

## On several new or poorly-known Oriental Paradoxosomatidae (Diplopoda: Polydesmida), XXX

### О нескольких новых или плохоизученных ориентальных Paradoxosomatidae (Diplopoda: Polydesmida), XXX

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KEY WORDS: taxonomy, new records, new species, Vietnam, China.

КЛЮЧЕВЫЕ СЛОВА: таксономия, новые находки, новый вид, Вьетнам, Китай.

**ABSTRACT.** This contribution is devoted to illustrated records of seven diplopod species from north-central Vietnam and one species from north-central China, including three new: *Anoplodesmus nguyeni* sp.n., *Kronopolites ramosus* sp.n. and *Tylopus simplex* sp.n. from Pu Mat National Park, Vietnam.

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**РЕЗЮМЕ.** Данное сообщение посвящено иллюстрированным находкам семи видов диплопод из северо-центральной части Вьетнама и одного из северо-центральной части Китая, включая три новых: *Anoplodesmus nguyeni* sp.n., *Kronopolites ramosus* sp.n. и *Tylopus simplex* sp.n. из национального парка Pu Mat (Вьетнам).

### Introduction

This paper is devoted to new illustrated records of several known species of paradoxosomatid millipedes from Vietnam and China, as well as to descriptions of three new species from lowland and/or midmontane tropical rainforests of Vietnam (Figs 108–111).

### Material and methods

Field work of IS was conducted in accordance with Agreement 1700/UBND.VX for the scientific cooperation between the Joint Russian-Vietnamese Tropical Centre and the Pu Mat National Park and Pu Hoat National Park. Material was collected during field trips to Pu Mat National Park on 11–24 April 2018, and to Pu Hoat National Park on 9–15 April 2021. Millipedes were obtained in habitats by hand-sorting the leaf litter, visual spotting on open places like

forest floor, log surface, and bushes, and through the examination of spaces under logs and stones. Collecting was performed in daylight, as well as at night. Ecological and behavioral data were recorded while collecting. Pictures of live animals were taken with a Panasonic DMC-TZ80 – LUMIX Digital Camera. Animals were preserved in 75% ethanol.

The material has been shared between the collections of the Zoological Museum, Moscow State University (ZMUM), Russia, and the Senckenberg Museum, Frankfurt a.M. (SMF), Germany, as indicated in the text. Pictures were taken with a Canon EOS 5D digital camera and stacked using Zerene Stacker software. An Olympus SZ61 stereo microscope was used for observation and capturing the images for line drawings.

### Taxonomic part

#### *Anoplodesmus nguyeni* sp.n.

Figs 1–19.

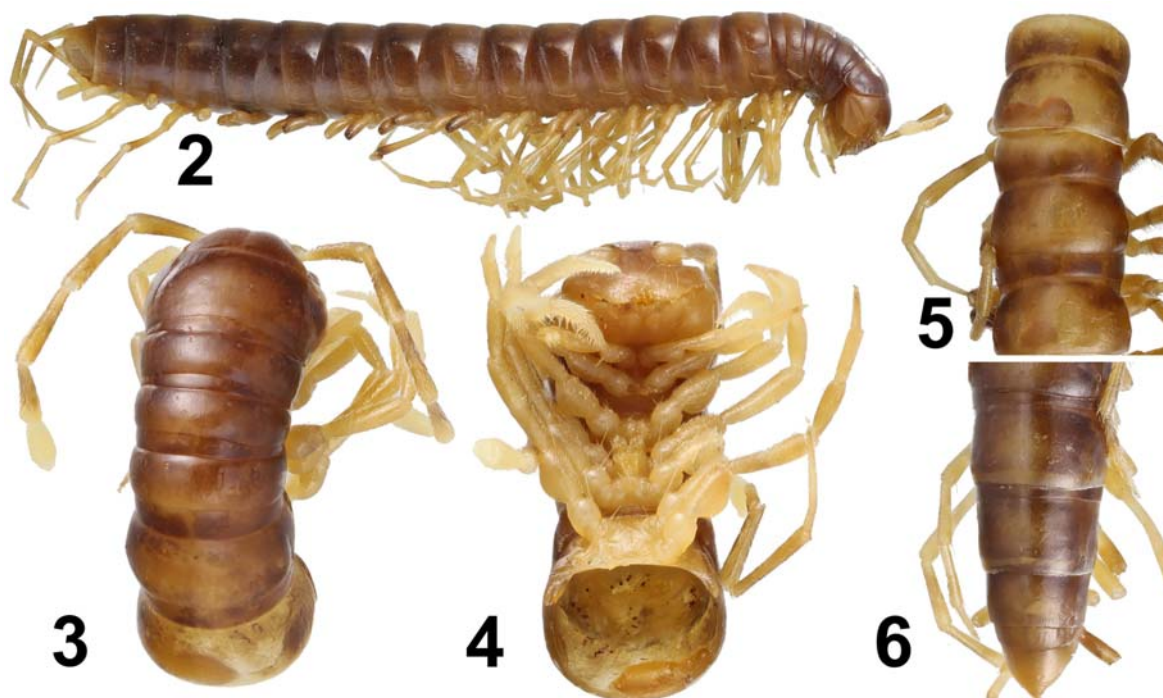
**HOLOTYPE** ♂ (ZMUM), Vietnam, Nghe An Prov., Pu Mat National Park, N18°57', E104°41', 180 m a.s.l., mixed tropical forest on hill slopes, dirty road crossing the middle of a hill, forest floor, night-time, April 2018, I.I. Semenyuk leg.

**PARATYPES:** 4 ♂♂, 3 ♀♀ (ZMUM), same data, together with holotype.

**DIAGNOSIS.** Using the latest key to species of the *elongissimus* group [Golovatch, Semenyuk, 2010] and all subsequent information concerning the later described members of the same group, including *A. borealis* Nguyen, 2010 and *A. solenophorus* Nguyen, 2010, both from northern Vietnam [Nguyen, 2010b], as well as *A. chinesis* Golovatch, 2013, from north-central China [Golovatch, 2013], the new species comes especially close to *A. anichkini* Golovatch et Semenyuk, 2010, from southern Vietnam [Golovatch, Semenyuk, 2010; Nguyen, 2010b], but it differs readily from all congeners by the gonopod femorite being particularly strongly enlarged distally, and the solenophore particularly strongly elaborate, showing as many as seven spines in various places (Figs 12–19).



Fig. 1A, B. *Anoplodesmus nguyenii* sp.n., live ♂ paratype from different sides. Pictures by I.I. Semenyuk, taken not to scale.  
Рис. 1А, В. *Anoplodesmus nguyenii* sp.n., живой паратип ♂. Фотографии И.И. Семенюк, сняты без масштаба.



Figs 2–6. *Anoplodesmus nguyenii* sp.n., ♀ (2) and ♂ paratypes (3–6). 2 — habitus, lateral view; 3, 4 — anterior part of body, dorsal and ventral views, respectively; 5, 6 — middle and posterior parts of body, dorsal views, respectively. Pictures by K.V. Makarov, taken not to scale.

Рис. 2–6. *Anoplodesmus nguyenii* sp.n., паратипы ♀ (2) и ♂ (3–6). 2 — общий вид, сбоку; 3, 4 — передняя часть тела, соответственно сверху и снизу; 5, 6 — соответственно средняя и задняя части тела, сверху. Фотографии К.В. Макарова, сняты без масштаба.

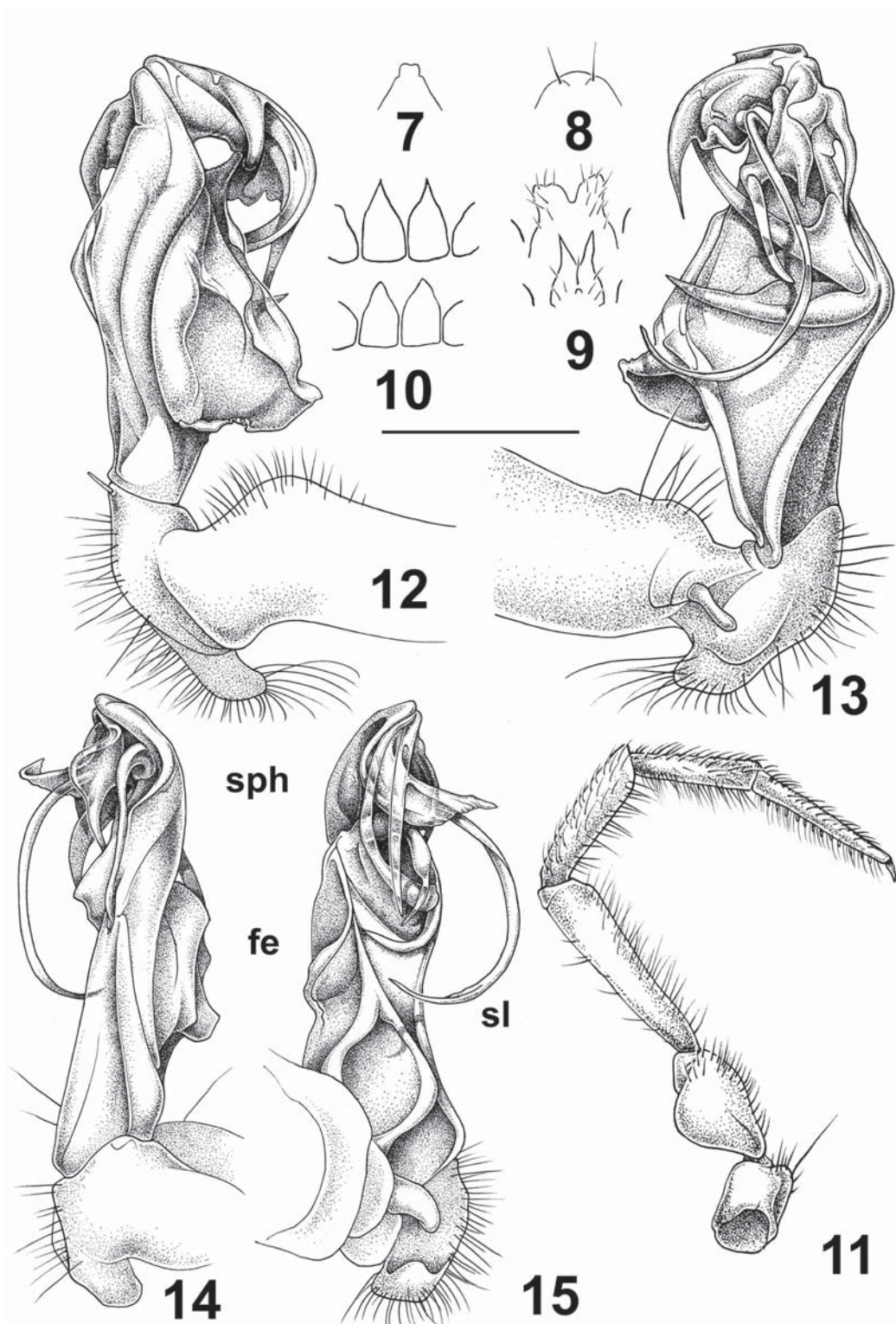
NAME. Honours Nguyen Duc Anh, a prominent Vietnamese specialist in millipede systematics.

DESCRIPTION. Length ca. 18–24 (♂) or 17–27 mm (♀), width of midbody pro- and metazonae 1.7–1.8 and 1.9–2.0 mm (♂), or 1.4–2.7 and 1.5–2.9 mm (♀), respectively. Holotype ca. 22 mm long, 1.8 and 2.0 mm wide on midbody pro- and metazonae, respectively. Live coloration brown, with contrasting pallid to yellowish spots on each segment, antennomeres 6–8 and legs (Fig. 1A, B); coloration in alcohol mostly very similar (Figs 2–6), but sometimes largely pale and marbled, with an indistinctly cingulate pattern due to darker stricture regions; a more or less wide, vague, lighter brown, axial stripe covering most to only central parts of metaterga; clypeus, genae, antennomeres 6–8, both

epi- and hypoproct, as well as legs and sterna mostly to completely light yellowish.

