Arthropoda Selecta 28(3): 347–367

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

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

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KEY WORDS: Diplopoda, Polydesmida, Paradoxosomatidae, taxonomy, new records, new species, China.
КЛЮЧЕВЫЕ СЛОВА: Diplopoda, Polydesmida, Paradoxosomatidae, таксономия, новые находки, новые виды, Китай.

ABSTRACT. This contribution is devoted to new records of four known, and to descriptions of the following five new, species from China: *Mandarinopus hirsutus* sp.n., from Yunnan, *Hedinomorpha bifida* sp.n. and *H. crassiterga* sp.n., both from Sichuan, and *H. flavobulbus* sp.n. and *H. altiterga* sp.n., both from Gansu. Keys are given to all five and 18 presently known species of *Mandarinopus* Verhoeff, 1934 and *Hedinomorpha* Verhoeff, 1934, respectively, including the following new formal synonymy and combinations: *Hedinomorpha hummelii hummelii* Verhoeff, 1934 = *H. hummelii svenhedini* Verhoeff, 1934, syn.n.; *Hedinomorpha circularis* (Takakuwa, in Takakuwa et Takashima, 1949) and *Mandarinopus corticinus* (Attems, 1936), both comb.n. ex *Orthomorpha* Bollman, 1893; *Mandarinopus rugosus* (Golovatch, 2013) and *M. semirugosus* (Golovatch, 2013), both comb.n. ex *Kronopolites* Attems, 1914.

How to cite this article: Golovatch S.I. 2019. On several new or poorly-known Oriental Paradoxosomatidae (Diplopoda: Polydesmida), XXVI // Arthropoda Selecta. Vol.28. No.3. P.347–367. doi: 10.15298/arthsel. 28.3.01

РЕЗЮМЕ. Данное сообщение посвящено находкам четырех известных, а также описаниям следующих пяти новых видов из Китая: *Mandarinopus hirsutus* sp.n., из Юннани, *Hedinomorpha bifida* sp.n. и *H. crassiterga* sp.n., оба из Сычуани, а также *H. flavobulbus* sp.n. и *H. altiterga* sp.n., из Ганьсу. Представлены ключи для определения всех известных пока соответственно пяти и 18 видов *Mandarinopus* Verhoeff, 1934 и *Hedinomorpha* Verhoeff, 1934, включая следуюшие новые формальные синонимию и комбинации: *Hedinomorpha hummelii hummelii* Verhoeff, 1934 = *H. hummelii svenhedini* Verhoeff, 1934, syn.n.; *Hedinomorpha circularis* (Takakuwa, in Takakuwa et Takashima, 1949) и *Mandarinopus corticinus* (Attems, 1936), обе comb.n. ex *Orthomorpha* Bollman, 1893; *Mandarinopus rugosus* (Golovatch, 2013) и *M. semirugosus* (Golovatch, 2013), обе comb.n. ex *Kronopolites* Attems, 1914.

Introduction

This paper treats a collection of paradoxosomatid millipedes from China, with new records of four known, as well as descriptions of five new, species. This material also allows for a new synonym and several new combinations to be established.

All samples have been housed in the Zoological Museum, Moscow State University, Russia (ZMUM), the types being supplied with the relevant acquisition numbers.

Taxonomic part

Hirtodrepanum chinense Golovatch, 2014
Figs 1–3.

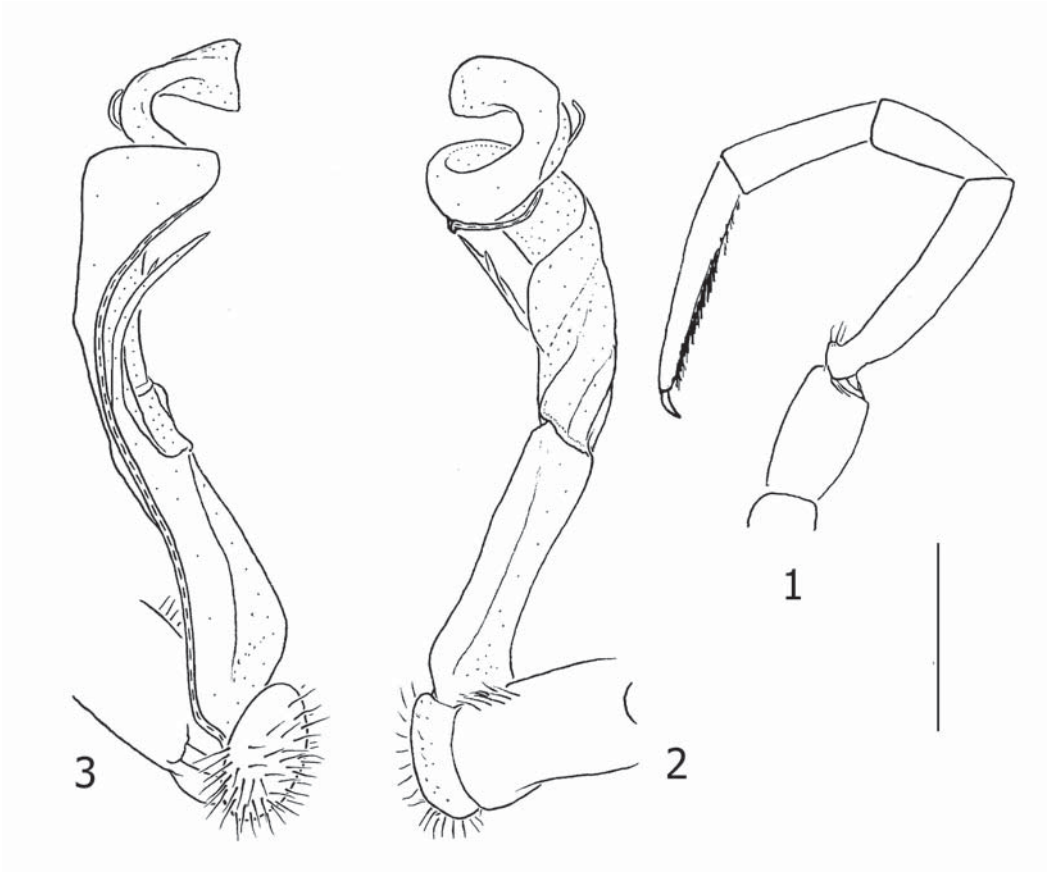
Hirtodrepanum chinense Golovatch, 2014: 7 (original description).

MATERIAL. 2 ♂♂, China, Yunnan Prov., Mekong Valley, 2 km E of Yezhixiang, 27°42′06″N, 99°04′01″E, 1990 m a.s.l., 27.05.2017, leg. I. Belousov & I. Kabak.

REMARKS. This conspicuous, densely hirsute species has hitherto been known only from the original description [Golovatch, 2014] from the holotype ♂ and a paratype ♀ from the same province. So the above new samples represent near-topotypes. New illustrations (Figs 1–3) are provided to document the species' identity and slight variations in the gonopodal conformation. In addition, very small ventrobasal knobs/adenostyles on all ♂ femora following the large unciform adenostyle on ♂ femur 1 are likewise characteristic (Fig. 1).

Sigipinius grahami Hoffman, 1961

MATERIAL. 3 ♂♂, China, Sichuan Prov., Lixian, NNW of Xuecheng, Ertaizi, Machingou River, 31°42′48″N, 103°16′25″E, 3110 m a.s.l., 12.VI.2017; 1 ♂, Sichuan Prov., N Lixian, Meng-



Figs 1–3. *Hirtodrepanum chinense* Golovatch, 2014, ♂ from near Yezhixiang: 1 — leg 9, lateral view; 2–3 — left gonopod, lateral and mesal views, respectively. Scale bar: 0.5 mm.

Рис. 1–3. *Hirtodrepanum chinense* Golovatch, 2014, ♂ из окрестностей Yezhixiang: 1 — нога 9, сбоку; 2–3 — левый гонопод, соответственно сбоку и изнутри. Масштаб: 0,5 мм.

donggou & Lianghekou divide, W of Xing Fanweizi, 31°45′27″N, 103°16′40″E, 4055 m a.s.l., 14.VI.2017; 2 ♂♂, China, Gansu Prov., WWS of Longnan (Wudu), Yin Duoguosa & Aounang divide, 33°21′14″N, 104°29′45″E, 3650 m a.s.l., 22.VI.2017; 2 ♂♂, 1 ♀, China, Gansu Prov., WWS of Longnan (Wudu), Yin Duoguosa & Yaxielu, W of Zhagazu, 33°21′22″N, 104°30′50″E, 3320 m a.s.l., 23.VI.2017; 2 ♂♂, 1 ♀, China, Gansu Prov., WWS of Longnan (Wudu), Wushenggou & Line Chaping divide, 33°12′43″N, 104°31′14″E, 3630 m a.s.l., 27.VI.2017; 1 ♂, 1 ♀, Gansu Prov., NNE Zhugqu, Minjiang Bas, 3 km ENE Xiaohuangya, Qinyugou, 33°50′08″N, 104°25′39″E, 3045 m a.s.l., 6.VII.2017, all leg. I. Belousov & I. Kabak.

REMARKS. The endemic Chinese genus *Sigipinius* Hoffman, 1961 is presently known to contain the following nine species, all high-montane: *S. campanuliformis* Golovatch, 2013, *S. complex* Golovatch, 2013, *S. dentiger* Golovatch, 2016, *S. grahami* Hoffman, 1961 (the type-species), *S. kabaki* Golovatch, 2013, *S. montanus* (Golovatch, 2009), *S. pinnifer* Golovatch, 2016, *S. simplex* Golovatch, 2013 and *S. spiniger* Golovatch, 2014. Most of them have been keyed [Golovatch, 2013b, 2016, 2017]. Only *S. campanuliformis* and *S. spiniger* have been described from Yunnan, whereas the other species have only been found in Sichuan (6) and Xinjiang Uygur (1) provinces [Golovatch, 2016, 2017]. Since *S. grahami* has hitherto been recorded only from several places across Sichuan Province [Golovatch, 2013b, 2017], some of the above new samples are the first to be reported from Gansu.

Kronopolites swinhoei (Pocock, 1895)
Figs 4–5.

Catalogue see in Likhitrakarn *et al*., 2015: 32.

MATERIAL. 1 ♂, China, Gansu Prov., WWS of Longnan (Wudu), 2.4 km NW of Zhongzhaixiang, 33°12′46″N, 104°25′43″E, 1445 m a.s.l., 25.VI.2017, leg. I. Belousov & I. Kabak.

REMARKS. This conspicuous, colourful, large species is widespread in central and southern China (Gansu, Shaanxi, Qinghai, Shandong, Zhejiang, Sichuan, Guizhou and Yunnan provinces). Interestingly, the above ♂ from Gansu represents a rare colour morph (Figs 4–5) hitherto recorded only from Qinghai Province: the caudal 1/3–1/2 of its metaterga show a continuous light yellowish band, not a median spot isolated from similarly light paratergal calluses, the dominant pattern [Golovatch, 2013a].

Mandarinopus gracilipes Verhoeff, 1934
Figs 6–16.

Mandarinopus gracilipes Verhoeff, 1934: 19 (original description).

MATERIAL. 4 ♂♂, China, Gansu Prov., WWS of Longnan (Wudu), 3 km W of Jiejiaonuocun, Yin Duoguosa, 33°21′54″N, 104°32′09″E, 2195 m a.s.l., 20.VI.2017, leg. I. Belousov & I. Kabak.

REMARKS. The hitherto monotypic genus *Mandarinopus* Verhoeff, 1934 and its type species *M. gracilipes* have

Figs 4–5. *Kronopolites swinhoei* (Pocock, 1895), ♂ from near Zhongzhaixiang: 4 — anterior part of body, ventrolateral view; 5 — midbody segments, dorsal view. Pictures by K. Makarov, taken not to scale.

