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On the first Polydesmidae, Opisotretidae and Fuhrmannodesmidae from Bhutan (Diplopoda, Polydesmida)

by **S. I. Golovatch**

Abstract: A collection of Polydesmoidea from Bhutan has proved to comprise 12 identifiable species, all new to science and three of them representing two new genera: *Bhutanodesmus velatus* n. gen., n. sp., *Glenniea perarmata* n. sp., *G. minuscula* n. sp., *G. bhotiaensis* n. sp. (Polydesmidae), *Martensodesmus excornis* n. sp., *M. bicuspidatus* n. sp. (Opisotretidae), *Magidesmus bhutanensis* n. gen., n. sp., *M. affinis* n. sp., *Hingstonia dorjulana* n. sp., *H. pelelana* n. sp., *H. gogonana* n. sp., and *H. yeti* n. sp. (Fuhrmannodesmidae). A revision of the types of both *Glenniea indica* Turk, 1945 and *G. nova* Turk, 1947, from the Himalayas of Kumaon, India, has revealed that: 1) *G. nova* is just a junior synonym of *G. indica* (n. syn.!), 2) the genus *Glenniea* Turk, 1945 is a senior synonym of *Nepalotretus* Golovatch, 1987 (n. syn.!), 3) it comprises at the moment five valid Himalayan species (key), and 4) it seems particularly closely related to the Nepalese *Himalodesmus* Golovatch, 1986. A key has been elaborated to all the nine currently known species of *Hingstonia* Carl, 1935.

Key words: Diplopoda Polydesmida – Bhutan – systematics – new species.

The millipede fauna of Bhutan has just begun receiving attention of specialists (Demange, 1987), chiefly due to the fine and diverse materials collected in this small Himalayan kingdom by the 1972 Zoological Expedition of the Naturhistorisches Museum Basel (NHMB) to Bhutan (Baroni Urbani et al., 1973).

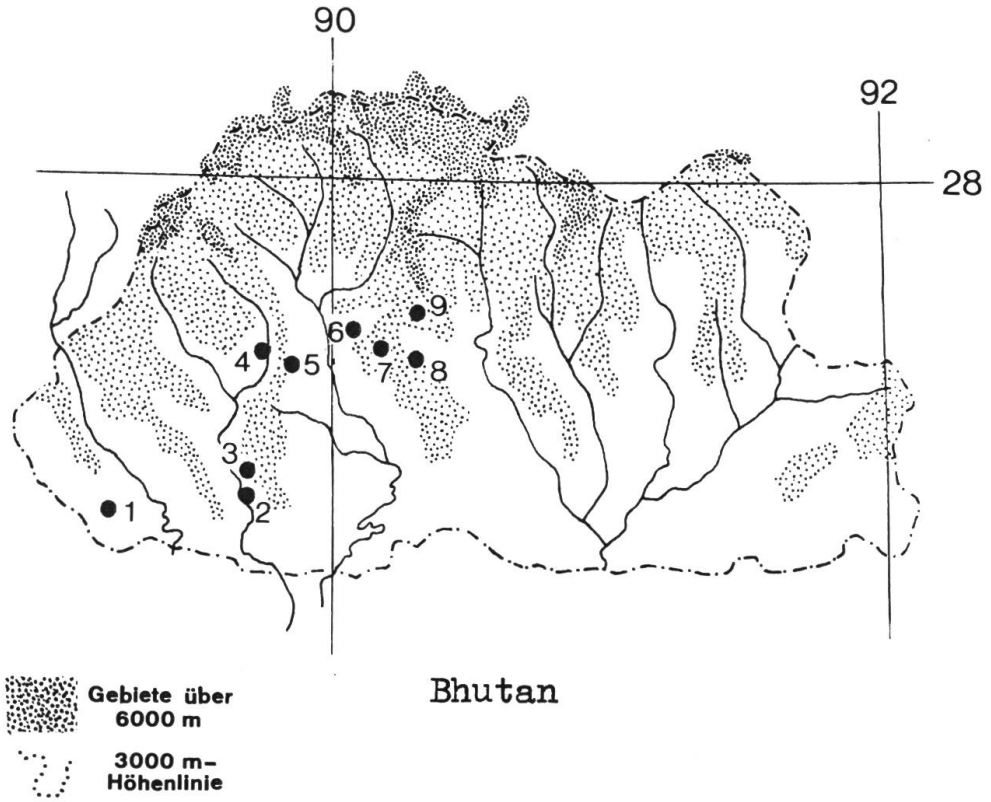
The present study is also based on part of this rich collection, and is restricted to the polydesmoid families Polydesmidae, Opisotretidae, and Fuhrmannodesmidae, i. e. the groups I have just dealt with as regards the fauna of Nepal (Golovatch, 1986a, 1987a, b). The only other polydesmoid millipede hitherto reported from Bhutan seems to be *Trichopeltis watsoni* Pocock, 1895, a species of Cryptodesmidae also known from Burma, Peninsula India, and the Himalayas of Darjeeling District and Assam (s. Demange, 1987).

The material treated below considerably enriches the Himalayan polydesmoid fauna. All the twelve identifiable species discovered in Bhutan have happened to be new to science and belonging to Himalayan genera, including a new genus of Polydesmidae and Fuhrmannodesmidae apiece. Besides, a revision of *Glenniea* Turk has been undertaken to incorporate three of the new Bhutanese species and to

synonymize the recently established *Nepalotretus* Golovatch, a genus hitherto treated of sedis mutabilis.

Except for a few duplictes retained by the author for a subsequent deposition in the collection of the Zoological Institute of the USSR Academy of Sciences, Leningrad, all the material has been returned to the NHMB. Before going further, I wish to express my cordial thanks to Chr. Stocker, of the NHMB, for the opportunity to examine this exciting material. For the loan of the type specimens of both *Glenniea indica* Turk and *G. nova* Turk I am extremely grateful to Dr P. D. Hillyard, of the British Museum (Nat. Hist.), London.

The Bhutanese localities mentioned hereinafter have been both presented in Map 1 and referred to as respective numbers put in square brackets in the material section of the descriptions. Scale of the figures is always in mm.