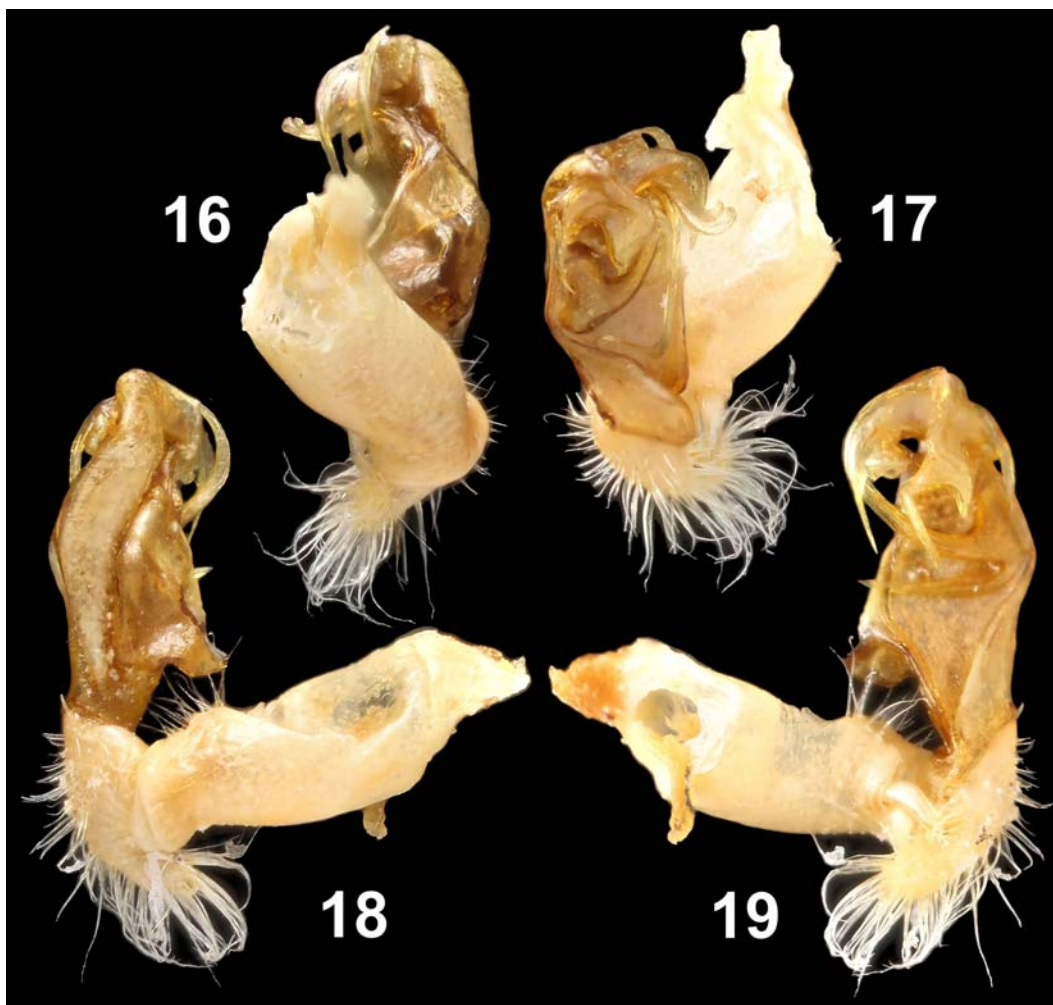
Body subcylindrical. Almost entire head rather densely setose; epicranial suture fine, but distinct (Fig. 4). Antennae very long, slender and only slightly clavate (Figs 2, 3), extending past metatergum 3 when stretched dorsally (♂, ♀). In length, antennomere 2=3=4>5=6>>1=7. Interantennal isthmus about as wide as diameter of antennal socket (Fig. 4). Tegument shining, mostly smooth, delicately shagreened, less delicately so only at bottom of strictures between pro- and metazonae, finely microgranulate and clearly arcuately striate/striolate below ozopore level. In width, collum > segment 2=3=4 > head = 2=5–16; body gradually tapering thereafter (Figs 3–6). Paraterga present only on collum,





Figs 7–15. *Anoplodesmus nguyenii* sp.n., ♂ paratype. 7 — epiproct tip, dorsal view; 8 — hypoproct, ventral view; 9 — sternal lobes between coxae 4 and 5, ventrocaudal view; 10 — sternite between coxae 12 and 13, anteroventral view; 11 — leg 7, lateral view; 12–15 — left gonopod, lateral, mesal, ventral and dorsal views, respectively. Abbreviations explained in text. Scale bars: 1.0 mm (7–10, 12–15) or 1.5 mm (11).

Рис. 7–15. *Anoplodesmus nguyenii* sp.n., паратип ♂. 7 — вершина эпипрокта, сверху; 8 — гипопрокт, снизу; 9 — стеральные пластинки между тазиками 4 и 5, одновременно снизу и сзади; 10 — стерниты между тазиками 12 и 13, одновременно спереди и снизу; 11 — нога 7, сбоку; 12–15 — левый гонопод, соответственно сбоку, изнутри, снизу и сверху. Объяснения обозначений в тексте. Масштаб: 1,0 мм (7–10, 12–15) и 1,5 мм (11).



Figs 16–19. *Anoplodesmus nguyenii* sp.n., ♂ paratype, left gonopod, dorsal, anteroventral, lateral and mesal views, respectively. Pictures by K.V. Makarov, taken not to scale.

Рис. 16–19. *Anoplodesmus nguyenii* sp.n., паратип ♂, левый гонопод, соответственно сверху, одновременно спереди и снизу, сбоку и изнутри. Фотографии К.В. Макарова, сняты без масштаба.

narrowly bordered and regularly rounded laterally (Fig. 2), thereafter fully reduced, traceable only as weak rounded swellings supporting ozopores on most of poriferous metaterga (Figs 2, 3, 5). Tergal setae mostly abraded, each ca. 1/3 as long as metatergum, pattern clearly traceable at least as 2+2 insertion points in one transverse row in anterior half of each metatergum; three transverse rows of setae on collum. Limbus entire. Stricture between pro- and metazonae deep and thin, very delicately striolate at bottom. Transverse metatergal sulci and an axial line missing. Pleurosternal carinae distinct, complete, arcuated and bordered ridges increasingly reduced to a line towards segment 16 (Fig. 2) (♂, ♀). Epiproct (Figs 6, 7) long, tip very small and subtruncate, lateral pre-apical papillae small, but evident. Hypoproct (Fig. 8) almost semi-circular, caudal margin with 1+1 setae borne on distinct and round knobs. Sterna densely setose, cross-impressions deep; sternum between legs 3 with a paramedian pair of round and setose tubercles, that between ♂ legs 4 with a single, transverse, high, setose and bifid lobe, that between ♂ legs 5 with a smaller, similarly setose, but sharp fork (Figs 4, 9). Following sterna with increasingly long,

strong, paramedian, caudal spines, anterior pair per body segment being slightly shorter than caudal pair (Fig. 10). No tubercles near gonopod aperture.

Legs strikingly and increasingly long and slender towards telson (Figs 1, 2, 11), mostly very densely setose, especially so ventrally (Fig. 11), but true tarsal brushes traced only on a few anterior ♂ legs (Fig. 4); adenostyles absent; ♂ prefemora bulged laterally (Fig. 11), but bulges increasingly reduced towards telson; ♂ legs clearly longer than ♀ ones, ca. 2.0 to >3.5x (♂) or ca. 1.5 to 2.5x (♀) as long as body height.

Gonopods (Figs 12–19) typical of the *elongissimus* group; coxite long, slender, subcylindrical, setose distoventrally, about as long as a distally very strongly enlarged femorite (**fe**) and clearly longer than a densely setose prefemoral part; postfemoral region particularly complex, massive, ribbed and crumpled, with at least seven differently shaped spines in various places on solenophore (**sph**), and a remarkably long and flagelliform solenonome (**sl**).

REMARKS. The large, South to Southeast Asian genus *Anoplodesmus* Pocock, 1895 is known to presently contain



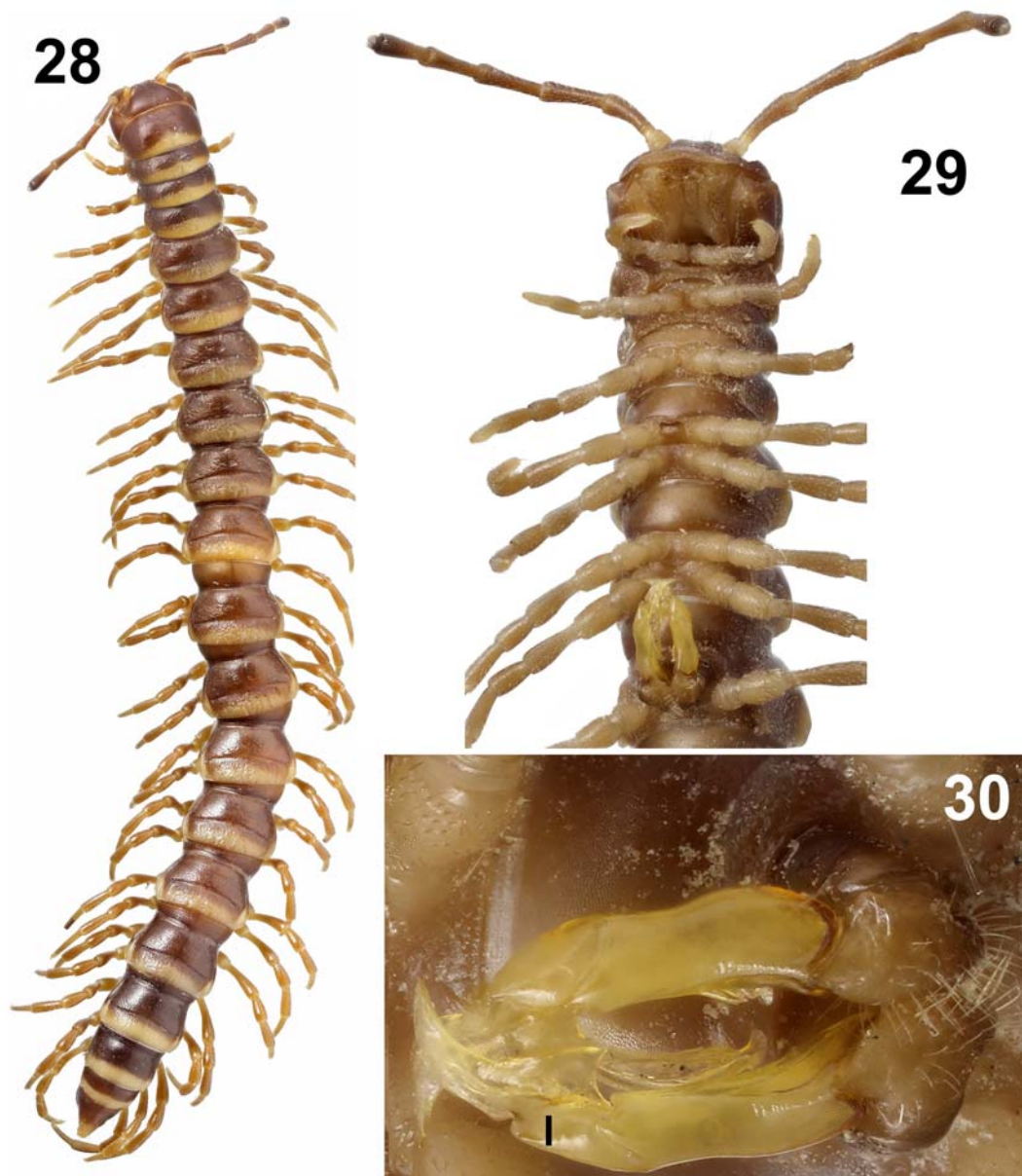


Figs 20–27. *Hylomus proximus* (Nguyen, Golovatch et Anichkin, 2005), ♂ from Pu Mat National Park. 20, 21 — habitus, dorsal and lateral views, respectively; 22 — anterior part of body, ventral view; 23 — body segments 7–10, ventral view; 24–26 — body segment 7 with gonopods *in situ*, ventral, lateral and sublateral views, respectively; 27 — both gonopods *in situ*, lateral view. Pictures by K.V. Makarov, taken not to scale.

Рис. 20–27. *Hylomus proximus* (Nguyen, Golovatch et Anichkin, 2005), ♂ из национального парка Пу Мат. 20, 21 — общий вид, соответственно сверху и сбоку; 22 — передняя часть тела, снизу; 23 — туловищные сегменты 7–10, снизу; 24–26 — туловищный сегмент 7 с гоноподами на месте, соответственно снизу, сбоку и почти сбоку; 27 — оба гонопода на месте, сбоку. Фотографии К.В. Макарова, сняты без масштаба.

35 described species which range from Sri Lanka, India and Nepal in the west, through the East Indies and Thailand, to Indochina (Vietnam), central China and Taiwan in the east [Chen *et al.*, 2010; Golovatch, Semenyuk, 2010; Nguyen, 2010b; Golovatch, 2013, 2015]. There are two main species groups recognized within *Anoplodesmus*, both rather distinct. The larger one, the *anthracinus* group, comprises all large-sized, as well as some medium to smaller species with mainly strongly developed, mostly at least traceable paraterga, and with relatively simple gonopods, including a relatively short solenomere. All such species occur in Sri Lanka, India, Nepal, Myanmar, southern Thailand and Sumatra,

Indonesia, and one such species, *A. saussurii* (Humbert, 1865), is particularly widespread, being introduced through human agency to Mauritius, Malaysia, Singapore and Fiji. Through a number of intermediates and transitions like *A. spinosus* Golovatch, 2016, from Nepal [Golovatch, 2016], *A. loebli* Golovatch, 2000, from Malaysia [Golovatch, 2000], or *A. tarmani* Mršić, 1992, from the southern Malay Peninsula within both Malaysia and Thailand [Mršić, 1992], in all three of which the paraterga are poorly-developed, but still clearly visible as low calluses, while the solenomere is as usual, not too long, the opposite extreme encompasses only seven species [Golovatch, Semenyuk, 2010; Nguyen, 2010b;



Figs 28–30. *Kronopolites swinhoei* (Pocock, 1895). ♂ from Shaanxi Prov. 28 — habitus, dorsal view; 29 — anterior part of body, ventral view; 30 — both gonopods *in situ*, ventral view. Pictures by K.V. Makarov, taken not to scale.

Рис. 28–30. *Kronopolites swinhoei* (Роскок, 1895). ♂ из провинции Шэньси. 28 — общий вид, сверху; 29 — передняя часть тела; 30 — оба гонопода на месте, снизу. Фотографии К.В. Макарова, сняты без масштаба.

Golovatch, 2013]. These species are assigned to the *elongissimus* group, all being relatively small in size and characterized by virtually or nearly completely reduced paraterga, strongly developed pleurosternal carinae, spinose sterna, unusually long and slender legs that very considerably and increasingly grow in length towards the telson, and particularly elaborate gonopods, including the remarkably spinose solenophore and long solenomere. Such species range from the Himalayas of India in the west, through northern Thailand and central China, to Taiwan in the east, thus being distributed rather randomly, but largely confined to the eastern part of the generic distribution area.

Nguyen [2010] listed most (31) of the species of *Ano-*

*plodesmus*, described two new species and keyed all three congeners then known from Vietnam. It is because of the later described *A. chinesis* Golovatch, 2013, from the *elongissimus* group from central China, and *A. magnus* Golovatch, 2015, from the *anthracinus* group from Nepal, that the species diversity of *Anoplodesmus* has since amounted to 35, while Golovatch & Semenyuk [2010] not only outlined and diagnosed the *elongissimus* group, but they also keyed all of its constituent species (5) then known. Together with Nguyen's [2010b] key to all three *Anoplodesmus* species hitherto reported from Vietnam, all representing the *elongissimus* group, diagnosing the above new congener becomes very simple.