Рис. 4–5. *Kronopolites swinhoei* (Pocock, 1895), ♂ из окрестностей Zhongzhaixiang: 4 — передняя часть тела, одновременно снизу и сбоку; 5 — среднетуловищные сегменты, сверху. Фотографии сделаны К. Макаровым, без масштаба.

never been recorded since their original descriptions [Verhoeff, 1934]. The species was described from two syntypes (a damaged ♂ and a complete ♀) taken at Pei-shui-ho (now Baishui Jiang River, a tributary of the Yangtze River, southernmost Gansu Prov.), the female being 38 mm long. The coloration was described as being surprisingly the same as in *Kronopolites swinhoei*, which is indeed nearly so (cf. Figs 4–5). The above samples (ca. 27–28 mm long and ca. 2.5 mm wide) represent near-topotypes and are illustrated to document the identity (Figs 6–16).

Figs 6–9. *Mandarinopus gracilipes* Verhoeff, 1934, ♂ from Yin Duoguosa: 6 — habitus, lateral view; 7–9 — anterior, middle and posterior parts of body, respectively, subdorsal or dorsal views. Pictures by K. Makarov, taken not to scale.

Рис. 6–9. *Mandarinopus gracilipes* Verhoeff, 1934, ♂ из Yin Duoguosa: 6 — общий вид, сбоку; 7–9 — соответственно передняя, средняя и задняя части тела, почти сверху или сверху. Фотографии сделаны К. Макаровым, без масштаба.

Mandarinopus hirsutus **sp.n.**
Figs 17–30.

HOLOTYPE ♂ (ZMUM Rd 4386), China, Yunnan Prov., NW of Lijiang, W of Chang Jiang (= Yangtze) River, NW of Jinzhuang, 2.5 km N of Tuozhi village, 27°09′32″N, 99°41′47″E, 2315 m a.s.l., 17.05.2017, leg. I. Belousov & I. Kabak.

NAME. To emphasize the dorsally very densely hirsute collum, following metaterga, and epiproct.

DIAGNOSIS. Differs from the sole formal congener, *M. gracilipes* (see above), mainly in the absence of a vivid colour pattern, the densely hirsute and rather uniformly blackbrown to brown body, coupled with the absence of a distofemoral process on the gonopodal telopodite (see also the key below).

DESCRIPTION. Length of holotype ca. 22 mm, width of midbody pro- and metazonae 1.7 and 2.1 mm, respectively.

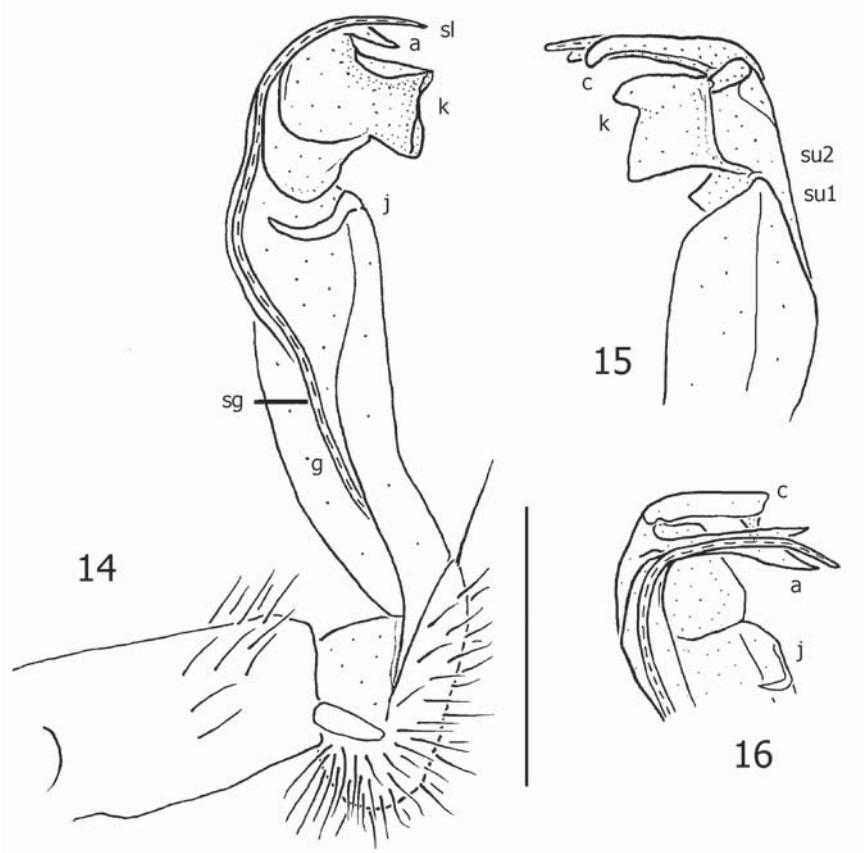
Coloration in alcohol mainly dark (Figs 17–20), without a vivid colour pattern; vertex, collum, following metaterga and epiproct blackish brown; most of head, rear halves of prozonae together with strictures, and antennomere 7 dark brown; most of antennae and head, caudal halves of prozonae, sides brown; clypeus, venter and legs light brown (Figs 17–20).

Entire head very densely setose; epicranial suture distinct. Antennae moderately long and slightly clavate (Figs 17, 18, 20), extending behind metatergum 2 when stretched dorsally (♂). In length, antennomere 2=3=4=5=6>>1=7. Interantennal isthmus ca. 0.6 as great as diameter of antennal socket.

Collum, following metaterga and epirpoct shining, beset with irregular, long, light hairs borne on minute knobs (Figs 17–20), tergal hairs 1/3–1/4 as long as metatergum; prozonae finely shagreened and poorly shining; surface below paraterga finely microgranulate (Figs 17, 18). In width, collum < segment 3=4 < head = segment 2 < 5–16, body gently and gradually tapering thereafter. Paraterga moderately developed, largely set high at upper 1/4 of metatergal height,

Figs 10–13. Left gonopod of *Mandarinopus gracilipes* Verhoeff, 1934, ♂ from Yin Duoguosa, dorsomesal, dorsal, mesal and ventrolateral views, respectively. Pictures by K. Makarov, taken not to scale.

Рис. 10–13. Левый гонопод *Mandarinopus gracilipes* Verhoeff, 1934, ♂ из Yin Duoguosa, соответственно одновременно сверху и изнутри, сверху, изнутри и одновременно снизу и сбоку. Фотографии сделаны К. Макаровым, без масштаба.



Figs 14–16. *Mandarinopus gracilipes* Verhoeff, 1934, ♂ from Yin Duoguosa: 14 — left gonopod, mesal view; 15–16 — distal part of left gonopod, lateral and dorsal views, respectively. Scale bar: 1.0 mm. Designations explained in text.

Рис. 14–16. *Mandarinopus gracilipes* Verhoeff, 1934, ♂ из Yin Duoguosa: 14 — левый гонопод, изнутри; 15–16 — дистальная часть левого гонопода, соответственно сбоку и сверху. Масштаб: 1,0 мм. Объяснения обозначений в тексте.

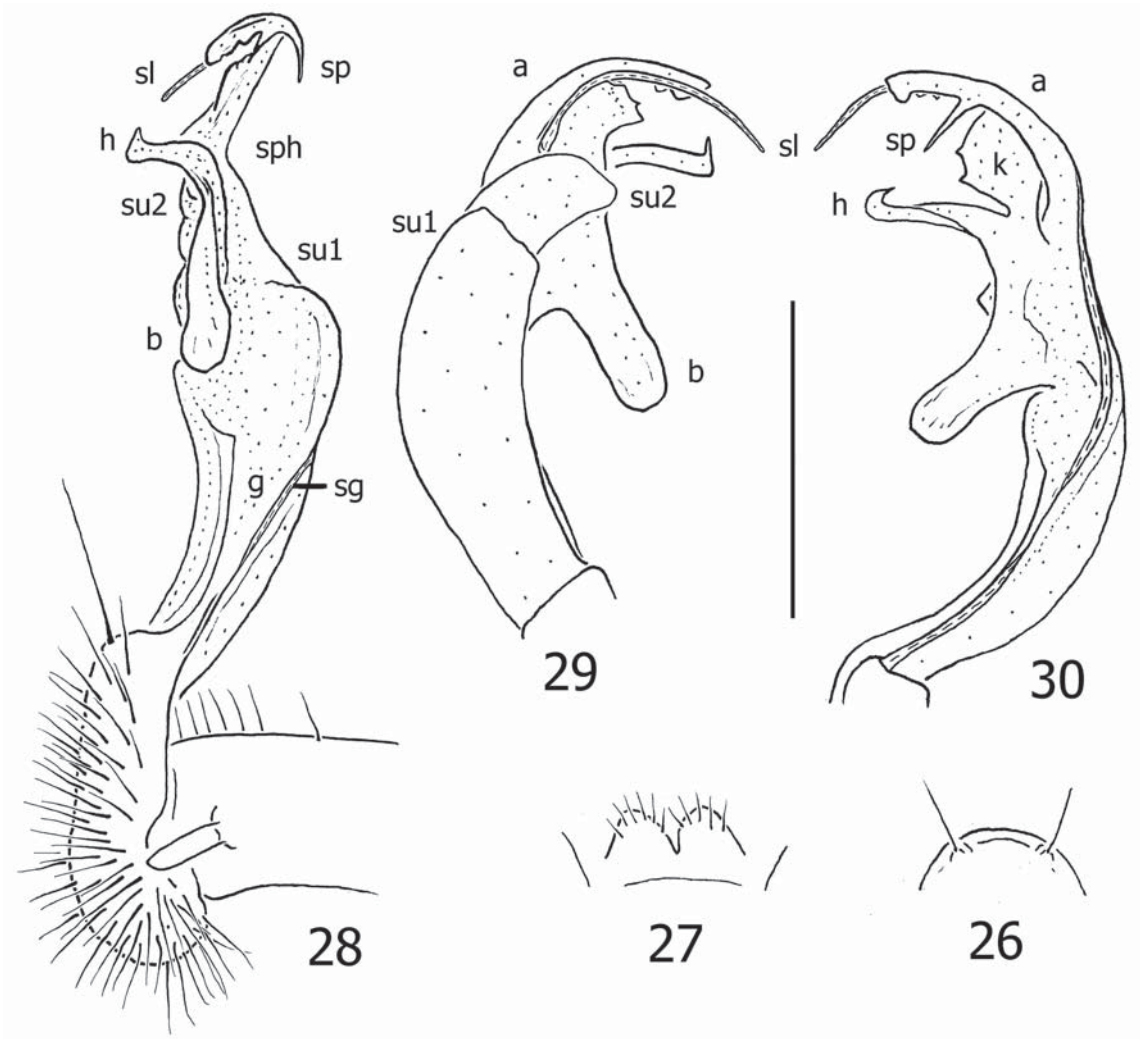
Figs 17–20. *Mandarinopus hirsutus* sp.n., holotype: 17 — habitus, lateral view; 18 — anterior part of body, ventrolateral view; 19 — midbody segments, dorsal view; 20 — head and caudal part of body, dorsal view. Pictures by K. Makarov, taken not to scale.

Рис. 17–20. *Mandarinopus hirsutus* sp.n., голотип: 17 — общий вид, сбоку; 18 — передняя часть тела, одновременно снизу и сбоку; 19 — среднетуловищные сегменты, сверху; 20 — голова и задняя часть тела, сверху. Фотографии сделаны К. Макаровым, без масштаба.

pore-bearing ones faintly upturned, poreless ones subhorizontal, broadly rounded on collum, clearly drawn both anteriad and caudad and well projecting beyond both tergal margins on segment 2, broadly rounded anteriorly on following metaterga, nearly pointed caudally and increasingly clearly projecting behind rear tergal margin, especially well so on segments 17–19. Lateral calluses narrow, but evident, delimited by a sulcus both dorsally and, albeit to a somewhat lesser degree, ventrally, a little thicker and slightly sinuate in ozopore region on pore-bearing segments compared to pore-

Figs 21–25. Right gonopod of *Mandarinopus hirsutus* sp.n., holotype, sublateral, lateral, mesal, submesal and submesal views, respectively. Pictures by K. Makarov, taken not to scale.

