins of paraterga mostly subrectangular at anterior and posterior corners, but clearly inclined caudad on segments 17–19; neither evident caudolateral nor anterolateral lobulations, nor superficially discernible tergal setae, although rudimentary, very short setae surmounting some tubercles traceable with SEM (Fig. 8). Metatergum 19 very special in showing particularly small and vaguely trilobate paraterga, coupled with unusually long, rounded, contiguous, caudal lobes with traces of MD crests (Fig. 8C, F, I). Metaterga strongly convex (Fig. 8J), with a usual ceratogenous layer on top of microvilli (Fig. 8K, L). Pore formula nearly normal: 5, 7, 9, 10, 12, 13, 15, 16, clearly traceable due to very evident, coniform, simple porosteles. Limbus very finely crenulate (Fig. 8L). Prozonae extremely delicately, stricture between pro- and metazona more roughly alveolate (Fig. 8L). Epiproct completely and very strongly concealed from above between medially fused ultimate crests (Fig. 8C, F). Hypoproct roundly subtriangular, with 1+1 subcaudal setae borne on small knobs.

Sterna narrow, deeply impressed along axis, without modifications (Fig. 8D–F). Epigynal ridge behind ♀ coxae 2 very low, rounded on sides. Legs relatively short and stout, not extending beyond lateral edges of paraterga, only tarsi particularly slender; larger setae on ♂ coxae modified, ribbed. Gonapophyses on ♂ coxae 2 vestigial (Fig. 8D). Gonopod aperture subcordiform, broad, nearly as wide as prozona 7 (Fig. 8M).

Gonopods (Figs 8M–O, 9) rather simple; coxae subglobose, large, microgranulate and micropilose laterally, with usual long cannulae and a moderately deep gonocoel; each telopodite mostly exposed, tripartite, with the largest, mesal, very delicately micropapillate, sac-shaped part (**a**) bearing a loop-shaped seminal groove (**sg**) terminating through a very short solenomere tooth (**sl**) near top, a rounded, hyaline, lateral, somewhat crumpled and partly unciform lobe (**y**), and a slender, very long, strongly sclerotized, apically subunciform process (**x**) caudolaterally.



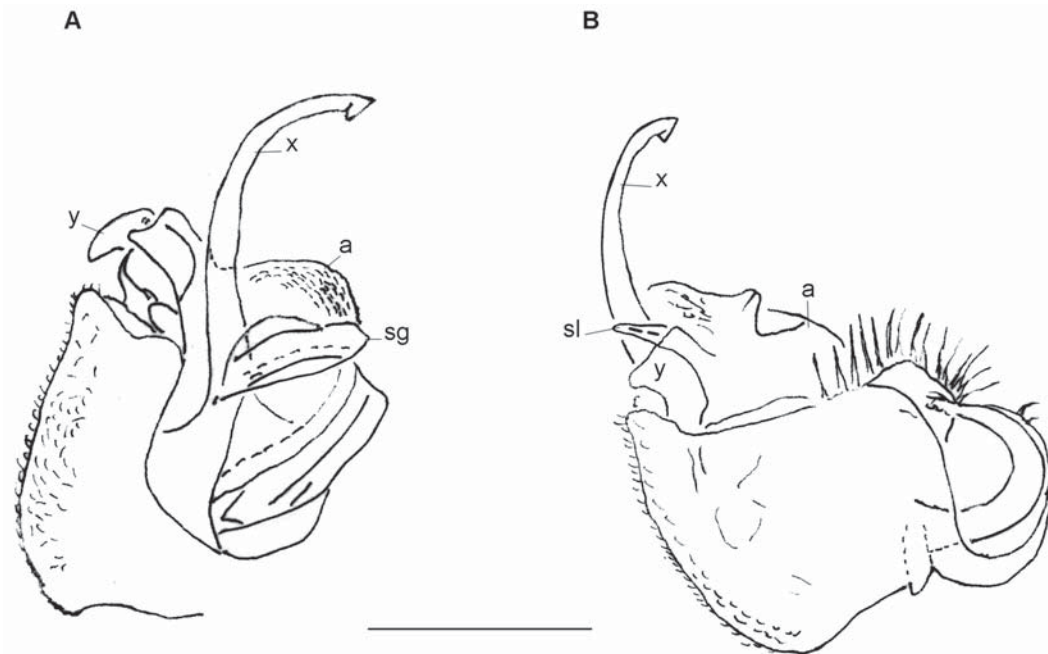


Fig. 9. *Monachodesmus bipindi* sp.n., ♂ paratype. A & B — left gonopod, sublateral and submesal views, respectively. Scale bar: 0.2 mm. Designations explained in text.

Рис. 9. *Monachodesmus bipindi* sp.n., паратип ♂. А и В — левый гонопод, соответственно почти сбоку и почти изнутри. Масштаб: 0,2 мм. Объяснение обозначений дано в тексте.

Monachodesmus awae sp.n.

Figs 10 & 11, Map.

HOLOTYPE ♂ (MRAC 22697), Cameroon, Central Region, Awaë, N 3°06'E 10°29'E, secondary forest near farmland, under dead leaves, 27.III.2017, leg. A.R. Nzoko Fiemapong.

PARATYPES: 2 ♂♂, 1 ♂ fragment, 37 ♀♀, 3 subadult ♀♀ (MRAC 22698), 1 ♂ (SEM, MRAC 22699), same data, together with holotype; 1 ♂, 30 ♀♀, 10 juv. (MRAC 22700), 1 ♂, 1 ♀ (ZMUM), 1 ♂, 1 ♀ (ARNF), same locality, but 30.II.2017, all leg. A.R. Nzoko Fiemapong.

DIAGNOSIS. Within the *longicaudatus* group, this new species shares the following characters with *M. bipindi* sp.n., *M. yabassi* sp.n. and *M. bagam* sp.n.: fore margin of collum non-differentiated, caudal lobes of segment 19 considerably shorter, process x of gonopodal telopodite long and flagelliform, while lateral-most structure y always present, albeit sometimes small. The above four species are best distinguished, based on minor details of gonopodal structure. See also Key below.

NAME. To emphasize the type and sole locality; noun in apposition.

DESCRIPTION. Length of holotype ♂ 7.5 mm, width together with paraterga 1.1 mm, width of prozonae 0.6 mm. Paratypes 7.0–8.0 (♂) or 7.5–9.0 mm (♀), width together with paraterga 1.2 mm (♂) or 1.1–1.3 mm (♀), width of prozonae 0.8 (♂) or 0.7–0.9 mm (♀).

General coloration in alcohol pinkish, rarely light pink, collum and metaterga, sometimes also vertex and partly telson pinkish, clypeolabral region or entire head, venter, legs and prozonae nearly pallid.

All other characters (Figs 10 & 11) as in *M. bipindi* sp.n., except as follows.

Body with 20 segments (♂, ♀) (Fig. 10A). In width, head << collum < segment 2 < 3 < 4 < 5–16; thereafter body gradually tapering towards telson. Lateral margin of paraterga 2 trilobate, all following ones bilobate (regardless of porosteles on poriferous segments). Metatergum 19 special in showing particularly small and vaguely bilobate paraterga, coupled with unusually long, rounded, contiguous, caudal lobes with traces of MD crests (Fig. 10D, G, J).

Gonopods (Figs 10N–P, 11) rather simple; coxae subglobose, large, microgranulate and micropilose lat-

Fig. 8. *Monachodesmus bipindi* sp.n., ♂ paratype. A, D, G — anterior part of body, lateral, ventral and dorsal views, respectively; B, E, H — midbody segments, lateral, ventral and dorsal views, respectively; C, F, I — caudal part of body, lateral, ventral and dorsal views, respectively; J — cross-section of a midbody segment, caudal view; K — poriferous paratergum, dorsal view; L — limbus and adjacent fine structures of tergal tegument, dorsal view; M — both gonopods in situ, ventral view; N & O — right gonopod, subventral and caudomesal views, respectively. Scale bars: 0.2 (B–I), 0.1 (A, J, M), 0.05 (K, N, O) & 0.02 mm (L).

Рис. 8. *Monachodesmus bipindi* sp.n., паратип ♂. А, D, G — передняя часть тела, соответственно сбоку, снизу и сверху; B, E, H — среднетеловишние сегменты, соответственно сбоку, снизу и сверху; C, F, I — задняя часть тела, соответственно сбоку, снизу и сверху; J — поперечный срез через среднетеловишный сегмент, сзади; K — несущий озопору паратергит, сверху; L — лимбус и соседние микроструктуры тергальных покровов, сверху; M — оба гонопода на месте, снизу; N и O — правый гонопод, соответственно почти снизу и одновременно сзади и изнутри. Масштаб: 0,2 (B–I), 0,1 (A, J, M), 0,05 (K, N, O) и 0,02 мм (L).

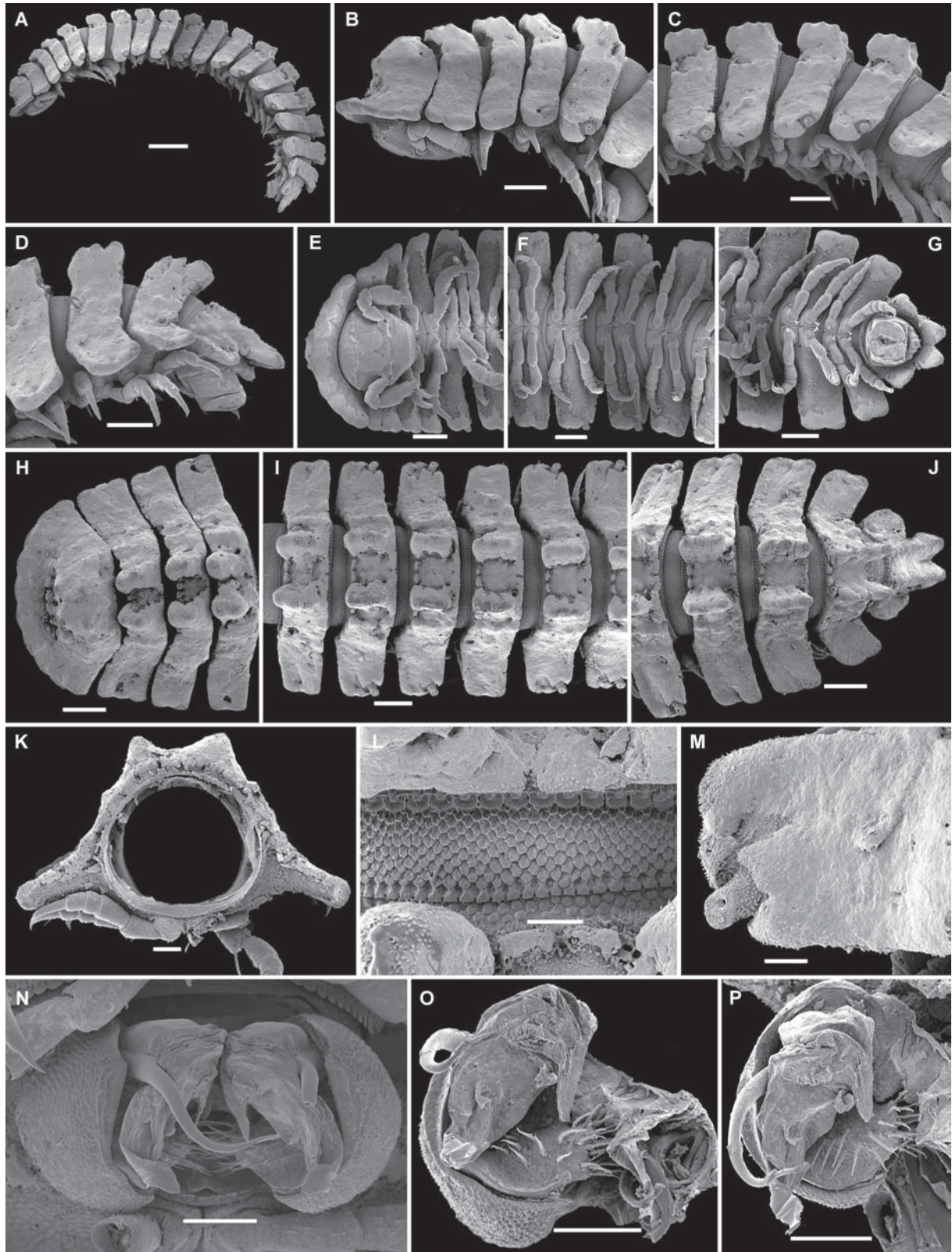


Fig. 10. *Monachodesmus awae* sp.n., ♂ paratype. A — habitus, lateral view; B, E, H — anterior part of body, lateral, ventral and dorsal views, respectively; C, F, I — midbody segments, lateral, ventral and dorsal views, respectively; D, G, J — caudal part of body, lateral, ventral and dorsal views, respectively; K — cross-section of a midbody segment, caudal view; L — limbus and adjacent fine structures of tergal tegument, dorsal view; M — poriferous paratergum, dorsal view; N — both gonopods in situ, ventral view; O & P — right gonopod, ventromesal and subventral views, respectively. Scale bars: 0.2 (B–I), 0.1 (A, J, M), 0.05 (K, N, O) & 0.02 mm (L).

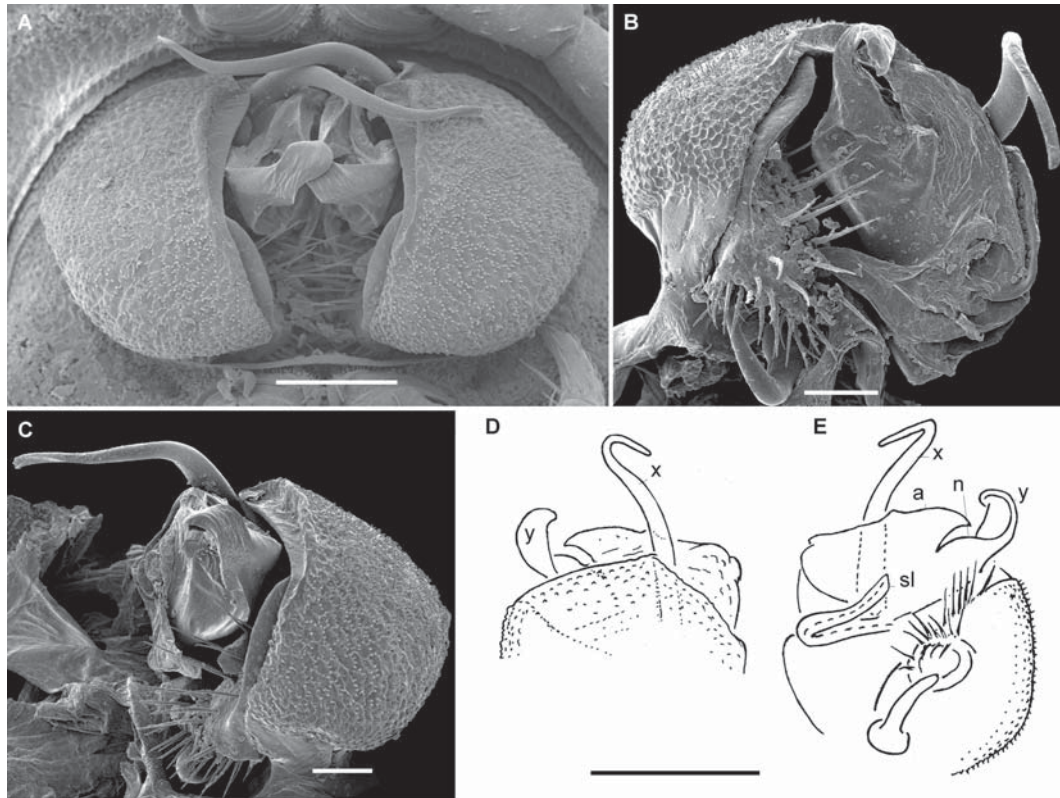


Fig. 11. *Monachodesmus awae* sp.n., ♂ paratype. A — both gonopods in situ, ventral view; B–E — left gonopod, submesal, ventral, lateral and mesal views, respectively. Scale bars: 0.2 (D, E), 0.1 (A) & 0.05 mm (B, C). Designations explained in text.

Рис. 11. *Monachodesmus awae* sp.n., паратип ♂. А — оба гонопода на месте, снизу; В–Е — левый гонопод, соответственно почти изнутри, снизу, сбоку и изнутри. Масштаб: 0,2 (D, E), 0,1 (A) и 0,05 мм (B, C). Объяснение обозначений дано в тексте.

erally, with usual long cannulae and a moderately deep gonocoel; each telopodite mostly exposed, tripartite, with the largest, mesal, sac-shaped part (a) bearing a very short solenomere tooth (sl) at base, a rounded, hyaline, apicolateral lobe (y) separated from a by a notch (n), and a slender, flageliform, very long, strongly sclerotized, simple, apically curved process (x).

Monachodesmus yabassi sp.n.
Figs 12–14, Map.

HOLOTYPE ♂ (MRAC 22701), Cameroon, Littoral Evergreen Forest Region, Yabassi, N 4°95', E 010°24', secondary forest, under dead leaves, 27.I.2017, leg. A.R. Nzoko Fiemapong.

PARATYPES: 1 ♂, 31 ♀♀, 1 subadult ♀ (MRAC 22702), 2 ♂♂ (SEM, MRAC 22703), 1 ♂, 1 ♀ (ZMUM), 1 ♀ (ARFN), same data, together with holotype.

DIAGNOSIS. This new species differs from the next one by process x of the gonopodal telopodite often being more or less ribbon-shaped and bifurcate at the apex, while the lateralmost outgrowth y is especial-

ly well differentiated in carrying two distinct fingers mesally at the base. See also Key below.

NAME. To emphasize the type and sole locality; noun in apposition.

DESCRIPTION. Length of holotype 5.2 mm, width of metazonae together with paraterga 0.9 mm, width of prozonae 0.6 mm. Length of paratypes 5.0–5.2 (♂) or 5.5–7.0 mm (♀), width together with paraterga 0.8–0.9 (♂) or 0.8–1.0 mm (♀), width of prozonae 0.6 (♂) or 0.5–0.7 mm (♀).

General coloration in alcohol rusty brown (more dirty specimens) to light yellowish brown (cleaner samples), but collum, metaterga and telson usually dirty brown to brown. Vertex and ventral sides of paraterga usually light brown, cleaner specimens light yellow-brown; antennae, clypeolabral region, venter and sometimes legs pallid, legs sometimes brown. Head above antennae finely microgranulate, genae roundish, clypeolabral region very finely and densely setose, epicranial suture fine, a little better visible in occipital re-

Рис. 10. *Monachodesmus awae* sp.n., паратип ♂. А — общий вид, сбоку; В, Е, Н — передняя часть тела, соответственно сбоку, снизу и сверху; С, F, I — среднетелуловищные сегменты, соответственно сбоку, снизу и сверху; D, G, J — задняя часть тела, соответственно сбоку, снизу и сверху; К — поперечный срез через среднетелуловищный сегмент, сзади; L — лимбус и соседние микроструктуры тергалных покровов, сверху; М — несущий озопору паратергит, сверху; N — оба гонопода на месте, снизу; O и P — правый гонопод, соответственно одновременно снизу и изнутри и почти снизу. Масштаб: 0,2 (B–I), 0,1 (A, J, M), 0,05 (K, N, O) и 0,02 мм (L).