Map 1. Localities of the new Bhutanese species: 1) Samchi *(Bhutanodesmus velatus* n. gen., n. sp., *Glenniea bhotiaensis* n. sp.). 2) 87 road-km Phuntsholing-Thimphu *(Glenniea perarmata* n. sp., *Martensodesmus bicuspidatus n. sp.). 3) Chimakothi (Glenniea minuscula* n. sp.). 4) Thimphu *(Martensodesmus excornis* n. sp.). 5) Pass Dorju-la *(Magidesmus bhutanensis* n. gen., n. sp., *Hingstonia dorjulana* n. sp.). 6) 21 km E of Wangdiphodrang *(Martensodesmus bicuspidatus* n. sp.). 7) Simphu-Kothoka *(Hingstonia yeti* n. sp.). 8) Sha Gogona (*Hingstonia gogonana* n.sp.). 9) Dechhi Paka *(Magidesmus affinis* n. sp., *Hingstonia pelelana* n. sp.).

Family **Polydesmidae**

Bhutanodesmus n.gen.

Type species: *Bhutanodesmus velatus* n.sp.

Body small (ca. 0.5 mm long), consists of 19 segments. Antennae stout and short, joint 6 with a disto-dorsal group of tiny bacilliform sensillae, joint 7 with a small dorsal tubercle at midlength. Paraterga very modestly developed, set relatively low; metazona with three usual rows of setae, macrosculpture wanting. Pore formula normal. Pleural keels absent. Legs incrassate (at least in ♂), without tarsal sphaerotrichs. Sterna usual, without modifications.

Gonopods rather stout, with good coxal cannulae; telopodite subfalcate, with a relatively poorly developed, distal accessory seminal chamber, a small and more or less spiniform endomerite, a simple tibiotarsus, and a peculiar mesal velum. Seminal groove runs chiefly mesally, but distally turns cephalo-laterad to end in accessory seminal chamber. Coxae medially fused.

Remarks: *Bhutanodesmus* n.gen. is a good member of Polydesmidae and seems particularly closely related to the Middle Asian genus *Turanodesmus* Lohmander, 1933[1], known to comprise six described and several further undescribed species (see revision by Golovatch, 1979). Similarities between the two genera in question lie in the habitus, relatively small body size, and gonopod structure, e. g. the stout telopodite, distal position of the accessory seminal chamber at the base of a slender endomerite, etc. However, the new genus is well distinguishable from *Turanodesmus* by the gonopods being particularly stout and better arched, provided with a peculiar velum and a poorer developed accessory seminal chamber, where a somewhat differently exposed seminal groove terminates.

So far, *Bhutanodesmus* n.gen. comprises only its type species, *B. velatus* n.sp., described below.

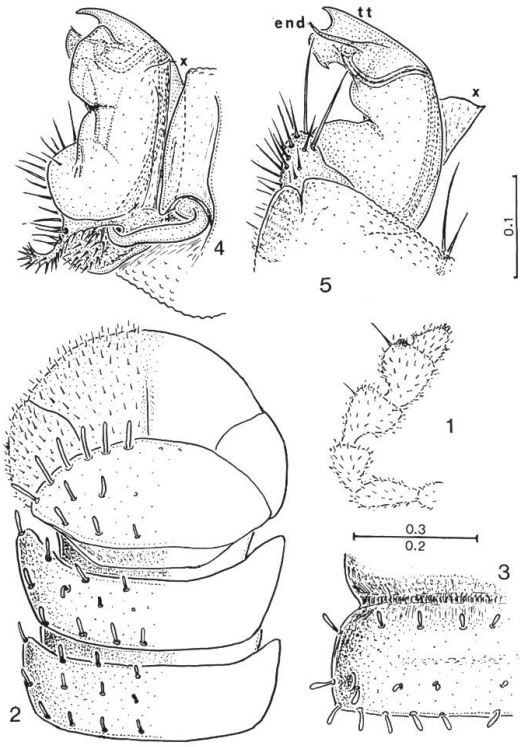
Bhutanodesmus velatus n.sp. Figs 1–5.

Length ca. 4.5–4.7 mm, width of midbody pro- and metazona 0.41 and 0.45–0.48 mm, respectively. Colour pale pinkish-brown to pale

[1] For nomenclatorial details see Jeekel (1970).

yellowish, ventrum and legs paler, whitish. 19 body segments.

Head well broader than collum and somewhat broader than segments 2–4 (Fig. 2) and even midbody rings, being ca. 0.55 mm wide. Antennae (Fig. 1) short and stout, in situ reaching to end of body segment 2, joint 6 with a good disto-dorsal group of bacilliform sensillae, joint 7 with a small dorsal tubercle at midlength. Body segments 3 and 4 subequal, both especially narrow. Body polydesmoid, from ring 6 till segment 13 or 14 parallel-sided, onward very gradually and gently tapering. Paraterga almost wanting, rather displayed as lateral swellings (Fig. 3), set low (dorsum well convex), at about midheight, absolutely devoid of lateral rim or indentation, caudally never projecting beyond hind tergal contour. Tergal microsculpture roughly shagreened, macrosculpture wanting, present only a very slight transverse sulcus dividing rows 1 and 2 of small, subclavate to bacilliform tergal setae; latters somewhat longer and slenderer in 1st row on collum (Fig. 2) and in hind rows of a few posteriormost terga (especially 18th). Pore formula normal, pores rather vague, lie dorso-laterally. Pleural keels wanting. Epiproct rather long, in dorsal view almost rounded at tip, very narrowly truncate, in the form of a bottle neck, in lateral view a little curved downward.



Figs 1–5: *Bhutanodesmus velatus* n. gen., n. sp., ♂ paratype: 1, antenna. 2, anterior body portion. 3, left half of metasomite 13 (dorsal view). 4–5, gonopods (mesal and lateral views, respectively).

Legs rather thick (except tarsi), perhaps somewhat incrassate as compared to ♀, growing a little longer and slenderer toward telson, without tarsal sphaerotrichs; claws simple, slender, slightly curved. Sterna without peculiarities, moderately setose.

Gonopods (Figs 4–5) quite complex; coxae rather voluminous, papillate, with a cavity for telopodite to hinge into, each provided with a good cannula; prefemoral portion densely setose; telopodite subfalcate, holds more or less parallel to main axis; femur with a peculiar mesal velum *(x);* endomerite *(end)* simple, spiniform, little; tibiotarsus *(tt)* as an apical unciform and a subsecuriform lobe, both little; seminal groove runs chiefly along mesal side, but at distal third turns abruptly cephalolaterad to end in a small accessory seminal chamber lying at base of endomerite.