Рис. 21–25. Правый гонопод *Mandarinopus hirsutus* sp.n., голотип, соответственно почти сбоку, сбоку, изнутри, почти изнутри и почти изнутри. Фотографии сделаны К. Макаровым, без масштаба.



Figs 26–30. *Mandarinopus hirsutus* sp.n., holotype: 26 — hypoproct, ventral view; 27 — sternal cones between coxae 4, caudal view; 28–30 — right gonopod, mesal, ventral and dorsal views, respectively. Scale bar: 0.5 (26, 27) or 1.0 mm (28–30). Designations explained in text.

Рис. 26–30. *Mandarinopus hirsutus* sp.n., голотип: 26 — гипопрокт, снизу; 27 — стернальные конусы между тазиками 4, сзади; 28–30 — правый гонопод, соответственно изнутри, снизу и сверху. Масштаб: 0,5 (26, 27) и 1,0 мм (28–30). Объяснения обозначений в тексте.

less ones; lateral margin densely microserrate due to setigerous knobs. Ozopores lateral, invisible from above, each lying inside an ovoid groove at ca. 1/5 off caudal corner. Limbus entire. Stricture between pro- and metazona thin, shallow, shining, nearly smooth, at most faintly striolate. Transverse metatergal sulci evident, thin, simple, slightly sinuate medially, not reaching the bases of paraterga, present on segments 4–18. Axial line missing. Pleurosternal carinae tuberculate/serrate, evident ridges with caudal teeth on segments 2–4, caudally rounded and increasingly reduced on segments 5–18. Epiproct (Fig. 20) as usual, long, subtruncate, lateral pre-apical papillae small. Hypoproct (Fig. 26) semi-circular, slightly bordered along caudal margin, the latter with 1+1 setae borne on minute knobs.

Sterna densely setose, cross-impressions shallow, without modifications except for two rounded, basally contiguous, setose cones between ♂ coxae 4 (Fig. 27). No tubercles near gonopod aperture. Legs long and slender, midbody ones ca. 1.9–2.0 times as long as body height, very densely setose, neither adenostyles nor laterally swollen prefemora, ventral brushes present on all ♂ podomeres.

Gonopods (Figs 21–25, 28–20) complex, in situ moderately curved ventrad and their distal parts crossing each other; coxite subcylindrical, setose distoventrally, ca. 2/3 as long as telopodite; prefemoral (= densely setose) part about half as long as acropodite; seminal groove (**sg**) running along femorite at bottom of an evident mesal gutter (**g**) before moving onto a distinct postfemoral part (= solenophore, **sph**), the latter demarcated by two sulci (**su1** and **su2**), grossly quadripartite, represented by (1) a prominent, rounded, lobe-shaped, basal process (**b**) directed both mesad and proximad, (2) a slender, similarly long, twisted, apically uncinate, mesal, hyaline ribbon (**h**), (3) a squarish, small, hyaline lobe (**k**), and (4) a long, slender, slightly curved branch (**a**) supporting most of a longer, free, apical, flagelliform solenomere (**sl**) and a distal spine (**sp**).

REMARKS. Superficially, the presence of only two more or less prominent processes on the solenophore is characteristic of *Kronopolites* Attems, 1914, another Oriental genus of Sulciferini which currently encompasses 11 species ranging from the Kashmir Himalayas in the west to Taiwan and Indochina in the east [Likhitrakarn *et al.*, 2015]. One more, still dubious species, *Orthomorpha almorensis* Turk, 1947, from Almora, Uttarakhand, India [Turk, 1947], seems to actually represent a *Kronopolites* [Golovatch, Wesener, 2016]. However, despite the lack of a distofemoral process on the gonopodal telopodite in *Mandarinopus hirsutus* sp.n., as opposed to a very evident one observed in *M. gracilipes* (Fig. 14, **j**), the best option to place the new species seems to be *Mandarinopus*. Indeed, contrary to *Kronopolites* spp., in which the solenophore is typically very strongly curved mesad and its basal, not apical branch, although likewise directed both mesad and proximad, supports a similarly strongly curved free solenomere (Fig. 4), the above two *Mandarinopus* show a far less clearly curved and much more strongly differentiated solenophore, and it is an apical branch that supports a free apical solenomere (Figs 10–16, 21–25, 28–30).

This conformation very strongly resembles that observed in *Orthomorpha corticina* Attems, 1936, a species described from an unspecified locality in Yunnan, China [Attems, 1936] and still treated *incertae sedis* within the tribe Sulciferini [Jeekel, 1968; Nguyen, Sierwald, 2013]. Apart from sympatry, based on the original description alone [Attems, 1936], the rough, dorsally rugose metaterga and strongly developed paraterga, and, above all, the solenophore that shows two strong processes and an apical branch supporting a free flagelliform solenomere, all this not only warrants the formal transfer of *O. corticina* to *Mandarinopus*, but this also brings it the closest to both *Kronopolites rugosus* Golovatch, 2013, from Yunnan, and *K. semirugosus* Golovatch, 2013, from Sichuan [Golovatch, 2013a, b]. Moreover, *M. corticinus*, comb.n., seems to be especially similar to *M. rugosus*, comb.n., because both share not only the large body (width >3 mm), the colour pattern (dark brown central parts of metaterga with much lighter, yellowish paraterga), the rugose metaterga and strongly developed paraterga, as well as the fully separated cones between ♂ coxae 4, but also the shapes of both larger processes of the solenophore. Yet both these species differ sufficiently well in the presence in *M. corticinus* of a small, but evident, basally directed distofemoral process (much like **j** in Fig. 14) and a distinct, mesal, spiniform process at about the midway of the apical branch (much like **sp** in Figs 28–30) (cf. Attems [1936, fig. 31] and Golovatch [2013a, figs 52, 53], see also key below).

The following formal transfers are thus proposed: *Mandarinopus corticinus* (Attems, 1936), comb.n. ex *Orthomorpha* Bollman, 1893; *Mandarinopus rugosus* (Golovatch, 2013) and *M. semirugosus* (Golovatch, 2013), both comb.n. ex *Kronopolites* Attems, 1914.

The following key can be offered to separate all five presently known species of *Mandarinopus*:

1(2) Collum and following metaterga very densely hirsute (Figs 17–20). Gonopods as in Figs 28–30. .... *M. hirsutus* sp.n.

2(1) Collum and following metaterga not hirsute, either smooth or rugose to rugulose. Gonopods otherwise. .. 3

3(4) Collum and metaterga smooth, colour pattern vivid, as in Figs 6–9. Gonopods as in Figs 10–16. .... *M. gracilipes*

4(3) Collum and metaterga rugose to rugulose, colour pattern, if any, otherwise. Gonopods otherwise. 5

5(6) Coloration uniformly pitchy blackish with only caudal parts of paraterga lighter, brownish. Sternal cones between ♂ coxae 4 contiguous medially. Gonopods without a distofemoral process, both larger processes of solenophore ribbon-shaped and rounded apically, subequal in shape and size. Sichuan. ..... *M. semirugosus*

6(5) Coloration dark brown to brown with contrasting yellowish paraterga. Sternal cones between ♂ coxae 4 fully separated. Gonopods with basal process of solenophore axe-shaped and much larger than a slender, finger-shaped, apical process. Yunnan. 7

7(8) A small, but evident, basally directed distogonofemoral and a distinct, mesal, spiniform process at about midway of apical branch of solenophore present. .... *M. corticinus*

8(7) Neither a distogonofemoral process nor a mesal process of apical branch of solenophore. ..... *M. rugosus*

Hedinomorpha bifida **sp.n.**
Figs 31–45.

HOLOTYPE ♂ (ZMUM Rd 4375), China, NW Sichuan, 7.3 km S of Ganzi, 31°33′8″N, 99°58′38″E, 3665 m a.s.l., 11.07.2016, leg. I. Belousov & I. Kabak.

PARATYPE: 1 ♀ (ZMUM Rd 4376), same data, together with holotype.

NAME. To emphasize the bifid tip of the solenophore; adjective in feminine gender.

Figs 31–34. *Hedinomorpha bifida* sp.n., holotype: 31 — habitus, lateral view; 32 — anterior part of body, dorsal view; 33 — midbody segments, dorsal view; 34 — head and caudal part of body, dorsal view. Pictures by K. Makarov, taken not to scale.

Рис. 31–34. *Hedinomorpha bifida* sp.n., голотип: 31 — общий вид, сбоку; 32 — передняя часть тела, сверху; 33 — среднетуловтщные сегменты, сверху; 34 — голова и задняя часть тела, сверху. Фотографии сделаны К. Макаровым, без масштаба.

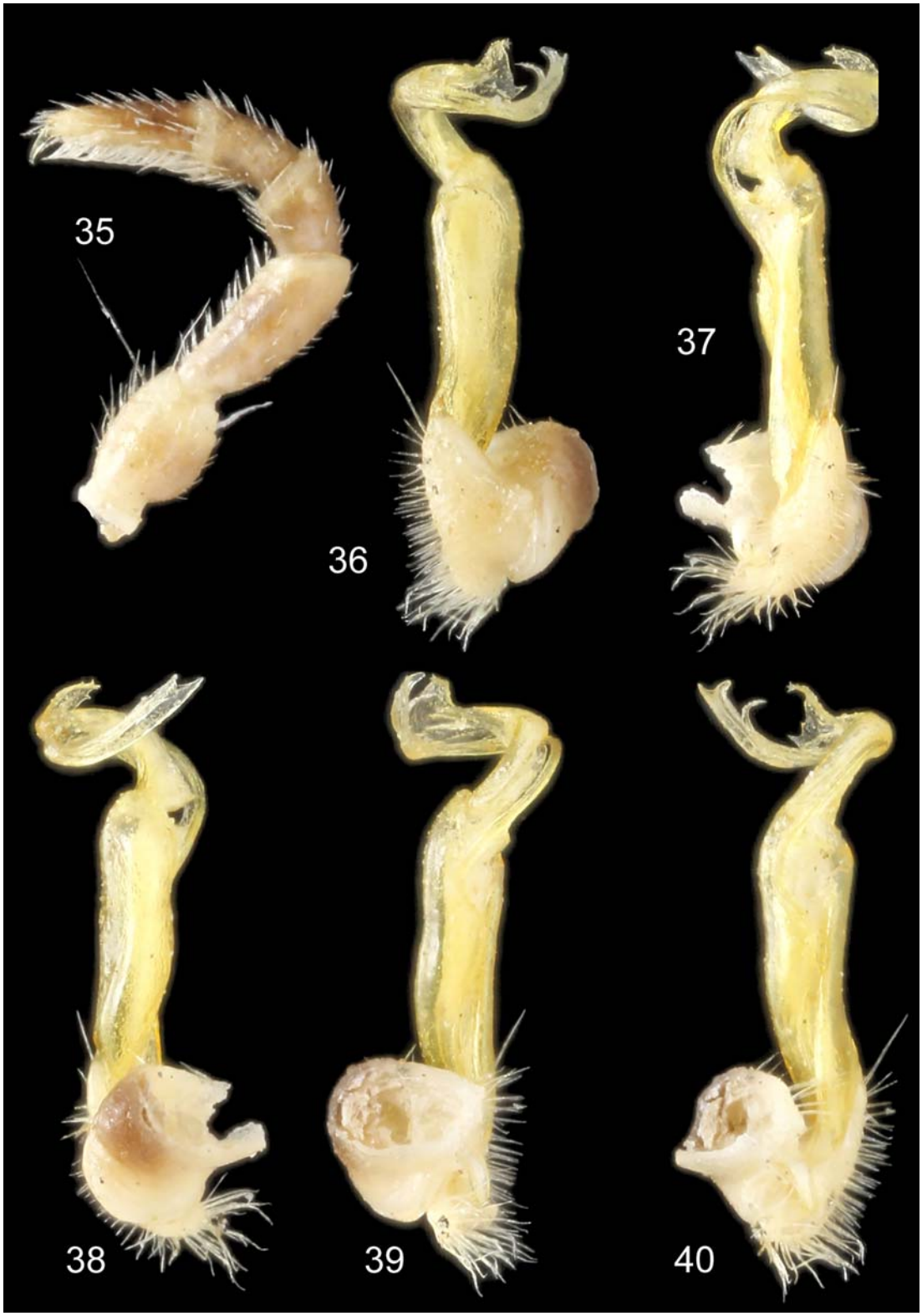
DIAGNOSIS. Differs from other species of the genus by the following combination of characters: coloration mainly dark brown, devoid of a vivid colour pattern; paraterga poorly-developed, their lateral calluses delimited by a distinct sulcus only dorsally; and the peculiar shapes of the solenophore and its outgrowths (see also the key below).