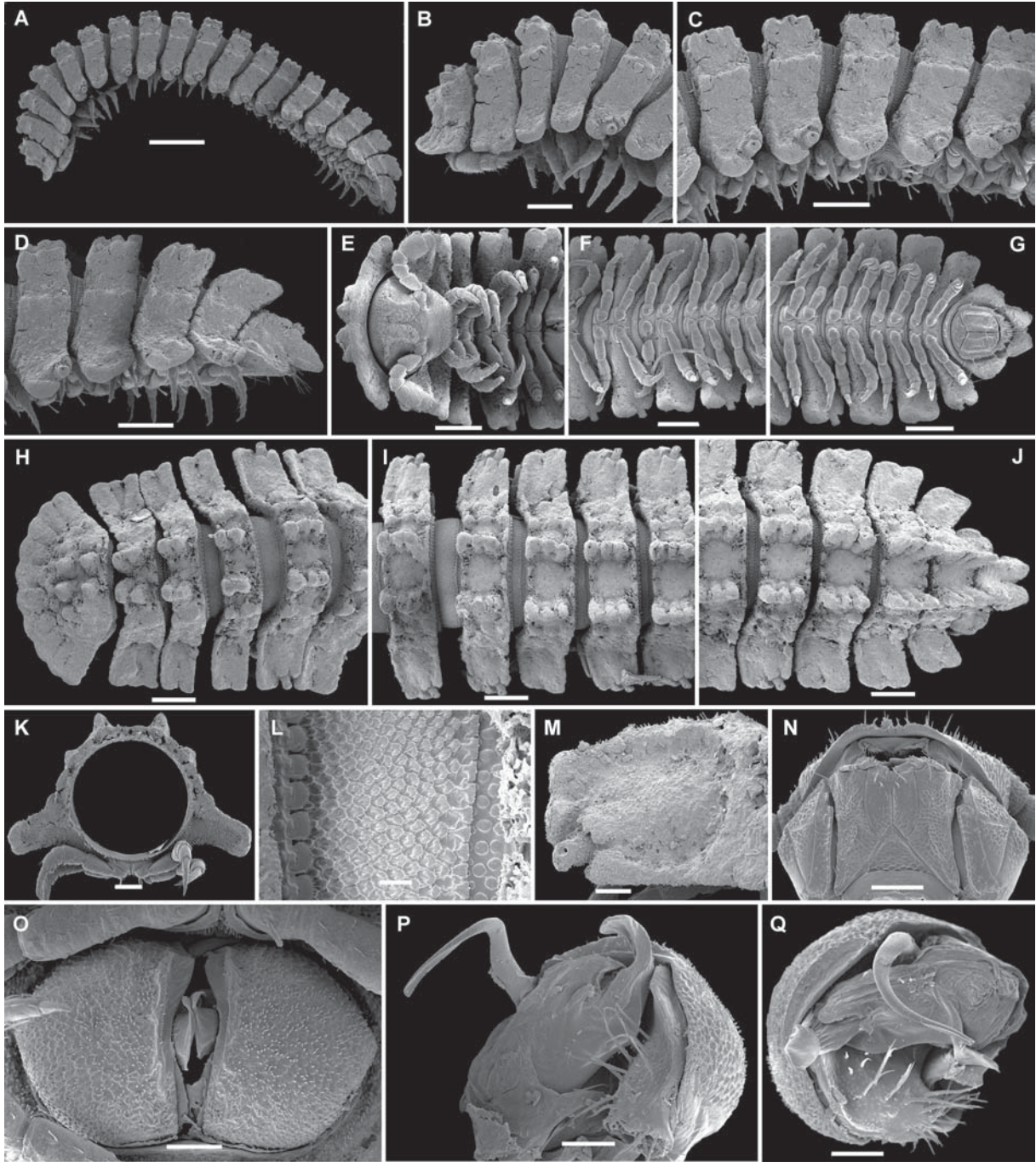


Fig. 12. *Monachodesmus yabassi* sp.n., ♂ paratype. A — habitus, lateral view; B, E, H — anterior part of body, lateral, ventral and dorsal views, respectively; C, F, I — midbody segments, lateral, ventral and dorsal views, respectively; D, G, J — caudal part of body, lateral, ventral and dorsal views, respectively; K — cross-section of a midbody segment, caudal view; L — limbus and adjacent fine structures of tergal tegument, dorsal view; M — poriferous paratergum, dorsal view; N — head, ventral view; O — both gonopods in situ, ventral view; P & Q — left gonopod, caudomesal and subventral views, respectively. Scale bars: 0.5 (A), 0.2 (B–J), 0.1 (K, N), 0.05 (M, O–Q) & 0.02 mm (L).

Рис. 12. *Monachodesmus yabassi* sp.n., паратип ♂. А — общий вид, сбоку; В, Е, Н — передняя часть тела, соответственно сбоку, снизу и сверху; С, F, I — среднетуловищные сегменты, соответственно сбоку, снизу и сверху; D, G, J — задняя часть тела, соответственно сбоку, снизу и сверху; K — поперечный срез через среднетуловищный сегмент, сзади; L — лимбус и соседние микроструктуры тергальных покровов, сверху; M — несущий озопору паратергит, сверху; N — оба гонопода на месте, снизу; O и P — левый гонопод, соответственно одновременно сзади и изнутри и почти снизу. Масштаб: 0,5 (A), 0,2 (B–J), 0,1 (K, N), 0,05 (M, O–Q) и 0,02 мм (L).

Рис. 13. *Monachodesmus yabassi* sp.n., паратип ♂. А — общий вид, сбоку; В, Е, Н — передняя часть тела, соответственно сбоку, снизу и сверху; С, F, I — среднетуловищные сегменты, соответственно сбоку, снизу и сверху; D, G, J — задняя часть тела, соответственно сбоку, снизу и сверху; K — поперечный срез через среднетуловищный сегмент, сзади; L — лимбус и соседние микроструктуры тергальных покровов, сверху; M — несущий озопору паратергит, сверху; N — оба гонопода на месте, снизу; O и P — левый гонопод, соответственно одновременно сзади и изнутри и почти снизу. Масштаб: 0,2 (A–F), 0,1 (G, M), 0,05 (L, N–P) и 0,02 мм (K).

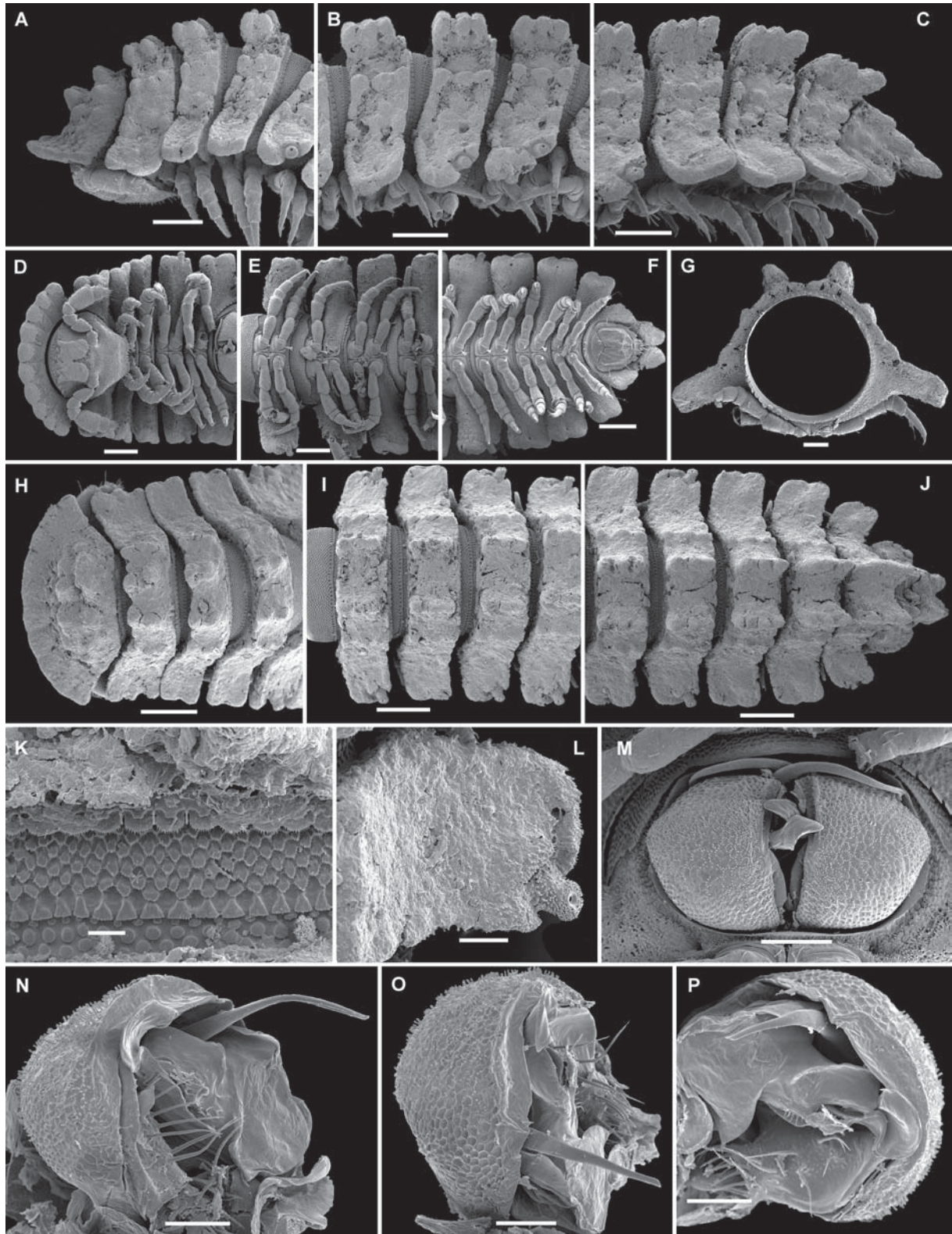


Fig. 13. *Monachodesmus yabassi* sp.n., ♂ paratype. A, D, H — anterior part of body, lateral, ventral and dorsal views, respectively; B, E, I — midbody segments, lateral, ventral and dorsal views, respectively; C, F, J — caudal part of body, lateral, ventral and dorsal views, respectively; G — cross-section of a midbody segment, caudal view; K — limbus and adjacent fine structures of tergal tegument, dorsal view; L — poriferous paratergum, dorsal view; M — both gonopods in situ, ventral view; N–P — left gonopod, ventromesal, subventral and caudomesal views, respectively. Scale bars: 0.2 (A–F, H–J), 0.1 (G, M), 0.05 (L, N–P) & 0.02 mm (K).

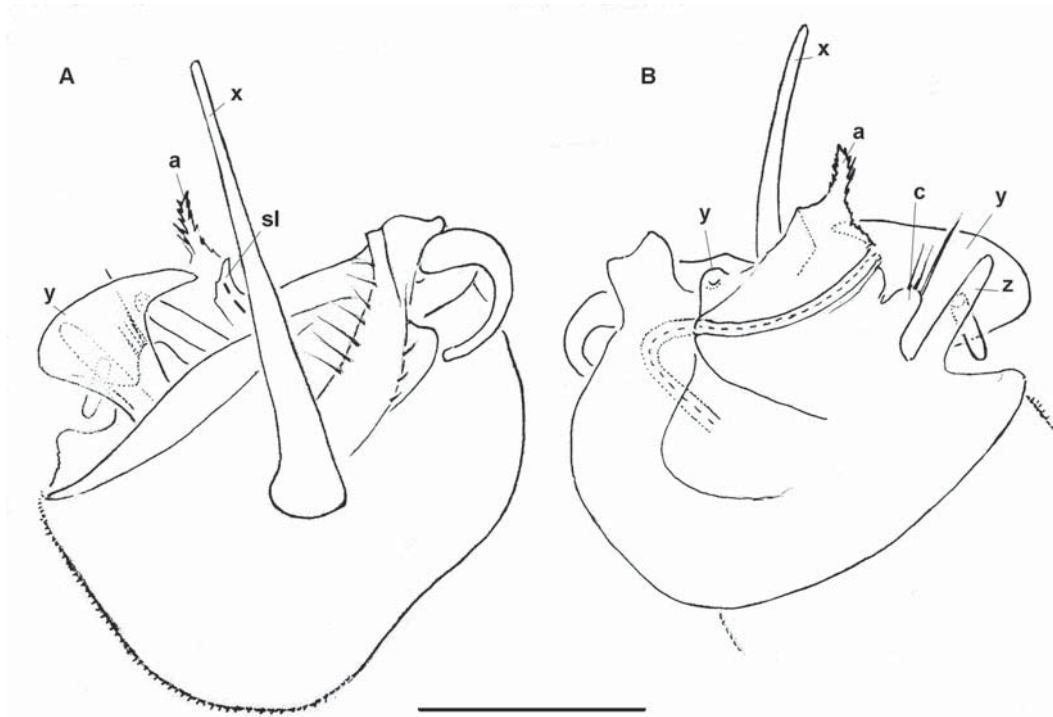


Fig. 14. *Monachodesmus yabassi* sp.n., ♂ paratype. A & B — right gonopod, lateral and mesal views, respectively. Scale bar: 0.1 mm. Designations explained in text.

Рис. 14. *Monachodesmus yabassi* sp.n., ♂ паратипе. А и В — правый гонопод, соответственно сбоку и изнутри. Масштаб: 0,1 мм. Объяснение обозначений дано в тексте.

gion; interantennal isthmus about 1.8 times as large as diameter of antennal socket. Antennae short, poorly C-shaped, two basal antennomeres lying inside a groove. In length, antennomere $7 < 1 = 2 = 4 = 6 < 5$, the latter being largest; antennomeres 5 and 6 each with a small, compact, apicodorsal group of bacilliform sensilla (Fig. 12E, 13D).

Body with 20 segments (♂, ♀) (Fig. 12A). In width, head $\ll 2 = 3 = 4 < \text{collum} < 5-16$; thereafter body gradually tapering towards telson. Body polydesmoid, with broad, moderately declivous, wing-shaped paraterga set very low (nearly level to venter) (Figs 12A–K, 13A–J). Collum flabellate, very wide, fully covering the head from above; anterior margin clearly and regularly convex, with 5+5 equal and distinct lobulations; central region with two evident, transverse rows of high, conical, roundish tubercles, 2+2 and 3+3 in front and caudal rows, respectively (Figs 12B, E, H, 13A, D, H). Lateral margin of paraterga 2 trilobate, following ones until segment 16 bilobate (regardless of porosteles on poriferous segments), again rather indistinctly tri- or more evidently bilobate on segments 17–19. Each postcollum metatergum until 18th with three transverse rows of distinct tubercles and two or more rows of small granulations in-between. MD tubercles increasingly and gradually high towards segment 18, also inclined increasingly caudad on segments 17 and 18. MD mostly higher than dorsolateral crests (DL), the latter increasingly small towards segment 18, replaced

by smaller granulations further caudad much like background ones. Lateral margins of paraterga mostly subrectangular at anterior and posterior corners, but clearly inclined caudad on segments 17–19; neither anterolateral lobulations nor superficially discernible tergal setae, but two caudolaterals usually visible (Figs 12A–D, H–K, 13A–C, H–J). Metatergum 19 very special in showing particularly small and bilobate paraterga, coupled with unusually long, rounded, contiguous, caudal lobes with traces of MD and DL crests (Figs 12A, D, G, J, 13C, F, J). Metaterga strongly convex, but sides declined almost as much as paraterga (Figs 12K, 13G), with a usual ceratogenous layer on top of microvilli (Figs 12L, M, 13K, L). Pore formula nearly normal: 5, 7, 9, 10, 12, 13, 15, 16, clearly traceable due to very evident, coniform, simple porosteles (Figs 12M, 13L). Limbus very finely crenulate (Figs 12L, 13K). Prozona extremely delicately, striate between pro- and metazona more roughly alveolate (Figs 12L, 13K). Telson entirely concealed from above between medially fused ultimate crests (Figs 12A, D, G, J, 13C, F, J). Hypoproct roundly subtriangular, with 1+1 subcaudal setae borne on small knobs (Figs 12G, 13F).

Sterna narrow, deeply impressed along axis, without modifications (Figs 12F, G, 13D–F). Epigynal ridge behind ♀ coxae 2 very low, rounded on sides. Legs relatively short and stout, not extending beyond lateral edges of paraterga, only tarsi particularly slender; larger setae on ♂ coxae modified, ribbed. Gonapophyses

on ♂ coxae 2 vestigial. Gonopod aperture subcordiform, broad, nearly as wide as prozona 7 (Figs 12O, 13D, M).

Gonopods (Figs 12O–Q, 13M–P, 14) rather complex; coxae subglobose, large, microgranulate and micropilose laterally, with usual long cannulae and a moderately deep gonocoel; each telopodite mostly exposed, basically tripartite, with an unusually small, membranous, fringed process (**a**) (which corresponds to **a** in several other congeners) carrying a very short solenomere tooth (**sl**) laterally at base; a very large, axe-shaped, hyaline, lateral blade or lobe (**y**) with two smaller, finger-shaped processes (a deeply bifid and higher **b** and a shorter, more mesal and apically setose **z**) mesally at base; and a slender, very long, strongly sclerotized, spiniform process (**x**) laterally.

Monachodesmus bagam sp.n.

Figs 15 & 16, Map.

HOLOTYPE ♂ (MRAC 22704), Cameroon, West Region, Bamboutos Division, Bagam, N 5°41', E 10°21', secondary sacred forest, under dead leaves, 17.IX.2016, leg. A.R. Nzoko Fiemapong.

PARATYPES: 1 ♂ (SEM, lost), 2 ♀♀, 1 ♀ fragment, 4 fragmented juv. (MRAC 22705), same data, together with holotype.

DIAGNOSIS. This new species seems to be especially similar to *M. yabassi* sp.n., but differs by the much more simple gonopod conformation, in particular, the very large and sac-shaped **a** and a small, subunciform **y**. See also Key below.

NAME. To emphasize the type and sole locality; noun in apposition.

DESCRIPTION. Length of holotype (incomplete, only head and first nine segments retained) unclear, width of metazonae together with paraterga 1.1 mm, width of prozonae 0.8 mm. Length of paratypes 6 mm (♀), width together with paraterga 1.1 mm width of prozonae 0.8 mm (♀).

General coloration in alcohol rusty brown, only juveniles slightly lighter. Vertigial region and ventral sides of paraterga pinkish; antennae, clypeolabral region, prozonae, venter and legs almost pallid. Head above antennae finely microgranulate, genae roundish, clypeolabral region very finely and densely setose, epicranial suture fine, a little better visible in occipital region; interantennal isthmus about 1.2 times as large as diameter of antennal socket. Antennae very short, C-shaped, two basal antennomeres lying inside a groove. In length, antennomere 7 < 1 = 3 = 4 < 2 = 6 < 5; antennomeres 5 and 6 each with a small, compact, apicodorsal group of bacilliform sensilla.

Body with 20 segments (♂, ♀) (Fig. 15A). In width, head << collum = 2 = 3 < 4 < 5–15; thereafter body gradually tapering towards telson. Body polydesmoid, with broad, moderately declivous, wing-shaped paraterga set very low (nearly level to venter), sides very strongly declivous, forming a distinct obtuse angle with paraterga (Fig. 15A–F, H). Collum flabellate, very wide, fully covering the head from above; anterior margin clearly and regularly convex, with 5+5 equal and mod-

est lobulations; central region with two evident, transverse rows of high, conical, roundish tubercles, 2+2 and 3+3 in fore and caudal rows, respectively; a few intercalary granulations visible (Fig. 15A, B, E). Lateral margin of paraterga 2 trilobate, all following ones bilobate (regardless of porosteles on poriferous segments). Each postcollum metatergum until 18th with three transverse rows of distinct tubercles and two or more rows of small granulations in-between. MD tubercles increasingly and gradually high towards segment 18, also inclined increasingly caudad on segments 17 to 18. MD mostly higher than dorsolateral crests (DL), the latter increasingly small towards segment 18, replaced by smaller granulations further caudad much like background ones. Lateral margins of paraterga mostly subrectangular at anterior and posterior corners, but clearly inclined caudad on segments 17 and 18; evident anterolateral and caudolateral lobulations, as well as tergal setae invisible. Metatergum 19 very special in showing particularly small and bilobate paraterga, coupled with unusually long, rounded, contiguous, caudal lobes with traces of MD crests (Fig. 15A, D, H). Metaterga strongly convex, with a usual ceratogenous layer on top of microvilli (Fig. 15G). Pore formula nearly normal: 5, 7, 9, 10, 12, 13, 15, 16, clearly traceable due to very evident, coniform, simple porosteles. Limbus very finely crenulate (Fig. 15G). Prozonae extremely delicately, striate between pro- and metazona more roughly alveolate (Fig. 15G). Telson completely concealed from above between medially fused ultimate crests (Fig. 15A, D, H). Hypoproct roundly subtriangular, with 1+1 subcaudal setae borne on small knobs.

Sterna narrow, deeply impressed along axis, without modifications. Epigynal ridge behind ♀ coxae 2 very low, rounded on sides. Legs relatively short and stout, not extending beyond lateral edges of paraterga, only tarsi particularly slender; larger setae on ♂ coxae modified, ribbed. Gonapophyses on ♂ coxae 2 vestigial. Gonopod aperture subcordiform, broad, nearly as wide as prozona 7 (Fig. 15I, J).

Gonopods (Figs 15I, J, 16) rather simple; coxae subglobose, large, microgranulate and micropilose laterally, with usual long cannulae and a moderately deep gonocoel; each telopodite mostly exposed, basically tripartite, with a typical membranous, micropapillate, mesal sac (**a**), followed by a long, slender, slightly curved, subtruncate, rigid process (**x**), a very short solenomere tooth (**sl**) laterally at base and an unciform, somewhat crumpled, lateralmost outgrowth (**y**).

REMARKS. The following key can be given to the presently known six species (all from Cameroon) of the *longicaudatus* group. It must enter the previous key [Golovatch et al., 2015] inside couplet 21(22).