Figs 31, 32. *Kronopolites ramosus* sp.n., live ♀ and ♂ paratypes, respectively. Pictures by I.I. Semenyuk, taken not to scale.

Рис. 31, 32. *Anoplodesmus ramosus* sp.n., соответственно живые паратипы ♀ и ♂. Фотографии И.И. Семенюк, сняты без масштаба.

**BIOLOGY.** Animals inhabit leaf litter, especially litter accumulations and suspended soil on stones near streams (Figs 109, 110). During daytime, animals keep in litter, but in the night some appear on open forest floor, actively walking. During the expedition time, leaf litter was scarce and absent from most of steep hills, but suspended soils on rocks near rivers were abundant. Most of soil fauna inhabited that microhabitat.

*Hylomus proximus* (Nguyen, Golovatch  
et Anichkin, 2005)  
Figs 20–27.

**MATERIAL.** 1 ♂, 1 ♀, 1 juv. (ZMUM), Vietnam, Nghe An Prov., Pu Mat National Park, N18°55', E104°35', 680 m a.s.l., mixed tropical forest on hill slopes, bottom part with a boggy permanent stream, in leaf litter, daytime, April 2018; 1 ♀ (ZMUM), Vietnam, Nghe An Prov., Pu Hoat National Park, N19°45', E104°47', 960 m a.s.l., deciduous tropical forest at bottom of river valley, in bush, daytime, April 2021, all I. I. Semenyuk leg.

**REMARKS.** This species was originally described as *Desmoxytes proxima* from Laocai Province, northern Vietnam [Nguyen *et al.*, 2005], later transferred to *Hylomus* Cook et Loomis, 1924 by Srisonchai *et al.* [2018]. It has hitherto been considered as narrowly endemic to the Mount Fansipan region [Nguyen *et al.*, 2021], but the above new samples allow for the distribution of *H. proximus* to be considerably extended south to a hilly lowland part of north-central Vietnam. New illustrations (Figs 20–27) are provided to confirm the species' identity.

**BIOLOGY.** Unlike many other *Hylomus*, this species failed to get accumulated in certain habitats or even to form dense groups. Animals were found occasionally. They seemed to prefer a very special habitat, i.e. very wet bottoms of river valleys, just next to water, with dense herbaceous plants growing with no trees. The animals did not occur in other types of forest, the most typical marker of their habitat being abundant fern thickets of *Angiopteris* sp. (Fig. 108). Millipedes live on forest floor or burrow inside plant debris on its surface, but they can also climb up plants on rainy days (Fig. 111). With very hard rains in the mountains, this habitat is easy to getting flooded for a short time. Thus, climbing up

plants may be regarded as an adaptation of the millipede to survival during flooding.

*Kronopolites swinhoei* (Pocock, 1895)  
Figs 28–30.

**MATERIAL.** 1 ♂ (SMF), China, Shaanxi Prov., Qin Ling Mts, S flanks, primary broadleaved forest, 1500 m a.s.l., 4.VII.1997, J. Martens, P. Jäger leg.; 1 ♂ (SMF), China, Sichuan Prov., Feng Xia near Ya'an, 1300 m a.s.l., 24.IV.2012, J. Martens leg.

**REMARKS.** This large species with a peculiar colour pattern and characteristic gonopodal structure (Figs 29–31) is widespread across central China: Gansu and Shaanxi provinces, at 1300–1700 m a.s.l. [Golovatch, Liu, 2020]. The particularly similar and even more widely distributed Chinese endemic, *K. biagrilectus* Hoffman, 1963, occurs in Jiangxi, Sichuan and Yunnan provinces, at 35–3600 m a.s.l. [Golovatch, Liu, 2020]. Golovatch [2020] has recently reviewed the genus *Kronopolites* Attems, 1914 and provided a key to all of its 11 hitherto known species. Another new species is added below. Postfemoral lobe I of the gonopodal telopodite in *K. swinhoei* is small, but visible (Fig. 30), clearly demarcated at the base by a subtransverse lateral sulcus (see also below).

*Kronopolites ramosus* sp.n.  
Figs 31–46.

**HOLOTYPE** ♂ (ZMUM), Vietnam, Nghe An Prov., Pu Mat National Park, N18°56', E104°37', 350 m a.s.l., mixed tropical forest on hill slopes, bottom part with a permanent stream, leaf litter, daytime, April 2018, I.I. Semenyuk leg.

**PARATYPES:** 3 ♂♂, 2 ♀♀ (ZMUM), same data, together with holotype.

**DIAGNOSIS.** Using the latest key to all 11 species of *Kronopolites* known to date [Golovatch, 2020], the new species keys out to a dead end in couplet 8, being distinguished from all congeners by the uniformly dark dorsum devoid of a colour pattern, coupled with a missing sternal lobe between ♂ coxae 4, the presence of a small, indistinct, but quite discernible postfemoral lobe I; an unequally bifurcate solenophore (**sph**) deeply split into a longer, distally strongly enlarged and helicoid proximal branch (c) and a shorter, ribbon-shaped and truncate distal branch (d); an



Figs 33–37. *Kronopolites ramosus* sp.n., ♂ paratype. 33 — habitus, lateral view; 34, 35 — anterior part of body, dorsal and ventral views, respectively; 36 — midbody segments, dorsal view; 37 — posterior part of body, dorsal view. Pictures by K.V. Makarov, taken not to scale.

Рис. 33–37. *Kronopolites ramosus* sp.n., паратип ♂. 33 — общий вид, сбоку; 34, 35 — передняя часть тела, соответственно сверху и снизу; 36 — среднетеловишние сегменты, сверху; 37 — задняя часть тела, сверху. Фотографии К.В. Макарова, сняты без масштаба.

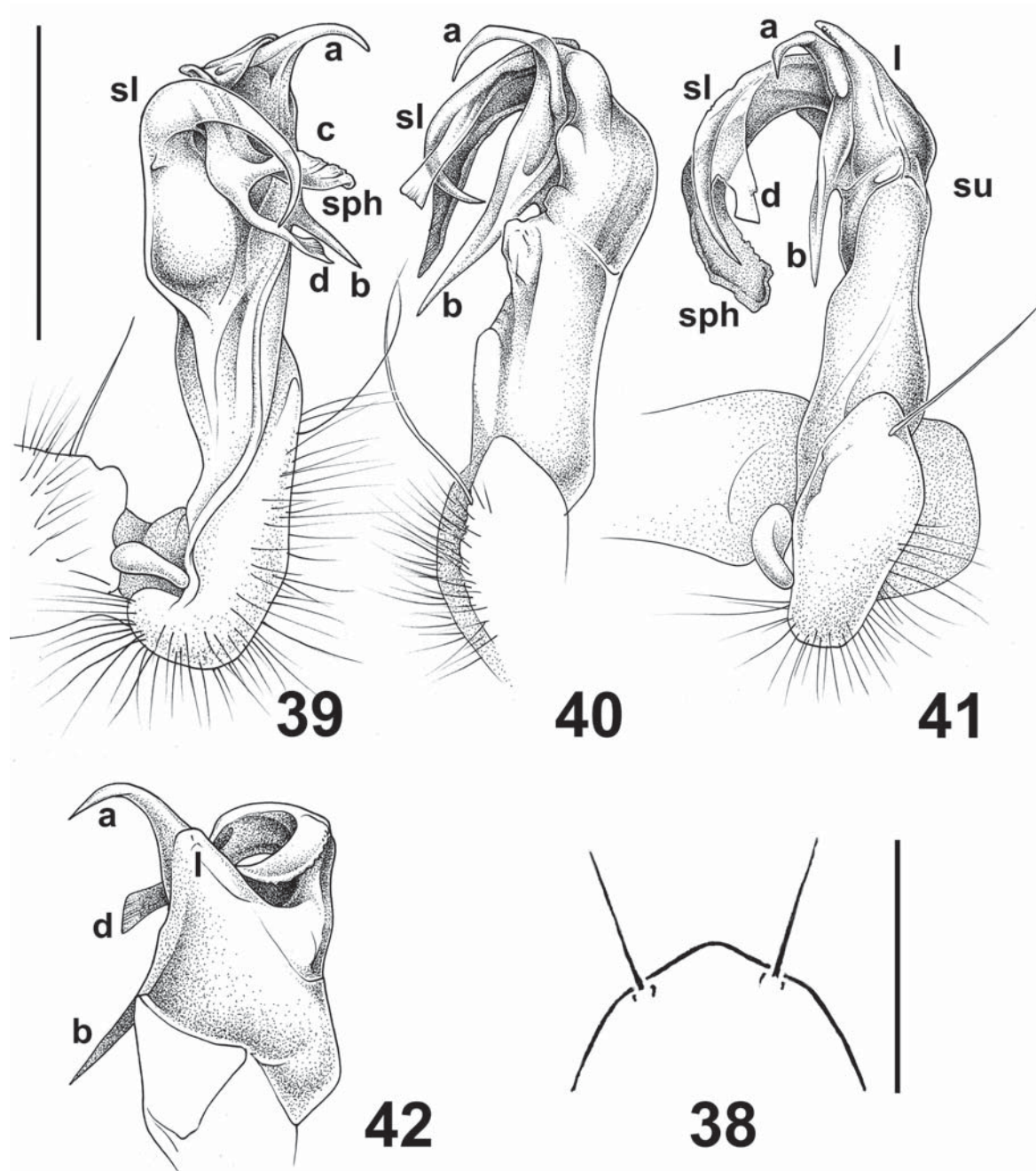
unciform, postfemoral, apical process **a** and a straight, post-femoral, basal process **b**, both **a** and **b** being slender and acuminate, located just distal to **l**, and sharing a very broad lobe-shaped base (Figs 38–42).

NAME. To emphasize the strongly ramose postfemoral portion of the gonopod, including the presence of an apico-lateral lobe (**l**) which is not so typical of the genus.

DESCRIPTION. Length ca. 36–40 (♂) or 39–42 mm (♀), width of midbody pro- and metazonae 3.0–3.1 and 3.8–

4.0 mm (♂), or 3.2–3.3 and 4.0–4.1 mm (♀), respectively. Holotype ca. 36 mm long, 3.0 and 3.9 mm wide on midbody pro- and metazonae, respectively. Live coloration uniformly dark brown to brown, with contrasting pale, yellowish antennae and legs (Figs 31, 32); coloration in alcohol very similar (Figs 33–37), prozonae and sides of metazonae below paraterga slightly, but venter considerably lighter than metaterga; a narrow, grey, axial stripe showing through a translucent tegument only on prozonae.



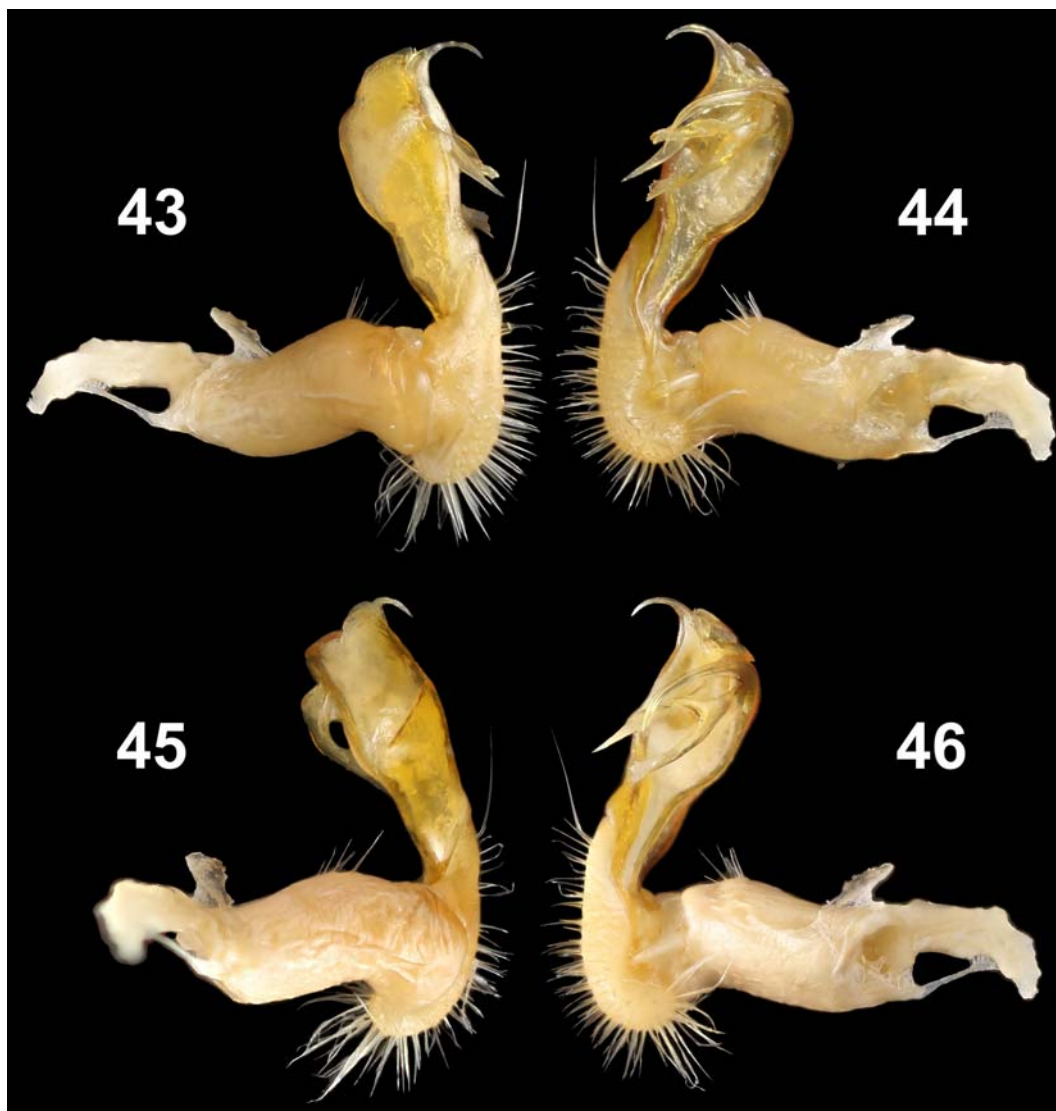


Figs 38–42. *Kronopolites ramosus* sp.n., ♂ paratype. 38 — hypoproct, ventral view; 39–41 — left gonopod, mesal, lateral and ventral views, respectively; 42 — solenophore, sublateral view. Abbreviations explained in text. Scale bar: 0.9 mm (38), 1.0 mm (39–41) and 42 is not to scale.