DESCRIPTION. Length of holotype ♂ ca. 23 mm, width of midbody pro- and metazonae 1.45 and 1.8 mm, respectively. Length of paratype ♀ ca. 24 mm, width of midbody pro- and metazonae 1.7 and 2.0 mm, respectively.

Coloration of holotype in alcohol mainly dark brown (Figs 31–35), devoid of a vivid colour pattern; head, ozopores, venter, distal podomeres and tip of epiproct light brown; basal podomeres even lighter, yellow-brown (Figs 17–20). Paratype generally lighter, brown.

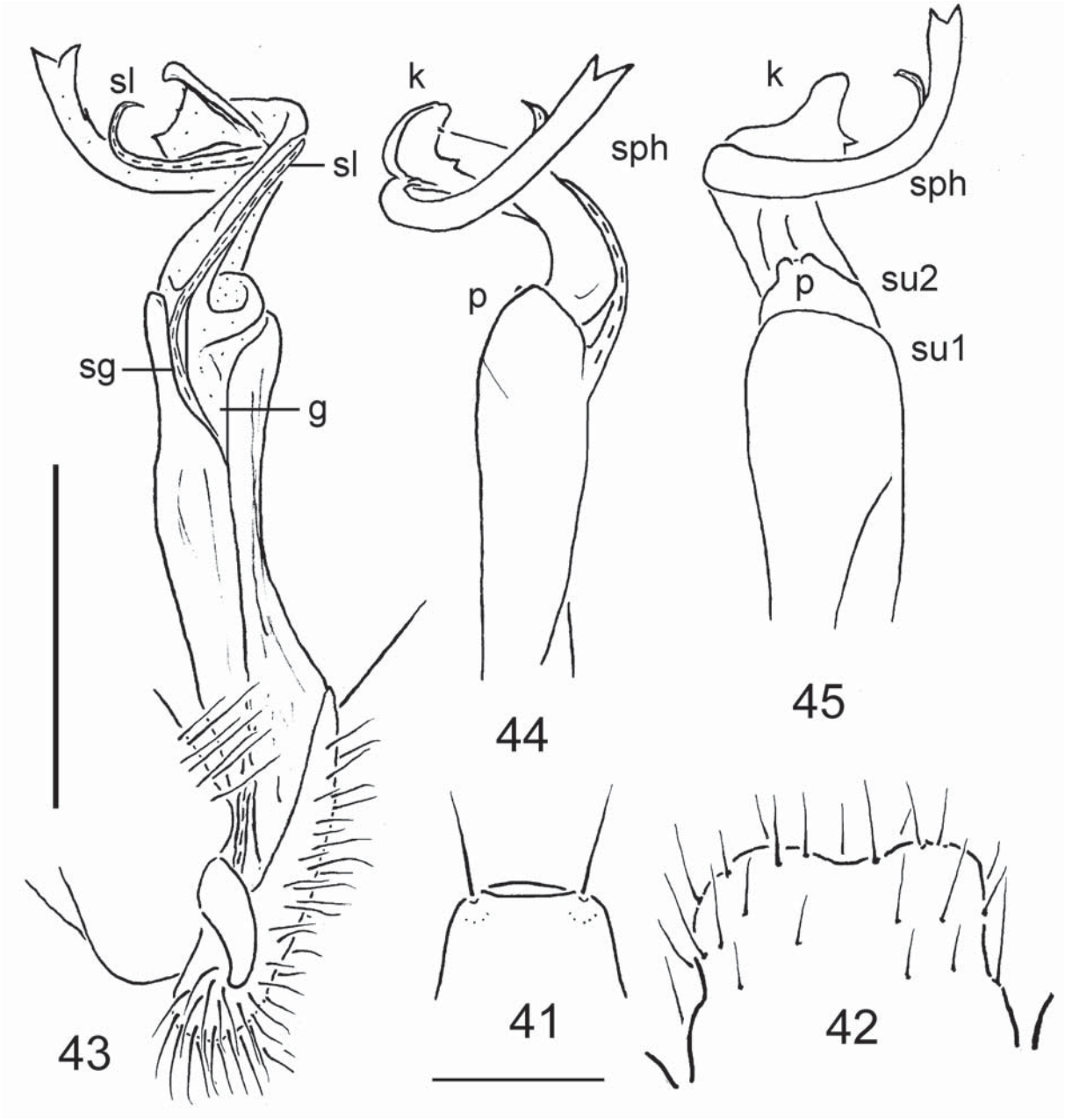
Clypeolabral region moderately setose, vertex bare; epicranial suture thin, but evident (Fig. 32). Antennae moderately long and only slightly clavate (Figs 31, 32, 34), extending behind metatergum 2 (♂) or collum (♀) when stretched dorsally. In length, antennomere 2=3=4=5=6>>1=7. Interantennal isthmus about as broad as diameter of antennal socket.

Tegument generally shining and smooth, only in places slightly rugulose above and below paraterga; surface below paraterga microgranulate; prozonae and strictures between pro- and metazonae very delicately shagreened (Figs 31–34). Tergal setae largely abraded, few remaining ones thin and short, ca. 1/4 as long as metaterga; setation pattern traceable as 2+2 in a transverse fore (= pre-sulcus) row. In width, head = segment 3=4 < collum < 2 = 5–16, body gently and gradually tapering thereafter. Paraterga poorly developed, largely set high at upper 1/3 of metatergal height, pore-bearing ones considerably thicker than poreless ones, broadly rounded on collum and following metaterga, clearly drawn both anteriad and caudad and somewhat projecting beyond both tergal margins only on segment 2, never extended behind rear tergal margin thereafter. Lateral calluses smooth and narrow, but evident, delimited by a distinct sulcus only dorsally. Ozopores lateral, invisible from above, each lying inside an ovoid pit at ca. 1/4–1/5 off caudal margin. Limbus entire. Stricture between pro- and metazona thin, shallow, nearly smooth. Transverse metatergal sulci evident, thin, simple, slightly sinuate medially, not reaching the bases of paraterga, present on segments 5–18, in places



Figs 35–40. *Hedinomorpha bifida* sp.n., holotype: 35 — leg 9, lateral view; 36–40 — left gonopod, ventrolateral, mesal, subdorsal, dorsal and dorsomesal views, respectively. Pictures by K. Makarov, taken not to scale.

Рис. 35–40. *Hedinomorpha bifida* sp.n., голотип: 35 — нога 9, сбоку; 36–40 — левый гонопод, соответственно одновременно снизу и сбоку, почти сверху, сверху и одновременно сверху и изнутри. Фотографии сделаны К. Макаровым, без масштаба.



Figs 41–45. *Hedinomorpha bifida* sp.n., holotype: 41 — hypoproct, ventral view; 42 — sternal lobe between coxae 4, caudal view; 43 — left gonopod, mesal view; 44–45 — distal half of left gonopodal telopodite, dorsal and lateral views, respectively. Scale bar: 0.2 (41), 0.4 (42) or 0.5 mm (43–45). Designations explained in text.

Рис. 41–45. *Hedinomorpha bifida* sp.n., голотип: 41 — гипопрокт, снизу; 42 — стернальная пластинка между тазиками 4, сзади; 43 — левый гонопод, изнутри; 44–45 — дистальная половина телоподита левого гонопода, соответственно сверху и сбоку. Масштаб: 0,2 (41), 0,4 (42) и 0,5 мм (43–45). Объяснения обозначений в тексте.

slightly punctured. Axial line missing. Pleurosternal carinae granulate ridges with caudal, narrowly rounded teeth (♂) or small rounded flaps (♀) on segments 2–6, these teeth or flaps being particularly prominent in segments 7 and 8 to abruptly grow increasingly reduced on segments 9–15(16). Epiproct (Fig. 34) as usual, rather long, faintly concave at tip, lateral pre-apical papillae small. Hypoproct (Fig. 41) subtrapeziform, caudal margin faintly convex, with 1+1 long setae borne on flat rounded knobs.

Sterna moderately setose, cross-impressions shallow, without modifications except for a roundly trapeziform, slightly concave, setose lobe between ♂ coxae 4 (Fig. 42). No tubercles near gonopod aperture. Legs moderately long and slender, clearly incrassate in ♂ compared to ♀, midbody ones ca 1.3–1.4 (♂) or 0.8–0.9 (♀) times as long as body height, densely setose, neither adenostyles nor laterally swollen prefemora, ventral brushes present on ♂ tibiae until midbody legs, tarsal brushes present on all ♂ legs (Fig. 35).

In length, femur > tarsus > coxa = prefemur = postfemur > tibia.

Gonopods (Figs 36–40, 43–45) suberect, *in situ* their distal parts coiled and crossing each other; coxite subcylindrical, setose distoventrally, ca 2/3 as long as femorite; prefemoral (= densely setose) part nearly half as long as acropodite; seminal groove (**sg**) running along femorite at bottom of an evident mesal groove/gutter (**g**) before moving onto a distinct flagelliform solenomere (**sl**) supported by a complex postfemoral part (= solenophore, **sph**), the latter demarcated at and near base by two sulci (**su1** and **su2**), showing a vestigial laterobasal outgrowth (**p**) and being largely represented by a long, ribbon-shaped, strongly coiled, apically bifid structure supplied with a rugged and folded lobe (**k**) near midway.

Hedinomorpha crassiterga **sp.n.**
Figs 46–56.

HOLOTYPE ♂ (ZMUM Rd 4381), China, NW Sichuan, 16.8 km SSW Ganzi, 31°28′18″N, 99°56′21″E, 4490 m a.s.l., 12.07. 2016, leg. I. Belousov & I. Kabak.

PARATYPE: 1 ♀ (ZMUM Rd 4382), same data, together with holotype.

NAME. To emphasize the unusually thick paraterga; adjective in feminine gender.

DIAGNOSIS. Differs from other species of the genus except *H. affinis* Golovatch, 2014, from Gansu [Golovatch, 2014], by the unusually thick and light paraterga, from *H. affinis* in the smaller size (ca. 11–12 mm long, width 1.3–1.5 mm, *vs.* 14–15 mm long, width 1.8–2.0 mm in *H. affinis*), as well as by the larger and beak-shaped, *vs.* smaller and rod-shaped, midway process (**k**) of the solenophore (see also the key below).