Types: Holotype ♂ (NHM-Basel) and 1 paratype ♂ (NHM-Basel); locality: Bhutan, Samchi [1], 350–450 m, patches of ancient forest in valley, 7.–11.V.1972, Naturhist. Mus. Basel Expedition (No. 21/2).

Glenniea perarmata n. sp. Figs 6–9.

Diagnosis: Most closely related to *G. minuscula* n. sp. (see below), but is well distinguishable by the relative breadth of the head and certain details of both tergal and gonopod structure.

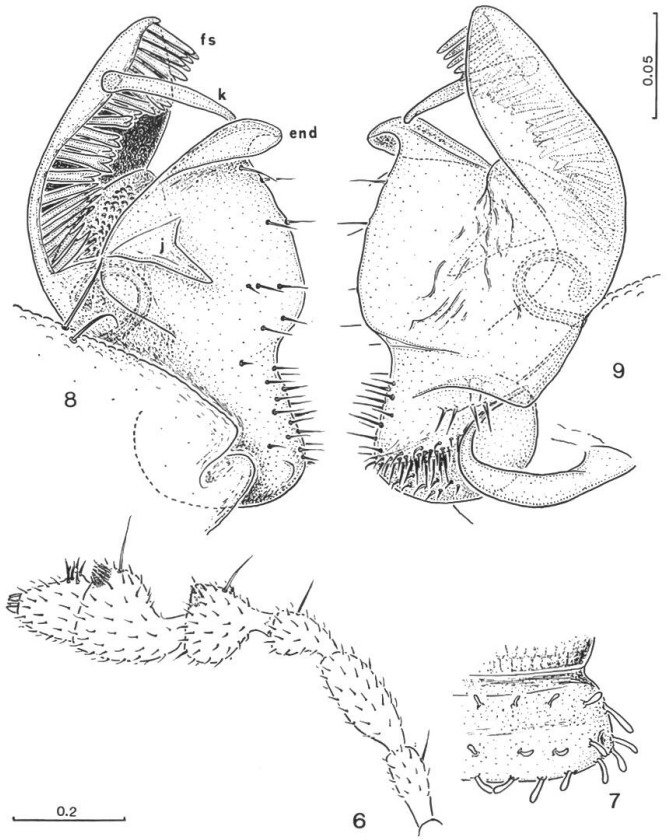
Description: Length ca. 4.5 mm, width of midbody pro- and metazona 0.7 and 0.8 mm, respectively. Colour whitish-yellow, legs and ventrum paler. 19 body segments.

Head ca. 1.4 times broader than collum and somewhat broader than midbody rings, being 0.9 mm wide. Antennae (Fig. 6) relatively long, rather clavate, in situ reaching to end of body segment 3, joint 5 with a loose disto-dorsal group of tiny sensillae, joint 6 with a well-developed disto-dorsal group of sensillae, joint 7 with a dorsal parabasal tubercle crowned with a bunch of minute setae. Collum somewhat narrower than body segment 2, laterally angular. Body segments 3 and 4 subequal in width, both a little narrower than segment 2. Body polydesmoid, gradually broadening from ring 5 till ring 7 or 8 to become parallel-sided further on until somite 15, onward gradually and rather gently tapering. Paraterga quite poorly developed, with neither lateral indentation nor marginal rim, caudally rather well and narrowly rounded, somewhat broader rounded on anterior body half (obtuse on segments 2–4, subrectangular on ring 5) and almost wanting on segments 17 and 18, nowhere beak-shaped and never projecting caudad beyond hind tergal contour, in general set quite low (at about 2/5ths of midbody

height), thus making dorsum rather convex. A very fine, usual polygonal pattern on prozona; metasoma also roughly shagreened, with three usual transverse rows of small (sub)clavate tergal setae (somewhat longer and slenderer in 1st row on collum and hind row on ring 18) divided by a poorly-developed sulcus between rows 1 and 2; macrosculpture wanting (Fig. 7). Pleural keels wanting. Pores rather vague, lie dorso-laterally. Epiproct rather short, thick, in dorsal view subrectangular and slightly rounded at tip, in lateral view somewhat curved downward. Anal valves margined.

Legs rather long and incrassate (except tarsi), particularly thick on anterior 2/3rds of body, gradually growing longer and slenderer toward telson; tarsi carry not sphaerotrichs, but quite long and spiniform setae instead; claws short, slightly curved, simple. Coxa 2 of ♂ with a ventral knob. Sterna without modifications, modestly setose.

Gonopods (Figs. 8–9) quite complex, massive; coxite rather large and carries a good cannula from inner side; prefemur setose, rather small; endomerite *(end)* in the form of a lobe supplied with an outer spi-



Figs 6–9: *Glenniea perarmata* n. sp., ♂ holotype: 6, antenna. 7, right half of metasomite 13 (dorsal view). 8–9, right gonopod (lateral and mesal views, respectively).

ne *(j);* femoral lateral process *(fs)* (= tibiotarsus) higher than endomerite, at distal third with a prominent outer subflagelliform process *(k)* and an outer premarginal row of peculiar bifid batons, at base with a small accessory seminal chamber; seminal groove like in *Himalodesmus,* i. e. makes a characteristic loop.

Holotype ♂ (NHM–Basel); locality: Bhutan, 87 road-km from Phuntsholing to Thimphu [2], 1680 m, upper border of evergreen forest, 21.–23.V.1972, Naturhist. Mus. Basel Expedition (No. 30).

Glenniea minuscula n. sp. Figs 10–14.

Diagnosis: Clearly most closely related to *G. perarmata* n. sp. (see above), but differs from it by the lesser body size, certain details of both tergal and gonopod structure, etc.