Рис. 38–42. *Kronopolites ramosus* sp.n., паратип ♂. 38 — гипопрокт, снизу; 39–41 — левый гонопод, соответственно изнутри, сбоку и снизу; 42 — соленофор, почти сбоку. Объяснения обозначений в тексте. Масштаб: 0,9 мм (38), 1,0 мм (39–41) и 42 без масштаба.

Entire head densely setose; epicranial suture fine, but distinct (Figs 34, 35). Antennae long, slender and only slightly clavate (Figs 35–37), extending past metatergum 2 when stretched dorsally (♂, ♀). In length, antennomere 2=3=5=6>4>>1=7. Interantennal isthmus almost as wide as diameter of antennal socket (Fig. 35). Tegument shining, mostly smooth, only metazonae below paraterga finely microgranulate and rugose/rugulose. In width, head = segment 3 = 4 <

collum < 2 < 5–16; body gradually tapering thereafter (Figs 34–37). Paraterga moderately developed, slightly better so in ♂ compared to ♀, mostly set at about upper 1/4–1/3 of midbody height, slightly declined; in lateral view, calluses smooth, much thicker on pore-bearing segments than on poreless ones, delimited by a distinct and complete sulcus only dorsally, but with an anteriorly abbreviated sulcus ventrally (to 1/4 in poreless segments, to 3/4 in pore-bearing



Figs 43–46. *Kronopolites ramosus* sp.n., ♂ paratype, right gonopod, lateral, mesal, sublateral and submesal views, respectively. Pictures by K.V. Makarov, taken not to scale.

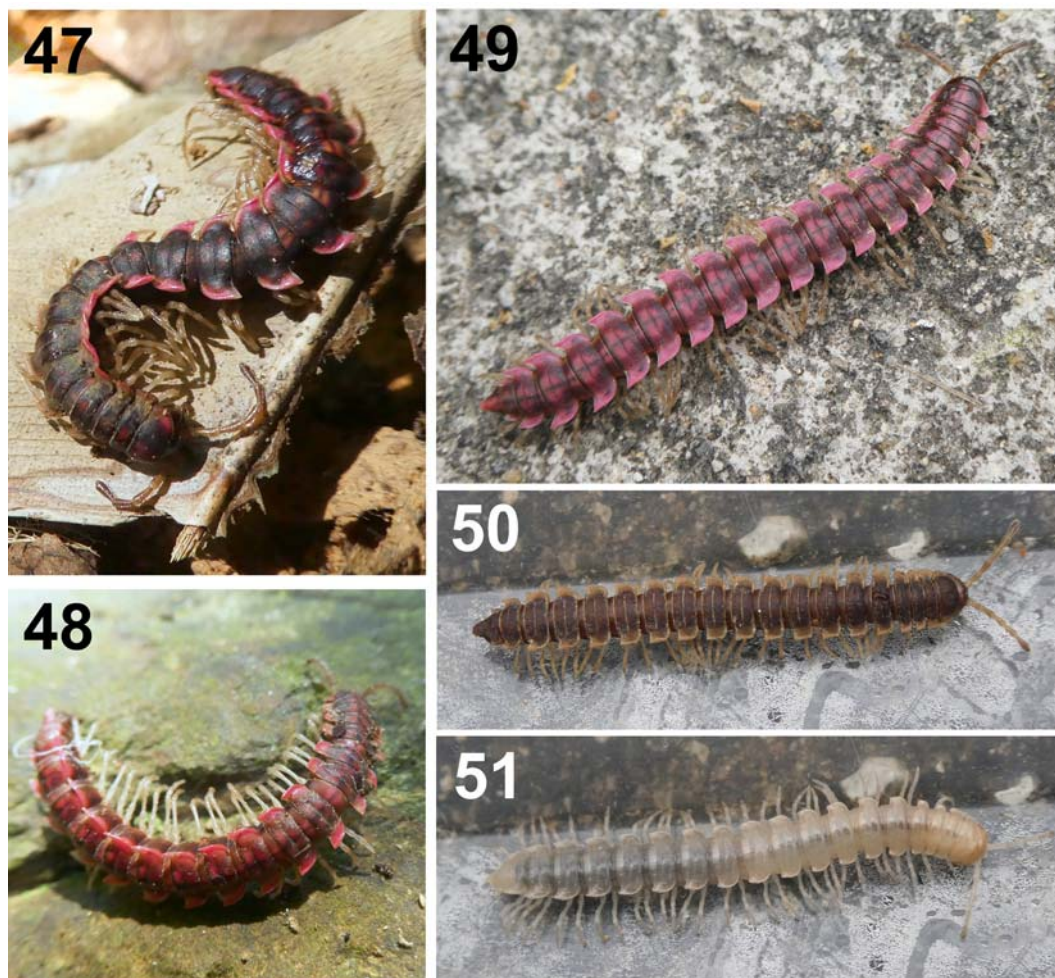
Рис. 43–46. *Kronopolites ramosus* sp.n., паратип ♂, правый гонопод, соответственно сбоку, изнутри, почти сбоку и почти изнутри. Фотографии К.В. Макарова, сняты без масштаба.

ones); paraterga on collum particularly thin, narrowly bordered, rather regularly and broadly rounded; paraterga 2 set especially low, as usual, clearly drawn into a rounded lappet and a strong tooth forward and caudad, respectively; in dorsal view, anterolateral margin of following paraterga strongly and regularly rounded, lateral edge of poreless caluses almost straight, of pore-bearing ones clearly thickened in caudal 1/3 to mark a small and dorsally almost invisible ozopore; caudal corners of paraterga 3–15 rounded, thereafter dentiform and increasingly produced past rear tergal margin, sharp in paraterga 18 and 19 (Figs 33–37). Each ozopore lying inside an elongate groove in front of caudal corner of poriferous paraterga. Tergal setae mostly abraded, each ca. 1/4 as long as metatergum, pattern traceable as 2+2 in one transverse row in anterior half of each metatergum. Limbus entire. Stricture between pro- and metazonae deep and thin, very delicately striolate at bottom. Transverse metatergal sulci clear, indistinctly punctured at bottom, mostly

reaching the bases of paraterga, present on segments 5–17, thinner on 18<sup>th</sup> (Figs 33, 34, 36, 37). Axial line missing. Pleurosternal carinae very distinct, complete, arcuated and granulated ridges with a narrowly rounded caudal tooth (♂) or lappet (♀) only on segments 2–4, thereafter increasingly reduced, but remaining complete towards segment 18. Epiproct (Fig. 37) long, conical, tip subtruncate, lateral pre-apical papillae small, but evident. Hypoproct (Fig. 38) almost semi-circular, caudal margin with 1+1 setae borne on minute knobs. Sterna densely setose, cross-impressions shallow, without modifications; neither lobe between ♂ coxae 4 nor tubercles near gonopod aperture (Fig. 35).

Legs long and slender (Figs 33–37), only slightly longer and incrassate in ♂ compared to ♀, midbody ones ca. 1.5–1.6 (♂) or 1.2–1.3 (♀) times as long as body height, very densely setose, neither adenostyles nor laterally swollen prefemora; ventral brushes on ♂ tarsi gradually thinning out towards segment 9 or 10.





Figs 47–51. *Parasundanina medialis* (Nguyen, 2010), live specimens from Pu Mat (♂, 47 and 48) and Pu Hoat (♂ topotype, 49, 50, and ♀ topotype, 51). Pictures by I.I. Semenyuk, taken not to scale.

Рис. 47–51. *Parasundanina medialis* (Nguyen, 2010), живые особи из Пу Мат (♂, 47 and 48) и Пу Хоат (топотип ♂, 49, 50, и топотип ♀, 51). Фотографии И.И. Семенюк, сняты без масштаба.

Gonopods (Figs 39–46) rather typical of the genus, relatively complex, multiramose, both *in situ* held parallel to each other, with tips directed mesad and crossing each other. Coxite subcylindrical, almost as long as telopodite, setose distoventrally; cannula as usual, a small, curved, hollow tube. Prefemoral (= densely setose) part almost as long as acropodite, but slightly longer than a medially hollow femorite. Seminal groove running along mesal face of femorite, moving onto a very long, flagelliform, free solenomere (**sl**) at base of a simple, small, postfemoral, lateral lobe (**l**) demarcated at base by a distinct, subtransverse, lateral sulcus (**su**), **sl** being supported by a massive solenophore (**sph**); postfemoral part bearing not only lobe **l** and a bifurcate **sph**, but also two distinct processes arising immediately distal to **l**: a curved, rather short, apical hook (**a**) and a longer, straight and similarly acuminate, basal spine **b**, both **a** and **b** sharing a very broad lobe-shaped base; both branches of **sph** unequal and coiled, distal branch (**d**) being shorter, ribbon-shaped and truncate compared to a longer, more massive, distally strongly enlarged and helicoid proximal branch (**c**).

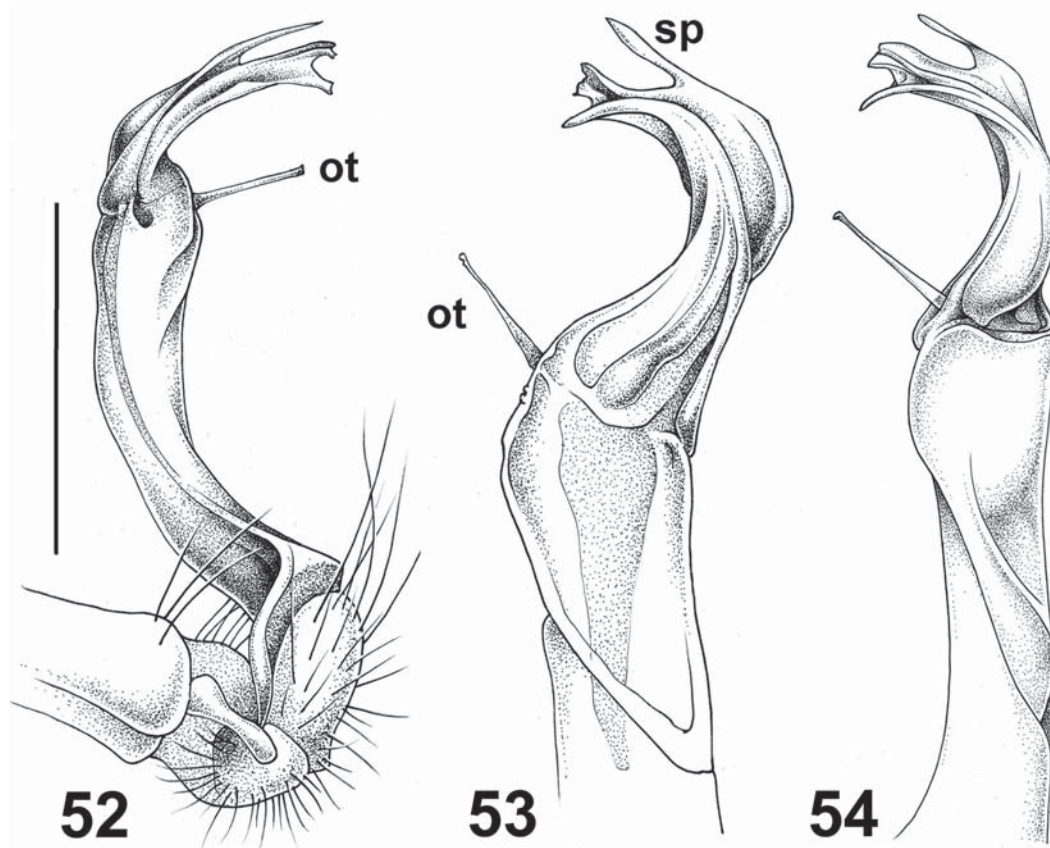
REMARKS. In showing a postfemoral, lateral lobe **l**, however small, on the gonopodal telopodite, *Kronopolites ramosus* sp.n. strongly resembles not only several other

congeners, e.g., *K. davidiani* Golovatch, 2014, *K. lunatus* Likhitrakarn, Golovatch et Panha, 2015, *K. montanus* Golovatch, 2009, *K. swinhoei* (Pocock, 1895) or *K. typicus* Golovatch, 2020 [Golovatch, 2009, 2014, 2020; Likhitrakarn *et al.*, 2015], but also all or some of the species representing further three genera of the tribe Sulciferini: *Oxidus* Cook, 1911, *Tylopus* Jeekel, 1968 and *Hedinomorpha* Verhoeff, 1934 [Golovatch, 2021]. However, postfemoral lobe **l**, if any, is not so strongly developed in *Kronopolites* compared to most species of the latter three genera (Figs 31, 39–46).

BIOLOGY. Animals were quite abundant and mainly inhabited leaf litter in the day time, occasionally appeared on log surfaces and forest floor. At night, they were active in open habitats, walking on floor, log surfaces, and tree trunks. Animals clearly preferred wet sites near streams, especially with abundant wild bananas which often grew in boggy areas. Millipedes were absent from drier hills slopes.

*Parasundanina medialis* (Nguyen, 2010)  
Figs 47–63.

MATERIAL. 1 ♂, 1 ♀ (ZMUM), Vietnam, Nghe An Prov., Pu Mat National Park, N18°56', E104°37', 350 m a.s.l., mixed tropical



Figs 52–54. *Parasundanina medialis* (Nguyen, 2010), ♂ topotype from Pu Mat, left gonopod, mesal, lateral and ventrolateral views, respectively. Abbreviations explained in text. Scale bar: 2.0 mm (52) and 1.0 mm (53, 54).