DESCRIPTION. Length of holotype ♂ ca. 11 mm, width of midbody pro- and metazonae 1.0 and 1.3 mm, respectively. Length of paratype ♀ ca. 12 mm, width of midbody pro- and metazonae 1.2 and 1.5 mm, respectively.

Coloration of holotype in alcohol mainly blackish brown (Figs 46–48), of paratype a little lighter, dark brown to brown, postsulcus halves of metaterga dark reddish brown; a vivid colour pattern expressed in paratergal calluses being contrasting lighter, grey-yellowish; head, venter and legs brown to red-brown; antennae mainly brown, increasingly infuscate distad, only antennomeres 6 and 7 dark brown.

Clypeolabral region densely setose, vertex nearly bare; epicranial suture thin, but evident (Fig. 48). Antennae moderately long and only slightly clavate (Figs 46, 49), extending behind metatergum 2 (♂) or collum (♀) when stretched dorsally. In length, antennomere 2=3=4=5=6>>1=7. Interantennal isthmus ca. 1.3 times as broad as diameter of antennal socket.

Tegument generally shining and smooth, surface below paraterga microgranulate and striate to striolate; prozonae very delicately shagreened, strictures between pro- and metazonae very finely striolate (Figs 46–48). Tergal setae largely abraded, few remaining ones thin and short, ca. 1/5 as long as metaterga; setation pattern traceable as 2+2 in a transverse fore (= pre-sulcus) row; a pre-caudal row of 2+2 or 3+3 insertion points traceable on several caudal metaterga. In width, collum = segment 3=4 < 2 < head = 5–16, body gently and gradually tapering thereafter. Paraterga poorly developed, largely set high at upper 1/3 of metatergal height, pore-bearing calluses unusually thick, only slightly thicker than poreless ones, strongly truncated caudally, smooth, delimited by a distinct sulcus both dorsally and, to a lesser degree, ventrally; paraterga broadly rounded on collum and following metaterga, poorly drawn both anteriad and caudad and somewhat projecting beyond both tergal margins only on segment 2, never extended behind rear tergal margin thereafter. Ozopores lateral, invisible from above, each lying inside an ovoid pit near ventrocaudal end of callus. Limbus entire. Transverse metatergal sulci rather superficial, thin, simple, slightly sinuate medially, not reaching the bases of paraterga, present on segments 5–18. Axial line missing. Pleurosternal carinae granulate ridges with an increasingly strong, caudal, nearly sharp tooth on segments 2–7 (♂) or a small, narrowly rounded denticle (♀), this tooth or denticle to abruptly grow increasingly reduced towards segment 10, being replaced after that by a small bulge until segment 14. Epiproct (Fig. 48) as usual, rather long, tip subtruncate, lateral pre-apical papillae very small. Hypoproct (Fig. 52) roundly subtrapeziform, caudal margin very faintly convex, with 1+1 long setae borne on very small knobs.

Sterna moderately setose, cross-impressions shallow, without modifications except for a roundly trapeziform, very slightly concave, setose lobe between ♂ coxae 4 (Fig. 53). No tubercles near gonopod aperture. Legs rather long and slender, clearly incrassate in ♂ compared to ♀, midbody ones ca 1.5–1.6 (♂) or 0.9–1.0 (♀) times as long as body height, densely setose, neither adenostyles nor laterally swollen prefemora, ventral brushes present only on ♂ tarsi 1–7. In length, femur > tarsus > coxa = prefemur = postfemur = tibia.

Gonopods (Figs 49–51, 54–56) much like in *H. bifida* sp.n., but laterobasal outgrowth (**p**) of solenophore (**sph**) a little better developed, rounded and lobe-shaped, midway outgrowth (**k**) a strong, beak-shaped process, while distal part of **sph** conspicuously fimbriate/spinose.

Hedinomorpha flavobulbus **sp.n.**
Figs 57–69.

HOLOTYPE ♂ (ZMUM Rd 4377), China, Gansu Prov., WWS of Longnan (Wudu), Yin Duoguosa & Aounang divide, 33°21′14″N, 104°29′45″E, 3650 m a.s.l., 22.06.2017, leg. I. Belousov & I. Kabak.

PARATYPE: 1 ♀ (ZMUM Rd 4378), same data, together with holotype.

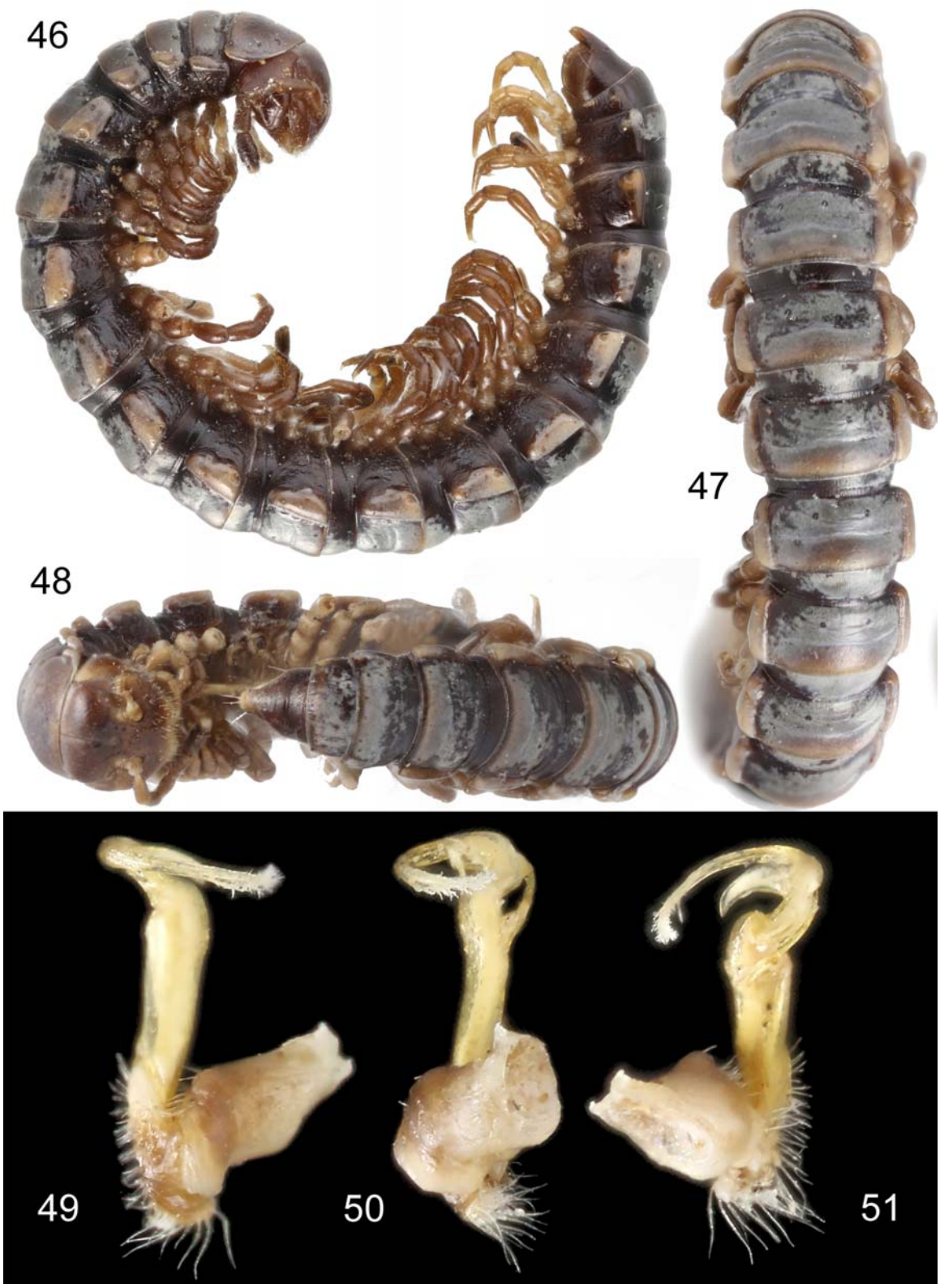
NAME. To emphasize the light bulbous epiproct; noun in apposition.

DIAGNOSIS. Differs from other species of the genus except *H. hummelii, H. biramipedicula* and *H. nigra* by the club-shaped epiproct [Golovatch, 2013a], from the latter three species by the shape of the midway process (**k**) of the solenophore (Figs 67–69), which is strong and bifid like in *H. biramipedicula*, but its tips are clearly rounded, not sharp (see also the key below).

DESCRIPTION. Length of holotype ♂ ca. 26 mm, width of midbody pro- and metazonae 2.5 and 3.0 mm, respectively. Length of paratype ♀ ca. 27 mm, width of midbody pro- and metazonae 2.6 and 3.0 mm, respectively.

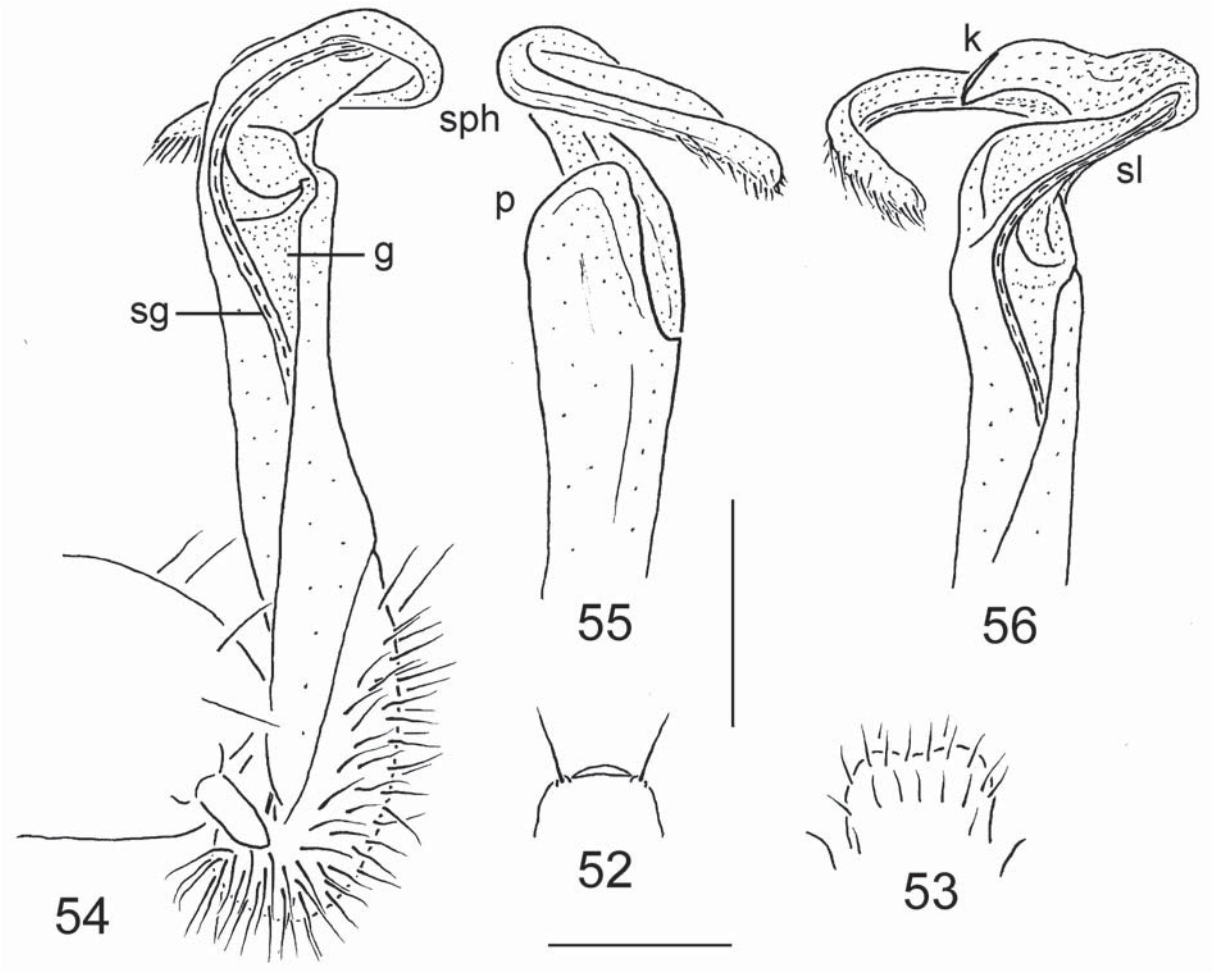
Coloration of holotype in alcohol mainly pitchy black (Figs 57–60), genae and proximal podomeres black-brown, only epiproct light greyish brown; ♀ paratype lighter, dark brown to brown, venter, proximal podomeres and epiproct light yellowish brown.