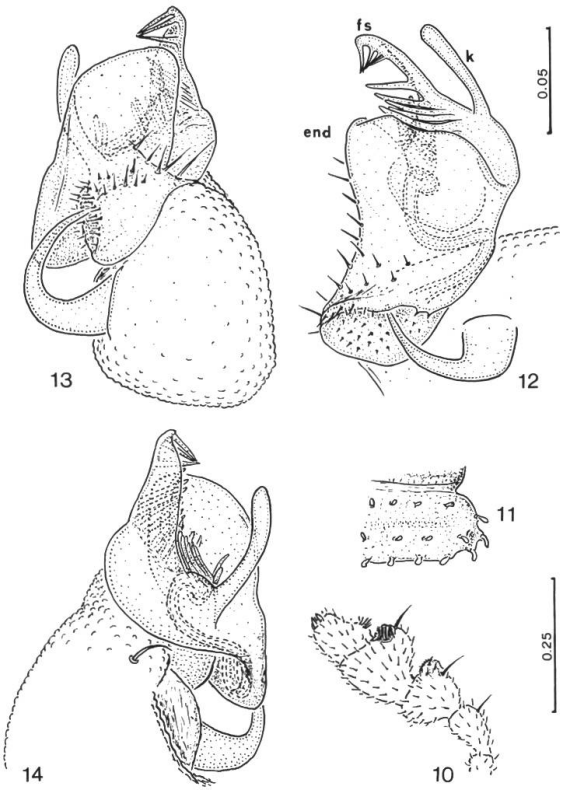
Description: Length ca. 2.7–2.9 mm in ♂ (holotype ca. 2.8 mm long) and ca. 2.9 mm in ♀, width of midbody pro- and metazona 0.35 and 0.4 mm, respectively, in ♂ (including holotype) and 0.4 and 0.45 mm, respectively, in ♀. Colour whitish-yellow, legs and ventrum even paler. 19 body segments.

Head ca. 1.4 times as broad as collum, a little broader than midbody somites, being about 0.45 and 0.5 mm wide in ♂ and ♀, respectively. Antennae (Fig. 10) like in *G. perarmata* n. sp., though a little shorter, scarcely reaching to middle of body segment 3, somewhat stouter. Collum angular laterally, somewhat narrower than body segment 2, latter a bit broader than subequal segments 3 and 4; body polydesmoid, slightly broadening till ring 6 or 7 to become parallel-sided until ring 14 or 15, onward gradually and very gently tapering. Paraterga rather poorly developed (Fig. 11), set low (at about 2/5ths of midbody height) and leave the dorsum rather convex, laterally devoid of rim, but with marginal poor indentation, caudo-laterally roundly obtuse on segments 2–4, further on subrectangular and narrowly rounded, onward slightly acute, though never projecting caudad beyond hind tergal contour in the form of a beak. A very fine, usual polygonal pattern on prozona; microsculpture of somites roughly shagreened, macrosculpture of metaterga wanting, present only a very poorly developed sulcus between rows 1 and 2 of particularly small and clavate tergal setae, which are a bit longer on a few anteriormost terga and in hind row on ring 18. Pleural keels wanting. Pores quite vague, lie dorso-laterally. Epiproct quite short, in dorsal view caudal angle ca. 70°, rounded at tip, in lateral view slightly curved downward. Anal valves margined.

Legs rather long and incrassate (except tarsi), a little stronger in ♂

than in ♀, in both sexes gradually and very gently growing longer and slenderer toward telson; tarsi without sphaerotrichs, in their stead a row of spiniform setae; claws simple, relatively short and small, slightly curved. Sterna without modifications (only in ♀ a little ridge behind coxae 2), modestly setose.

Gonopods (Figs. 12–14) quite complex, massive; prefemur rather small, setose; endomerite *(end)* also lobe-like, simple, without outgrowths; femoral lateral process *(fs)* higher than endomerite, parabasally with a prominent outer subflagelliform process *(k)* and an outer premarginal row of simple and long bacilli, at base with a small accessory seminal chamber; seminal groove with a characteristic loop.



Figs 10–14: *Glenniea minuscula* n. sp., ♂ paratype: 10, distal part of antenna. 11, right half of metasomite 13 (dorsal view). 12, right gonopod (mesal view). 13–14, left gonopod (caudal and frontal views, respectively).

Types: Holotype ♂ (NHM-Basel), 1 paratype ♂ (coll. Golovatch) and 1 paratype ♀ (NHM-Basel); locality: Bhutan, Chimakothi, 98 road-km from Phuntsholing to Thimphu [3], lower border of mist forest belt, 1900–2300 m, 20.–24.V.1972, Naturhist. Mus. Basel Expedition (No. 29).

Glenniea bhotiaensis n. sp. Figs 15–18, 24.

Diagnosis: Clearly most closely related to *G. martensi* (GOLOVATCH, 1987b and below), from Nepal, chiefly due to the outstanding gonopod endomerite *(1),* but differs from it by the relatively broad head and shorter tergal setae, as well as by the shape and armament of both gonopod telopodite *(te)* and endomerite *(1).*

Derivatio nominis: Named after the main people and language of Bhutan, the Bhotia.

Description: Length ca. 4.4 mm, width of midbody pro- and metazona 0.45 and 0.55 mm, respectively. Colour uniform whitish. 19 body segments.

Head broader than collum (ca. 1.4 times) and even midbody somites, being ca. 0.7 mm wide. Antennae in situ reaching to middle of body segment 3, like in *G. martensi,* but sensillae on joint 5 even looser and fewer. Segments 3 and 4 subequal, either somewhat narrower than segment 2 or 5; body polydesmoid, broadens on somites 5 and 6 to become parallel-sided until segment 16, from ring 17 gradually and rather gently tapering. Paraterga rather poorly developed, displayed rather as swellings (Fig. 24), set relatively low (at about 1/3rd of midbody height) and leave dorsum quite convex, laterally with neither rim nor proper indentation, caudo-laterally almost devoid of beak-like angles and always lie within hind tergal contour. Microsculpture rather roughly shagreened, a very fine, usual polygonal pattern on prozona; metazonital macrosculpture wanting except for a very slight sulcus present between rows 1 and 2 of relatively short and more or less clavate tergal setae, which sit on a very small tubercle each, reaching to only a quarter to third of metazonite length, use to grow a little in length toward telson, and more rarely (1st row on collum and hind row on ring 18) longer and bacilliform. Pleural keels wanting. Pores rather vague, lie dorsolaterally. Epiproct quite short, in dorsal view almost pointed (caudal angle ca. 70°), very narrowly truncate, with sides somewhat concave, in lateral view a little curved downward. Anal valves margined.