Рис. 52–54. *Parasundanina medialis* (Nguyen, 2010), топотип ♂ из Пу Мат, левый гонопод, соответственно изнутри, сбоку и одновременно снизу и сбоку. Объяснения обозначений в тексте. Масштаб: 2,0 мм (52) и 1,0 мм (53, 54).

forest on hill slopes, bottom part with a permanent stream, leaf litter, daytime, April 2018; 3 ♂♂, 5 ♀♀ (ZMUM), Vietnam, Nghe An Prov., Pu Hoat National Park, N19°45', E104°47', 960 m a.s.l., deciduous tropical forest on hill slopes, on forest floor and in bushes, daytime, April 2021, all I.I. Semenyuk leg.

**REMARKS.** This species was originally described as *Sundanina medialis* Nguyen, 2010, from both Thanh Hoa and Ninh Binh provinces, northern Vietnam [Nguyen, 2010a], later transferred to *Parasundanina* Golovatch, 2019 [Golovatch, 2019]. The above samples are the first to be reported from Nghe An Province, north-central Vietnam.

In addition to minor variations in coloration (Figs 47–51), slight, but remarkable variations are also noted in the length and shape of both the ventral gonopostfemoral process (**ot** in Nguyen [2010a] and Figs 52–63) and the apical spine of the lamina medialis (**sp** in Nguyen [2010] and Figs 52–63) of this species. These variations seem to be purely individual, as they are not encountered in ♂ samples from Pu Mat alone, partly also from Pu Hoat, in which both **ot** and **sp** can be typically long and slender (Figs 61–63, cf. Nguyen [2010a]) to somewhat or even considerably shorter and subhelicoid (Figs 55–60).

**BIOLOGY.** Like many other diplopod species in this area, animals were hiding in leaf litter during the daytime. In the night time, few of them appeared in open areas.

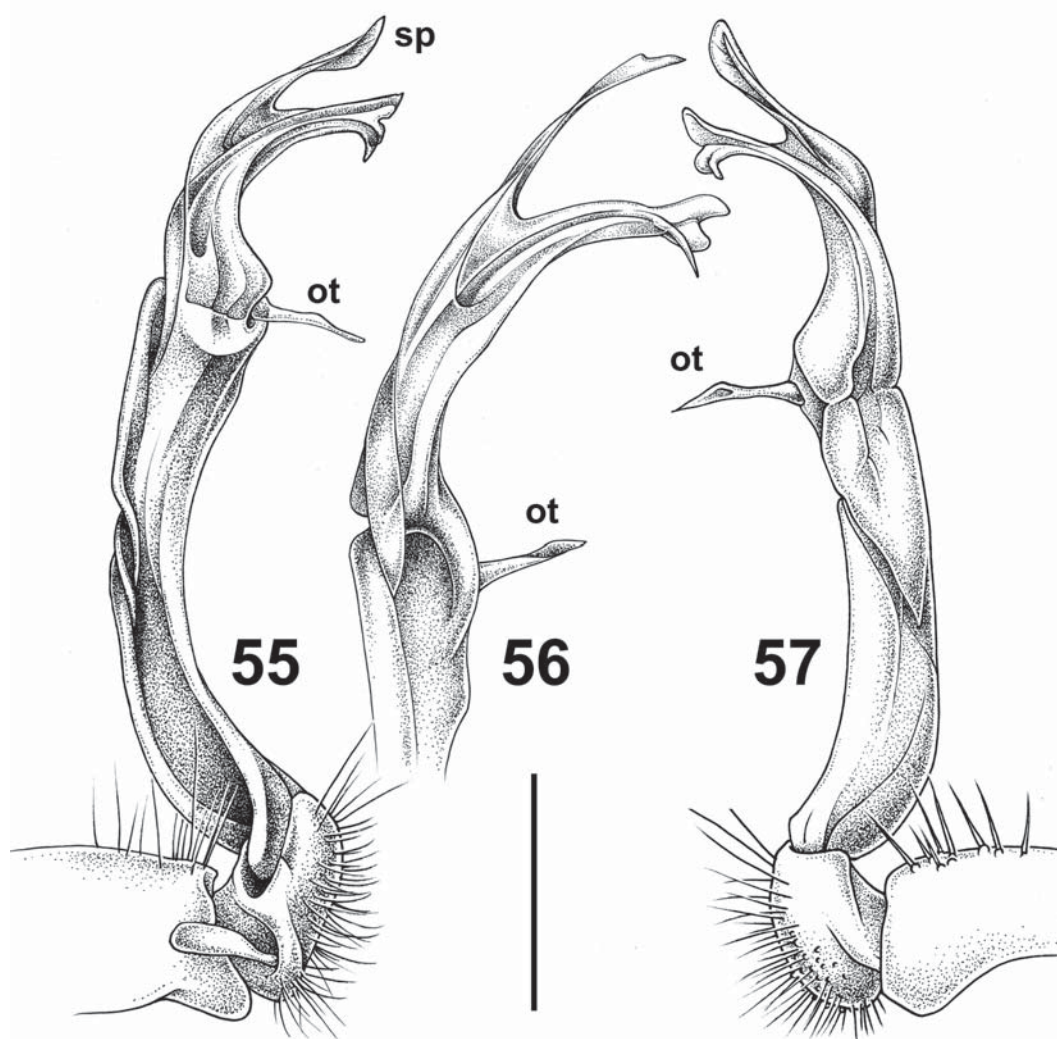
#### *Sellanucheza grandis* (Golovatch, 1984) Figs 64–73.

**MATERIAL.** 5 ♂♂, 2 ♀♀ (ZMUM), Vietnam, Nghe An Prov., Pu Mat National Park, N18°57', E104°41', 180 m a.s.l., mixed tropical forest on hill slopes, bottom part with a permanent stream, leaf litter and on forest floor, daytime, April 2018; 2 ♂♂, 1 ♀ (ZMUM), Vietnam, Nghe An Prov., Pu Hoat National Park, N19°45', E104°47', 960 m a.s.l., deciduous tropical forest on hill slopes, in leaf litter, night time, April 2021, all I.I. Semenyuk leg.

**REMARKS.** This large species with a peculiar gonopodal structure (Figs 68–73) is widespread across northern Vietnam, where, among other places, it has already been recorded from Pu Mat National Park [Golovatch, 1984; Nguyen, 2011]. New illustrations (Figs 64–73) are provided not only to confirm the species' identity, but also to show minor variations in coloration, as well as somatic and gonopodal structure. The coloration varies from nearly blackish or dark brown with contrasting reddish paraterga/ozopore regions and legs (Figs 64–67) to uniformly nearly pallid.

**BIOLOGY.** Millipedes usually spend the daytime in leaf litter, feeding on it and forming small chambers filled with excrements. In the night time or during a rain, millipedes come out to open spaces and walk actively on the forest floor. A very abundant species in both Pu Mat and Pu Hoat national parks.





Figs 55–57. *Parasundanina medialis* (Nguyen, 2010), ♂ from Pu Hoat (Fig. 50 live), left gonopods, mesal, submesal, lateral views, respectively. Abbreviations explained in text. Scale bar: 1.0 mm (55, 57) and 56 is not to scale.

Рис. 55–57. *Parasundanina medialis* (Nguyen, 2010), ♂ из Пу Хоат, (Рис. 50 живая особь), левые гоноподы, соответственно изнутри, почти изнутри, сбоку. Объяснения обозначений в тексте. Масштаб: 1,0 мм (55, 57) и 56 не в масштабе.

*Tylopus simplex* sp.n.  
Figs 74–92.

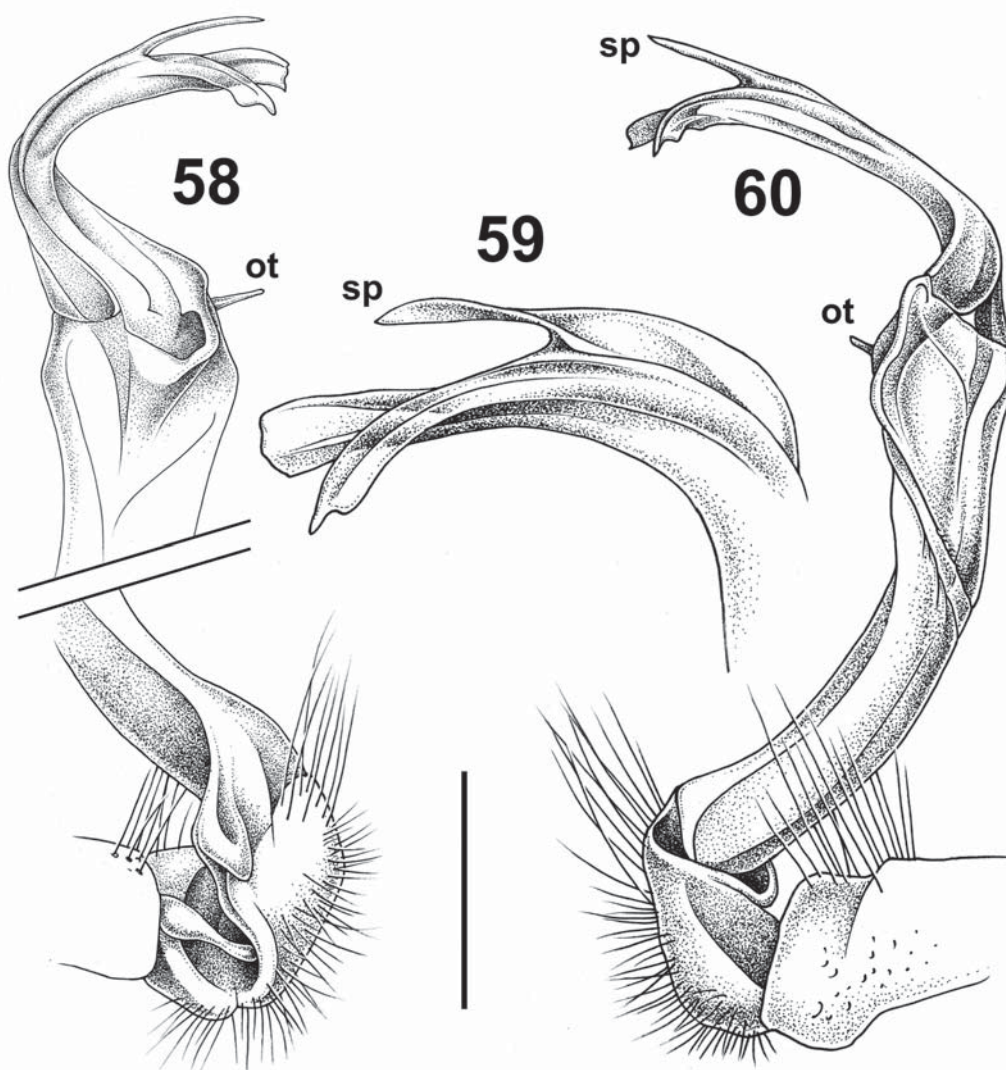
HOLOTYPE ♂ (ZMUM), Vietnam, Nghe An Prov., Pu Mat National Park, N18°57', E104°41', 180 m a.s.l., mixed tropical forest on hill slopes, bottom part with a permanent stream, leaf litter and on forest floor, daytime, April 2018, I.I. Semenyuk leg.

PARATYPES: 1 ♂ (fragmented), 1 ♀ (ZMUM), same data, together with holotype.

DIAGNOSIS. The genus *Tylopus* Jeekel, 1968 is the largest in Paradoxosomatidae, presently counting 76 species described from Indochina, Thailand, Myanmar and southern China [Likhitrakarn *et al.*, 2021]. The new species is distinct in showing a gonopodal conformation perhaps one of the simplest among congeners (postfemoral region at base of lateral lobe I represented solely by a poorly discernible, transverse, undulate outgrowth z), coupled with the well-developed paraterga, the roughly punctured and tuberculate metaterga, and the presence of two fully divided transverse lobes between ♂ coxae 4 and of adenostyles on ♂ legs.

DESCRIPTION. Length ca. 19 (♂ holotype) or 23 mm (♀), width of midbody pro- and metazonae 1.8 and 2.2 mm (♂ holotype and ♂ paratype), or 2.7 and 3.0 mm (♀), respectively. Live coloration and coloration in alcohol after 3 years of preservation very similar (Figs 74–79), mostly brown to dark brown; pattern distinct, with a darker, thin, axial line and two darker, horologiform, paramedian, wider stripes on pro- and metaterga, coupled with contrasting pale, yellow-brown paraterga, epiproct, hypoproct and small, metatergal, setigerous knobs; antennae and legs increasingly infusate distad, antennomere 7 dark brown, 8<sup>th</sup> contrasting pallid (Figs 74, 78); sides brown, venter lighter.

Entire head very densely setose; epicranial suture fine, but distinct (Fig. 78). Antennae rather short, slender and only slightly clavate (Figs 74–78), *in situ* extending past metatergum 2 (♂) or collum (♀) when stretched dorsally. In length, antennomere 3=6>2=4=5>>1=7. Interantennal isthmus almost as wide as diameter of antennal socket (Fig. 78). Tegument mostly dull, but metaterga often rather shining and roughly punctured and tuberculate; prozonae smooth



Figs 58–60. *Parasundanina medialis* (Nguyen, 2010), ♂ from Pu Hoat (Fig. 49 live), left gonopods, ventromesal, ventrolateral and lateral views, respectively. Abbreviations explained in text. Scale bar: 1.0 mm (58, 60) and 59 is not to scale.