- 1(2) Caudal lobes of segment 19 particularly long (Figs 4A, B, 5C, F, I). Process **x** of gonopodal telopodite much shorter, non-flagelliform 3
 2(1) Caudal lobes of segment 19 clearly shorter (Figs 8C, F, I, 10A, G, J, 12A, D, J, 13C, G, 15A, D, H). Process **x** of gonopodal telopodite much longer, flagelliform 5

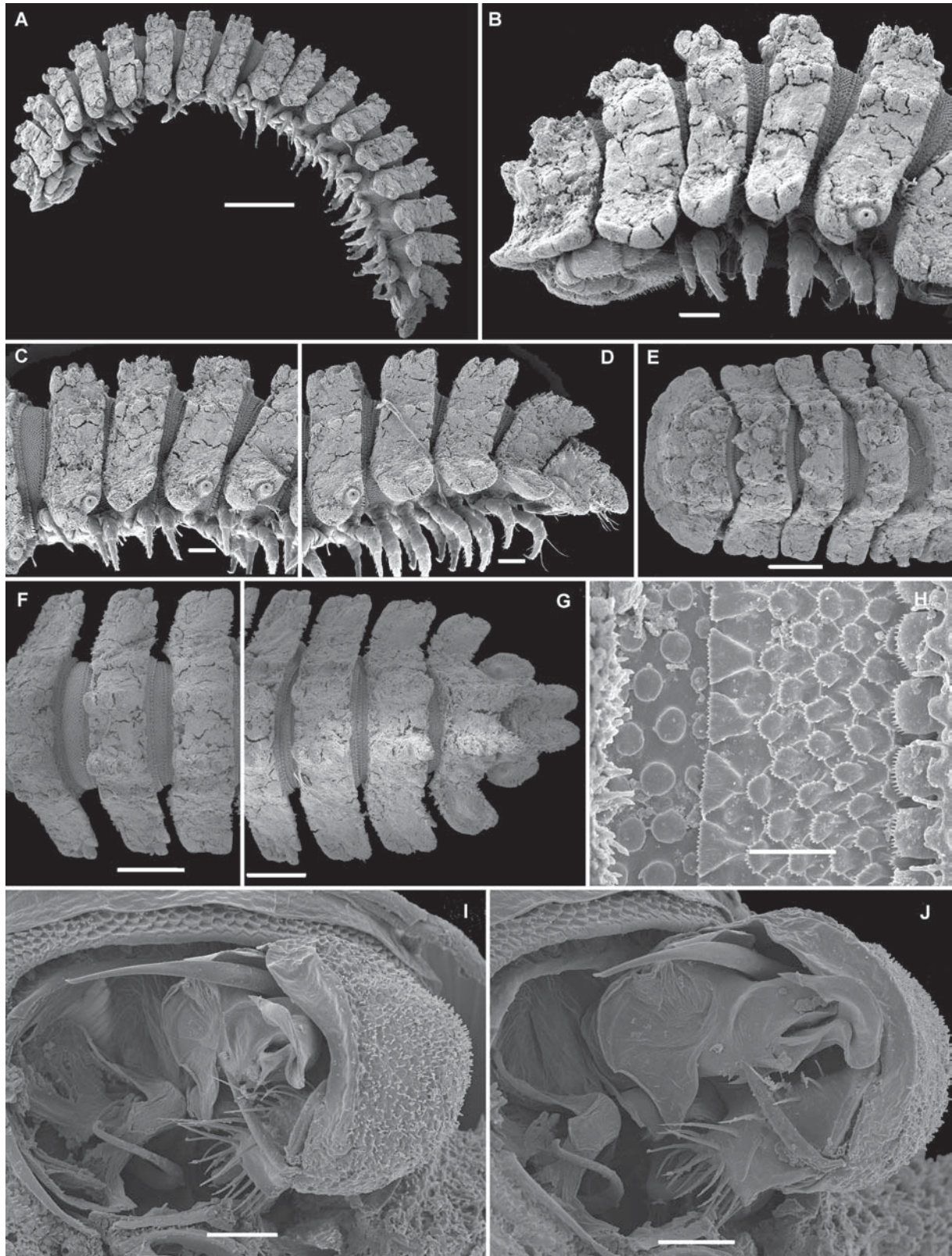


Fig. 15. *Monachodesmus bagam* sp.n., ♂ paratype. A — habitus, lateral view; B & E — anterior part of body, lateral and dorsal views, respectively; C & F — midbody segments, lateral and dorsal views, respectively; D & G — caudal part of body, lateral and dorsal views, respectively; H — limbus and adjacent fine structures of tergal tegument, dorsal view; I & J — left gonopod, subventral and ventromesal views, respectively. Scale bars: 0.5 (A), 0.2 (E, F, H), 0.1 (B–D), 0.05 (I, J) & 0.02 mm (G).

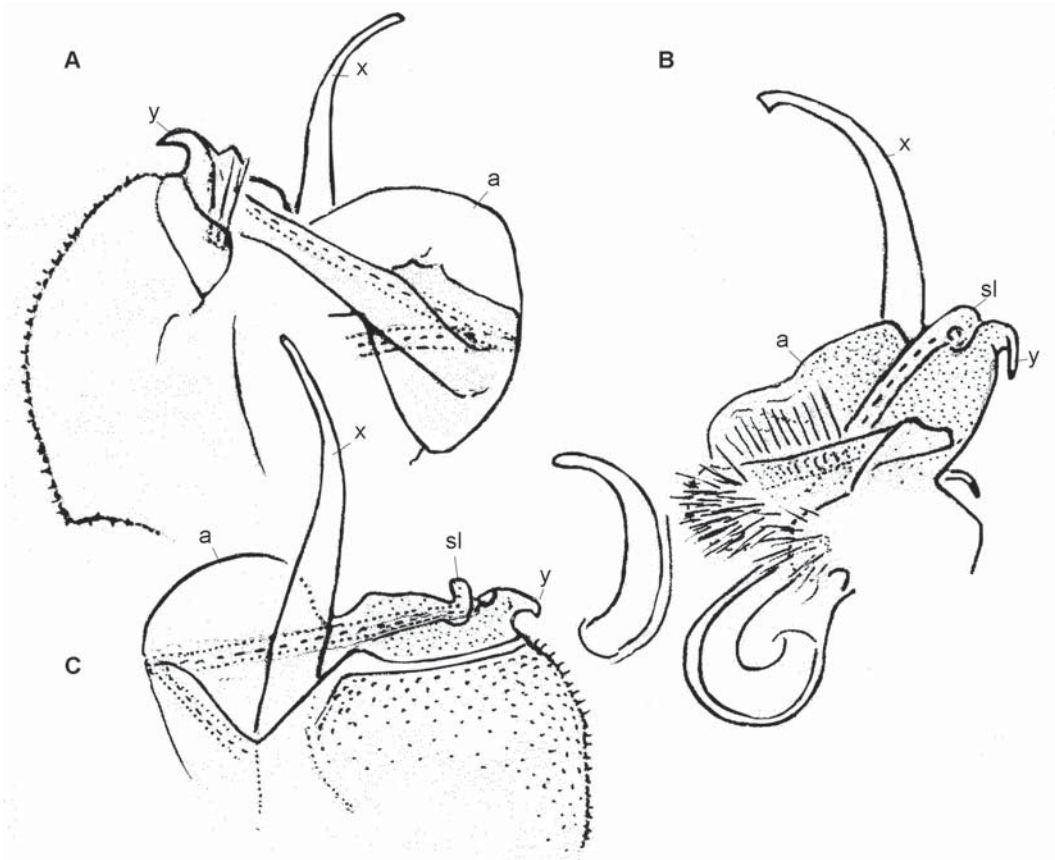


Fig. 16. *Monachodesmus bagam* sp.n., ♂ holotype. Left (A, C) and right (B) gonopod, mesal (A, B) and lateral (C) views. Scale bar: 0.2 mm. Designations explained in text.

Рис. 16. *Monachodesmus bagam* sp.n., голотип ♂. Левый (A, C) и правый (B) гонопод, изнутри (A, B) и сбоку (C). Масштаб: 0,2 мм. Объяснение обозначений дано в тексте.

- 3(4) Fore margin of collum clearly differentiated medially. Process *x* of gonopodal telopodite much stouter and shorter *M. longicaudatus*
- 4(3) Fore margin of collum non-differentiated (Figs 4A, B, 5A, D, G). Process *x* of gonopodal telopodite longer and more slender (Figs 6 & 7) *M. bamboutos* sp.n.
- 5(6) Process *a* (in place of a lobe) on gonopodal telopodite very small and fimbriate, located mesad to a particularly complex structure (*y*) consisting of an anchor-shaped lobe and two fingers mesally at its base (Figs 13M–P, 14) *M. yabassi* sp.n.
- 6(5) Lobe *a* of gonopodal telopodite prominent, sac-shaped, while lateralmost outgrowth *y* less strongly differentiated (Figs 8M–O, 9, 10N–P, 11, 12O–Q, 15I, J, 16) 7
- 7(8) Gonopodal telopodite especially simple (Figs 15I, J, 16) *M. bagam* sp.n.
- 8(7) Gonopodal telopodites more complex and differentiated (Figs 8M–O, 9, 10N–P, 11, 12O–Q) 9
- 9(10) Gonopodal telopodite with a well-developed lateralmost lobe (*y*) divided from a sac-shaped *a* by a distinct notch (*n*) (Figs 10N–P, 11) *M. awae* sp.n.

- 10(9) Gonopodal telopodite with a much smaller and crumpled lateralmost lobe (*y*), devoid of *n* from *a* (Figs 8M–O, 9) *M. bipindi* sp.n.

Monachodesmus djawara sp.n.
Figs 17–20, Map.

HOLOTYPE ♂ (MRAC 22706), Cameroon, Littoral Evergreen Forest Region, Nkam Division, Djawara, N 04°20', E 009°83', little-disturbed natural forest, 23.III.2016, leg. A.R. Nzoko Fiemapong & J.A. Yetchom Fondjo.

PARATYPES: 2 ♂♂, 7 ♀♀, 5 subadult ♀♀, 1 ♀ fragment (MRAC 22707), 2 ♂♂ (SEM, MRAC 22708), same locality and habitat, together with holotype; 1 ♂, 4 ♀♀, 2 subadult ♀♀ (MRAC 22709), 1 ♂, 1 ♀ (ZMUM), 1 ♂, 1 ♀ (ARNF), same place, Winkler extraction, 23.III.2016, 2 ♂♂, 4 ♀♀, 8 subadult ♀♀ (MRAC 22710), same locality but 7.II.2016, all leg. A.R. Nzoko Fiemapong & J.A. Yetchom Fondjo.

DIAGNOSIS. Using the latest key to *Monachodesmus* species [Golovatch et al., 2015], this new species keys out to couplet 3(4), but *M. djawara* sp.n. differs

Рис. 15. *Monachodesmus bagam* sp.n., паратип ♂. А — общий вид, сбоку; В и Е — передняя часть тела, соответственно сбоку и сверху; С и F — среднелувищные сегменты, соответственно сбоку и сверху; D и G — задняя часть тела, соответственно сбоку и сверху; H — лимбус и соседние микроструктуры тергалных покровов, сверху; I и J — левый гонопод, соответственно почти снизу и одновременно снизу и изнутри. Масштаб: 0,5 (A), 0,2 (E, F, H), 0,1 (B–D), 0,05 (I, J) и 0,02 мм (G).

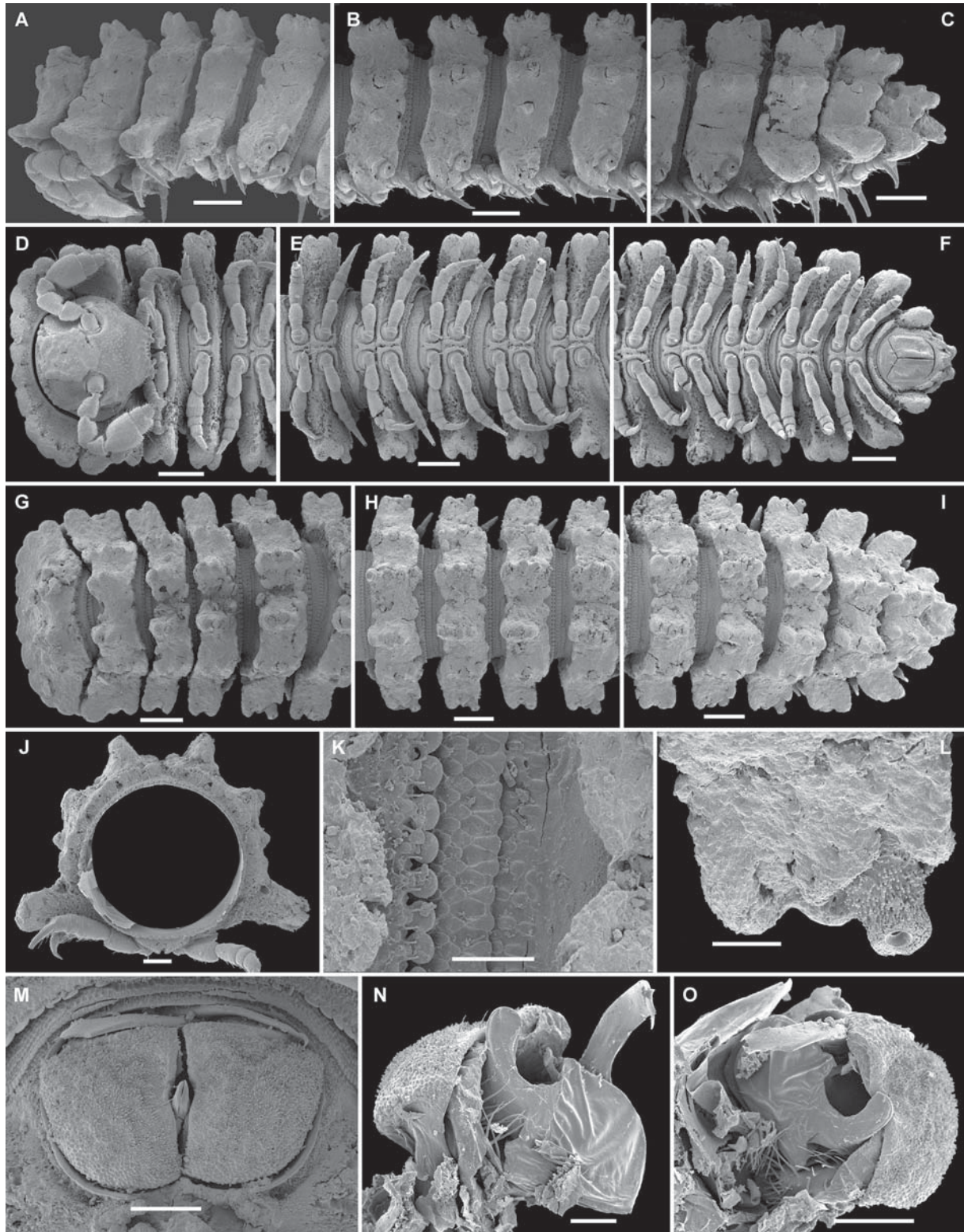


Fig. 17. *Monachodesmus djawara* sp.n., ♂ paratype. A, D, G — anterior part of body, lateral, ventral and dorsal views, respectively; B, E, H — midbody segments, lateral, ventral and dorsal views, respectively; C, F, I — caudal part of body, lateral, ventral and dorsal views, respectively; J — cross-section of a midbody segment, caudal view; K — limbus and adjacent fine structures of tergal tegument, dorsal view; L — poriferous paratergum, dorsal view; M — both gonopods in situ, ventral view; N — left gonopod, mesal view; O — right gonopod, ventromesal view. Scale bars: 0.2 (A–I), 0.1 (J, M, O) & 0.05 mm (K, L, N).

from *M. armorum* Golovatch, Nzoko Fiemapong et VandenSpiegel, 2015, also from Cameroon, in the much smaller size, the much shorter tuberculations on the collum and, above all, the gonopodal structure. It is likewise clearly distinguished from similarly small-bodied congeners following couplet 5(6) by its telson being well-exposed in dorsal view.

NAME. To emphasize the type and sole locality; noun in apposition.

DESCRIPTION. Length of holotype ca 6.0 mm, width of metazonae together with paraterga 1.0 mm, width of prozonae 0.6 mm. Length of paratypes 5.5–6.3 (♂) or 6.2–7.0 mm (♀), width together with paraterga 0.9–1.0 mm (♂, ♀), width of prozonae 0.6–0.7 mm (♂, ♀).

General coloration in alcohol light brown (cleaner specimens) to dirty brown (some paraterga with a dirty crust), vertex, ventral sides of paraterga and epiproct light brown; clypeolabral region, antennae, prozonae, venter and legs very light grey-brown to nearly pallid.

Head above antennae very finely microgranulate, genae roundish, clypeolabral region very finely and densely setose, epicranial suture fine, a little better visible in occipital region; interantennal isthmus about 1.8 times as large as diameter of antennal socket. Antennae short, C-shaped, two basal antennomeres lying inside a groove. Antennae clavate, antennomere 7 shortest, antennomeres 1–4 and 6 subequal in length, 5th being largest; antennomeres 5 and 6 each with a compact apicodorsal group of bacilliform sensilla (Figs 17D, 18G).

Body with 20 segments (♂, ♀). In width, head << collum = segment 2 < 3 = 4 < 5–16; thereafter body gradually tapering towards telson. Body polydesmoid, with broad, moderately declivous, relatively small, wing-shaped paraterga set very low (nearly level with venter) (Figs 17A–J, 18A–F, J). Collum flabellate, very wide, fully covering the head from above, with 5+5 equal and distinct lobulations at anterior margin; the latter clearly and almost regularly convex, only 2+2 paramedian lobulations faintly flattened at fore margin; central region with two evident, transverse rows of high, conical, roundish tubercles, 2+2 and 3+3 in front and caudal rows, respectively; isthmus between paramedian tubercles in each row about as large as diameter of a tubercle; surface in front of fore row granulate (Figs 17A, D, G, 18A, D, G). Lateral margin of paraterga 2 trilobate, following ones until segment 16 bilobate (regardless of porosteles on poriferous segments), again rather indistinctly trilobate on segments 17–19. Each postcollum metatergum until 19th with three transverse rows of distinct tubercles and two or more rows of small granulations in-between. MD tubercles increasingly and gradually high towards segment 18, also

inclined increasingly caudad on segments 17–19. MD mostly higher than dorsolateral crests (DL), the latter increasingly small towards segment 17, replaced by smaller granulations further caudad much like background ones. Lateral margins of paraterga mostly subrectangular at anterior and posterior corners, but clearly inclined caudad on segments 17–19; neither evident anterolateral lobulations nor superficially discernible tergal setae, the latter only occasionally traceable on top of some tubercles using SEM (Figs 17A–C, G–I, 18A–F, J). Intercalary granulations and two caudolateral lobulations small, but evident. Metatergum 19 not too special, only considerably smaller than previous ones, leaving most of telson clearly exposed in dorsal view (Figs 17C, F, I, 18C, F, I). Metaterga very strongly convex, sides subvertical, but paraterga nearly horizontal (Figs 17J, 18J), with a usual ceratageum layer on top of microvilli (Figs 17K, L, 18K, L). Pore formula nearly normal: 5, 7, 9, 10, 12, 13, 15, 16, clearly traceable due to very evident, coniform, simple porosteles (Figs 17L, 18K). Limbus very finely crenulate (Figs 17K, 18L). Prozonae extremely delicately, stricture between pro- and metazona more roughly alveolate (Figs 17K, 18L). Hypoproct roundly subtriangular, with 1+1 subcaudal setae borne on small knobs (Figs 17F, 18I).

Sterna narrow, deeply impressed along axis, without modifications (Figs 17D–F, 18G–I). Epigynal ridge behind ♀ coxae 2 very low, rounded on sides. Legs relatively short and stout, not extending beyond lateral edges of paraterga, only tarsi particularly slender; larger setae on ♂ coxae modified, ribbed. Gonapophyses on ♂ coxae 2 vestigial (Fig. 17D). Gonopod aperture subcordiform, broad, nearly as wide as prozona 7 (Fig. 17M).

Gonopods (Figs 17M–O, 18M–O, 19, 20) rather simple; coxae subglobose, large, microgranulate and micropilose laterally, with usual long cannulae and a moderately deep gonocoel; each telopodite mostly exposed, tripartite, with the largest, mesal, sac-shaped part (a) bearing a very short solenomere tooth (sl) near top, a curved, sclerotized, subquadrate, lateral lobe or tooth (y) and a more or less slender, sometimes ribbon-shaped, very long, strongly sclerotized, apically large-bifurcate process (x) laterally.