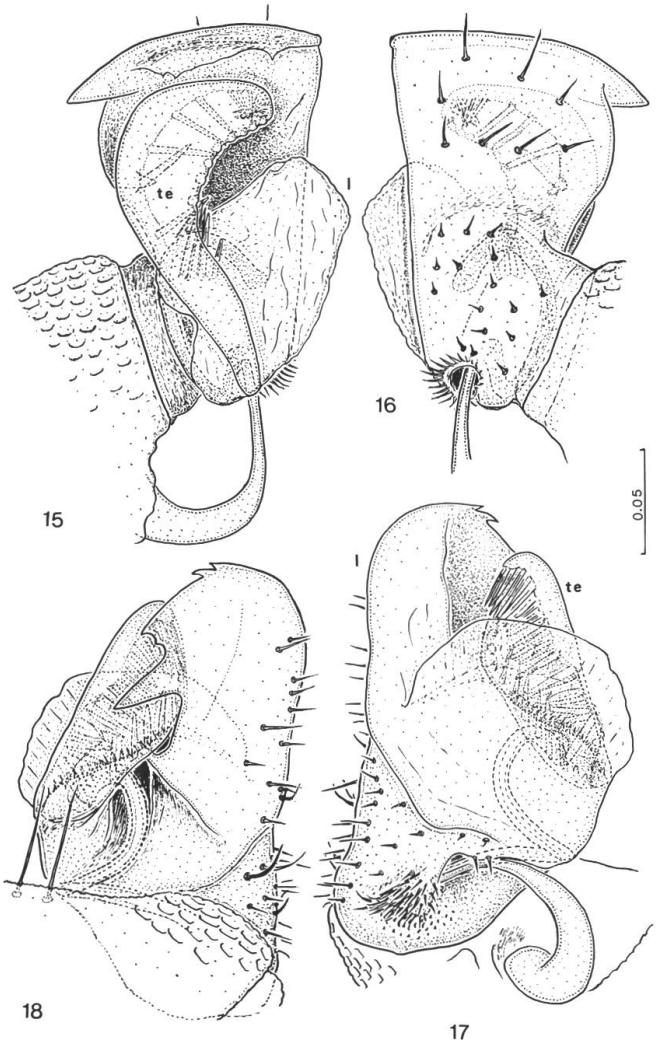
Legs relatively long, slender, slightly incrassate (particularly pregonopodal pairs but 1 and 2), gently and gradually growing longer and slenderer toward telson; tarsi devoid of sphaerotrichs, in their stead a row of long and spiniform setae. Sterna without peculiarities, modestly setose.

Gonopods (Figs 15–18) highly complicated, massive; telopodite *(te)* (femoral lateral process, tibiotarsus) subfalcate, supplied with two rows of long and simple spines; a huge antero-lateral prefemoral outgrowth

(1), which corresponds to endomerite, almost sheathes entire telopodite; seminal groove makes a characteristic loop before ending in a small accessory seminal chamber at base of *te*.

Holotype ♂ (NHM-Basel); locality: Bhutan, Samchi [1], 350–450 m, patches of ancient forest in valley, 7.–11.V.1972, Naturhist. Mus. Basel Expedition (No. 21/4).

Remarks: The genus *Glenniea* Turk, 1945 has hitherto been known but by two species, *G. indica* Turk, 1945 (type species) and *G. nova* Turk, 1947, both from caves near Dehra Dun, Kumaon, North India (Turk, 1945, 1947). Originally described within the family Vanhoef-



Figs 15–18: *Glenniea bhotiaensis* n. sp., ♂ holotype: 15–16, left gonopod (submesal and sublateral views, respectively). 17–18, right gonopod (caudal and frontal views, respectively).

feniidae, this genus has recently been assigned to the family Fuhrmannodesmidae according to the modern classification of Diplopoda by HOFFMAN (1979).

I have been able to restudy the type material of both *G. indica* and *G. nova* housed at the British Museum (Nat. Hist.), London, and can present now overwhelming evidence on the status of this enigmatic genus within Polydesmidae.

First of all, the type series of *G. indica* consists of a single fragmented and incomplete male herewith designated as lectotype. Perhaps to this male belongs a slide with completely broken, mounted gonopods. I have designated this particular specimen taken from the Moila Swallet Cave in June 1940 as lectotype, because TURK (1945, 1947) based his first description of *G. indica* on a series collected by Glennie in the Moila Swallet and Moila Toad Caves in June 1940. Besides, as topotypes I have designated further 1 ♂ and fragments of about 5 specimens taken in these very caves by Glennie in June 1943, as well as 2 ♂ and about 10 juveniles collected there in 1945. I presume these very specimens served for the 1947 redescription of *G. indica,* thus being nothing else but topotypes. The only male, poorly preserved, fragmented, but carrying intact gonopods, of the 1943 series has been sorted out and chosen for another redescription of the gonopod structure.

The type series of *G. nova* comprises 2 ♂, 1 ♀ and 3 juveniles from the Lower Swift Pot Cave taken by Glennie on October 25, 1944. Of them, I have selected a complete and quite well preserved male to designate it as lectotype and to describe the taxon, particularly its gonopod structure. Besides, it was still possible to make use of one of TURK's original slides to redepict the gonopods of *G. nova* (Fig. 19).

With pertinent material at hand, I have found that none of the characters stated to distinguish *G. nova* from *G. indica* actually holds. Therefore, I consider *G. nova* Turk, 1947 a subjective junior synonym of *G. indica* Turk, 1945 (**n. syn.!**). Besides, judging from the only female paralectotype of *G. nova,* both sexes of *Glenniea* are provided with 19 body segments, i. e. just like in the other known congeners. The reader is kindly invited to look at Figs. 19–23 and particularly to compare Figs. 19 (redrawn from Turk's original slide with mounted gonopods of a paralectotype of *G. nova*) and 20 (drawn from a gonopod preparation of the selected topotype of *G. indica*), which might have been mistaken as depicting one and the same gonopod pair, if it were not for the fact that they actually illustrate different taxa.

Taking into account the above new synonymy, the following combi-

bined redescription of *G. indica* can be proposed instead of Turk's (1945, 1947) ones.

Glenniea indica Turk, 1945 Figs 19–23.