Рис. 54–59. *Parasundanina medialis* (Nguyen, 2010), ♂ из Пу Хоат (Рис. 49 живая особь), левые гоноподы, соответственно одновременно снизу и изнутри, одновременно снизу и сбоку, а также сбоку. Объяснения обозначений в тексте. Масштаб: 1,0 мм (58, 60) и 59 не в масштабе.

and finely shagreened, metazonae below paraterga finely microgranulate. In width, head < collum = segment 3 = 4 < 2 = 5–16(17); body gradually tapering thereafter (Figs 77–79). Dorsum strongly convex. Paraterga well-developed, slightly better so in ♂ compared to ♀, mostly set at about upper 1/3 of midbody height, at base clearly declined, then mostly subhorizontal, always thin and blade-shaped; lateral calluses delimited by a distinct, complete and very narrow sulcus only dorsally, also with a considerably weaker and anteriorly abbreviated sulcus ventrally in pore-bearing segments; paraterga on collum particularly small, with a setigerous incision laterally near midway and drawn into a small, sharp, subrectangular tooth caudally, remaining within caudal tergal contour; paraterga 2 set especially low, as usual, clearly drawn into a rounded lappet and a strong tooth forward and caudad, respectively, with three lateral setigerous incisions; in dorsal view, anterolateral margin of follow-

ing paraterga strongly and regularly rounded into shoulder, lateral edge of poreless calluses with two setigerous incisions, of pore-bearing ones with one such incision; caudal corners of paraterga 3–19 spiniform, sharp, very clearly drawn past caudal tergal margin, tips of paraterga 17–19 curved mesad (Figs 77–79). Each ozopore lying inside a small elongate groove at rear 1/3 off caudal corner of poriferous paraterga. Tergal setae simple, mostly abraded, each ca. 1/3 as long as metatergum, pattern readily traceable as two or three regular transverse rows of lighter, rounded or slightly longitudinally oblong, setigerous knobs, caudal knobs usually being somewhat larger: three rows on collum (4(5)+4(5), 2+2 and 4+4), two rows on metaterga 2–4 (3+3 and 4+4), followed by 3(4)+3(4) and 4+4 until metatergum 10 or 11, thereafter an increasingly evident, 3<sup>rd</sup>, intermediate row just before caudal row: fore 4(5)+4(5) before sulcus, and 3–5+3–5 and 5–7+5–7, both latter rows located behind





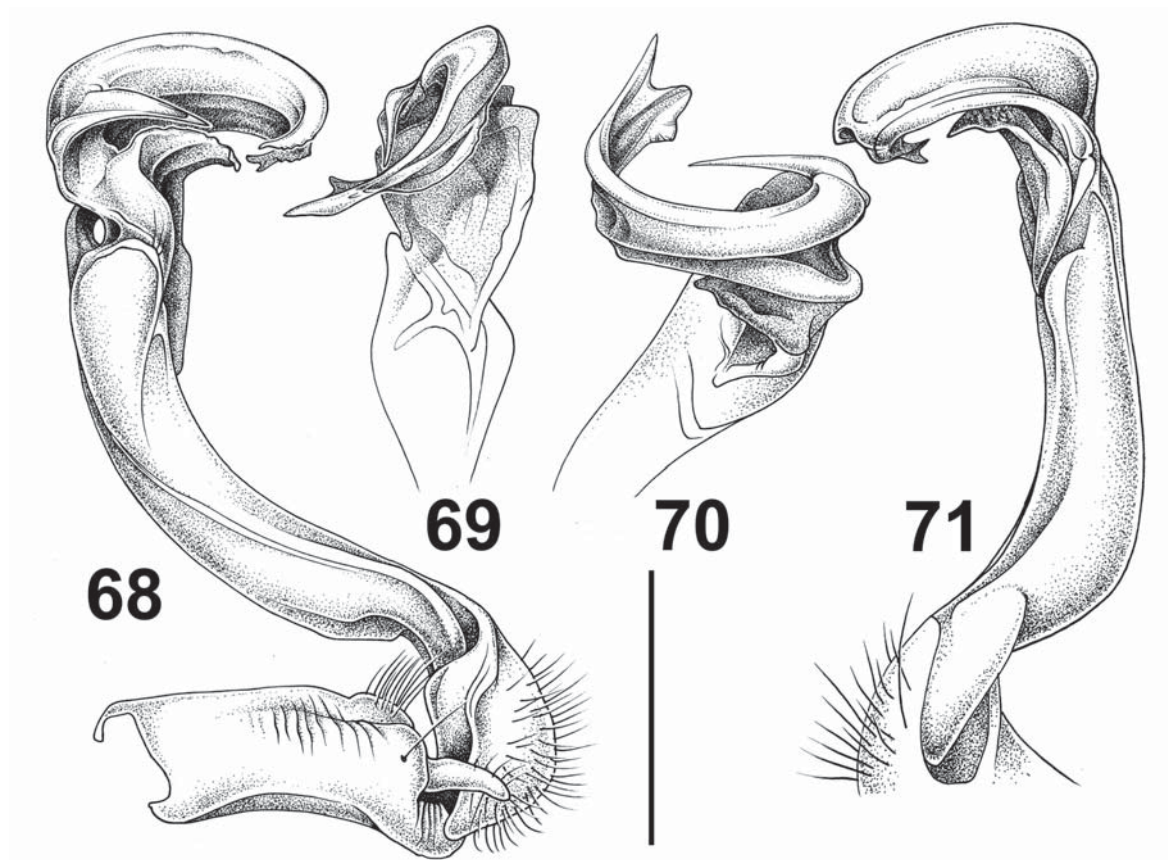
Figs 61–63. *Parasundanina medialis* (Nguyen, 2010), ♂ from Pu Mat, left gonopod, submesal, mesal, and ventral views, respectively. Pictures by K.V. Makarov, taken not to scale.

Рис. 61–63. *Parasundanina medialis* (Nguyen, 2010), ♂ из Pu Mat, левый гонопод, соответственно почти изнутри и изнутри и снизу. Фотографии К.В. Макарова, сняты без масштаба.



Figs 64–67. *Sellanucheza grandis* (Golovatch, 1984), live specimens from Pu Hoat (♂, ♂, 64 and 66) and Pu Mat (♂, ♂, 65 and 67, respectively). Pictures by I.I. Semenyuk, taken not to scale.

Рис. 64–67. *Sellanucheza grandis* (Golovatch, 1984), живые особи из Pu Hoat (♂, ♂, 64, 66) и Pu Mat (♂, ♂, 65, 67). Фотографии И.И. Семенюк, сняты без масштаба.



Figs 68–71. *Sellanucheza grandis* (Golovatch, 1984), ♂ from Pu Mat, left gonopod, mesal, ventral, subdorsal and lateral views, respectively. Scale bar: 1.0 mm.

Рис. 68–71. *Sellanucheza grandis* (Golovatch, 1984), ♂ из Pu Mat, левый гонопод, соответственно изнутри, снизу, почти сверху и сбоку. Масштаб: 1,0 мм.



Figs 72, 73. *Sellanucheza grandis* (Golovatch, 1984), ♂ from Pu Mat, left gonopod, mesal and lateral views, respectively. Pictures by K.V. Makarov, taken not to scale.

Рис. 72, 73. *Sellanucheza grandis* (Golovatch, 1984), ♂ из Pu Mat, левый гонопод, соответственно изнутри и сбоку. Фотографии К.В. Макарова, сняты без масштаба.





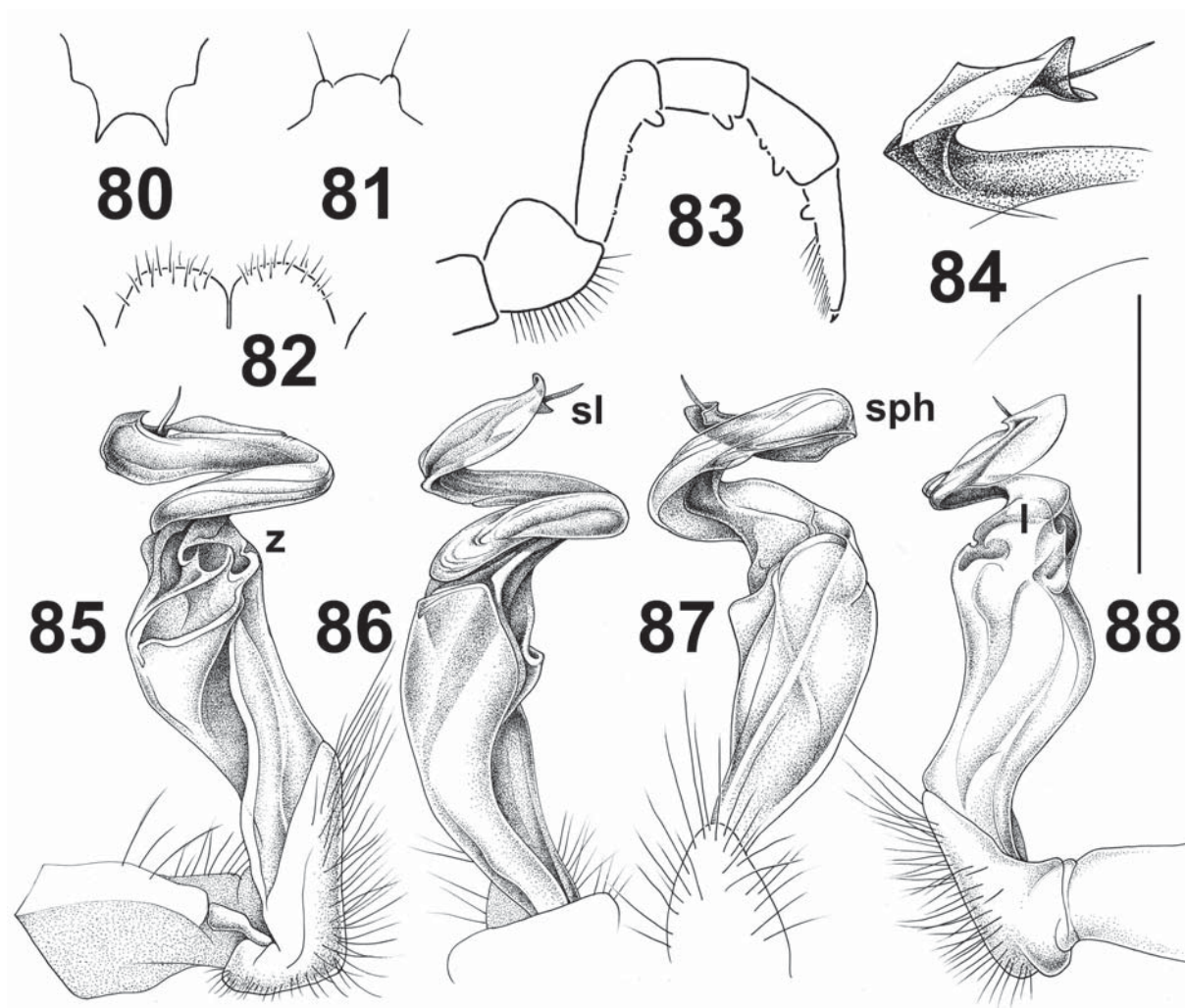
Figs 74–76. *Tylopus simplex* sp.n., live ♂ holotype (74), and ♂ and ♀ paratypes (75, 76, respectively), habituses, dorsolateral views. Pictures by I.I. Semenyuk, taken not to scale.

Рис. 74, 76. *Tylopus simplex* sp.n., живые голотип ♂ (74) и паратипы ♂ и ♀ (соответственно 75, 76), общий вид, одновременно сверху и сбоку. Фотографии И.И. Семенюк, сняты без масштаба.



Figs 77–79. *Tylopus simplex* sp.n., ♂ holotype. 77 — habitus, dorsal view; 78 — anterior part of body, ventral view; 79 — midbody segments, dorsal view. Pictures by K.V. Makarov, taken not to scale.

Рис. 77–79. *Tylopus simplex* sp.n., голотип ♂. 77 — общий вид, сверху; 78 — передняя часть тела, снизу; 79 — среднетуловищные сегменты, сверху. Фотографии К.В. Макарова, сняты без масштаба.



Figs 80–88. *Tylopus simplex* sp.n., ♂ paratype. 80 — epiproct tip, ventral view; 81 — hypoproct, ventral view; 82 — sternal lobes between coxae 4, caudal view; 83 — leg 9, lateral view; 84 — tip of left gonopod, anteroventral view; 85–88 — left gonopod, mesal, dorsal, ventral and lateral view, respectively. Abbreviations explained in text. Scale bar: 0.3 mm (80–82, 85–88) and 0.5 mm (83), while 84 is not to scale.