Clypeolabral region densely setose, vertex nearly bare; epicranial suture thin, but evident (Fig. 58). Antennae moderately long and only slightly clavate (Figs 57–58), extending behind metatergum 2 (♂) or collum (♀) when stretched



Figs 46–51. *Hedinomorpha crassiterga* sp.n., holotype: 46 — habitus, lateral view; 47 — middle part of body, dorsal view; 48 — head and caudal part of body, dorsal view; 49–51 — left gonopod, lateral, dorsal and mesal views, respectively. Pictures by K. Makarov, taken not to scale.

Рис. 46–51. *Hedinomorpha crassiterga* sp.n., голотип: 46 — общий вид, сбоку; 47 — средняя часть тела, сверху; 48 — голова и задняя часть тела, сверху; 49–51 — левый гонопод, соответственно изнутри, сверху и сбоку. Фотографии сделаны К. Макаровым, без масштаба.



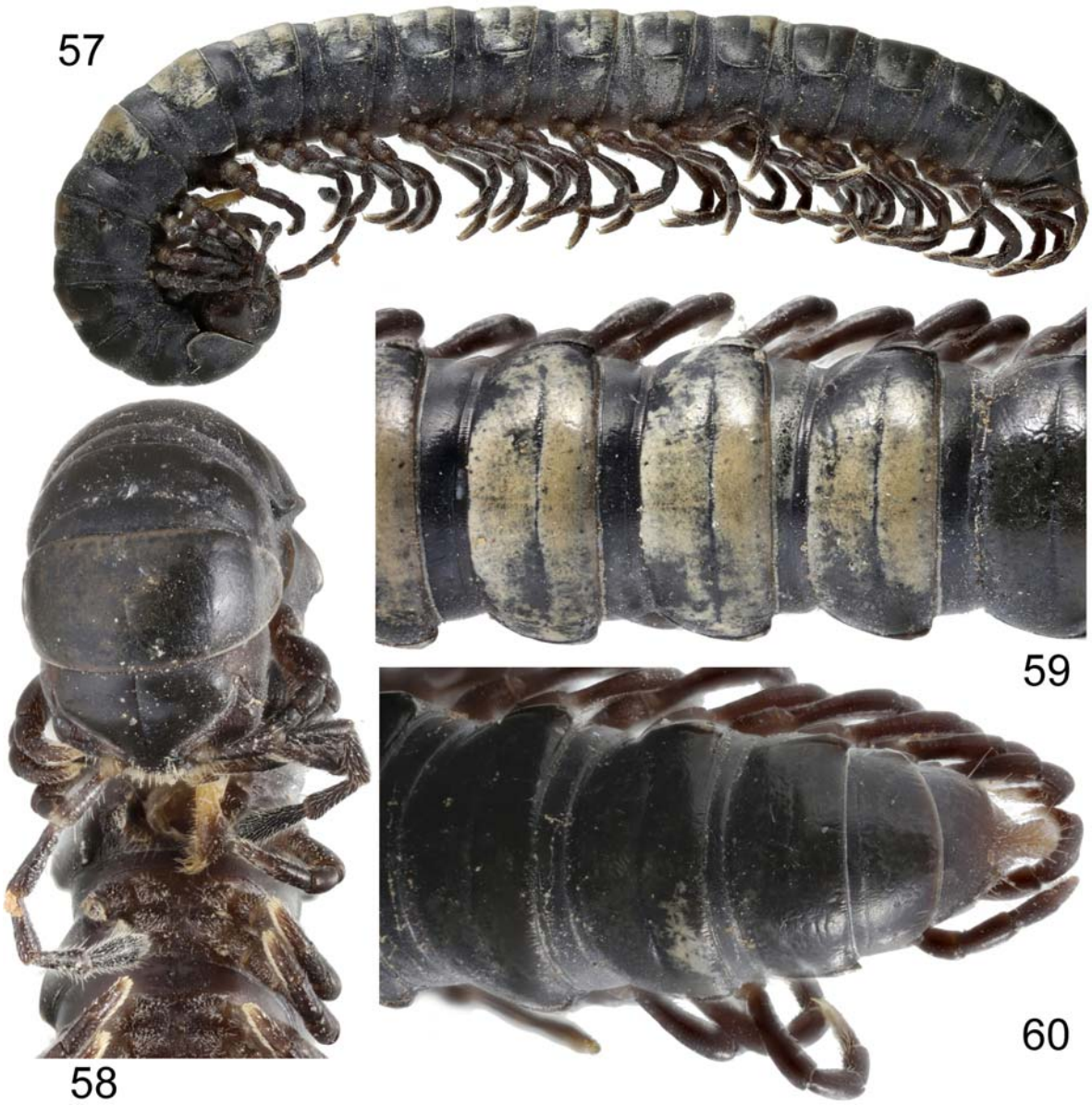
Figs 52–56. *Hedinomorpha crassiterga* sp.n., holotype: 52 — hypoproct, ventral view; 53 — sternal lobe between coxae 4, caudal view; 54 — left gonopod, mesal view; 55–56 — distal half of left gonopodal telopodite, dorsal and lateral views, respectively. Scale bars: 0.2 mm. Designations explained in text.

Рис. 52–56. *Hedinomorpha crassiterga* sp.n., голотип: 52 — гипопрокт, снизу; 53 — стернальная пластинка между тазиками 4, сзади; 54 — левый гонопод, изнутри; 55–56 — дистальная половина телоподита левого гонопода, соответственно сверху и сбоку. Масштаб: 0,2 мм. Объяснения обозначений в тексте.

dorsally. In length, antennomere 2=3=4=5=6>>1=7. Interantennal isthmus ca. 1.3 times as broad as diameter of antennal socket.

Tegument generally smooth and shining, only in places faintly striolate; surface below paraterga microgranulate; prozonae very delicately shagreened, strictures between pro- and metazonae finely striolate (Figs 57, 59, 60). Tergal setae largely abraded, few remaining ones thin and short, ca. 1/5–1/6 as long as metaterga; setation pattern barely traceable as 2+2 in a transverse fore (= pre-sulcus) row. In width, head < segment 3=4 < collum < 2 < 5–16, body gently and gradually tapering thereafter. Paraterga poorly developed, largely set rather low, at upper 1/3–1/2 of metatergal height, calluses relatively thin and narrow, pore-bearing calluses only slightly thicker than poreless ones, smooth, delimited by a distinct sulcus only dorsally, near caudal end by a vague sulcus also ventrally; paraterga broadly rounded on collum and following metaterga, rounded flaps poorly drawn both anteriad and caudad and somewhat projecting beyond both tergal margins only on segment 2, never extended behind rear tergal margin thereafter. Ozopores lateral, visible from above only due to subcaudally fainly sinuous calluses, each pore lying inside an ovoid pit near ventrocaudal end of callus. Limbus entire. Transverse metatergal sulci rather superficial, thin, simple, often slightly sinuate medially and in places punctured, not reaching the bases of paraterga, present on segments 5–18, on 18th incomplete and particularly vague (Fig. 60). Axial line missing. Pleurosternal carinae small granulate ridges with blunt caudal teeth, the latter especially strong on segments 6 and 7, thereafter increasingly reduced bulges traceable until segment 17. Epiproct (Fig. 60) rather long, densely setose and club-shaped. Hypoproct (Fig. 65) roundly subtrapeziform, caudal margin convex, with 1+1 long setae borne on knobs.

Sterna moderately setose, cross-impressions shallow, without modifications except for a roundly trapeziform, clearly emarginate, setose lobe between ♂ coxae 4 (Fig. 66). No tubercles near gonopod aperture. Legs rather long and slender, clearly incrassate in ♂ compared to ♀, midbody ones ca 1.5–1.7 (♂) or 0.9–1.0 (♀) times as long as body height, densely setose, neither adenostyles nor laterally swollen prefemora, ventral brushes present on ♂ tibiae until mid-



Figs 57–60. *Hedinomorpha flavobulbus* sp.n., holotype: 57 — habitus, lateral view; 58 — anterior part of body, ventral view; 59 — middle part of body, dorsal view; 60 — caudal part of body, dorsal view. Pictures by K. Makarov, taken not to scale.

Рис. 57–60. *Hedinomorpha flavobulbus* sp.n., голотип: 57 — общий вид, сбоку; 58 — передняя часть тела, снизу; 59 — средняя часть тела, сверху; 60 — задняя часть тела, сверху. Фотографии сделаны К. Макаровым, без масштаба.

body legs and on all ♂ tarsi. In length, femur > tarsus > prefemur > coxa = postfemur = tibia.

Gonopods (Figs 61–64, 67–69) much like in *H. bifida* sp.n., but laterobasal outgrowth (**p**) of a more slender and simple solenophore (**sph**) particularly small/vestigial, midway outgrowth (**k**) a strong and curved spine, while distal part of **sph** neither fimbriate nor spinose, tip blunt.

Hedinomorpha altiterga **sp.n.**
Figs 70–78.

HOLOTYPE ♂ (ZMUM Rd 4379), China, Gansu Prov., WWS of Longnan (Wudu), 2.4 km NW of Zhongzhaixiang, 33°12′46″N, 104°25′43″E, 1445 m a.s.l., 25.06.2017, leg. I. Belousov & I. Kabak.

PARATYPES: 2 ♂♂, 2 ♀♀, 1 incomplete ♀ (head and anterior 7 segments) (ZMUM Rd 4380), same data, together with holotype.