Diagnosis: Differs from other congeners by the well-developed paraterga, presence of the tergal macrosculpture, certain details of the gonopod structure, etc.

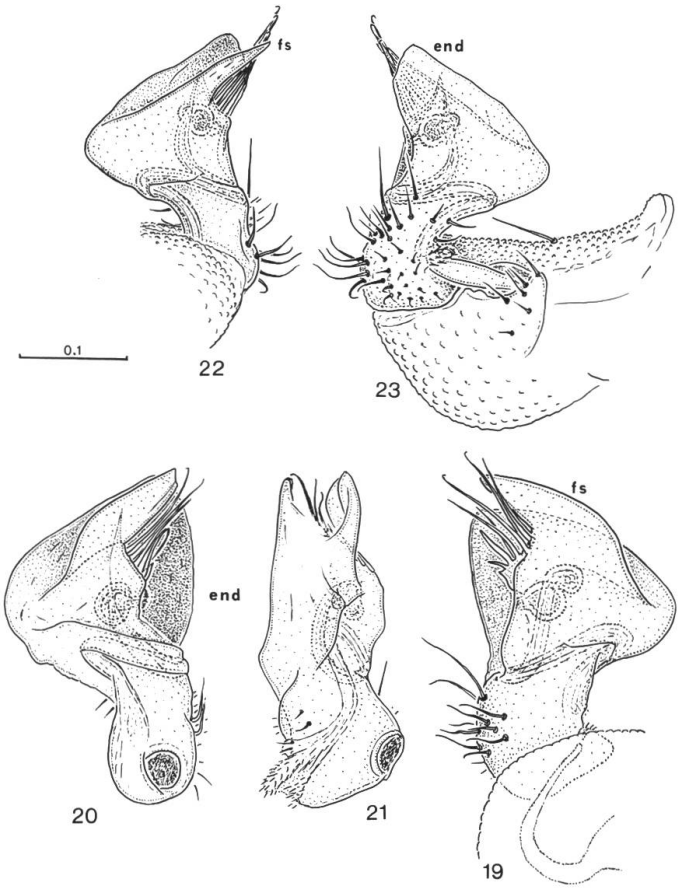
Redescription: Length ca. 4.7–5.8 mm, width of midbody pro- and metazona 0.6–0.65 and 0.8–0.9 mm, respectively. Colour whitish-yellow to light brownish, ventrum and legs paler. 19 body segments in both sexes.

Head somewhat broader than collum and subequal to or a bit narrower than segment 2. Antennae relatively short, in situ reaching to end of segment 3 (at least in ♂), joint 5 with a few disto-dorsal sensillae, joint 6 with a well-developed, compact group of disto-dorsal bacilliform sensillae, joint 7 with a tiny middorsal tubercle. Both segments 3 and 4 subequal to head, a little narrower than ring 2 and well narrower than 5th; body well polydesmoid, parallel-sided on segments 5 to 14, onward gently and gradually tapering. Paraterga well-developed, laterally indentated and rimmed, set relatively high (at about a quarter of midbody height) and leaving the dorsum only slightly convex; caudal angle rounded until segment 4, on rings 5 and 7 very obtuse, on both rings 6 and 8 almost rectangular, onward slightly projecting caudad as a triangle (angle ca. 70°), on pore-bearing somites protruding somewhat better to become almost beak-like on ring 15 and well beak-like on rings 16 and 17, but again as a poor beak on segment 18. Pore formula normal, pores not particularly vague, lie dorso-laterally close to hind corner. Microsculpture roughly shagreened, usual very fine polygonal pattern on prozona; macrosculpture of metazona not very well developed, though traceable, with three usual rows of bacilliform, relatively long and slender (particularly long and slender in foremost row on collum and in hind row on segment 18) tergal setae. A poor sulcus dividing rows 1 and 2 of setae starts from ring 4 and is even better developed than that dividing rows 2 and 3. Pleural keels wanting. Epiproct rather short, narrowly truncate, in lateral view slightly curved downward. Anal valves margined.

Legs rather long, at least in ♂ somewhat incrassate (particularly pre-gonopodal pairs), gradually growing longer and slenderer toward telson; tarsi particularly long and slender, devoid of sphaerotrichs. Sterna without modifications, modestly setose.

Gonopods (Figs 19–23) complex; coxites not very large, papillate; prefemur setose; endomerite *(end)* as a large simple lobe; femoral lateral process *(fs)* about as high as endomerite, distally subspiniform, parabasally with a number of setoid outgrowths; seminal groove makes a characteristic loop laterad beneath *fs* before ending in a good accessory seminal chamber as base of *fs;* orifice of accessory seminal chamber surrounded by a pilose pulvillus.

Material studied: Discussed above.



Figs 19–23: *Glenniea indica* Turk, 1945; gonopods: 19, paralectotype (lateral view, drawn from original slide of Turk of *G. nova* Turk, 1947). 20–21, topotype (lateral and frontal views, respectively, of right gonopod of *G. indica* Turk, 1945). 22–23, lectotype (lateral and mesal views, respectively, of right gonopod of *G. nova* Turk, 1947).

Glenniea is undoubtedly a good member of Polydesmidae, judging from the gonopod structure, in particular from the presence of a well-developed seminal chamber terminating the seminal groove, and, at least sometimes, of a pulvillus at its orifice. Moreover, having been pri-

vileged to restudy the type species *G. indica,* as well as to discover three further congeners from Bhutan, I am able now to throw additional light on the status of *Nepalotretus* Golovatch, 1987, a genus hitherto known by its type species only, *N. martensi* Golovatch, 1987 from Nepal, and tentatively assigned to the family Opisotretidae (Golovatch, 1987b). Erection of *Nepalotretus* seemed well justified due to the presence in *N. martensi* of a huge lateral outgrowth of the gonoprefemur which practically sheathes the acropodite, i. e. just in the same way as it exists in *G. bhotiaensis* n. sp. (see above). Due to the lateral outgrowth and torded gonopod telopodite carrying a loop-shaped seminal groove, *Nepalotretus* was originally believed to represent a highly aberrant opisotretid, with its gonopod telopodite holding more or less parallel to the main axis only because the huge lateral prefemoral outgrowth might have prevented the acropodite from being directed laterad. However, in the light of the discovery of three new *Glenniea* in Bhutan, as well as due to the possibility to clarify the identity of both *Glenniea* and *G. indica,* I think it warranted to regard *Nepalotretus* Golovatch, 1987 as a subjective junior synonym of *Glenniea* Turk, 1945 (**n. syn.**!).Therefore, *Nepalotretus martensi* must become *Glenniea martensi* (Golovatch, 1987) (n. comb.!).