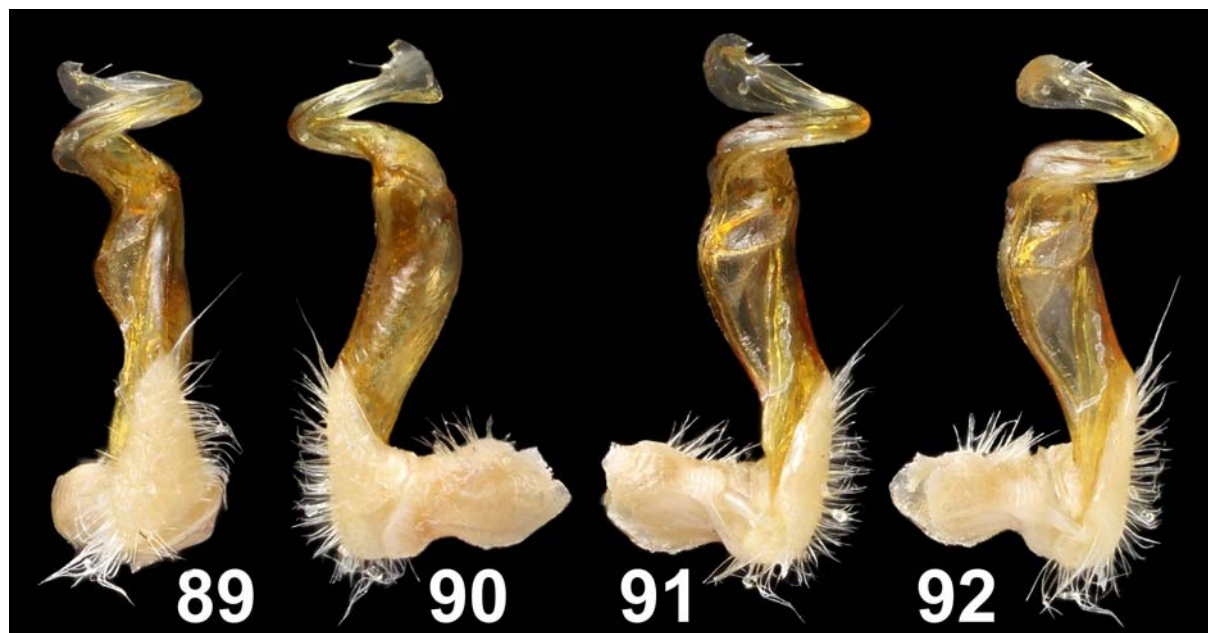
Рис. 80–88. *Tylopus simplex* sp.n., паратип ♂. 80 — кончик эпипрокта, снизу; 81 — гипопрокт, снизу; 82 — стернальные пластинки между тазиками 4, сзади; 83 — нога 9, сбоку; 84 — кончик левого гонопода, одновременно спереди и снизу; 85–88 — левый гонопод, соответственно изнутри, сверху, снизу и сбоку. Объяснения обозначений в тексте. Масштаб: 0,3 мм (80–82, 85–88) и 0,5 мм (83), а 84 не в масштабе.

sulcus. Stricture between pro- and metazonae deep and thin, distinctly ribbed at bottom. Transverse metatergal sulci evident on segments 4–19, faintly arcuate medially, punctured at bottom, mostly reaching the bases of paraterga (Fig. 77). Pleurosternal carinae very distinct, complete, arcuated and granulated ridges with a narrowly rounded caudal tooth on segments 2–7(8) (♂) or 3–5 (♀), thereafter increasingly reduced to small bulges disappearing towards segment 16. Epiproct (Figs 77, 80) long, clearly flattened dorsoventrally, tip distinctly emarginated between two small sharp hooks directed ventrad, lateral pre-apical papillae very evident. Hypoproct (Fig. 81) roundly subtriangular, caudal margin with 1+1 long setae borne on well-developed rounded knobs. Sterna densely setose, cross-impressions shallow, without modifications except for two rounded, transverse, subcontiguous and densely setose lobes between ♂ coxae 4; no tubercles near gonopod aperture (Fig. 78).

Legs long and slender (Figs 77–79, 83), longer and incrassate in ♂ compared to ♀, midbody ones ca. 1.6–1.7 (♂) or 1.2–1.3 (♀) times as long as body height, very densely setose; ♂ prefemora mostly strongly swollen laterally; ♂ adenostyles mostly numerous and differentiated, at least one larger and rounded adenostyle/knob each on prefemur, femur, tibia (all distoventrally) and tarsus (parabasally), usually coupled with up to several smaller, additional nodules (Fig. 81); ventral brushes on ♂ tarsi gradually thinning out towards caudal body 1/4.

Gonopods (Figs 84–92) quite typical of the genus, but unusually simple, both *in situ* held parallel to each other, with tips crossing each other. Coxite subcylindrical, almost as long as telopodite, setose distoventrally; cannula as usual, a small, curved, hollow tube. Prefemoral (= densely setose) part almost as long as acropodite and about as long as a medially hollow femorite. Seminal groove running along





Figs 89–92. *Tylopus simplex* sp.n., ♂ paratype, left gonopod, ventral, lateral, submesal and mesal views, respectively. Pictures by K.V. Makarov, taken not to scale.

Рис. 89–92. *Tylopus simplex* sp.n., паратип ♂, левый гонопод, соответственно снизу, сбоку, почти изнутри и изнутри. Фотографии К.В. Макарова, сняты без масштаба.



Figs 93, 94. *Vietnamorpha pumatensis* Nguyen, 2017, live ♂ (93) and ♀ (94) topotypes, habituses. Pictures by I.I. Semenyuk, taken not to scale.

Рис. 93, 94. *Vietnamorpha pumatensis* Nguyen, 2017, живые топотипы ♂ (93) и ♀ (94), общий вид. Фотографии И.И. Семенюк, сняты без масштаба.

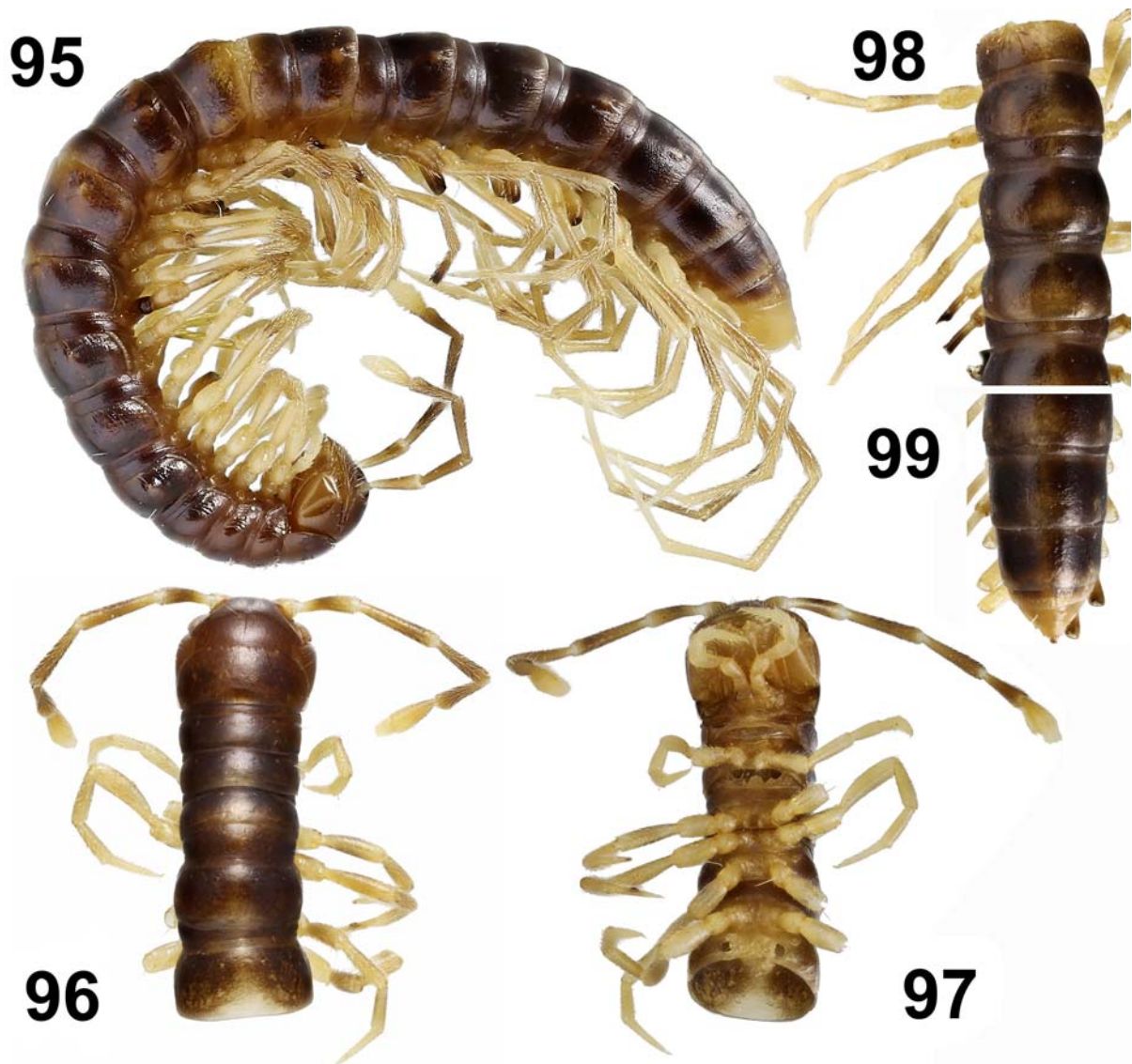
mesal face of femorite, moving onto a very long, flagelliform, free solenomere (**sl**) at base of a simple, small, postfemoral, lateral lobe (**l**) demarcated at base by a distinct, subtransverse, lateral sulcus, **sl** being supported by a massive and strongly coiled solenophore (**sph**); postfemoral part bearing only lobe **l** and a single, indistinct, somewhat undulate, transverse process **z** arising immediately distal to **l**; tip of **sl** visible above a gently bifid apex of **sph**.

REMARKS. Such a surprisingly simple postfemoral region of the gonopod consisting of only lobe **l** and just one outgrowth at its base is rarely observed in *Tylopus*. Thus, a similarly inconspicuous process/outgrowth **z** is known in *T. sutchariti* Likhitrakarn, Golovatch, Srisonchai et Panha, 2021, from Myanmar [Likhitrakarn *et al.*, 2021], but its gonopod is slightly more complex compared to *T. simplex* sp.n. Simi-

larly, a strong and unipartite solenophore with only a small and indistinct lobe **l** at its base is characteristic of *T. moniliformis* Likhitrakarn, Golovatch et Panha, 2016, from Thailand, but most of its somatic features are strikingly different from those of *T. simplex* sp.n. [Likhitrakarn *et al.*, 2016].

In contrast, most of the somatic and leg traits of *T. simplex* sp.n. are shared with *T. corrugatus* Likhitrakarn, Golovatch et Panha, 2014 or *T. rugosus* Golovatch et Enghoff, 1993, both from Thailand, or *T. tuberculatus* Golovatch et Semenyuk, 2018, from southern Vietnam, but the gonopods in the latter three species are far more elaborate [Likhitrakarn *et al.*, 2010, 2014; Golovatch, Semenyuk, 2018].

BIOLOGY. Apparently, a cryptic and rare species. Even on rainy days millipedes kept in leaf litter during the day time and occasionally appeared in the open at night.



Figs 95–99. *Vietnamorpha pumatensis* Nguyen, 2017, ♂ topotype. 95 — habitus, lateral view; 96, 97 — anterior part of body, dorsal and ventral views, respectively; 98 — midbody segments, dorsal view; 99 — posterior part of body, dorsal view. Pictures by K.V. Makarov, taken not to scale.

Рис. 95–99. *Vietnamorpha pumatensis* Nguyen, 2017, топотип ♂. 95 — общий вид, сбоку; 96, 97 — передняя часть тела, соответственно сверху и снизу; 98 — среднетеловишние сегменты, сверху; 99 — задняя часть тела, сверху. Фотографии К.В. Макарова, сняты без масштаба.

*Vietnamorpha pumatensis* Nguyen, 2017  
Figs 93–107.

**MATERIAL.** 3 ♂♂, 5 ♀♀, 1 juv. (ZMUM), Vietnam, Nghe An Prov., Pu Mat National Park, N18°57', E104°41', 180 m a.s.l., mixed tropical forest on hill slopes, bottom part with a permanent stream, leaf litter and on forest floor, daytime, April 2018, I.I. Semenyuk leg.

**REMARKS.** As this species was originally described from the same locality in north-central Vietnam [Nguyen, 2017], the above new samples can be considered as strict topotypes. New illustrations (Figs 93–107) are provided not only to confirm the species' identity, but also to show minor variations in coloration, as well as somatic and gonopodal structures. Due to the subcylindrical body and the legs that

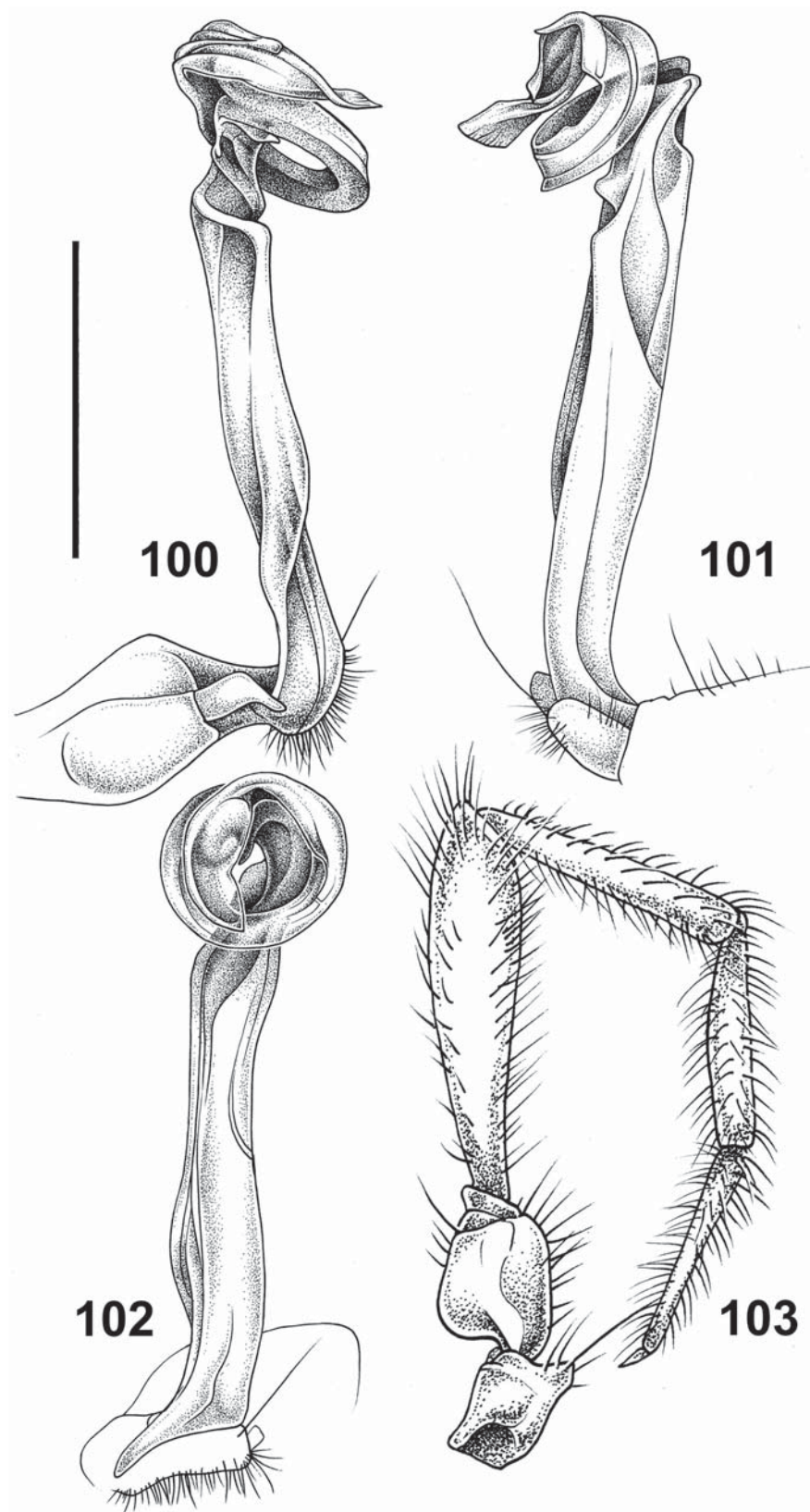
grow considerably elongated towards the telson, this species superficially resembles the sympatric *Anoplodesmus nguyenii* sp.n. (cf. Figs 2 and 95).