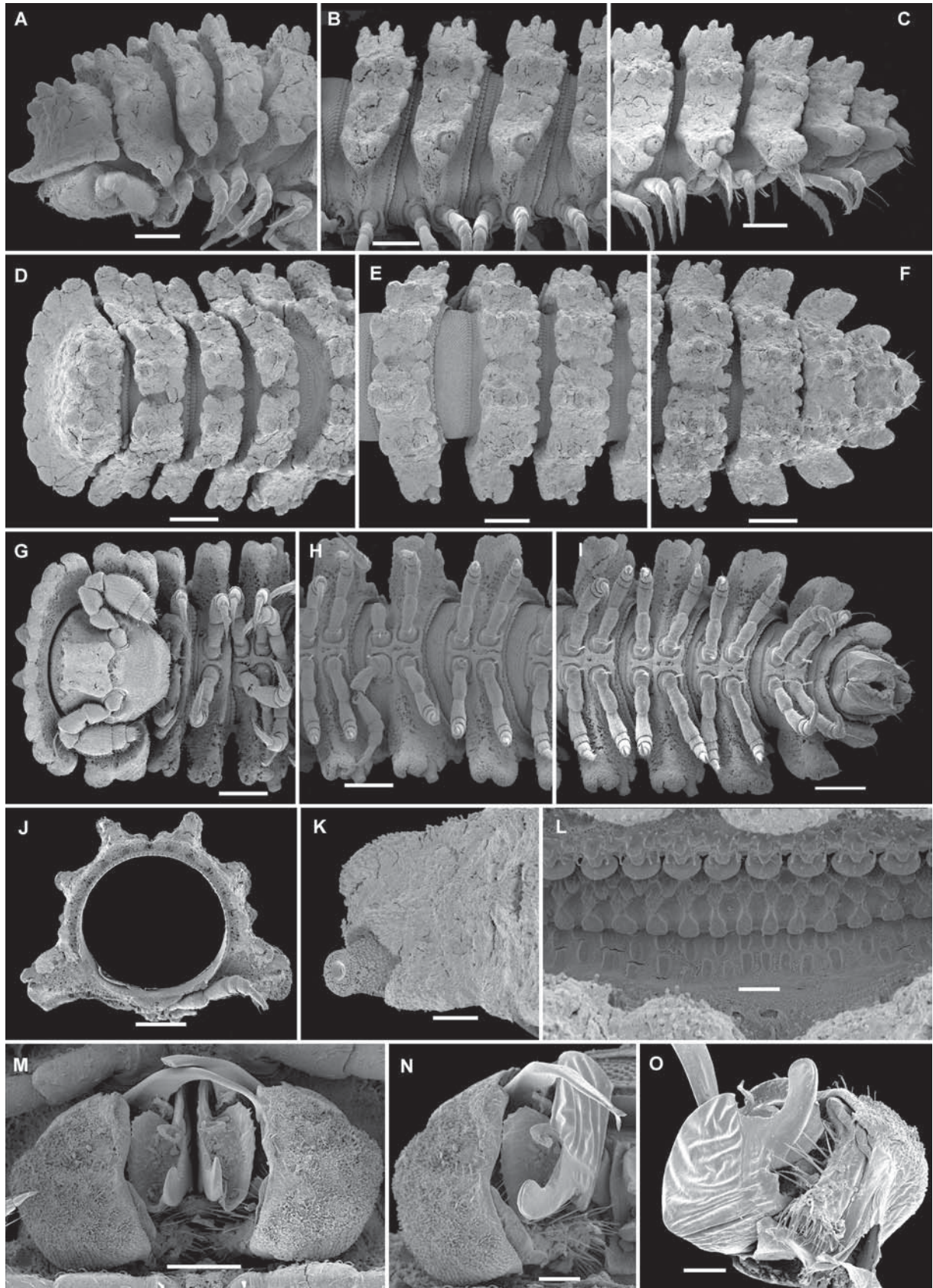
REMARKS. This species is slightly variable as regards the shapes of gonopodal outgrowths x, a and y. These variations, however, seem to be purely random and individual.

Monachodesmus minutus sp.n.

Figs 21–23, Map.

HOLOTYPE ♂ (MRAC 22711), Cameroon, Littoral Evergreen Forest Region, Nkam Division, Djawara, N 04°20', E 009°83',

Рис. 17. *Monachodesmus djawara* sp.n., паратип ♂. А, D, G — передняя часть тела, соответственно сбоку, снизу и сверху; В, Е, Н — среднетеловищные сегменты, соответственно сбоку, снизу и сверху; С, F, I — задняя часть тела, соответственно сбоку, снизу и сверху; J — поперечный срез через среднетеловищный сегмент, сзади; К — лимбус и соседние микроструктуры тергальных покровов, сверху; L — несущий озопору паратергит, сверху; М — оба гонопода на месте, снизу; N — левый гонопод, изнутри; O — правый гонопод, одновременно снизу и изнутри. Масштаб: 0,2 (А–I), 0,1 (J, М, O) и 0,05 мм (K, L, N).



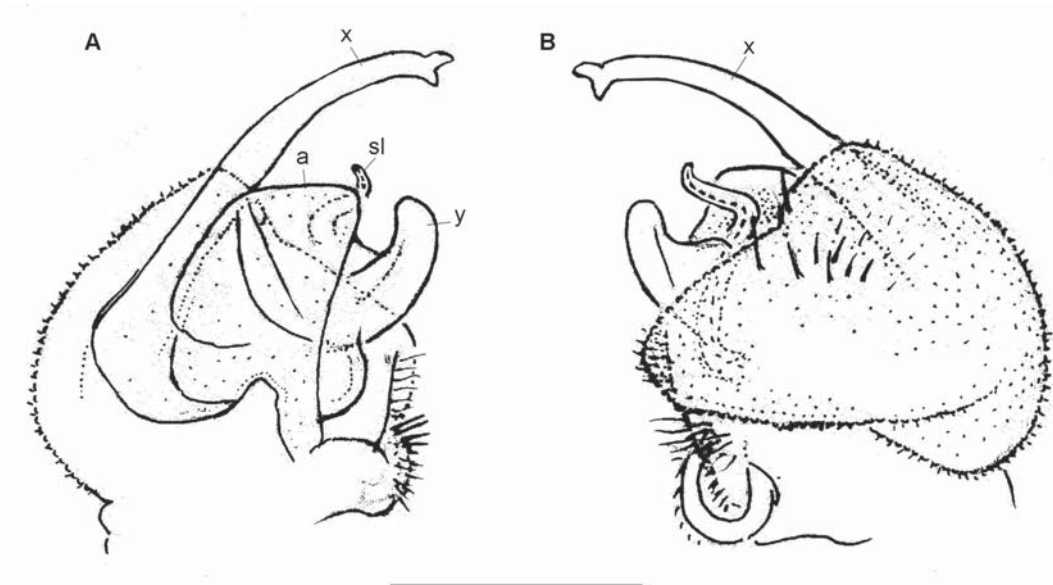


Fig. 19. *Monachodesmus djawara* sp.n., ♂ paratype. A & B — right gonopod, lateral and mesal views, respectively. Scale bar: 0.2 mm. Designations explained in text.

Рис. 19. *Monachodesmus djawara* sp.n., паратип ♂. А и В — правый гонопод, соответственно сбоку и изнутри. Масштаб: 0,2 мм. Объяснение обозначений дано в тексте.

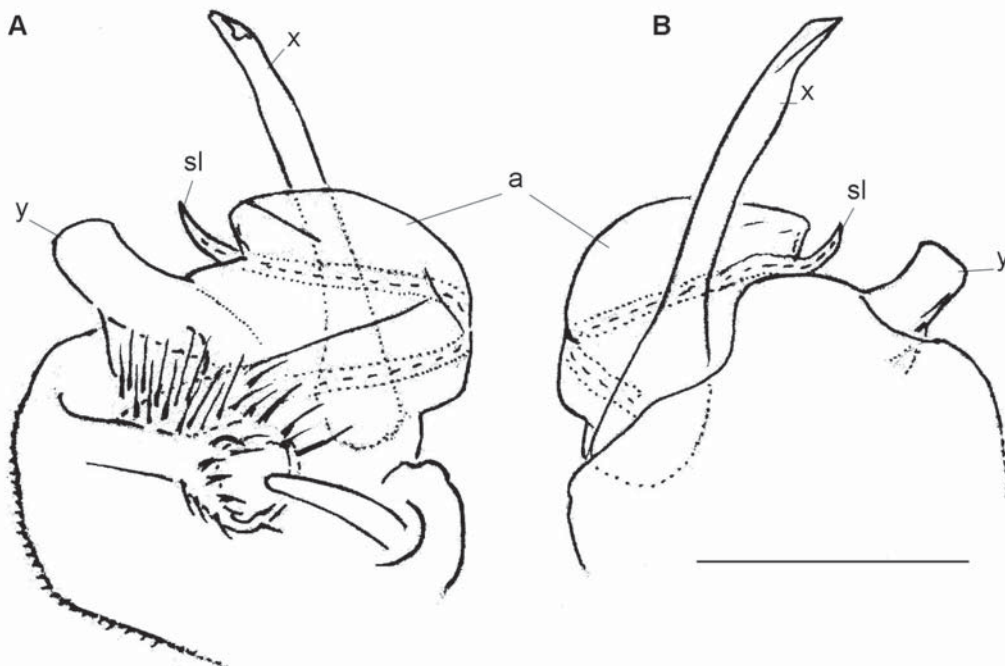


Fig. 20. *Monachodesmus djawara* sp.n., ♂ paratype. A & B — right gonopod, mesal and lateral views, respectively. Scale bar: 0.2 mm. Designations explained in text.

Рис. 20. *Monachodesmus djawara* sp.n., паратип ♂. А и В — правый гонопод, соответственно изнутри и сбоку. Масштаб: 0,2 мм. Объяснение обозначений дано в тексте.

Fig. 18. *Monachodesmus djawara* sp.n., ♂ paratype. A, D, G — anterior part of body, lateral, dorsal and ventral views, respectively; B, E, H — midbody segments, lateral, dorsal and ventral views, respectively; C, F, I — caudal part of body, lateral, dorsal and ventral views, respectively; J — cross-section of a midbody segment, caudal view; K — poriferous paratergum, dorsal view; L — limbus and adjacent fine structures of tergal tegument, dorsal view; M — both gonopods in situ, ventral view; N — right gonopod, ventral view; O — left gonopod, mesal view. Scale bars: 0.2 (A–J), 0.1 (M), 0.05 (K, N, O) & 0.02 mm (L).

Рис. 18. *Monachodesmus djawara* sp.n., паратип ♂. А, D, G — передняя часть тела, соответственно сбоку, сверху и снизу; В, E, H — среднетелувищные сегменты, соответственно сбоку, сверху и снизу; С, F, I — задняя часть тела, соответственно сбоку, сверху и снизу; J — поперечный срез через среднетелувищный сегмент, сзади; K — несущий озопору паратергит, сверху; L — лимбус и соседние микроструктуры тергальных покровов, сверху; M — оба гонопода на месте, снизу; N — правый гонопод, снизу; O — левый гонопод, изнутри. Масштаб: 0,2 (А–J), 0,1 (M), 0,05 (K, N, O) и 0,02 мм (L).

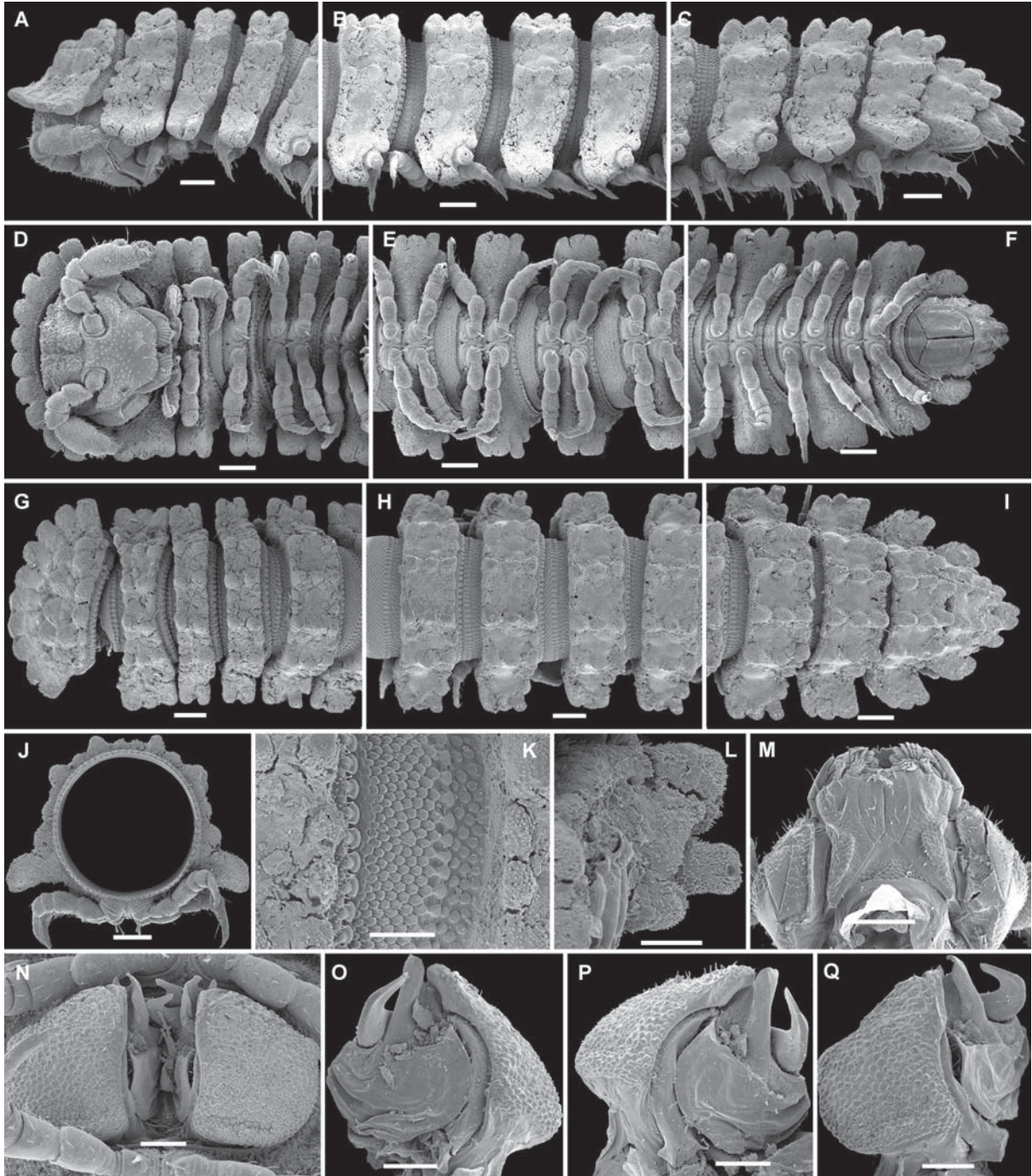


Fig. 21. *Monachodesmus minutus* sp.n., ♂ paratype. A, D, G — anterior part of body, lateral, dorsal and ventral views, respectively; B, E, H — midbody segments, lateral, dorsal and ventral views, respectively; C, F, I — caudal part of body, lateral, dorsal and ventral views, respectively; J — cross-section of a midbody segment, caudal view; K — limbus and adjacent fine structures of tergal tegument, dorsal view; L — poriferous paratergum, dorsal view; M — head, ventral view; N — both gonopods in situ, ventral view; O — right gonopod, mesal view; P & Q — right gonopod, frontomesal and ventral views, respectively. Scale bars: 0.1 (A–J, M) & 0.05 mm (K, L, N–Q).

Рис. 21. *Monachodesmus minutus* sp.n., паратип ♂. A, D, G — передняя часть тела, соответственно сбоку, сверху и снизу; B, E, H — среднетуловищные сегменты, соответственно сбоку, сверху и снизу; C, F, I — задняя часть тела, соответственно сбоку, сверху и снизу; J — поперечный срез через среднетуловищный сегмент, сзади; K — лимбус и соседние микроstructures тергалных покровов, сверху; L — несущий озопору паратергит, сверху; M — голова, снизу; N — оба гонопода на месте, снизу; O — правый гонопод, снизу; P и Q — правый гонопод, соответственно одновременно спереди и изнутри и снизу. Масштаб: 0,1 (A–J, M) и 0,05 мм (K, L, N–Q).

соответственно сбоку и снизу; E — поперечный срез через среднетуловищный сегмент, сзади; K — лимбус и соседние микроstructures тергалных покровов, сверху; L — оба гонопода на месте, снизу; M и N — правый гонопод, соответственно почти снизу и изнутри. Масштаб: 0,2 (A), 0,1 (B–J) & 0,05 мм (K–N).

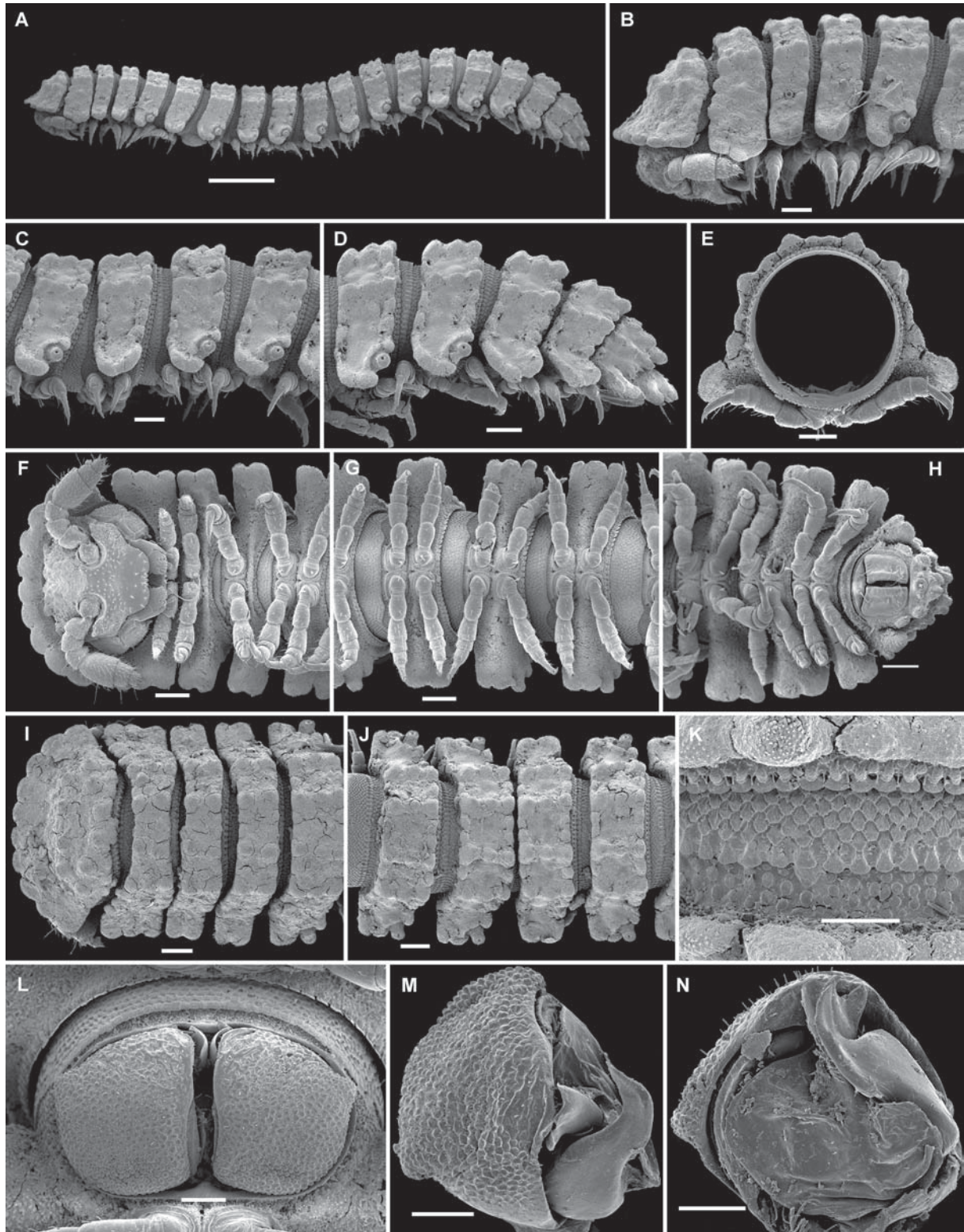


Fig. 22. *Monachodesmus minutus* sp.n., ♂ paratype. A — habitus, lateral view; B, F, I — anterior part of body, lateral, ventral and dorsal views, respectively; C, G, J — midbody segments, lateral, ventral and dorsal views, respectively; D & H — caudal part of body, lateral and ventral views, respectively; E — cross-section of a midbody segment, caudal view; K — limbus and adjacent fine structures of tergal tegument, dorsal view; L — both gonopods in situ, ventral view; M & N — right gonopod, subventral and mesal views, respectively. Scale bars: 0.2 (A), 0.1 (B–J) & 0.05 mm (K–N).

Рис. 22. *Monachodesmus minutus* sp.n., паратип ♂. А — общий вид, сбоку; В, F, I — передняя часть тела, соответственно сбоку, снизу и сверху; С, G, J — среднетелувищные сегменты, соответственно сбоку, снизу и сверху; D и H — задняя часть тела,

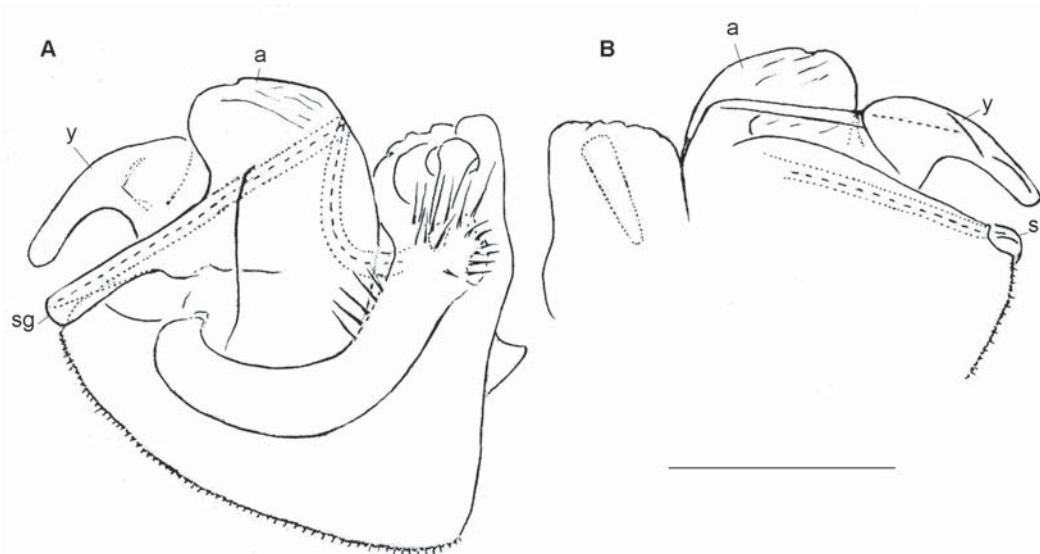


Fig. 23. *Monachodesmus minutus* sp.n., ♂ paratype. A & B — right gonopod, mesal and lateral views, respectively. Scale bar: 0.1 mm. Designations explained in text.