Indeed, in *G. indica* (Figs 19–23) the gonopod endomerite is in the form of a simple and prominent lobe, while the acropodite (= femoral lateral process, = tibiotarsus) is rather stout, simple, parabasally carrying a number of setoid outgrowths. This very general pattern is also observed in *G. perarmata* n. sp. (Figs 8–9) and *G. minuscula* n. sp. (Figs 12–14): the endomerite *(end)* is relatively simple, but the acropodite *(fs)* carries a good number of simple or bifid subbacilliform outgrowths. In both *G. bhotiaensis* n. sp. (Figs 15–18) and *G. martensi* (Golovatch), the lobe-like endomerite must have become particularly hypertrophied, huge, almost concealing the entire acropodite, whereas the latter has practically retained the size and shape of that, e. g., in *G. perarmata* n. sp.

In other words, there seems to be no longer a need in opposing the forms possessing such a hypertrophied endomerite (i. e. *Nepalotretus)* to the forms with the endomerite relatively moderately developed (i. e. *Glenniea).* Furthermore, if some other polydesmoid intergrades emerge in the future as a sort of a link between the state of development of the gonopod endomerite and acropodite in, e. g., *G. indica* and that in the Himalayan genus *Himalodesmus* Golovatch, 1986 (Golovatch, 1986, 1987a), the latter genus might as well become a junior synonym of, and

its seven currently known Nepalese species be relegated to, *Glenniea*. However, at present the hiatus between *Glenniea* and *Himalodesmus* seems to hold and be of a generic level, although both these genera are undoubtedly very closely related as witnessed by the peculiar course of the loop-like seminal groove and the presence of an accessory seminal chamber. The main characters distinguishing *Glenniea* from *Himalodesmus* are the lobe-like to sacciform shape of the gonopod endomerite and presence on the acropodite of a good number of peculiar setoid to bacilliform structures in the former genus. Besides, the antennomere 5 in *Himalodesmus* seems to be provided with a considerably better developed disto-dorsal group of sensillae as compared to *Glenniea*, while the accessory seminal chamber, on the contrary, seems poorer expressed.

Having brought a total of the known *Glenniea* species to five, I believe a tentative key to all of them warranted.

Key to the species of the genus Glenniea

1. Paraterga quite well-developed, subhorizontal, set relatively high (at about a quarter of midbody height), with traces of macrosculpture; caudo-lateral angle well beak-like and projecting beyond hind tergal contour at least on rings 16 and 17; tergal setae subbacilliform, usually about a third of metazonital length; gonofemoral lateral process (*fs*, Figs. 19–23) parabasally with a relatively compact group of slender, setiform outgrowths. India (Kumaon). **G. indica** Turk, 1945 (= *G. nova* Turk, 1947, **n.syn.**!)

– Paraterga developed much worse (dorsum more convex), set lower, with wanting tergal macrosculpture; caudo-lateral angles never beak-like, nor projecting caudad beyond hind tergal contour; tergal setae usually either (sub)clavate and short, or much longer and bacilliform (a half to two thirds of metazonital length); gonofemoral lateral process parabasally without setiform outgrouths. Nepal, Bhutan 2

2. Tergal setae always very long, bacilliform (up to two thirds of metazonital length); antennae in situ reaching only to end of body segment 2 (at least in ♂). Nepal. **G. martensi**(Golovatch, 1987) (n.comb.!)

– Tergal setae invariably much shorter, usually subclavate

(s. Figs 7, 11, 24); antennae somewhat longer, in situ reaching to at least midlength of body segment 3. Bhutan 3

3. Body particularly small (about 3 mm long); tergal setae particularly short and clavate (Fig. 11); gonopod endomerite relatively simple, without processes (Figs 12–14), gonofemoral lateral process *(fs)* with a good parabasal finger *(k)*.
G. minuscula n. sp.

– Body somewhat larger (over 4 mm long); tergal setae somewhat longer (Figs 7 and 24); gonopod endomerite either huge (like in *G. martensi)* or supplied with an outer parabasal spine 4

4. Midbody rings about 0.5–0.6 mm wide; antennae in situ reaching to midlength of body segment 3; gonopod endomerite (1, Figs 15–18) huge, almost sheathing entire acropodite *(te)*. **G. bhotiaensis** n. sp.

– Midbody rings about 0.8 mm wide; antennae in situ reaching to end of body ring 3 (at least in ♂); gonopod endomerite *(end,* Figs 8–9) much lower than acropodite *(fs)*.
G. perarmata n. sp.

Family **Opisotretidae**

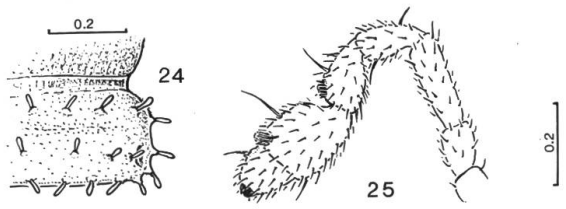
Martensodesmus excornis n. sp. Figs 25–27.

Diagnosis: Differs well from other congeners by the lack of a tubercle on the vertex in ♂, as well as by certain details of the gonopod structure.

Description: Length ca. 4.2 mm, width of midbody pro- and metazona 0.5 and 0.75 mm, respectively. Colour pale yellowish-brown; ventrum, legs and antennae somewhat paler. 19 body segments.