Live animals are darkish with white legs (Figs 93, 94).

**BIOLOGY.** A very abundant species, active both in daytime and at night, inhabiting leaf litter including suspended soils, and often appearing in open spaces. Millipedes can run very fast and, if scared, suddenly reverse to run away.

**Acknowledgements.** Special thanks go to Kirill Mikhailov and Arkady Schileyko (both ZMUM) who helped us incorporate the ZMUM samples into the collection under their care. We were partly supported by the Presidium of the Russian Academy of Sciences, Program No. 41 "Biodiversi-





Figs 100–103. *Vietnamorpha pumatensis* Nguyen, 2017, ♂ topotype. 100–102 — left gonopod, mesal, lateral and ventral views, respectively; 103 — leg 7, lateral view. Scale bar: 1.0 mm (100–102) and 0.5 mm (103).

Рис. 96–99. *Vietnamorpha pumatensis* Nguyen, 2017, топотип ♂. 100–102 — левый гонопод, соответственно изнутри, сбоку и снизу; 103 — нога 7, сбоку. Масштаб: 1,0 мм (100–102) и 0,5 мм (103).



Figs 104–107. *Vietnamorpha pumatensis* Nguyen, 2017, ♂ topotype, left gonopod, lateral, subventral, subdorsal and mesal views, respectively. Pictures by K.V. Makarov, taken not to scale.

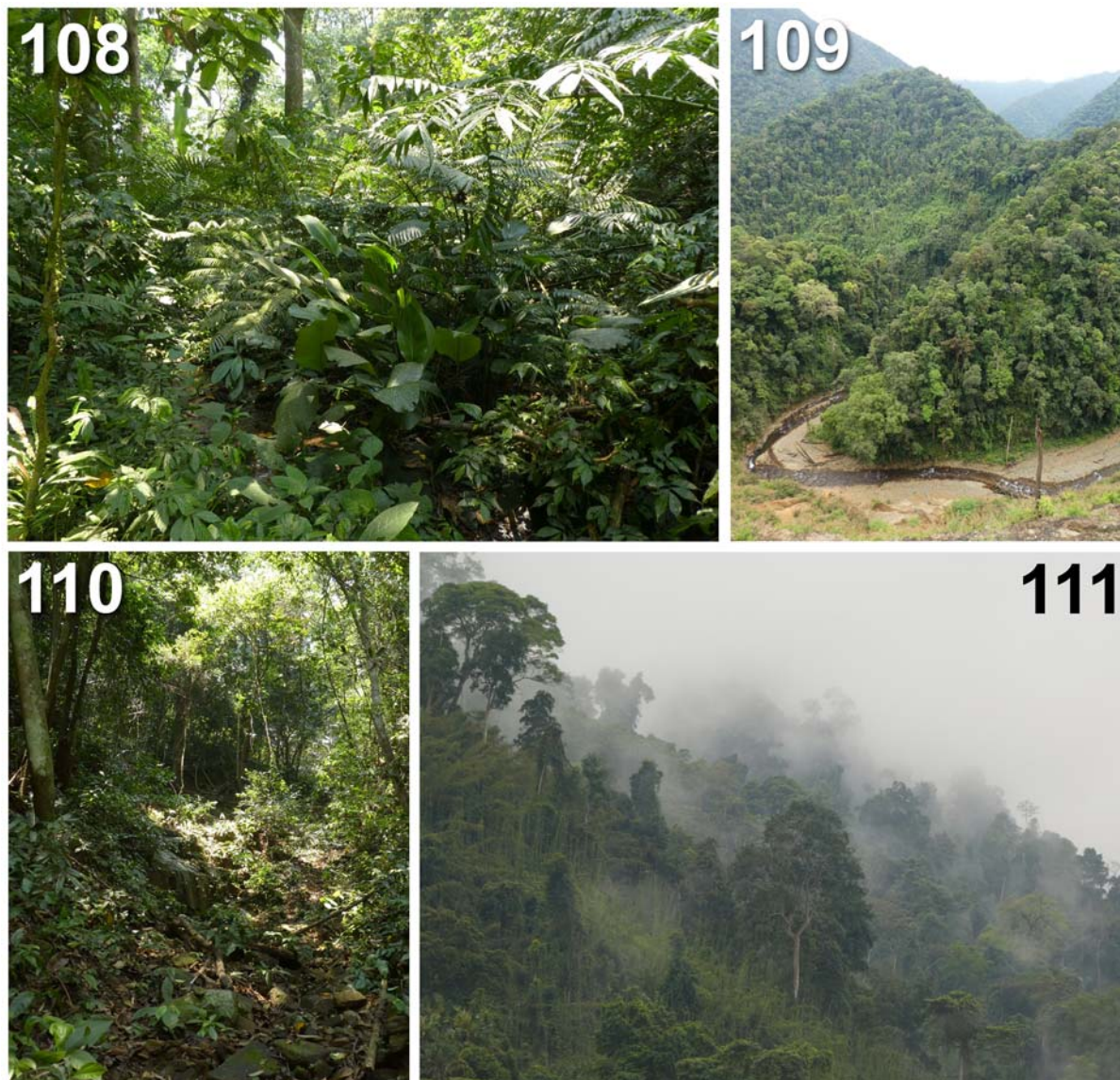
Рис. 104–107. *Vietnamorpha pumatensis* Nguyen, 2017, топотип ♂, левый гонопод, соответственно сбоку, почти снизу, почти сверху и изнутри. Фотографии К.В. Макарова, сняты без масштаба.

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## References

- Chen C.-C., Golovatch S.I., Mikhajlova E.V., Chang, H.-W. 2010. The millipede genus *Anoplodesmus* Pocock, 1895, recorded in Taiwan for the first time, with descriptions of two new species (Diplopoda: Polydesmida: Paradoxosomatidae: Sulciferini) // *Zootaxa*. Vol.2399. P.20–30.
- Golovatch S.I. 1984. Contributions to the millipede fauna of Vietnam (Diplopoda) II // *Acta Zoologica Hungarica*. Vol.30. Nos 1–2. P.53–77.
- Golovatch S.I. 2000. On several new or poorly-known Oriental Paradoxosomatidae (Diplopoda: Polydesmida), VII // *Arthropoda Selecta*. Vol.8. No.4. P.215–220 (for 1999).
- Golovatch S.I. 2009. On several new or poorly-known Oriental Paradoxosomatidae (Diplopoda: Polydesmida), IX // *Arthropoda Selecta*. Vol.18. Nos 3–4. P.119–124.
- Golovatch S.I. 2013. On several new or poorly-known Oriental Paradoxosomatidae (Diplopoda: Polydesmida), XIII // *Arthropoda Selecta*. Vol.22. No.1. P.1–31.
- Golovatch S.I. 2014. On several new or poorly-known Oriental Paradoxosomatidae (Diplopoda: Polydesmida), XXV // *Arthropoda Selecta*. Vol.23. No.1. P.1–19.
- Golovatch S.I. 2015. On several new or poorly-known Oriental Paradoxosomatidae (Diplopoda: Polydesmida), XVII // *Arthropoda Selecta*. Vol.24. No.2. P.127–168.
- Golovatch S.I. 2016. On several new or poorly-known Oriental Paradoxosomatidae (Diplopoda: Polydesmida), XVIII // *Arthropoda Selecta*. Vol.25. No.1. P.1–18.
- Golovatch S.I. 2019. On several new or poorly-known Oriental Paradoxosomatidae (Diplopoda: Polydesmida), XXVII // *Arthropoda Selecta*. Vol.28. No.4. P.459–478.
- Golovatch S.I. 2020. On several new or poorly-known Oriental Paradoxosomatidae (Diplopoda: Polydesmida), XXVIII // *Arthropoda Selecta*. Vol.29. No.2. P.161–173.
- Golovatch S.I. 2021. Review of the millipede genus *Hedinomorpha* Verhoeff, 1934, with descriptions of three new species collected in China by Professor Jochen Martens (Diplopoda, Polydesmida, Paradoxosomatidae) // *Zootaxa*. Vol.4984. No.1. P.368–384.
- Golovatch S.I., Liu W.X. 2020. Diversity, distribution patterns, and fauno-genesis of the millipedes (Diplopoda) of mainland China // *ZooKeys*. Vol.930. P.153–198.
- Golovatch S.I., Semenyuk I.I. 2010. On several new or poorly-known Oriental Paradoxosomatidae (Diplopoda: Polydesmida), X // *Arthropoda Selecta*. Vol.19. No.3. P.123–127.





Figs 108–111. Habitats. 108 — typical habitat of *Hylomus proximus* (Nguyen, Golovatch et Anichkin, 2005) at the very wet and shady bottom of a river valley with abundant *Angiopteris* sp. ferns; 109 — typical river meandering among steep hills in Pu Mat National Park; 110 — valley of a small temporal river in forest, where a steep slope is turning into the river bed, leaf litter is being accumulated on fallen rocks and forms a most productive habitat for soil fauna; 111 — foggy forest after a rain in Pu Mat National Park, typical weather conditions during the field work time.

Рис. 108–111. Биотопы. 108 — типичный биотоп *Hylomus proximus* (Nguyen, Golovatch et Anichkin, 2005) на тенистом и переувлажнённом дне речной долины с обильными папоротниками *Angiopteris* sp.; 109 — типичная река, изгибающаяся между крутыми холмами в национальном парке Пумат; 110 — ущелье маленькой временной речки, где крутые склоны холмов переходят в плоское дно долины и на камнях скапливается намытый со склонов растительный опад, формируя очень продуктивный биотоп для почвенной фауны; 111 — туман, поднимающийся над лесом после дождя в национальном парке Пумат, типичная погода во время полевой работы.

Golovatch S.I., Semenyuk I.I. 2018. On several new or poorly-known Oriental Paradoxosomatidae (Diplopoda: Polydesmida), X // *Arthropoda Selecta*. Vol.27. No.3. P.187–200.

Likhitrakarn N., Golovatch S.I., Panha S. 2014. Three new species of the millipede genus *Tylopus* Jeekel, 1968 from Thailand, with additional notes on the species described by Attems (Diplopoda, Polydesmida, Paradoxosomatidae) // *ZooKeys*. Vol.435. P.63–91.

Likhitrakarn N., Golovatch S.I., Panha S. 2015. Review of the millipede genus *Kronopolites* Attems, 1914 (Diplopoda, Polydesmida, Paradoxosomatidae), with the description of a new species from Laos // *ZooKeys*. Vol.472. P.27–41.

Likhitrakarn N., Golovatch S.I., Panha S. 2016. The millipede genus *Tylopus* Jeekel, 1968 (Diplopoda, Polydesmida, Paradoxosomatidae), with a key and descriptions of eight new species from Indochina // *European Journal of Taxonomy*. Vol.195. P.1–47.

Likhitrakarn N., Golovatch S.I., Prateepasen R., Panha S. 2010. Review of the genus *Tylopus* Jeekel, 1968, with descriptions of five new species from Thailand (Diplopoda, Polydesmida, Paradoxosomatidae) // *ZooKeys*. Vol.72. P.23–68.

Likhitrakarn N., Golovatch S.I., Srisonchai R., Panha S. 2021. Two new species of the millipede genus *Tylopus* Jeekel, 1968 from Shan State, Myanmar (Diplopoda, Polydesmida, Paradoxosomatidae) // *ZooKeys*. Vol.1040. P.167–185.

- Nguyen D.A. 2010a. The millipede tribe Sundaninini in Vietnam (Diplopoda: Polydesmida: Paradoxosomatidae) // *Zootaxa*. Vol.2479. P.59–68.
- Nguyen D.A. 2010b. The millipede genus *Anoplodesmus* Pocock, 1895 in Vietnam (Diplopoda: Polydesmida: Paradoxosomatidae) // *Zootaxa*. Vol.2649. P.52–60.
- Nguyen D.A. 2011. A review of the millipede tribe Tonkinosomatini (Diplopoda: Polydesmida: Paradoxosomatidae) from Vietnam // *Zootaxa*. Vol.3036. P.58–68.
- Nguyen D.A. 2017. A second species of the genus *Vietnamorpha* Golovatch, 1984 (Polydesmida: Paradoxosomatidae) and notes on the generic relationship // *Journal of Natural History*. Vol.51. Issue 39–40. P.1–13.
- Nguyen D.A., Golovatch S.I., Anichkin A.E. 2005. The dragon millipedes in Vietnam (Polydesmida: Paradoxosomatidae, genus *Desmoxytes* Chamberlin, 1923) // *Arthropoda Selecta*. Vol.14. No.3. P.251–257.
- Nguyen D.A., Nguyen D.D., Eguchi K. 2021. Mountainous millipedes in Vietnam. I. Two new species of the family Paradoxosomatidae from Mount Fansipan (Diplopoda, Polydesmida) // *ZooKeys*. Vol.1032. P.1–15.
- Srisonchai R., Enghoff H., Likhitrakarn N., Panha S. 2018. A revision of dragon millipedes I: genus *Desmoxytes* Chamberlin, 1923, with the description of eight new species (Diplopoda, Polydesmida, Paradoxosomatidae) // *ZooKeys*. Vol.761. P.1–177.

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