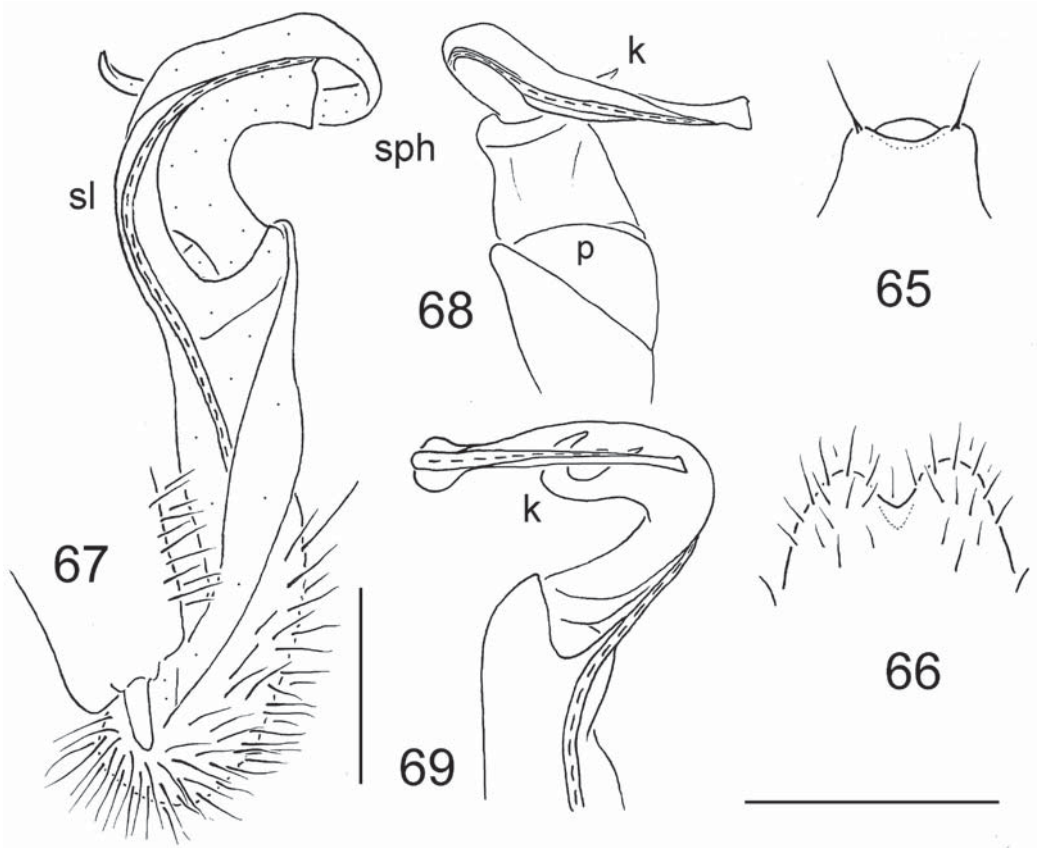
NAME. To emphasize the relatively strong and high paraterga; adjective in feminine gender.

DIAGNOSIS. Differs from other species of the genus in the paraterga being strongly developed and, in the ♂, clearly upturned, with their caudal corners produced past the caudal tergal margin, coupled with a vivid colour pattern (Figs 70–73) and a peculiar shape of the solenophore (Figs 76–78) (see also the key below).

DESCRIPTION. Length of holotype ♂ ca. 17 mm, width of midbody pro- and metazonae 1.5 and 2.0 mm, respectively. Length of ♂♂ paratypes ca. 15–16 mm, width of midbody pro- and metazonae likewise 2.6 and 3.0 mm, respec-

Figs 61–64. *Hedinomorpha flavobulbus* sp.n., holotype, left gonopod, lateral, dorsal, subdorsal and mesal views, respectively. Pictures by K. Makarov, taken not to scale.

Рис. 61–64. *Hedinomorpha flavobulbus* sp.n., голотип, левый гонопод, соответственно сбоку, сверху, почти сверху и изнутри. Фотографии сделаны К. Макаровым, без масштаба.



Figs 65–69. *Hedinomorpha flavobulbus* sp.n., holotype: 65 — hypoproct, ventral view; 66 — sternal lobe between coxae 4, caudal view; 67 — left gonopod, mesal view; 68–69 — distal half of left gonopodal telopodite, ventral and dorsal views, respectively. Scale bars: 1.0 (65–66) or 0.5 mm (67–69). Designations explained in text.

Рис. 65–69. *Hedinomorpha flavobulbus* sp.n., голотип: 65 — гипопрокт, снизу; 66 — стернальная пластинка между тазиками 4, сзади; 67 — левый гонопод, изнутри; 68–69 — дистальная половина телоподита левого гонопода, соответственно снизу и сверху. Масштаб: 1,0 (66–66) и 0,5 мм (67–69). Объяснения обозначений в тексте.

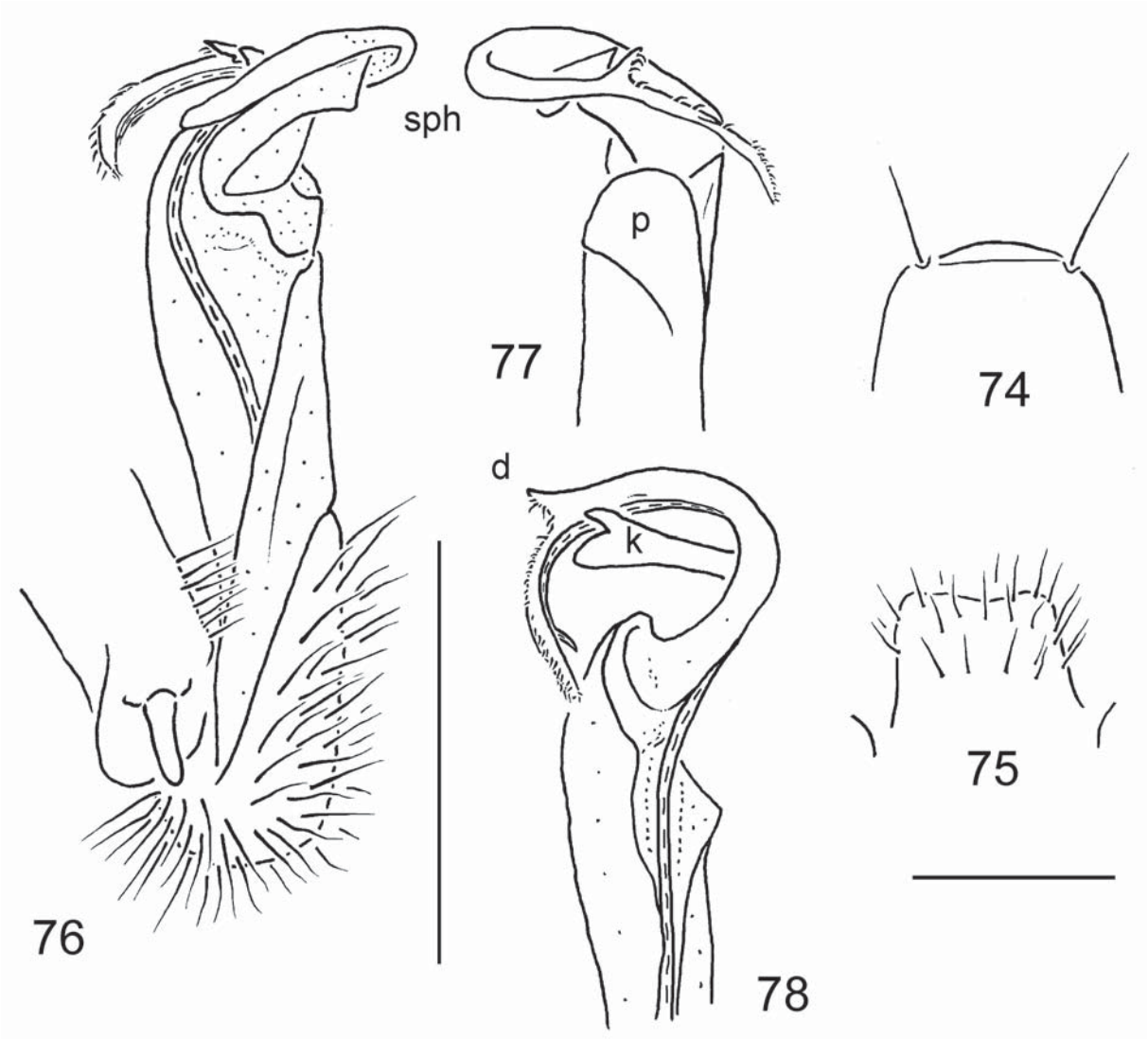
Figs 70–73. *Hedinomorpha altiterga* sp.n., ♂ paratype: 70 — habitus, lateral view; 71 — anterior part of body, ventral view; 72 — middle part of body, dorsal view; 73 — caudal part of body, dorsal view. Pictures by K. Makarov, taken not to scale.

Рис. 70–73. *Hedinomorpha altiterga* sp.n., паратип ♂: 70 — общий вид, сбоку; 71 — передняя часть тела, снизу; 72 — средняя часть тела, сверху; 73 — задняя часть тела, сверху. Фотографии сделаны К. Макаровым, без масштаба.

tively. Length of complete ♀♀ paratypes ca. 18 or 20 mm, width of midbody pro- and metazonae 2.0 and 2.4–2.5 mm, respectively.

Coloration in alcohol generally rusty dark brown (♂♂) or brown to light brown (♀♀) with contrasting yellowish to nearly whitish paraterga, including those of collum (Figs 70–73); one ♀ paratype particularly light, with almost entire dorsum yellowish and axial line darker, brownish. Antennomeres 6 and 7 darkest.

Clypeolabral region densely setose, vertex with a few setae; epicranial suture thin, but evident (Fig. 71). Antennae moderately long and only slightly clavate (Figs 70–71),



Figs 74–78. *Hedinomorpha altiterga* sp.n., ♂ paratype: 74 — hypoproct, ventral view; 75 — sternal lobe between coxae 4, caudal view; 76 — left gonopod, mesal view; 77–78 — distal half of left gonopodal telopodite, lateral and ventral views, respectively. Scale bars: 0.2 (74–75) or 0.5 mm (76–78). Designations explained in text.

Рис. 74–78. *Hedinomorpha altiterga* sp.n., паратип ♂: 74 — гипопрокт, снизу; 75 — стернальная пластинка между тазиками 4, сзади; 76 — левый гонопод, изнутри; 77–78 — дистальная половина телоподита левого гонопода, соответственно сбоку и снизу. Масштаб: 0,2 (74–75) и 0,5 мм (76–78). Объяснения обозначений в тексте.

extending behind metatergum 2 (♂) or collum (♀) when stretched dorsally. In length, antennomere 2=3=4=5=6>>1=7. Interantennal isthmus ca. 1.4 times as broad as diameter of antennal socket.

Tegument generally smooth, poorly shining or dull due to finely micropunctate and striolate/rugulose metaterga; surface below paraterga microgranulate and rugulose; prozonae very delicately shagreened, strictures between pro- and metazonae finely striolate (Figs 70–73). Tergal setae largely abraded, remaining ones thin and short, ca. 1/4–1/5 as long as metaterga; setation pattern traceable as 3+3 in a transverse fore (= pre-sulcus) row and 1–2 lateral setae on paratergal callus; one anterolateral seta present on callus of collum; a pre-caudal row of 3(4)+3(4) insertion points traceable on several caudal metaterga. In width, head < collum < segment 3=4 < 2 < 5–16, body gently and gradually tapering thereafter. Postcollum paraterga strongly developed, mostly wing-shaped, set high at upper 1/4 (♂) or 1/3–1/2 (♀) of metatergal height, largely slightly upturned and held (almost) level with dorsum (♂) or considerably smaller, subhorizontal and lying well below dorsum (♀); only calluses on collum thin, postcollum ones relatively thick and broad, pore-bearing calluses only slightly thicker than poreless ones, smooth, slightly sinuate in ozopore region in dorsal view, delimited by a distinct sulcus both dorsally and, to a lesser degree, ventrally; paraterga broadly rounded anteriorly on collum and following metaterga, drawn both anteriad and caudad and somewhat projecting beyond both tergal margins only in segment 2, following paraterga always broadly rounded anteriorly and increasingly well extended behind rear tergal margin, subspiniform caudally, almost or fully pointed, especially strongly produced caudally on segments 17–19. Ozopores lateral, invisible from above, each lying inside an ovoid groove at about 1/3–1/4 off caudal end of callus.

Limbus entire. Transverse metatergal sulci evident, beaded at bottom, slightly sinuate medially, almost reaching the bases of paraterga, present on segments 5–18. Axial line missing. Pleurosternal carinae evident, more strongly developed in ♂ than in ♀, granulate arcuated ridges with increasingly strong, caudal, rounded teeth on segments 2–7, the largest on segments 6 and 7, these teeth being abruptly and increasingly reduced toward segment 10, still traceable thereafter as small bulges/ridges until segment 16–17. Epiproct (Fig. 73) as usual, rather long, tip subtruncate, lateral preapical papillae evident. Hypoproct (Fig. 74) roundly subtrapeziform, caudal margin faintly convex, with 1+1 long setae not borne on knobs.