Рис. 23. *Monachodesmus minutus* sp.n., паратип ♂. А и В — правый гонопод, соответственно изнутри и сбоку. Масштаб: 0,1 мм. Объяснение обозначений дано в тексте.

little-disturbed natural forest, Winkler extraction, 23.III.2016, leg. A.R. Nzoko Fiemapong & J.A. Yetchom Fondjo.

PARATYPES: 19 ♂♂, 39 ♀♀, 3 juv. (MRAC 22712), 2 ♂♂ (SEM, MRAC 22713), same locality and habitat, together with holotype; 1 ♂, 2 ♀♀ (ZMUM), 1 ♂, 1 ♀ (ARNF), same place, Winkler extraction, 23.III.2016, all leg. A.R. Nzoko Fiemapong & J.A. Yetchom Fondjo.

DIAGNOSIS Using the latest key to *Monachodesmus* species [Golovatch *et al.*, 2015], this new species, just like *M. djawara* sp.n., keys out to couplet 3(4), but both differ from *M. armorum* Golovatch, Nzoko Fiemapong *et* VandenSpiegel, 2015, also from Cameroon, in the much smaller size, the well shorter tuberculations on the collum and, above all, the gonopodal structure. It is likewise clearly distinguished from similarly small-bodied congeners following couplet 5(6) by its telson being well-exposed in dorsal view. Both *M. minutus* sp.n. and *M. djawara* sp.n. are quite different in the central tuberculations on the collum and the DM on postcollum metaterga being much higher, the paraterga considerably larger, and the gonopodal telopodites more strongly differentiated, in particular, showing a very long lateral branch *x* in the former species.

NAME. To emphasize the very small size and paraterga; adjective.

DESCRIPTION. Length of holotype 5.0 mm, width of metazonae together with paraterga 0.8 mm, width of prozonae 0.6 mm. Length of paratypes 4.5–5.5 (♂) or 5–5.5 mm (♀), width together with paraterga 0.7–0.8 (♂) or 0.8–0.9 mm (♀), width of prozonae 0.5–0.6 (♂) or 0.6–0.7 mm (♀).

General coloration in alcohol rusty brown (dirty specimens) to light brown (cleaner samples); vertex, ventral sides of paraterga and telson light brown; clypeolabral region, antennae, prozonae, venter and legs pallid to light brown.

Head above antennae finely microgranulate, genae roundish, clypeolabrum densely and finely setose, epicranial suture fine, a little better visible in occipital region; interantennal isthmus about as large as diameter of antennal socket. Antennae short, C-shaped, two basal antennomeres lying inside a groove. Antennae clavate, antennomere 7 shortest, antennomeres 1–4 and 6 subequal in length, 5th being largest; antennomeres 5 and 6 each with a compact apicodorsal group of bacilliform sensilla (Figs 21D, 22F).

Body with 20 segments (♂, ♀) (Fig. 22A). In width, head \ll collum = segment 2 = 3 < 4 < 5–16; thereafter body gradually tapering towards telson. Body polydesmoid, with moderately declivous, relatively small, wing-shaped paraterga set very low (nearly level to venter) (Figs 21A–C, G–J, 22A–E, I, J). Collum flabellate, very wide, fully covering the head from above, with 5+5 equal and distinct lobulations at anterior margin; the latter clearly and regularly convex; central region with two evident, transverse rows of high, conical, roundish tubercles, 2+2 and 3+3 in front and caudal rows, respectively; paramedian tubercles in each row almost contiguous; surface in front of fore row granulate (Figs 21A, D, G, 22A, B, F, I). Lateral margin of paraterga 2 trilobate, following ones until segment 16 bilobate (regardless of porosteles on poriferous segments), again rather indistinctly trilobate on segments 17 and 19. Each postcollum metatergum until 19th with three transverse rows of distinct tubercles and two or more rows of small granulations in-between. MD tubercles increasingly and gradually high towards segment 18, also inclined increasingly caudad on segments 18 and 19. MD mostly higher than dorsolateral crests (DL), the latter increasingly small towards segment 18, replaced by smaller granulations further caudad

much like background ones. Lateral margins of paraterga mostly subrectangular at anterior and posterior corners, but clearly inclined caudad on segments 17–19; neither evident anterolateral nor caudolateral lobulations, nor superficially discernible tergal setae (Figs 21A–C, G–I, 22A–D, I, J). Intercalary granulations small, but often evident. Metatergum 19 not too special, only considerably smaller than previous ones, leaving most of telson clearly exposed in dorsal view (Figs 21C, F, I, 22A, D, H). Metaterga very strongly convex, sides subvertical, but paraterga close to horizontal (Figs 21J, 22E), with a usual cerategument layer on top of microvilli (Figs 21K, 22K). Pore formula nearly normal: 5, 7, 9, 10, 12, 13, 15, 16, clearly traceable due to very evident, coniform, simple porostyles. Limbus very finely crenulate (Figs 21K, 22K). Prozonae extremely delicately, stricture between pro- and metazona more roughly alveolate (Figs 21K, 22K). Hypoproct roundly subtriangular, with 1+1 subcaudal setae borne on small knobs (Figs 21F, 22H).

Sterna narrow, deeply impressed along axis, without modifications (Figs 21D–F, 22F–H). Epigynal ridge behind ♀ coxae 2 very low, rounded on sides. Legs relatively short and stout, not extending beyond lateral edges of paraterga, only tarsi particularly slender; larger setae on ♂ coxae modified, ribbed. Gonapophyses on ♂ coxae 2 vestigial (Figs 21D, 22F). Gonopod aperture subcordiform, broad, nearly as wide as prozona 7 (Figs 21N, 22L).

Gonopods (Figs 21N–Q, 22L–N, 23) simple; coxae subglobose, large, microgranulate and micropilose laterally, with usual long cannulae and a moderately deep gonocoel; each telopodite mostly exposed, tripartite, with only a large, mesal, sac-shaped part (**a**), a very short solenomere tooth (**sl**) terminating a mostly mesal seminal groove (**sg**), and a curved, unciform, hyaline, lateral lobe (**y**) about as high as **a**.

REMARKS. This species is slightly variable as regards the shapes of gonopodal outgrowths **x**, **a** and **y**. These variations, however, seem to be purely random and individual.

Cryptocorypha dimorpha sp.n.

Figs 24 & 25, Map.

HOLOTYPE ♂ (MRAC 22714), Congo D. R., Kivu, Maniema Prov., Mwenga, S 03°03', E 028°26', woody swamp with numerous *Pandanus* trees, 24.IV.1958, leg. N. Leleup.

PARATYPES: 10 ♂♂, 1 ♀, 2 juv. (MRAC 11.181), 1 ♂ (SEM, MRAC 22715), 1 ♂ (ZMUM), same data, together with holotype.

DIAGNOSIS. Differs from all sufficiently well documented congeners except *C. monomorpha* sp.n. by the presence of 19 body segments in both sexes, coupled with the conformation of the gonopodal telopodite, in particular, a conspicuously prominent and apically beak-shaped exomere (**ex**) which is about as high as a slender solenomere (**sl**), as well as the low, sac-shaped, lateralmost part (**o**) of the endomere (**en**). Differs from *C. monomorpha* sp.n., which seems to be especially

similar to *C. dimorpha* sp.n. because of the presence of two conspicuous protuberances on the ♂ vertex, by the lack of such protuberances on ♀ vertex, by the much longer solenomere (**sl**) and the far more prominent exomere (**ex**). See also Key below.

NAME. To emphasize the remarkable sexual dimorphism expressed through the presence of conspicuous protuberances on the vertex only in the ♂, but not in the ♀.

DESCRIPTION. Length ca 5 (♂) or 6.5 mm (♀), width of midbody segments together with paraterga 1.1 (♂) or 1.3 mm (♀), width of prozonae 0.5 (♂) or 0.8 mm (♀). Coloration in alcohol from very light yellow-brown to nearly pallid.

Body with 19 segments (♂, ♀), paraterga very broad (Fig. 24A–J). In width, head << collum < segment 2 = 3 = 4 < 5–14, thereafter body very gradually tapering towards telson (Fig. 24G–J). Head nearly round, densely setose in clypeolabral region, with a paramedian pair of conspicuous, round, large protuberances on vertex (♂). Antennae strongly clavate, short, but nearly fully exposed (Fig. 24A, D). Interantennal isthmus nearly twice as large as diameter of antennal socket. In length, antennomere 1 = 2 = 4 = 7 < 3 = 5 < 6; antennomere 6 the largest, 5th and 6th each with a group of apicodorsal sensilla (Fig. 24A, D). Collum flabellate (Fig. 24A, D, G), completely covering the head from above; fore margin entire, regularly rounded, with 6+6 equal, rather vague sectors delimited by 11 radii; central part with two irregular transverse rows of small round tubercles, 3+3 in fore row, 2+2 in rear one. Paraterga set at about upper 1/3 of body height, largely as slightly declined as dorsum (Fig. 24A–C, G–J). Tegument encrusted with a microspiculate cerategument, dull, beset with microvilli arranged in a polygonal alveolate pattern. Prozonae and stricture between pro- and metazonae very delicately alveolate. Metaterga with non-differentiated tuberculations, with three transverse and distinct rows of usually round, low tubercles like those on collum (Fig. 24A–C, G–J). Tergal setae largely abraded, retained ones inconspicuous, very short. Postcollum paraterga thin and rather indistinctly lobulated laterally (Fig. 24D–I), with three lobulations in all poreless segments, with four, seldom five, lobulations in all pore-bearing ones, all also delimited by long radii both dorsally and, to a lesser degree, ventrally; anterior marginals absent, but two caudal marginals evident. Pore formula normal: 5, 7, 9, 10, 12, 13, 15–18, all ozopores being very small, round, discernible dorsally at base of penultimate lobulation (Fig. 24G–I). Limbus microspiculate. Epiproct readily visible from above, not hidden under segment 18 (Fig. 24C, F, I). Hypoproct subtriangular, caudal edge with 1+1 strong, widely separated setae on knobs (Fig. 24F).

Sterna rather wide, about as broad as coxa. Legs (Fig. 24D–F) rather long and slender, extending laterad well beyond paraterga, slightly enlarged in both sexes, tarsi longest, last tibia both in ♂ and ♀ with a small, but evident, apicodorsal tubercle bearing a very long tactile seta on top (Fig. 24C).

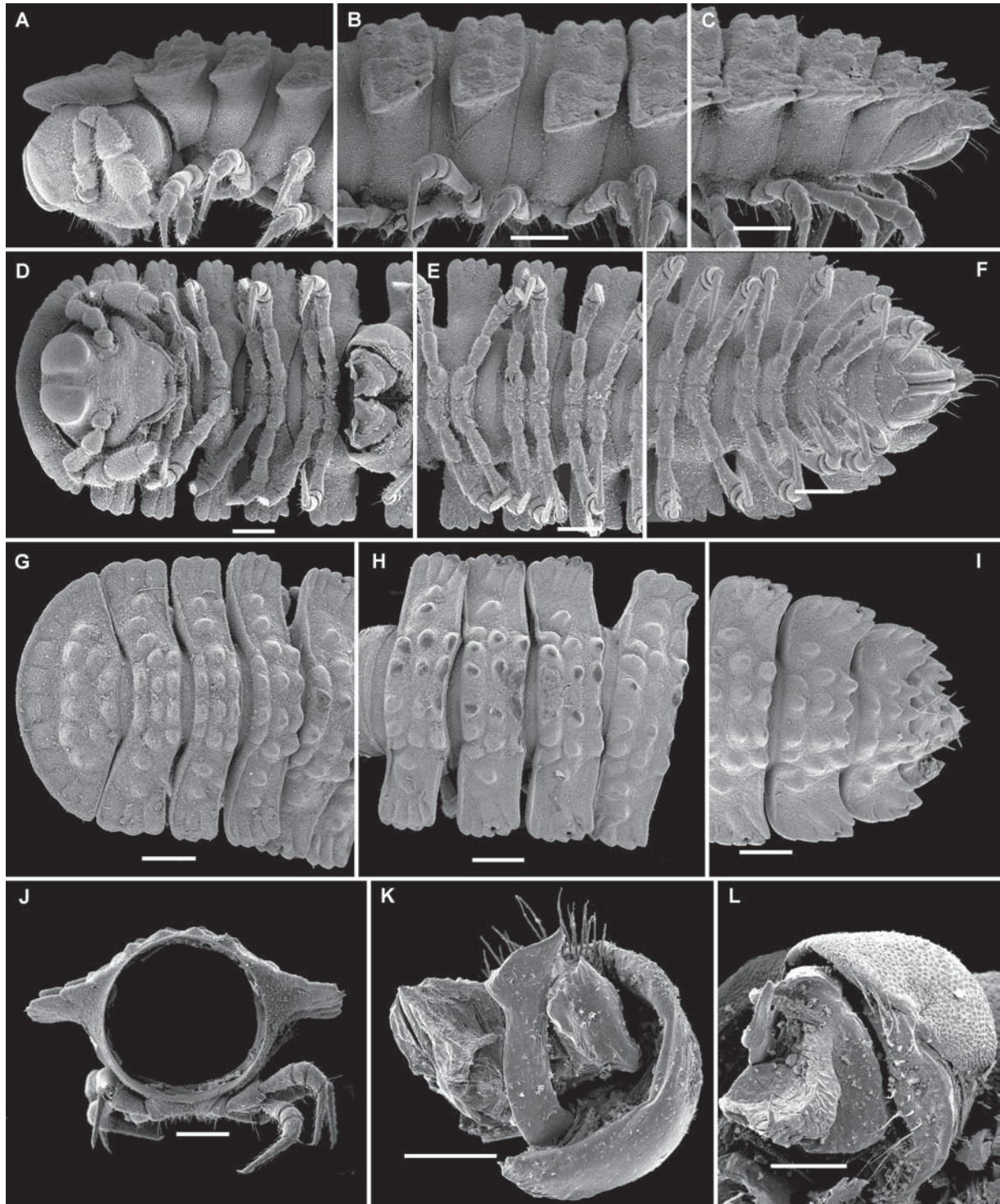


Fig. 24. *Cryptocorypha dimorpha* sp.n., ♂ paratype. A, D, G — anterior part of body, lateral, ventral and dorsal views, respectively; B, E, H — midbody segments, lateral, ventral and dorsal views, respectively; C, F, I — caudal part of body, lateral, ventral and dorsal views, respectively; J — cross-section of a midbody segment, caudal view; K & L — right gonopod, ventrolateral and ventromesal views, respectively. Scale bars: 0.2 (A–J) & 0.1 mm (K, L).

Рис. 24. *Cryptocorypha dimorpha* sp.n., паратип ♂. A, D, G — передняя часть тела, соответственно сбоку, снизу и сверху; B, E, H — среднетуловищные сегменты, соответственно сбоку, снизу и сверху; C, F, I — задняя часть тела, соответственно сбоку, снизу и сверху; J — поперечный срез через среднетуловищный сегмент, сзади; K и L — правый гонопод, соответственно одновременно снизу и сбоку и одновременно снизу и изнутри. Масштаб: 0,2 (A–J) и 0,1 мм (K, L).

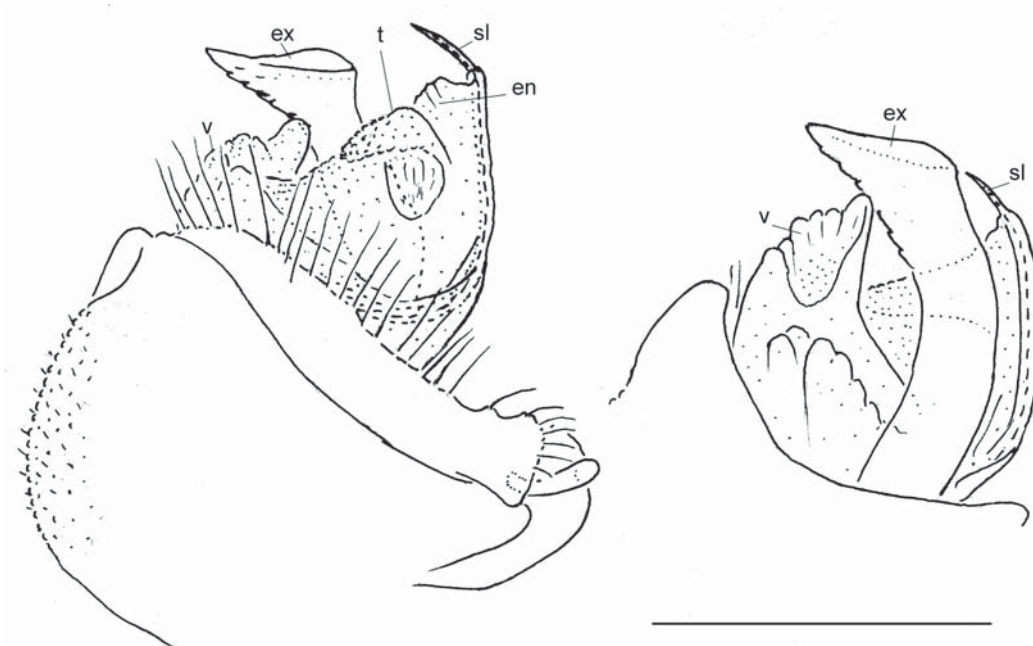


Fig. 25. *Cryptocorypha dimorpha* sp.n., ♂ paratype. A & B — left gonopod, mesal and lateral views, respectively. Scale bar: 0.2 mm. Designations explained in text.

Рис. 25. *Cryptocorypha dimorpha* sp.n., паратип ♂. А и В — левый гонопод, соответственно изнутри и сбоку. Масштаб: 0,2 мм. Объяснение обозначений дано в тексте.

Gonopods (Figs 24K, L, 25) taking up most of ventral surface of segment 7, reaching the bases of paraterga from below. Coxae voluminous, globose and transverse, microgranulate and microsetose on lateral surface; cannulae as usual; gonocoel modest, leaving most of telopodites exposed; telopodites quite complex, directed anteromesad, but not crossing each other medially. Each telopodite represented by a very stout, strongly setose, prefemoral part which is much shorter than a basically tripartite acropodite. Solenomere (**sl**) a mesal, rather long, slender, simple branch moderately and regularly curved mesad with a spiniform tip and over most of its extent enveloped by a membranous, slightly shorter endomere (**en**), the latter equipped with a large, subapical, papillate, subtransverse tooth (**t**) on mesal face. A prominent, clearly sclerotized, central exomere (**ex**) about as long and likewise moderately curved as **sl**, serrate distolaterally and beak-shaped apically. A relatively inconspicuous, low, sac-shaped, membranous velum (**v**) forming a lateralmost extension to **en**.

Cryptocorypha monomorpha sp.n.

Figs 26 & 27, Map.

HOLOTYPE ♂ (MRAC 11.954), Congo D. R., Dorsale de Lubero, Mt Muleke, versant Sud, village Itala, S 00°17', E 029°15', 1820 m a.s.l., 6.VII.1963, leg. R.P.M.J. Celis.

PARATYPE: 1 ♀ (SEM, MRAC 22726), same data, together with holotype.

DIAGNOSIS. Differs from all sufficiently well documented congeners except *C. dimorpha* sp.n. by the

presence of 19 body segments in both sexes, coupled with the conformation of the gonopodal telopodite, in particular, a high, ribbon-shaped, slightly curved exomere (**ex**) which is much longer than a finger-shaped solenomere (**sl**). Differs from *C. dimorpha* sp.n., which seems to be especially similar to *C. monomorpha* sp.n., by the presence of two conspicuous protuberances on the vertex in both sexes. See also Key below.

NAME. To emphasize the conspicuous similar protuberances on the vertex in both sexes.

DESCRIPTION. Length ca 5.5 (♂) or 6.5 mm (♀), width of midbody segments together with paraterga 1.1 (♂) or 1.2 mm (♀), width of prozonae 0.8 (♂) or 0.9 mm (♀). Coloration in alcohol uniformly and entirely yellowish, but dorsum very finely brownish. Body with 19 segments (♂, ♀).

All other characters (Figs 26 & 27) as in *C. dimorpha* sp.n., except as follows.

Vertex with a paramedian pair of conspicuous round protuberances in both sexes (Fig. 26D). Maximum four lateral lobulations of paraterga (Fig. 26A–I, K). In width, head << collum < segment 3 = 4 < 2=5–16, thereafter body very gradually tapering towards telson (Fig. 26G–I). Interantennal isthmus ca 1.5 as large as diameter of antennal socket (Fig. 26D). Last tibia both in ♂ and ♀ with a very small, apicodorsal tubercle bearing a very long tactile seta on top (Fig. 26F).

Gonopods (Fig. 27): gonocoel modest, leaving much of telopodites exposed; telopodites quite complex, directed anteromesad, but not crossing each other medially. Each telopodite represented by a very stout, strong-

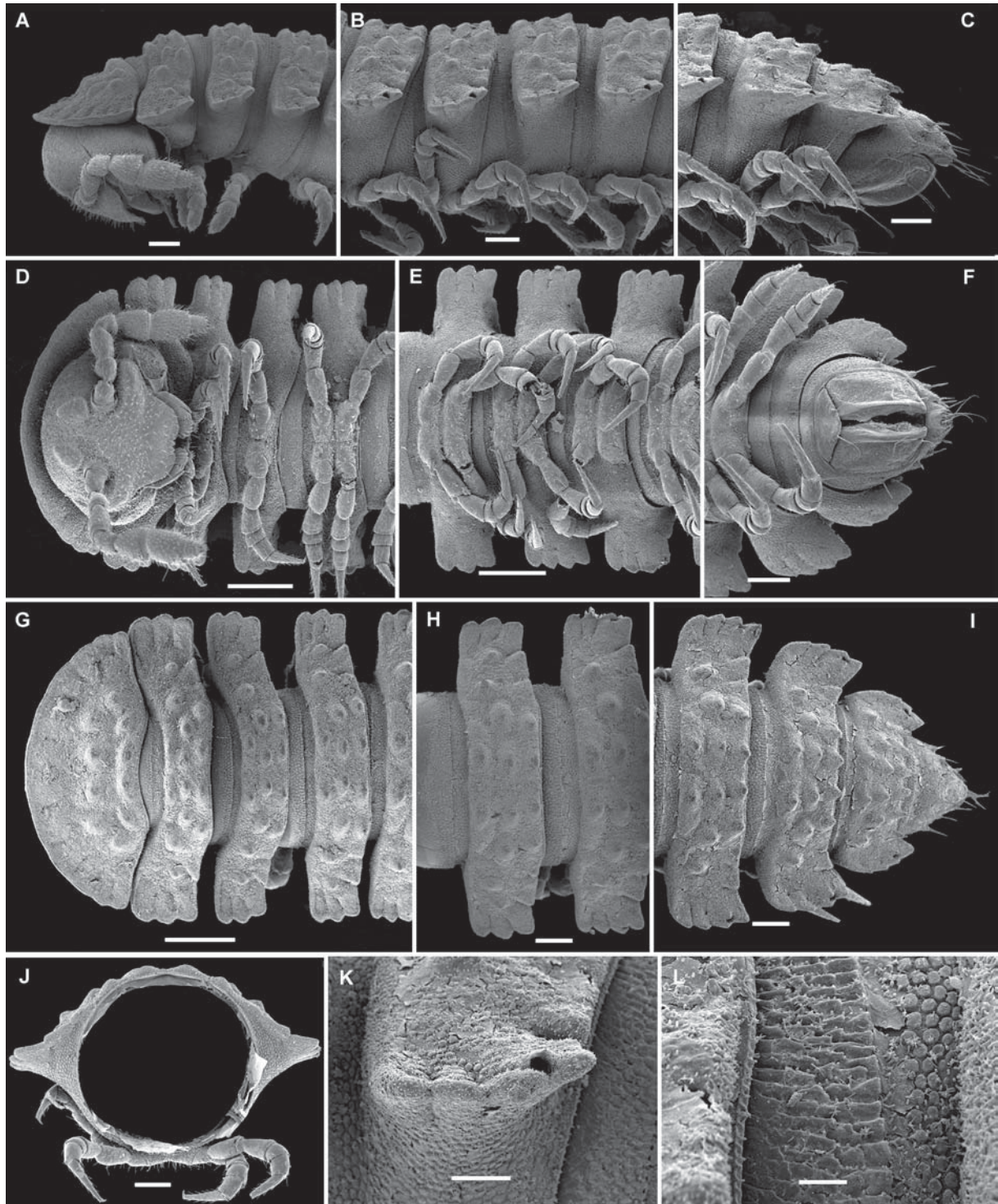


Fig. 26. *Cryptocorypha monomorpha* sp.n., ♀ paratype. A, D, G — anterior part of body, lateral, ventral and dorsal views, respectively; B, E, H — midbody segments, lateral, ventral and dorsal views, respectively; C, F, I — caudal part of body, lateral, ventral and dorsal views, respectively; J — cross-section of a midbody segment, caudal view; K — poriferous paratergum, lateral view; L — limbus and adjacent fine structures of tergal tegument, dorsal view. Scale bars: 0.2 (D, E, G), 0.1 (A–C, F, H–I), 0.05 (K) & 0.02 mm (L).

Рис. 26. *Cryptocorypha monomorpha* sp.n., паратип ♀. A, D, G — передняя часть тела, соответственно сбоку, снизу и сверху; B, E, H — среднетелувищные сегменты, соответственно сбоку, снизу и сверху; C, F, I — задняя часть тела, соответственно сбоку, снизу и сверху; J — поперечный срез через среднетелувищный сегмент, сзади; K — несущий озопору паратергит, сбоку; L — лимбус и соседние микроструктуры тергалных покровов, сверху. Масштаб: 0,2 (D, E, G), 0,1 (A–C, F, H–I), 0,05 (K) и 0,02 мм (L).

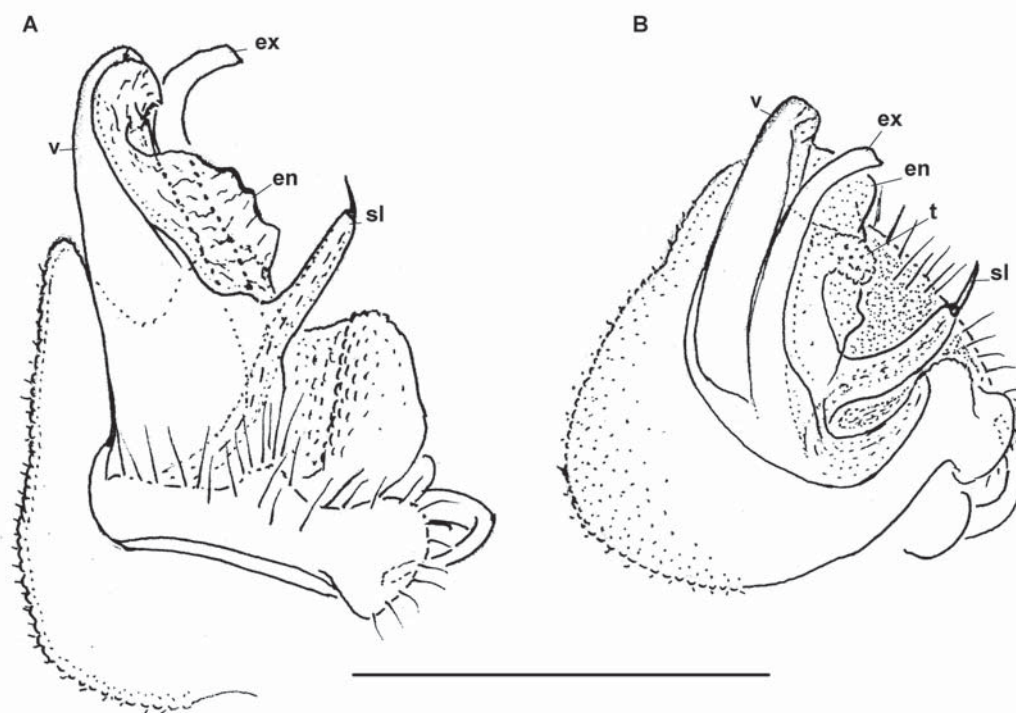


Fig. 27. *Cryptocorypha monomorpha* sp.n., holotype. A & B — right gonopod, lateral and mesal views, respectively. Scale bar: 0.2 mm. Designations explained in text.

Рис. 27. *Cryptocorypha monomorpha* sp.n., голотип. А и В — правый гонопод, соответственно сбоку и изнутри. Масштаб: 0,2 мм. Объяснение обозначений дано в тексте.

ly setose prefemoral part which is much shorter than a basically tripartite acropodite. Solenomere (sl) a mesal, moderately long, finger-shaped trichostele with a short spiniform tip. Endomere (en) a membranous structure showing a short, papillate, subtransverse tooth (t) on mesal face and connecting the base of sl to the lateralmost, prominent, suberect velum (v), the latter nearly as high as a slender, ribbon-shaped, slightly curved exomere (ex).

Cryptocorypha bocal sp.n.

Figs 4C, 28 & 29, Map.

HOLOTYPE ♂ (MRAC 22716), Congo D.R., South Kivu Prov., Itombwe, Uvira Distr., road-km 10 from Katobo to Kahololo, S 03°12', E 028°51', 2400 m a.s.l., humus in montane forest, I.1960, leg. N. Leleup.

PARATYPES: 1 ♂ (SEM, MRAC 22717), 2 ♂♂ (fragments of anterior body portions), 5 ♀♀, 8 subadult ♂♂, 15 ♀♀ juv. (mostly fragmented) (MRAC 11.591), same data, together with holotype; 1 ♂ (MRAC 11567), 1 ♂ (ZMUM), Congo D. R., South Kivu Prov., Itombwe, Uvira Distr., road-km 10 from Katobo to Kahololo, S 03°12', E 028°51', 2800 m a.s.l., humus in montane forest with *Bambusa*, I.1960, leg. N. Leleup.

DIAGNOSIS. Based on gonopodal structure, this new species comes the closest, both geographically and taxonomically, to the next one. See also Key below.

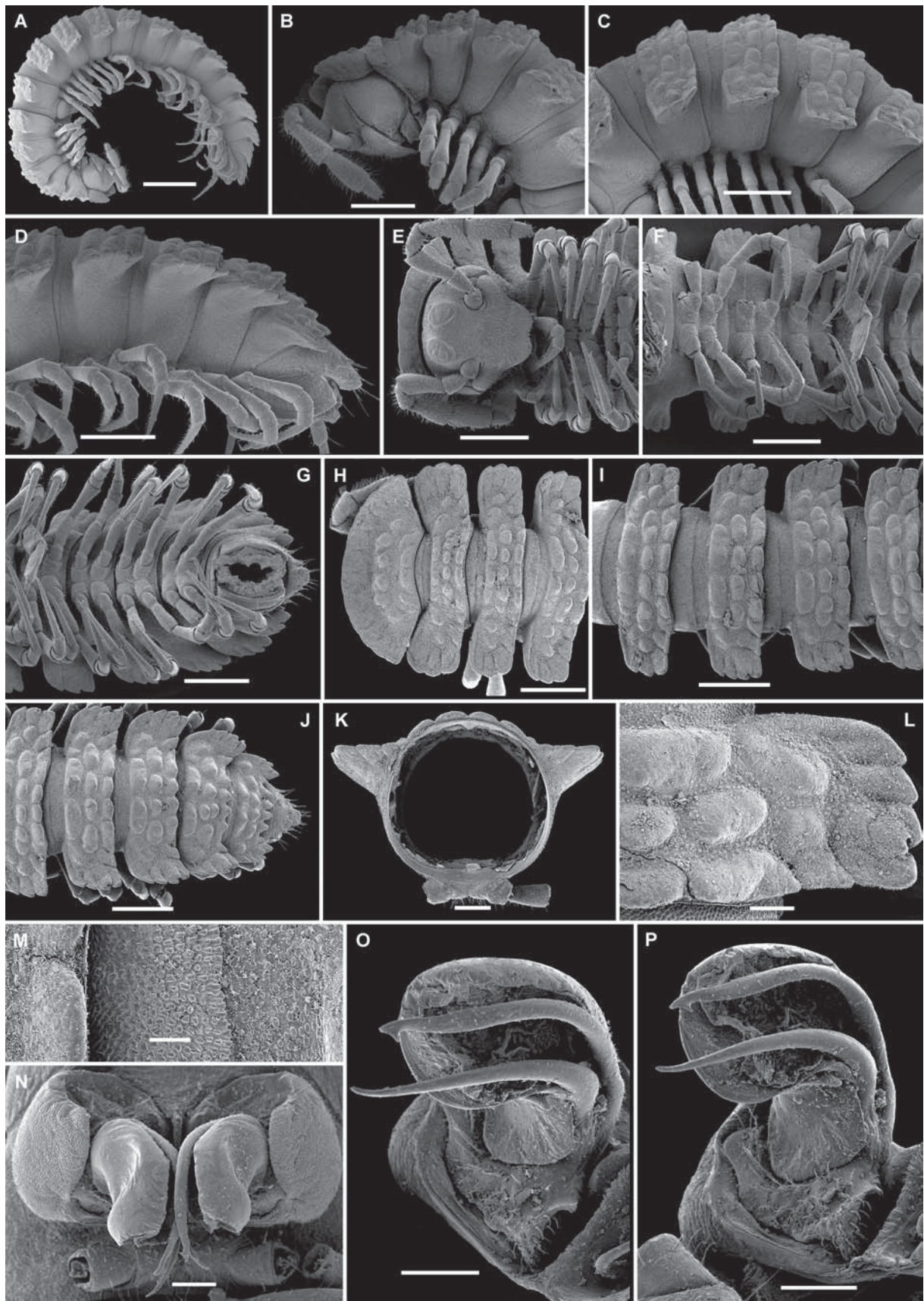
NAME. To emphasize the cup-shaped gonopodal telopodite; noun in apposition from French “bocal” (meaning “jar” or “cup” in English).

DESCRIPTION. Length of holotype ca 10 mm, width of midbody segments together with paraterga 1.3 mm, width of prozonae 1.0 mm. Length of paratypes 11–12 mm (♀), width of midbody segments together with paraterga 1.3–1.5 (♂) or 1.5–1.6 mm (♀), width of prozonae 1.0 (♂) or 1.0–1.1 mm (♀).

Coloration in alcohol from uniformly light yellow to pallid, sometimes in places very light brownish (Fig. 4C). Body with 19 segments (♂, ♀), paraterga very broad (Figs 4C, 28A). In width, head << collum < segment 3 = 4 < 2 = 5 < 6–15, thereafter body very gradually tapering towards telson (Fig. 28H–J).

All other characters (Figs 4C, 28, 29) as in *C. dimorpha* sp.n., except as follows.

Head roundish, slightly transverse, genae roundish, clypeus subtrapeziform, well delimited on sides at base from frons by a concavity (Fig. 28E). Clypeolabral region densely setose. Vertex with a paramedian pair of large, round, stump-shaped, slightly boletiform protuberances just behind antennae, these protuberances especially well-developed in adult ♂ (Fig. 28E), but considerably lower in adult ♀ or subadult ♂ (as in *C. leleupi* sp.n., Fig. 30G); surface behind protuberances very delicately microgranulate, epicranial suture very fine. Antennae long and slender, poorly clavate, nearly fully exposed (Fig. 28A, B, E). Interantennal isthmus nearly twice as large as diameter of antennal socket (Fig. 28E). In length, antennomere 1 = 2 = 4 = 7 < 3 < 5



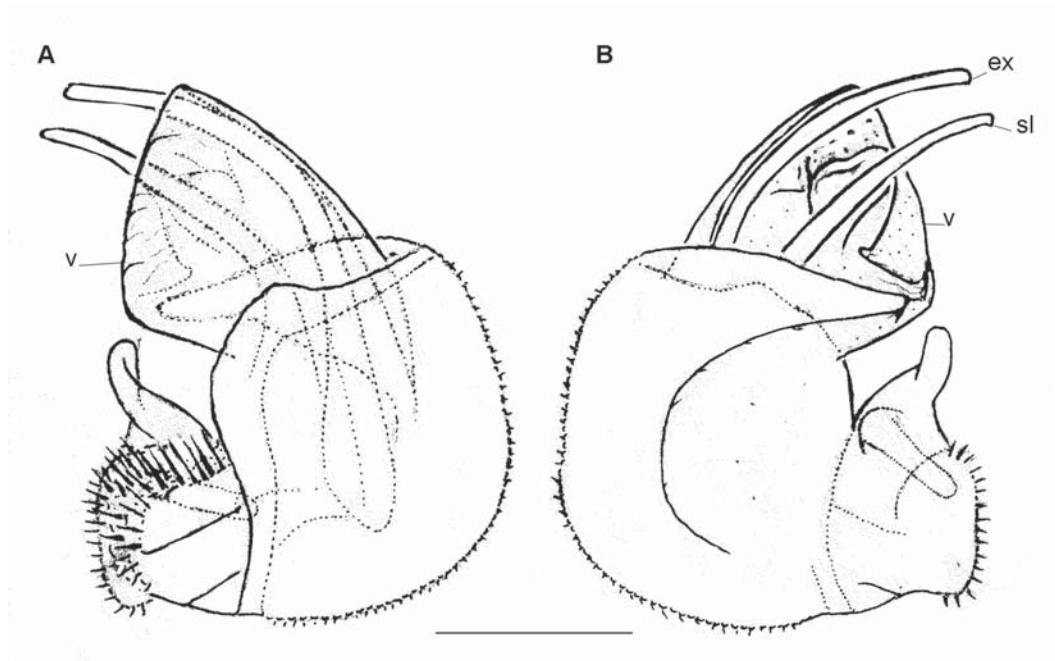


Fig. 29. *Cryptocorypha bocal* sp.n., ♂ paratype. A & B — left gonopod, lateral and mesal views, respectively. Scale bar: 0.2 mm. Designations explained in text.

Рис. 29. *Cryptocorypha bocal* sp.n., паратип ♂. А и В — левый гонопод, соответственно сбоку и изнутри. Масштаб: 0,2 мм. Объяснение обозначений дано в тексте.

< 6; antennomere 6 the largest, 5th and 6th each with a group of apicodorsal sensilla. Paraterga set at about upper 1/3 of body height, largely subhorizontal as opposed to a slightly convex dorsum (Fig. 28A–L). Metaterga with non-differentiated, low, mostly transversely oval tuberculations arranged in usual three transverse and distinct rows, much like those on collum (Fig. 28H–L). Tergal setae invisible. Limbus entire, nearly straight (Fig. 28M).

Legs (Fig. 28A–G) long and slender, slightly enlarged in both sexes, about as long as width of metaterga; tarsi longest, last tibia both in ♂ and ♀ bearing a very long tactile seta on top, the latter not borne on a knob (Fig. 28G).

Gonopods (Figs 28N–P, 29): gonocoel modest, leaving much of telopodites exposed; telopodites relatively simple, directed and curved anteriad, not crossing each other medially. Each telopodite represented by a very stout, strongly setose, prefemoral part which is much shorter than a basically tripartite acropodite. Solenomere (sl) a mesal, suberect, long flagellum. Exomere (ex) a slightly longer, more laterally placed, similarly

flagelliform procees finely subunciform at tip. Both sl and ex enveloped on lateral side by a prominent, membranous, rounded velum (v) which, together with an apicomeral edge (e) of coxa, forms a nearly complete cup to protect both sl and ex.

Cryptocorypha leleupi sp.n.

Figs 30 & 31, Map.

HOLOTYPE ♂ (MRAC 22718), Congo D. R., South Kivu Prov., Itombwe, Uvira Distr., road-km 10 from Katobo to Kahololo, S 03°12', E 028°51', 2800 m a.s.l., humus in montane forest with *Bambusa*, 1.1960, leg. N. Leleup.

PARATYPES: 1 ♂ (SEM, MRAC 22725), 1 ♂ (MRAC 22719), 1 ♀ (SEM, lost), 1 ♂ (MRAC 22720), same data, together with holotype.

DIAGNOSIS. Based on gonopodal structure, this new species comes the closest, both geographically and taxonomically, to the previous one. See also Key below.

NAME. Honours Narcisse Leleup, the famous Belgian explorer of tropical Africa whose enormous collections are largely kept at MRAC and whose ideas on

Fig. 28. *Cryptocorypha bocal* sp.n., ♂ paratype. A — habitus, lateral view; B, E, H — anterior part of body, lateral, ventral and dorsal views, respectively; C, F, I — midbody segments, lateral, ventral and dorsal views, respectively; D, G, J — caudal part of body, lateral, ventral and dorsal views, respectively; K — cross-section of a midbody segment, caudal view; L — poriferous paratergum, dorsal view; M — limbus and adjacent fine structures of tergal tegument, dorsal view; N — both gonopods in situ, ventral view; O & P — right gonopod, ventromesal and mesal views, respectively. Scale bars: 1.0 (A), 0.5 (B–J), 0.2 (K), 0.1 (L, N–P), 0.05 mm (M).

Рис. 28. *Cryptocorypha bocal* sp.n., паратип ♂. А — общий вид, сбоку; В, Е, Н — передняя часть тела, соответственно сбоку, снизу и сверху; С, F, I — среднетелувищные сегменты, соответственно сбоку, снизу и сверху; D, G, J — задняя часть тела, соответственно сбоку и снизу; K — поперечный срез через среднетелувищный сегмент, сзади; L — несущий озопору паратергит, сверху; M — лимбус и соседние микроструктуры тергалных покровов, сверху; N — оба гонопода на месте, снизу; O и P — правый гонопод, соответственно одновременно снизу и изнутри и изнутри. Масштаб: 1,0 (А), 0,5 (В–J), 0,2 (K), 0,1 (L, N–P) и 0,05 мм (M).