Sterna moderately setose, cross-impressions shallow, without modifications except for a roundly trapeziform, very slightly concave, setose lobe between ♂ coxae 4 (Fig. 75). No tubercles near gonopod aperture. Legs relatively long and slender, clearly incrassate in ♂ compared to ♂, midbody ones ca 1.8–2.0 (♂) or 1.1–1.2 (♀) times as long as body height, densely setose, neither adenostyles nor laterally swollen prefemora, tarsal brushes gradually thinning out only towards a few last ♂ legs. In length, femur > tarsus > coxa = prefemur = postfemur = tibia.

Gonopods (Figs 76–78) much like in *H. bifida* sp.n., but laterobasal outgrowth (**p**) of solenophore (**sph**) a small rounded lobe, midway outgrowth (**k**) a prominent, long, ribbon-shaped, apically rounded, bifid and curved process, while distal part of **sph** clearly fimbriate/spinose and showing a strong tooth (**d**).

REMARKS. The genus *Hedinomorpha* Verhoeff, 1934 has hitherto been known to comprise the following 13 accepted species. The type species is *H. hummelii* Verhoeff, 1934, with two varieties from southern Gansu, China [Verhoeff, 1934], both presently regarded as the subspecies *H. h. hummelii* Verhoeff, 1934 and *H. hummelii svenhedini* Verhoeff, 1934 [Wang, Mauriès, 1996; Nguyen, Sierwald, 2013]. However, it actually represents a single, slightly variable species without recognizable subspecies, just as originally introduced by Verhoeff [1934] and later reinstated by Jeekel [1968, 1988]. So I advance herewith the following new formal synonymy: *H. hummelii hummelii* Verhoeff, 1934 = *H. hummelii svenhedini* Verhoeff, 1934, **syn.n.**

In addition to *H. hummelii*, Gansu Province supports the following species: *H. affinis* Golovatch, 2014, *H. altiterga* sp.n. and *H. flavobulbus* sp.n. The remaining congeners are as follows: *H. bucharensis* (Lohmander, 1933), from Tajikistan, Central Asia; *H. biramipedicula* Zhang et Tang, 1985, from Shanxi Province; *H. circofera* Golovatch, 2013, from Qinghai Province; *H. jeekeli* (Golovatch, 2009), from Shaanxi Province; *H. bifida* sp.n., *H. crassiterga* sp.n., *H. martensi* Golovatch, 2014, *H. nigra* Golovatch, 2013 and *H. reducta* Golovatch, 2012, all from Sichuan Province; *H. montana* Golovatch, 2016, *H. proxima* Golovatch, 2016, *H. subnigra* Golovatch, 2013 and *H. yunnanensis* Golovatch, 2016, all from Yunnam Province, China [Zhang, Tang, 1985; Jeekel, 1988; Golovatch, 2009, 2012, 2013a, b, 2014, 2016]. Based on the original description and the drawing of a gonopod, *Orthomorpha circularis* Takakuwa, in Takakuwa et Takashima, 1949, a species described from Shanxi Province [Takakuwa, Takashima, 1949] and hitherto either neglected [Jeekel, 1968, 1988] or considered *incertae sedis* [Nguyen, Sierwald, 2013], definitely belongs to *Hedinomorpha* as well. This formally results in *Hedinomorpha circularis* (Takakuwa, in Takakuwa et Takashima, 1949), **comb.n.** ex *Orthomorpha* Bollman, 1893.

With the addition of the above four new *Hedinomorpha*, the previous key [Golovatch, 2013b] becomes so obsolete that a new, up-to-date key is warranted, even though further new congeners, at least from China, may well be expected in future.

The key below to all 18 presently described species of *Hedinomorpha* is chiefly based on ♂ characters, largely gonopodal ones. The main differences among particularly similar species appear to lie in the shapes of two principal outgrowths of the solenophore, one laterobasal (**p**) and the other, when present, more or less midway (**k**). An additional outgrowth at the base of the solenophore is rarely present as well. Consulting the relevant literature (see above) is strongly recommended for a safe identification.

1(2) Adults larger: ♂ body width ≥3.5 mm. Paraterga especially poorly developed, low bulges to nearly missing. Gonopodal femorite particularly slender, devoid of a mesal groove, lateral process at base of an acuminate solenophore unciform. Sichuan. ..... *H. reducta*
2(1) Adults smaller: ♂ body width ≤3.2 mm. Paraterga keel- or wing-shaped, at least some in posterior 1/3 body usually extended caudad behind rear tergal margin. Gonopodal femorite far from that slender, a mesal groove/gutter on gonopodal femorite usually well-developed, only rarely vague, but still discernible; lateral process or outgrowth at base of a more usually non-acuminate solenophore shorter or longer, typically not unciform. 3
3(4) Epiproct club-shaped (Fig. 60). Laterobasal outgrowth (**p**) of solenophore vestigial, a small lobe, while midway outgrowth (**k**) prominent (Figs 67–69). China. 5
4(3) Epiproct as usual, flattened dorsoventrally, not clavate (Figs 34, 48, 73). Laterobasal outgrowth (**p**) of solenophore vestigial to well-developed. 11
5(6) Midway outgrowth of solenophore long, straight and clearly bifid, both tips sharp. Shanxi. .... *H. biramipedicula*
6(5) Midway outgrowth of solenophore otherwise. 9
7(8) Midway outgrowth (**k**) of solenophore strongly curved and spiniform (Figs 67–69). Gansu. .... *H. flavobulbus* sp.n.
8(7) Midway outgrowth of solenophore otherwise. 10
9(10) Midway outgrowth of solenophore a long, apically enlarged, subtruncate and folded ribbon; solenophore acuminate. Sichuan. ..... *H. nigra*
10(9) Midway outgrowth of solenophore a very long, regularly slender and coiled ribbon; solenophore not acuminate. Gansu. ..... *H. hummelii*
11(12) Calluses of paraterga particularly thick in lateral view and contrasting lighter than a dark dorsum (Figs 46–48). 13
12(11) Paratergal calluses never so thick in lateral view and usually same or almost same in colour as dorsum. 15
13(14) Larger: 14–15 mm long, width 1.8–2.0 mm. Sichuan. Midway outgrowth (**k**) of solenophore a strong beak-shaped process (Figs 54–56). ..... *H. crassiterga* sp.n.
14(13) Smaller: ca. 11–12 mm long, width 1.3–1.5 mm. Midway outgrowth of solenophore a slender process/rod. Gansu. ..... *H. affinis*
15(16) Solenophore subtruncate, laterobasal outgrowth of solenophore a short subtruncate stump, midway outgrowth a short sharp tooth. Tajikistan. . *H. bucharensis*
16(15) Solenophore and its main outgrowths otherwise. China. 17
17(18) Paraterga particularly strongly developed and contrasting light, in ♂ clearly upturned; calluses relatively

broad in dorsal view (Figs 70–73). Gonopods as in Figs 76–78. Gansu. ..... *H. altiterga* sp.n.

18(17) Paraterga poorly-developed and usually not so contrasting light, never upturned; calluses thinner and narrower in dorsal view (e.g. Figs 31–34). Gonopods otherwise. 19

19(20) General coloration dark brown with a vivid pattern of a slightly lighter mid-dorsal area and contrasting light paraterga. Body up to 15 mm long. Solenophore circular, clearly fringed/fimbriate distally and acuminate apically, its laterobasal outgrowth a small lobe, but midway one an elongate leaf-shaped, basally narrowed, medially enlarged, distally attenuated and apically acuminate process in basal 1/3 of solenophore. Shanxi. ..... *H. circularis*

20(19) General coloration rather uniformly dark, devoid of a vivid pattern. Body ≥16 mm long. Gonopods otherwise. 21

21(22) Caudal corner of paratergal calluses 3–19 never drawn behind caudal tergal margin, thus caudally forming neither a tooth nor a spine. 23

22(21) Caudal corner of some paratergal calluses denti- or spiniform and certain past 2nd (always 18th) visibly drawn behind caudal tergal margin. 27

23(24) Smaller: 16 mm long. Solenophore sparsely denticulate distally, subapical part with a conspicuous membranous velum, tip acuminate; laterobasal outgrowth a large rounded lobe, midway outgrowth a long slender spine. Sichuan. ..... *H. martensi*

24(25) Larger: 23–27 mm long. Gonopods otherwise. 25

25(26) Ventral brushes present on ♂ tibiae until midbody legs, tarsal brushes present on all ♂ legs. A trapeziform, slightly concave, setose lobe between ♂ coxae 4 (Fig. 42). Gonopods as in Figs 43–45, tip of solenophore bifid. Sichuan. ..... *H. bifida* sp.n.

26(25) Most ♂ femora, tibiae and tarsi with ventral brushes. Sternal lobe between ♂ coxae 4 small, tongue-shaped, with a central knob on caudal face. Gonopods otherwise, laterobasal outgrowth of solenophore a prominent curved finger directed ventrad, midway outgrowth an evident squarish lobe. Yunnan. ..... *H. subnigra*

27(28) Lateral calluses of paraterga deliminted by a sharp sulcus only dorsally, their caudal corners at most dentiform and narrowly rounded. Nearly all ♂ tibiae and tarsi with ventral brushes. Solenophore neither fringed nor fimbriate. 29

28(27) Lateral calluses of paraterga delimited by a sharp sulcus not only dorsally, but also partly ventrocaudally. Prefemoral, tibial and tarsal brushes on most to all ♂ legs. Solenophore fringed/fimbriate distally. Yunnan. 31

29(30) Caudal corner of paraterga 2 and 18 dentiform, 2nd strongly, but 18th barely drawn past rear tergal margin. Laterobasal outgrowth of an acuminate and distally denticulate solenophore a small rounded lobe, midway outgrowth a strong, long, curved spine. Qinghai. ..... *H. circofera*

30(29) Caudal corner of paraterga 2, 18 and 19 clearly drawn behind rear tergal margin. Laterobasal outgrowth of a subacuminate and distally fringed solenophore a small, but strong and sharp tooth, midway outgrowth a similar, but even smaller tooth. Shaanxi. ..... *H. jeekeli*

31(32) Transverse sulci visible only on metaterga 5–16. Solenophore tip a long spine, laterobasal outgrowth a small sharp tooth, midway one a rather large and subtriangular lobe. ..... *H. proxima*

32(31) Transverse sulci visible on metaterga 5–(17)18. Gonopods otherwise. 33

33(34) Transverse sulci visible on metaterga 5–17. Solenophore tip subacuminate, laterobasal outgrowth a small, but strong and slender finger-shaped process, midway one a distinct dentiform lobe. ..... *H. montana*

34(33) Transverse sulci visible on metaterga 5–18. Solenophore tip not acuminate, laterobasal outgrowth a small, but strong peg, the latter opposed to another, sharp, basal tooth, while a midway outgrowth absent. ..... *H. yunnanensis*

Acknowledgements. I am most grateful to Igor Belousov and Ilya Kabak (both St. Petersburg, Russia), the collectors who rendered me their material for treatment. Kirill Makarov (Moscow) very generously took all colour picures. Tian Minyi (Guangzhou, China) kindly helped me elucidate the present spelling of a type locality, while Alessandro Minelli (Padua, Italy) consulted me on the proper spelling of a latinized species name. Special thanks go to Yasuyuki Nakamura (Ryukyu University Museum, Fujukan, Okinawa, Japan) and Zoltán Korsós (Hungarian Natural History Museum, Budapest, Hungary), who arrranged for me an English translation from Japanese of the original description of a dubious old species. Kirill Mikhailov and Darya Alkhimova (both ZMUM) very nicely helped me incorporate the above new samples into the collection under their care.

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Responsible editor K.G. Mikhailov