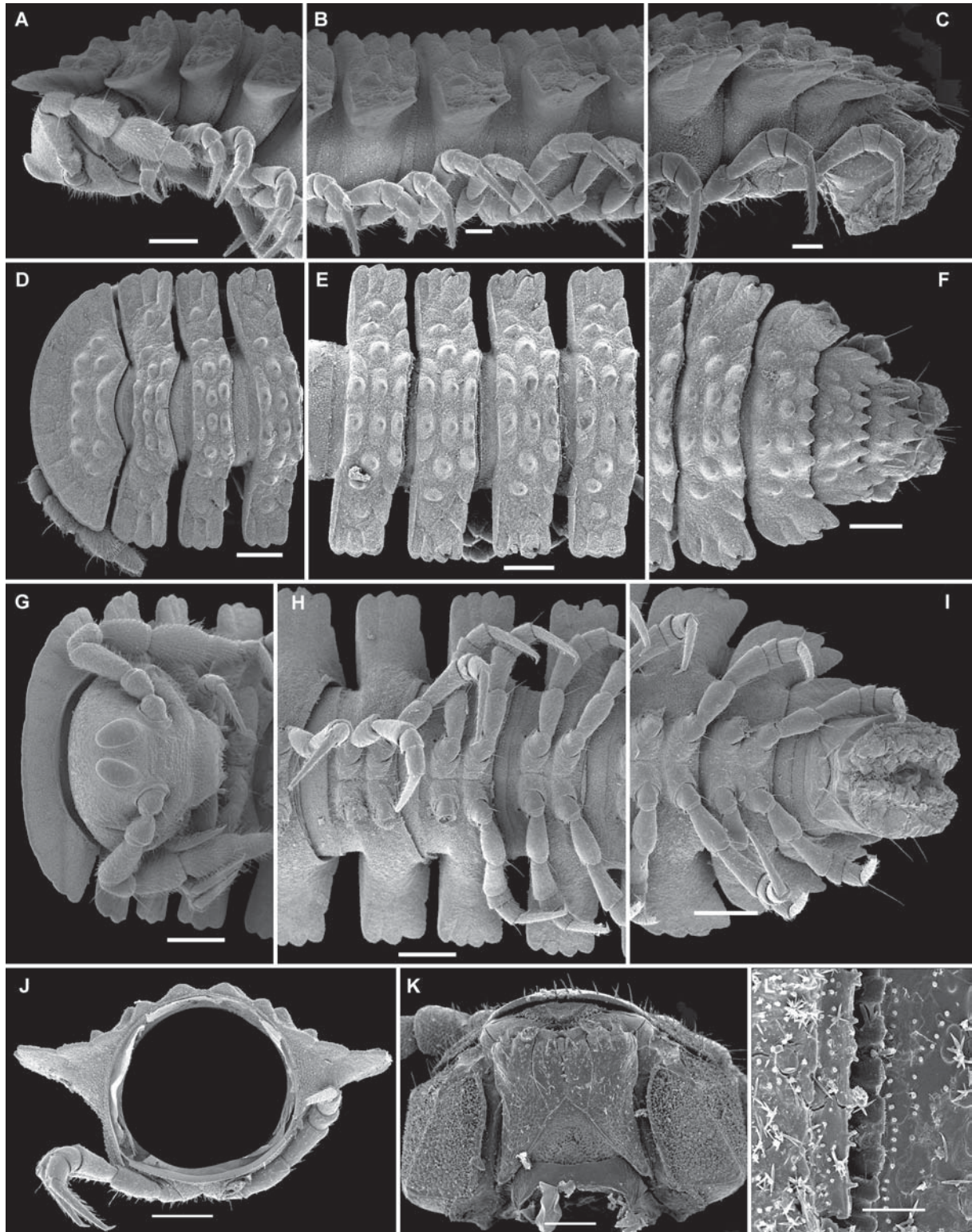


Fig. 30. *Cryptocorypha leleupi* sp.n., ♂ paratype. A, D, G — anterior part of body, lateral, dorsal and ventral views, respectively; B, E, H — midbody segments, lateral, dorsal and ventral views, respectively; C, F, I — caudal part of body, lateral, dorsal and ventral views, respectively; J — cross-section of a midbody segment, caudal view; K — head, ventral view; L — limbus and adjacent fine structures of tergal tegument, dorsal view. Scale bars: 0.2 (A, D–J), 0.1 (B, C, K) & 0.02 mm (L).

Рис. 30. *Cryptocorypha leleupi* sp.n., паратип ♂. А, D, G — передняя часть тела, соответственно сбоку, сверху и снизу; B, E, H — среднетуловищные сегменты, соответственно сбоку, сверху и снизу; C, F, I — задняя часть тела, соответственно сбоку, сверху и снизу; J — поперечный срез через среднетуловищный сегмент, сзади; K — голова, снизу; L — лимбус и соседние микроструктуры тергальных покровов, сверху. Масштаб: 0,2 (А, D–J), 0,1 (B, C, K) и 0,02 мм (L).

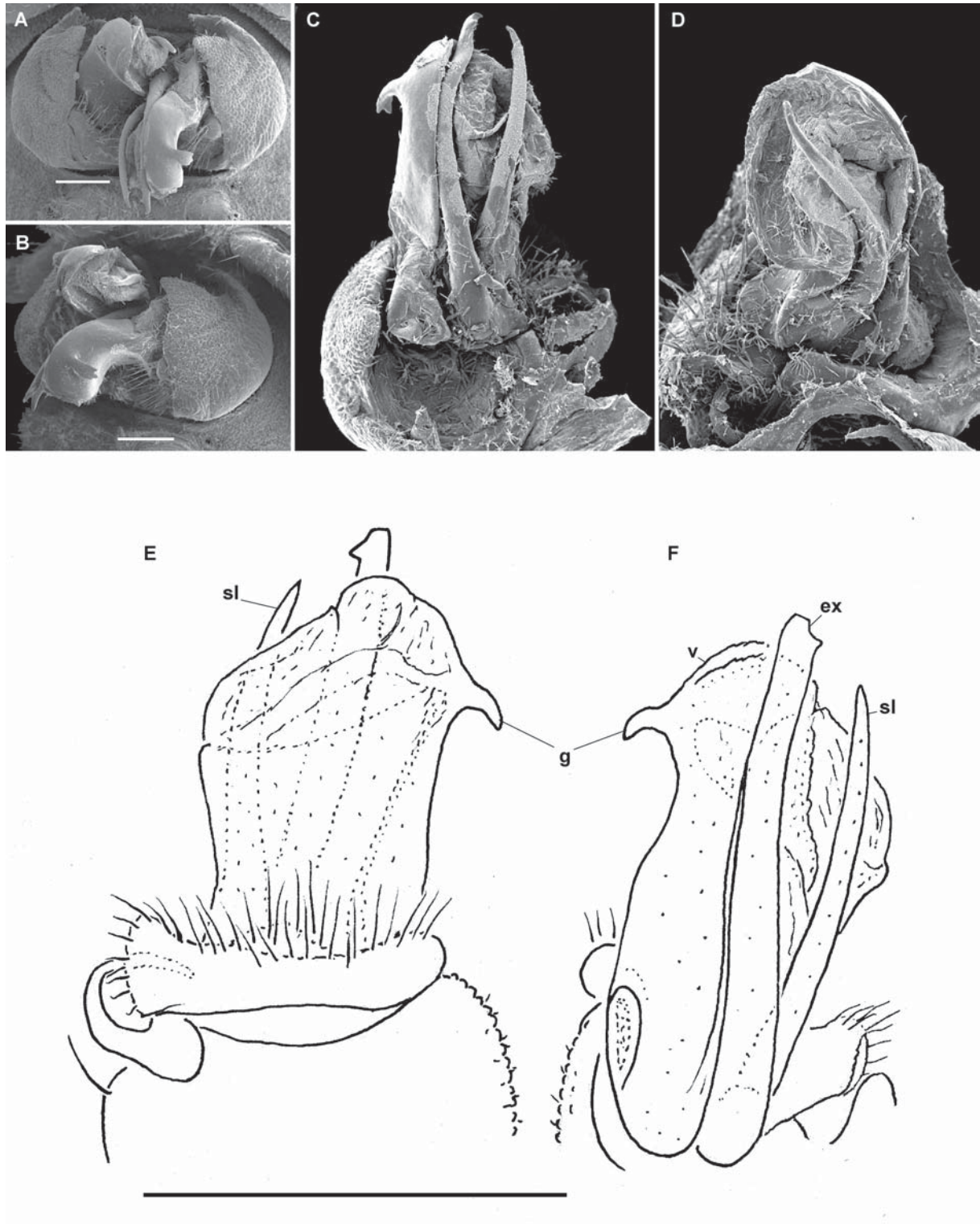


Fig. 31. *Cryptocorypha leleupi* sp.n., ♂ paratypes. A & B — both gonopods in situ, ventral and ventrolateral views, respectively; C–F — right gonopod, mesal, ventromesal, lateral and mesal views, respectively. Scale bars: 0.2 (E, F), 0.1 (A, B) & 0.05 mm (C, D). Designations explained in text.

Рис. 31. *Cryptocorypha leleupi* sp.n., паратипы ♂♂. А и В — оба гонопода, соответственно снизу и одновременно снизу и сбоку; С–F — правый гонопод, соответственно изнутри, одновременно снизу и изнутри, сбоку и изнутри. Масштаб: 0,2 (Е, F), 0,1 (А, В) и 0,05 мм (С, D). Объяснение обозначений дано в тексте.

the evolution of subterranean life are still highly topical. This new species, like the previous one, was also collected by N. Leleup.

DESCRIPTION. Length of holotype ca 9 mm, width of midbody segments together with paraterga 1.2 mm, width of prozonae 0.9 mm. Length of paratype ♂♂ ca 8 mm, width of midbody segments together with paraterga 1.1 mm, width of prozonae 0.85 mm.

Coloration in alcohol from light brown to nearly pallid, metaterga mostly slightly darker, light brown. Body with 19 segments (♂), paraterga very broad (Figs 30A–K). In width, head \ll collum $<$ segment 3 = 4 $<$ 2 $<$ 5–15, thereafter body very gradually tapering towards telson (Fig. 30D–F).

All other characters (Figs 30 & 31) as in *C. dimorpha* sp.n., except as follows.

Protuberances on ♂ vertex as in *C. bocal* sp.n. (Fig. 30A, G). Antennae only slightly shorter and stouter than in *C. bocal* sp.n. (Fig. 28A, B, E), but clearly longer and more slender than in *C. dimorpha* sp.n. and *C. monomorpha* sp.n. (Figs 24A, D, 26A, D).

Legs (Fig. 30A–C, H–K) long and slender, but only ca 0.7 times as long as metatergal width; tarsi longest, last tibia with a very long tactile seta apicodorsally on top, the seta not borne on a knob (Fig. 30C, I).

Gonopods (Fig. 31) very similar to those of *C. bocal* sp.n. Solenomere (**sl**) a mesal, suberect, long flagellum. Exomere (**ex**) a slightly longer, more laterally placed, similarly flagelliform process nearly subunciform at tip. Both **sl** and **ex** enveloped on lateral side by a prominent, membranous, rounded, ear-shaped velum (**v**) with a short, distal, apically slightly bidentate, lateral process (**g**), but forming no distinct cup like the one observed in *C. bocal* sp.n.

Cryptocorypha diffusa (Brolemann, 1920), **comb.n.**
Figs 32 & 33, Map.

MATERIAL. 13 ♂♂, 12 ♀♀ (MRAC 10893–10902), 1 ♂ (SEM, MRAC 22723), Mission Zoolog. I.R.S.A.C. en Afrique Orientale, Tanganyika terr. (= Tanzania), Ngorongoro, Region Bocagere, 2300 m a.s.l., 8.VI.1957; 26 ♂♂, 12 ♀♀, 11 juv. (MRAC 10832–10881), Mission Zoolog. I.R.S.A.C. en Afrique Orientale, Tanganyika terr., Mt Oldeani versant Est, mountain forest with *Bambusa*, 2350–2500 m a.s.l., 6/9.VI.1957; 11 ♀♀, 11 subadults (MRAC 10832–10881), Mission Zoolog. I.R.S.A.C. en Afrique Orientale, Tanganyika terr., Mt Oldeani versant Est, mountain forest, 1880–1950 m a.s.l., 8.V.1957; 3 ♂♂, 3 ♀♀, 6 juv. (MRAC 10646–10663), Mission Zoolog. I.R.S.A.C. en Afrique Orientale, Tanganyika terr., Mt Oldeani versant N.O, etrepage sous *Hagenia*, 2600 m a.s.l., 3.VII.1957, all leg. P. Basilevsky & N. Leleup.

REMARKS. This species was originally described as *Procoptodesmus diffusus* Brolemann, 1920, from a

small series coming from near a forest at 2700–2800 m a.s.l. on Mt Kilimanjaro, now in Tanzania [Brolemann, 1920]. The genus *Procoptodesmus* Brolemann, 1920, has since remained monobasic [Hoffman, 1980], while the species has since been recorded, and abundantly illustrated, based on samples from Taita Hills, Kenya [Golovatch, VandenSpiegel, 2014].

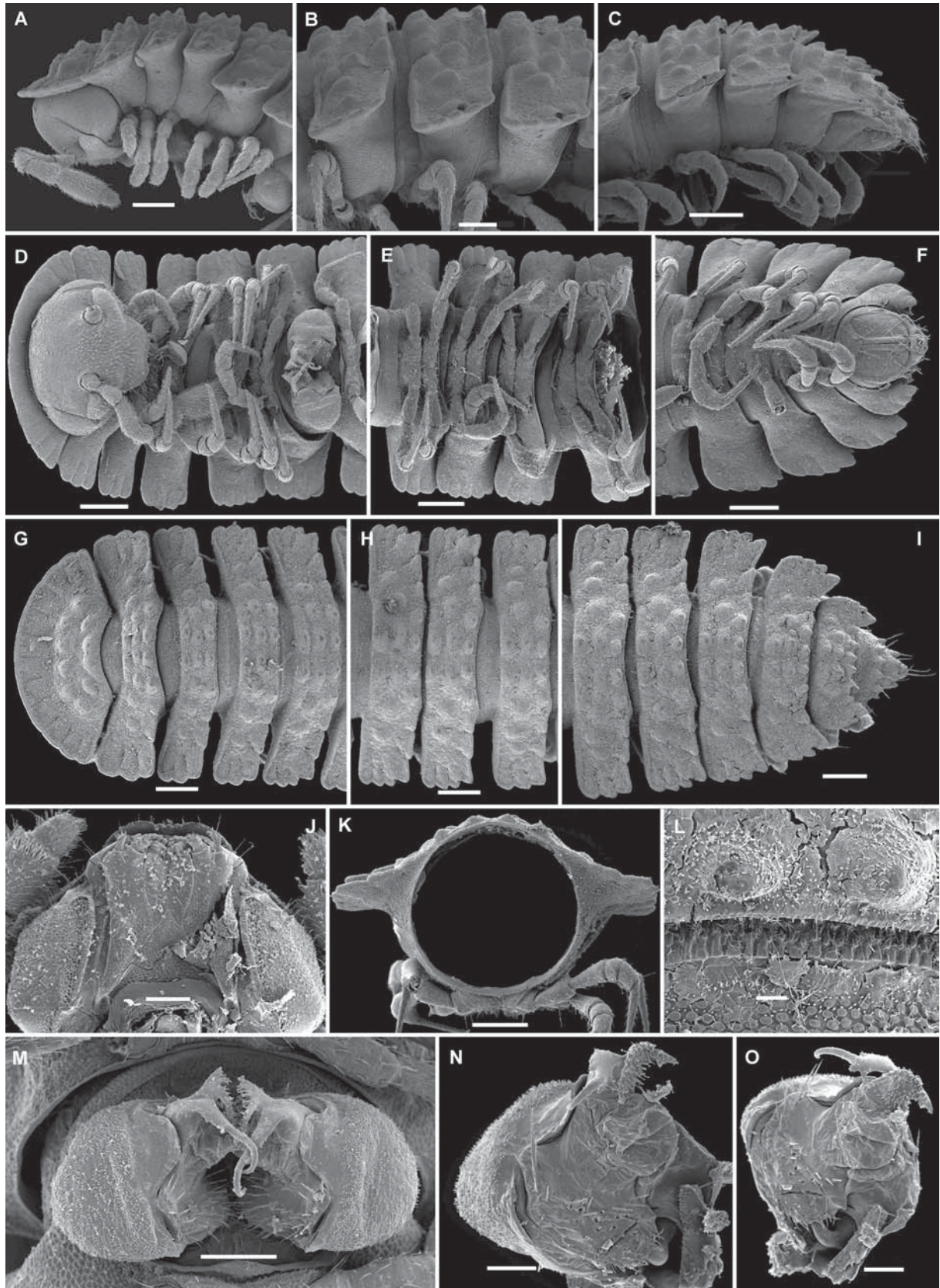
With the discovery of several species of *Cryptocorypha* in the Congo Basin, the generic identity of *P. diffusus* can now be clarified. We do not hesitate to formally synonymize *Procoptodesmus* under *Cryptocorypha*, **syn.n.**, because *C. diffusa*, comb.n., shares all basic elements of somatic and gonopodal structure with the other formal congeners.

We can add the following notes to the original description [Brolemann, 1920] and the recent record of this species from Kenya [Golovatch, VandenSpiegel, 2014].

BRIEF REDESCRIPTION. Length ca 6–9 mm, usually ♂♂ being smaller than ♀♀; width of metaterga 1.0–1.4 (♂) or 1.1–1.8 mm (♀). Body with 19 (♂) or 20 segments (♀); dorsum at most poorly convex; paraterga set high (at about upper 1/3 of body height), subhorizontal (Fig. 32A–C, G–I, K). Head without modifications, interantennal isthmus about twice as great as diameter of antennal socket (Fig. 32D). Antennae long and only slightly clavate, C-shaped, nearly completely exposed (Fig. 32A, D). Collum very broad and flabellate, fully covering the head from above, anterior margin with 6+6 indistinct sectors divided by 11 faint radii; central part with two transverse rows of 3+3 and 2+2 flat, roundish or transversely oval bosses or low tubercles (Fig. 32A, D, G). Postcollum metaterga each with three transverse rows of regular, similarly non-differentiated, flat bosses partly extending onto paraterga (Fig. 32G–I, K). Lateral margin of postcollum paraterga always indistinctly lobulated, without porostyles: paraterga 2 and 3 invariably trilobate, following ones tri-, quadri- or pentalobate, but usually poreless paraterga with fewer lobulations than pore-bearing ones (except for segments 16–18(19) which are typically 4-lobulate) (Fig. 32A–I). Anterolateral lobulations always absent, fore margin of paraterga largely being straight, inclined increasingly caudad and broadly rounded only in segments 17–18(19). Caudolateral lobulations evident, 2–3 per paratergum. Tergal setae invisible. Pore formula normal, ozopores inconspicuous, open flush on tergal surface near base of penultimate lobulation. Telson fully exposed in dorsal view (Fig. 32C, F, I).

Fig. 32. *Cryptocorypha diffusa* (Brolemann, 1920), ♂ from Ngorongoro. A, D, G — anterior part of body, lateral, ventral and dorsal views, respectively; B, E, H — midbody segments, lateral, ventral and dorsal views, respectively; C, F, I — caudal part of body, lateral, ventral and dorsal views, respectively; J — head, ventral view; K — cross-section of a midbody segment, caudal view; L — limbus and adjacent fine structures of tergal tegument, dorsal view; M — both gonopods in situ, ventral view; N & 0 — right gonopod, mesal and lateral views, respectively. Scale bars: 0.2 (A, D–J), 0.1 (B, C, K) & 0.02 mm (L).

Рис. 32. *Cryptocorypha diffusa* (Brolemann, 1920), ♂ из Ngorongoro. А, D, G — передняя часть тела, соответственно сбоку, сверху и снизу; В, E, H — среднетелувищные сегменты, соответственно сбоку, снизу и сверху; С, F, I — задняя часть тела, соответственно сбоку, снизу и сверху; J — голова, снизу; K — поперечный срез через среднетелувищный сегмент, сзади; L — лимбус и соседние микроструктуры тергальных покровов, сверху; M — оба гонопода на месте, снизу; N и 0 — правый гонопод, соответственно изнутри и сбоку. Масштаб: 0,2 (А, D–J), 0,1 (В, С, K) и 0,02 мм (L).



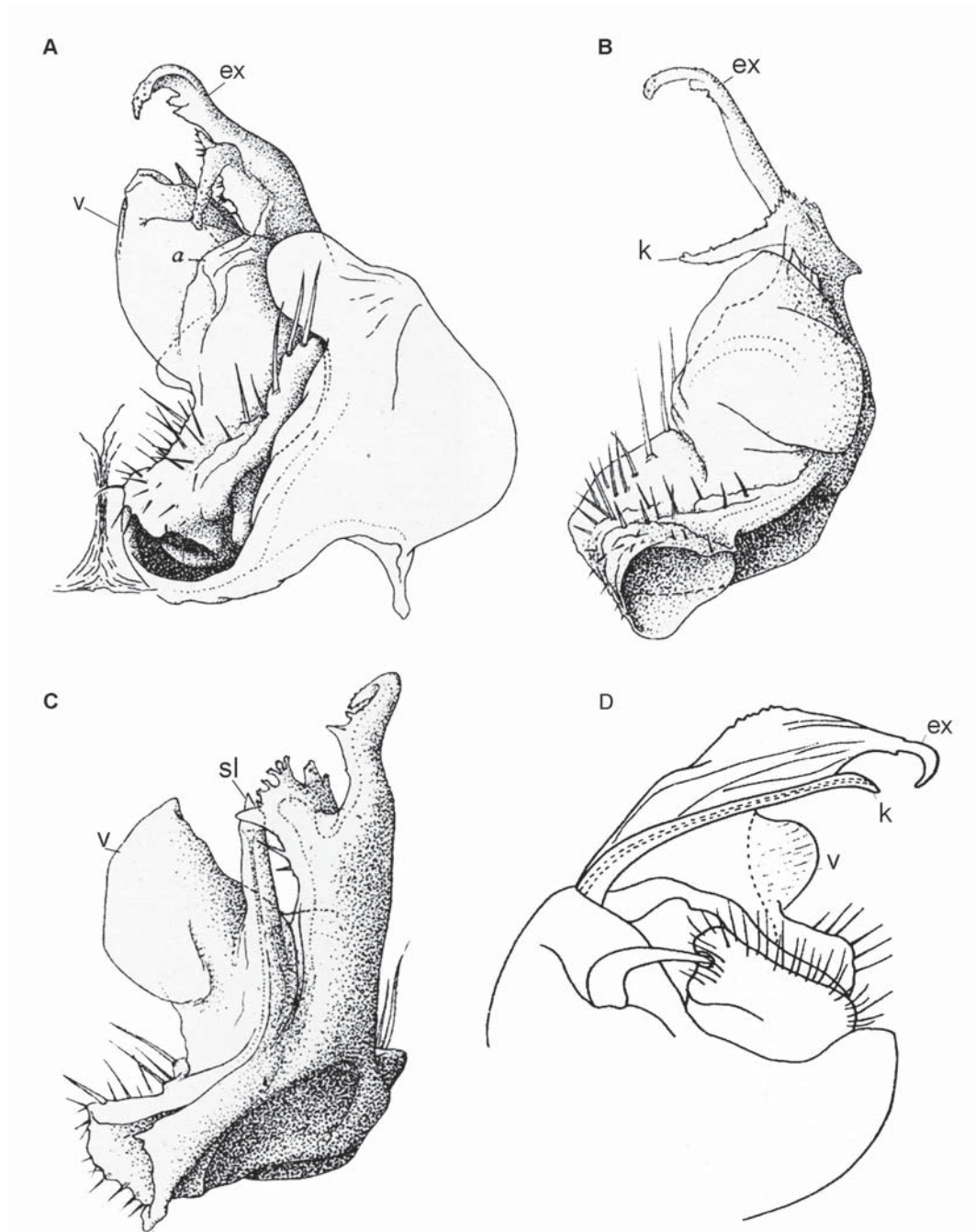


Fig. 33. Gonopods of *Cryptocorypha diffusa* (Brolemann, 1920) (A–C) and *C. nympa* Loksa, 1967 (D), caudal, sublateral, mesal and mesal views, respectively. Drawings after Brolemann [1920] and Loksa [1967], not to scale. Designations explained in text.

Рис. 33. Гонаподы *Cryptocorypha diffusa* (Brolemann, 1920) (A–C) и *C. nympa* Loksa, 1967 (D), соответственно сзади, почти сбоку, изнутри и изнутри. Рисунки из Brolemann [1920] и Loksa [1967], без масштаба. Объяснение обозначений дано в тексте.

Sterna usual, without modifications. Legs long and slender, only slightly incrassate in both sexes, about 0.7 times as long as metatergal width; tarsus longest, claws simple.

Gonopods (Figs 32M–O, 33A–C) quite complex, but telopodites well exposed beyond a modest gonocoele, each basically tripartite, consisting of a distinct, mesal, digitiform solenomere branch (sl) flanked by a

prominent, subquadrate, membranous, sac-shaped velum (v) on mesal side, and a complex, high, lateral exomere process (ex) with an expanded, conspicuously spinose-fimbriate, midway outgrowth, a long, laterally curved, slender apical part of ex, and a lateral, subtransverse, midway spine (k) set subrectangular to ex.

TAXONOMIC NOTES. According to the latest reviews [Golovatch *et al.*, 2011, 2013; Golovatch, Van-

denSpiegel, 2015, and literature therein], the genus *Cryptocorypha* Attems, 1907, currently encompasses 13 species: *C. stylopus* Attems, 1907 (the type species) and *C. leia* Chamberlin, 1945, both from Java, Indonesia; *C. tobana* Chamberlin, 1945, from Sumatra, Indonesia; *C. ornata* (Attems, 1938), nearly pantropical, especially characteristic of remote archipelagos; *C. chernovi* Golovatch, Geoffroy et VandenSpiegel, 2013, from Vanuatu, Melanesia, southwestern Pacific; *C. hoffmani* Golovatch, Semenyuk, VandenSpiegel et Anichkin, 2011, from southern Vietnam; *C. areata* (Carl, 1932) and *C. tuberculata* (Carl, 1932), both from southern India; *C. kandyana* (Carl, 1932), from Sri Lanka; *C. spinicoronata* (Zhang et Li, 1981), from southern China; *C. perplexa* Golovatch et VandenSpiegel, 2015, from Myanmar, as well as *C. japonica* (Miyosi, 1957) and *C. kumamotoensis* (Murakami, 1966), from southern Honshu and Kyushu, Japan, respectively. One more species, *C. (Afrocorypha) nympa* Loksa, 1967, which has inadvertently been omitted, remains the sole Afrotropical congener, originally described from Congo-Brazzaville [Loksa, 1967], now the Republic of the Congo. This is exactly *C. nympa* that interests us most in the context of the present discoveries of *C. dimorpha* sp.n., *C. monomorpha* sp.n., *C. bocal* sp.n. and *C. leleupi* sp.n., as well as the transfer of *C. diffusa* to *Cryptocorypha*.

Loksa [1967] established his *Afrocorypha* as a new and monotypic subgenus of *Cryptocorypha*, based on two characters: (1) the ozopores are also present on segment 19, and (2) the paraterga are upturned so that the dorsum appears concave. Hoffman [1980] promoted this subgenus to full genus.

Both these features, however, are strange and hard to take seriously. Firstly, the ♂ holotype of *C. nympa*, the only specimen that is currently known to represent *C. nympa*, was stated to be 19-segmented. This certainly implies that Loksa miscounted body segments, apparently meaning the presence of ozopores on the penultimate, 18th segment. However, this condition is rather typical of *Cryptocorypha*, with all congeners but *C. stylopus* showing a normal ozopore formula: 5, 7, 9, 10, 12, 13, 15–18(19); all ozopores are very small, round, discernible dorsally at the base of the penultimate lobulation. To base a new generic-level taxon on such a minor character (which could have easily been overlooked in *C. stylopus*) seems to be a very poor choice. Even variations in the number of body segments, often sex-linked, are only species-specific: both ♂ and ♀ with 19 segments (*C. dimorpha* sp.n., *C. monomorpha* sp.n., maybe also *C. nympa*), both ♂ and ♀ with 20 segments (*C. hoffmani*, *C. ornata*, *C. perplexa*, *C. spinicoronata*) or ♂ with 19 while ♀ with 20 segments (the remaining congeners except for *C. leia* and *C. tobana* for which no segment counts are provided in the original descriptions). The presence of humps on the vertex is likewise species-specific, as only *C. dimorpha* sp.n., *C. monomorpha* sp.n., *C. bocal* sp.n. and *C. leleupi* sp.n. show such protuberances,

mostly in the ♂ alone. This would have been a more important character to outline natural species groups than another poorly visible ozopore traced. Among the six presently known Afrotropical *Cryptocorypha* species, only *C. diffusa* and probably *C. nympa* do not have such modifications.

As regards the paraterga described in *C. nympa* as being upturned, while the dorsum in-between concave, this is too hard to believe in. ALL Pyrgodesmidae, including *Cryptocorypha*, show more or less declivous paraterga, only very rarely are these subhorizontal (the paraterga on the collum and a few following segments can even be faintly upturned, see Fig. 28B) and held high on the body, while the dorsum is typically convex, at most flattened. The same applies to all *Cryptocorypha* spp., in which the collum's fore margin is nearly not lobulated, but has 11 radii dividing it into 12 sectors frontally; the paraterga are set high (at about the upper 1/3 to 1/4) and usually 3- (poreless segments) or 4-lobulated (pore-bearing ones) laterally, rarely 4- or 5-lobulated (individual variations in *C. diffusa*, rarely also in *C. dimorpha* sp.n.); the pore-formula is normal, the ozopores open flush on the dorsal surface, but never on porosteles; the dorsum and paraterga are only slightly declined, both either creating the same outline or the paraterga are subhorizontal; the last tibia is often, but not always supplied with a small apicodorsal stump supporting a particularly long tactile seta.

Apparently, Loksa had an abnormal or damaged holotype which could have also become strongly curved dorsad during fixation. The gonopodal structure of *C. nympa* unequivocally confirms the correct assignment of this species to *Cryptocorypha*. The gonopodal telopodite in this genus is usually clearly tripartite, only rarely bipartite with a voluminous sac-shaped bulk, but invariably with a long solenomere being the mesalmost branch.

As a result, we do not hesitate to formally synonymize *Afrocorypha* under *Cryptocorypha* as well, **syn.n.**

Because some of the species are too poorly known, no key to all known *Cryptocorypha* spp. can be attempted yet [Golovatch et al., 2011, 2013; Golovatch, VandenSpiegel, 2015]. But one to cover all six African congeners is given below. In addition, the following new diagnosis of *Cryptocorypha* can be proposed.

Cryptocorypha Attems, 1907

SHORT DESCRIPTION. A genus of small Pyrgodesmidae (5–12 mm long) with a strongly flat body and high paraterga. Adult body with 19 or 20 segments in both sexes, but more usually with 19 segments in ♂ and 20 segments in ♀. Head usually unmodified, only in several Afrotropical species with a paramedian pair of vertigial humps (only ♂ or also ♀). Antennae C-shaped, mostly exposed, antennomere 6 the largest; interantennal isthmus > 1.6 times as great as diameter of antennal socket. Collum flabellate, fully covering the head from above, fore margin regularly convex,

nearly not lobulated, but with 6+6 (sub)equal sectors divided by 11 radii; central part with two transverse rows of 3+3 and 2+2 flat, roundish or transversely oval bosses or low tubercles. Postcollum metaterga each with three transverse rows of regular, non-differentiated, flat bosses partly extending onto paraterga. Lateral margin of postcollum paraterga always indistinctly lobulated, without porosteles: paraterga 2 and 3 invariably trilobate, following ones 3-, 4- or 5-lobate, but usually poreless paraterga showing fewer lobulations than pore-bearing ones. Anterolateral lobulations absent, but caudolateral ones present (2–3). Tergal setae invisible. Pore formula normal, ozopores inconspicuous, open flush on tergal surface near base of penultimate lobulation. Telson fully exposed in dorsal view.

Gonopods from simple (e.g. *C. hoffmani* or *C. nympha*, Fig. 34) to complex (e.g. *C. diffusa*, Figs 32M–O, 33), but telopodites well exposed beyond a modest gonocoel, each typically tripartite, consisting of a distinct, mesal solenomere branch flanked by a more or less prominent, membranous, sac-shaped velum (**v**) on mesal side, and a normally high, lateral exomere process (**ex**). Only rarely (*C. hoffmani*) are both **v** and **ex** fused into a single sac-shaped structure, leaving the gonopodal telopodite bipartite.

Type-species: *Cryptocorypha stylopus* Attems, 1907

Other species included: *C. areata* (Carl, 1932); *C. bocal* sp.n.; *C. chernovi* Golovatch, Geoffroy et VandenSpiegel, 2013; *C. diffusa* (Brolemann, 1920); *C. dimorpha* sp.n.; *C. hoffmani* Golovatch, Semenyuk, VandenSpiegel et Anichkin, 2011; *C. japonica* (Miyosi, 1957); *C. kandyana* (Carl, 1932); *C. kumamotoensis* (Murakami, 1966); *C. leia* Chamberlin, 1945; *C. leleupi* sp.n.; *C. monomorpha* sp.n.; *C. nympha* Loksa, 1967; *C. ornata* (Attems, 1938); *C. perplexa* Golovatch et VandenSpiegel, 2015; *C. spinicoronata* (Zhang et Li, 1981); *C. tobana* Chamberlin, 1945; and *C. tuberculata* (Carl, 1932).

At present the distribution of *Cryptocorypha* covers central and eastern Africa, though India, Sri Lanka and Myanmar, to East Asia, southern China, Indochina, western Indonesia, and even Melanesia; one species (*C. ornata*) is particularly widespread, likely due to ornitho- and/or anthropochory introduced to several remote islands and archipelagos in the Indian and Pacific oceans.

The following key can be proposed to separate all six Afrotropical *Cryptocorypha* species.

- 1(2) Vertex devoid of protuberances (e.g. Fig. 32D) 3
- 2(1) At least ♂ vertex with a paramedial pair of evident, often more or less mushroom-shaped protuberances (e.g. Figs 4C, 28E, 30G). Congo 5
- 3(4) Lateral margin of paraterga 3- or 4-lobulate on poreless and pore-bearing segments, respectively. Gonopod relatively simple (Fig. 33D), with exomere (**ex**) being the longest branch, solenomere (**sl**) somewhat shorter, while velum (**v**) a small lateral lobe. Congo *C. nympha*
- 4(3) Lateral margin of paraterga 3–15 largely 4- or 5-lobulate on poreless and pore-bearing segments, respectively (Figs 32D–I). Gonopod relatively complex (Fig. 32M–O, 33A–C), with exomere (**ex**) being the longest and

especially complex branch, solenomere (**sl**) relatively short, while velum (**v**) a prominent lateral sac-shaped structure. East Africa (at least Tanzania and Kenya)

- *C. diffusa*
- 5(6) Antennae considerably longer and more slender (Fig. 28A, B, E). Metatergal tubercles largely transversely oval (Fig. 28H–J). Gonopods (Figs 28N–P, 30) with both solenomere (**sl**) and exomere (**ex**) branches about equally long and slender, while velum (**v**) a very large, ear-shaped, simple, lateral lobe *C. bocal* sp.n.
 - 6(5) Antennae shorter and more robust (Figs 24A, D, 26A, D, 30A, G). Metatergal tubercles mostly round (Fig. 24G–I, 26G–I, 30D–F). Gonopods with solenomere (**sl**) either slightly shorter than or subequal in length to exomere (**ex**), while velum (**v**) either very large (but not ear-shaped) or a considerably smaller, more simple, lateral outgrowth 7
 - 7(8) Body larger, 8–9 mm long. Solenomere (**sl**) (Fig. 31) spiniform, only slightly shorter than a thicker exomere (**ex**), while velum (**v**) very large, with a characteristic distolateral uncus (**g**) *C. leleupi* sp.n.
 - 8(7) Body smaller, 5.5–6.5 mm long. Solenomere (**sl**) finger-shaped, equipped with a small, flagelliform filament at tip; exomere (**ex**) ribbon-shaped and clearly curved mesad; velum (**v**) devoid of a distolateral uncus 9
 - 9(10) Both ♂ and ♀ with a paramedian pair of vertigial protuberances. Velum (**v**) (Fig. 27) prominent, but exomere (**ex**) slender *C. monomorpha* sp.n.
 - 10(9) Only ♂ with a paramedian pair of vertigial protuberances. Velum (**v**) (Fig. 24K, L, 25) much shorter, but exomere (**ex**) prominent, axe-shaped apically
..... *C. dimorpha* sp.n.

Conclusions

The distribution of *Monachodesmus* in Cameroon and of *Cryptocorypha* in the Congo Basin and eastern Africa clearly shows (Map) that most of their constituent species appear to be restricted to a single locality. Only very few are more widespread, like *M. longicaudatus* in the lowland southwestern parts of Cameroon or *C. diffusa* in Tanzania and Kenya. The general impression is such that the pyrgodesmid faunas of western and central Africa, either separately or combined, are much more diverse at least at the species level than that east of the Rift Valley [cf. Hoffman, 1993]. Not a single species of Pyrgodesmidae seems to have crossed the Rift Valley from either side. Furthermore, while the class Diplopoda is accepted as a basically mesophilous forest floor-dwelling group with very limited dispersal capacities [e.g. Golovatch, Kime, 2009], highly localized endemism amongst tropical and even warm temperate millipedes worldwide is a rule rather than an exception, especially as regards such overall small-bodied and poorly vagile species as Pyrgodesmidae. A wider distribution seems to be related to synanthropization, as likely is the case concerning *M. longicaudatus*. Maybe the same can be suggested for *C. diffusa* as well.

There can be no doubt that future explorations of and collecting efforts in the remaining forested parts of tropical Africa will reveal lots of novelties in such a still poorly assessed family as Pyrgodesmidae.

ACKNOWLEDGEMENTS. Both ARNF and SIG are most grateful to the MRAC administration for the financial support rendered to make their joint research at MRAC possible in May 2017. The authors thank most heartily Christophe Allard (MRAC) for his technical assistance. ARNF is greatly obliged to the Rufford Foundation, grant No. 20687-1 and Congo Basin Grant Program (2016) which supported him financially during his field work in Cameroon. He is also grateful to Mr. Charly Oumarou Ngoute and Miss Jaenne Agripine Yetchom Fondjo for assistance in the field. SIG is thankful to Kirill Mikhailov (Moscow) for the incorporation of ZMUM samples into the collection. Jonathan Brecko (MRAC) most helpfully took all colour pictures.

References

- Attems C. 1953. Neue Myriopoden des Belgischen Congo // *Annales du Musée Royal du Congo Belge, Tervuren. Série in 80. Sciences Zoologiques*. No.18. P.1–139 (for 1952).
- Brecko J., Mathys A., Dekoninck W., Leponce M., VandenSpiegel D., Semal P. 2014. Focus stacking: Comparing commercial top-end set-ups with a semi-automatic low budget approach. A possible solution for mass digitization of type specimens // *ZooKeys*. Vol.464. P.1–23.
- Brolemann H.W. 1920. Myriapodes III, Diplopoda // *Voyage de Ch. Alluaud et R. Jeannel en Afrique orientale (1911–1912). Résultats scientifiques*. Paris: L. Lhomme. P.49–298.
- Golovatch S.I., VandenSpiegel D. 2014. Notes on Afrotropical Pyrgodesmidae, 1 (Diplopoda: Polydesmida) // *Arthropoda Selecta*. Vol.23. No.4. P.319–335.
- Golovatch S.I., Kime R.D. 2009. Millipede (Diplopoda) distributions: A review // *Soil Organisms*. Vol.81. No.3. P.565–597.
- Golovatch S.I., VandenSpiegel D. 2015. A new species of the millipede genus *Cryptocorypha* Attems, 1907, from Myanmar (Diplopoda: Polydesmida: Pyrgodesmidae) // *Arthropoda Selecta*. Vol.24. No.1. P.27–31.
- Golovatch S.I., Geoffroy J.-J., VandenSpiegel D. 2013. A new species of the millipede genus *Cryptocorypha* Attems, 1907, from Vanuatu, Melanesia, southwestern Pacific (Diplopoda: Polydesmida: Pyrgodesmidae) // *Arthropoda Selecta*. Vol.22. No.4. P.333–337.
- Golovatch S.I., Nzoko Fiemapong A.R., VandenSpiegel D. 2015. Notes on Afrotropical Pyrgodesmidae, 2 (Diplopoda: Polydesmida) // *Arthropoda Selecta*. Vol.24. No.4. P.387–400.
- Golovatch S.I., Semenyuk I.I., VandenSpiegel D., Anichkin A.E. 2011. Three new species of the millipede family Pyrgodesmidae from Nam Cat Tien National Park, southern Vietnam (Diplopoda: Polydesmida) // *Arthropoda Selecta*. Vol.20. No.1. P.1–9.
- Hoffman R.L. 1980. Classification of the Diplopoda. Genève: Muséum d'histoire naturelle. 237 pp. (for 1979)
- Hoffman R.L. 1993. Biogeography of East African montane forest millipedes // Lovett J.C., Wasser S.K. (eds.). *Biogeography and ecology of the rain forests of eastern Africa*. Cambridge Univ. Press. P.103–114.
- Loksa I. 1967. The Scientific Results of the Hungarian Soil Zoological Expedition to the Brazzaville-Congo. 32. Diplopoda, I // *Opuscula Zoologica, Budapest*. Vol.7. No.2. P.205–220.

Responsible editor K.G. Mikhailov