Head normal, without modifications, well broader (ca. 1.4 times) than normal collum and subequal to segment 4. Antennae (Fig. 25) relatively short, in situ reaching to end of body segment 3, clavate, with a well-developed group of disto-dorsal sensillae on each of joints 5 and 6, and with a tiny medio-dorsal tubercle on joint 7. Segment 2 of body well broader than collum and a little broader than subequal segments 3 and 4. Collum set particularly obliquely. Body well polydesmoid, gradually broadening till ring 6 to become parallel-sided until segment 16, onward abruptly tapering. Paraterga well-developed, set high and quite obliquely (the dorsum rather slightly convex), laterally rimmed and in-

dentated (somewhat better and rounder at anterior body portion, increasingly poor till ring 14 to become almost wanting onward); caudal angles mainly obtuse, well rounded till segment 4, on ring 5 begin to project backward as a small and narrowly rounded triangle from each side, well within hind tergal contour till body segments 13 or 14, onward very gently and narrowly rounded and projecting caudad beyond the contour, somewhat better (though far from very well) and poorly beak-like on ring 17, and still worse (though better beak-like) on ring 18. Tergal microsculpture rather finely shagreened, macrosculpture wanting. Tergal setae bacilliform, usually ⅓–½ as long as metazonite, each sits on a poor knob, all arranged in two distinct rows divided by a very poorly developed sulcus; 3+3 or 4+4 setae in a row, hind row more irregular. Pores rather well visible, lie dorso-laterally, relatively large. Pleural keels evident only at anterior body half, onward substituted by more or less moderately developed swellings. Epiproct rather long, in dorsal view in the form of a more or less regular triangle very narrowly truncate at tip, sides even (not concave), in lateral view slightly curved downward. Anal valves margined.



Figs 24–25: 24, *Glenniea bhotiaensis* n.sp., ♂ holotype, right half of metasomite 13 (dorsal view). 25, *Martensodesmus excornis* n.sp., ♂ holotype, antenna.

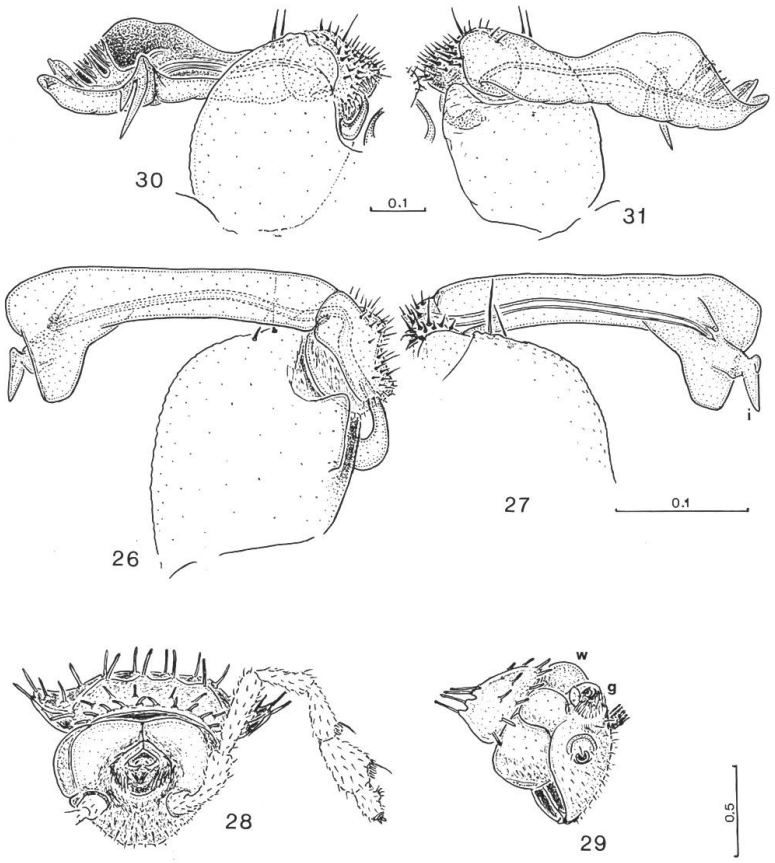
Legs rather long and slender (particularly tarsi), gradually growing longer and slenderer toward telson, perhaps somewhat incrassate as compared to ♀, devoid of tarsal sphaerotrichs. Sterna without modifications, modestly setose.

Gonopods (Figs 26–27) with relatively small coxae, telopodites in situ directed laterad; seminal groove runs along inner (frontal) side to end distally on a small tooth provided by a somewhat larger outgrowth at its base; broadened apical lobe with a peculiar, torded inner process *(i)*.

Holotype ♂ (NHM-Basel); locality: Bhutan, Thimphu [4], guesthouse, 2440m, 29.IV.1972, Naturhist. Mus. Basel Expedition (No. 8).

Martensodesmus bicuspidatus n. sp. Figs 28–31.

Diagnosis: Differs from other congeners by the peculiar vertigial tubercle and shape of the collum in ♂, as well as by certain details of the gonopod structure.



Figs 26–31: 26–27. *Martensodesmus excornis* n. sp., ♂ holotype, left gonopod (frontal and caudal views, respectively). 28–31. *Martensodesmus bicuspidatus* n. sp., ♂ paratype: 28, anterior body portion (frontal view), 29, head and collum (antero-lateral view). 30–31, right gonopod (caudal and frontal views, respectively).

Description: Length in ♂ ca. 7.5–8.0 mm, in juv. ♀ (19 segments) ca. 8.0 mm, width of midbody pro- and metazona 0.95 and 1.5 mm, respectively, in ♂ and up to 1.0 and 1.5 mm, respectively, in juv. ♀ (19 segments). Juveniles of 18 body segments up to 6.5 mm long and 0.75 and 1.0 mm wide on pro- and metazona, respectively. Colour pale whitish-

brown; legs, antennae and ventrum paler. 19 body segments in ♂ and 20 body segments in ♀[2].

Head (Figs 28–29) a little broader than collum, but narrower than body segment 2 (at least in ♂), densely setose in front of antennal sockets, normal in juvenile ♂ and ♀, but in adult ♂ with a large vertigial tubercle (g) consisting of a relatively low semi-lunar anterior ridge bearing a row of fimbriae, behind it a couple of paramedian setoids (on a knob?) almost sheathed by a hinder paramedian pair of fimbriate, chitinous, membranous outgrowths situated just anteriorly at base of a couple of good, rounded, occipital swellings (*w*). Antennae relatively long and slender, in situ reaching to middle of body segment 4 (♂) or to end of segment 3 (juv. ♀), with a very good group of disto-dorsal sensillae on each of joints 5 and 6, and a small medio-dorsal knob crowned with a bunch of tiny setae on joint 7 (Fig. 28). Collum normal in juveniles (and evidently in ♀), but in ♂ with four distinct rounded teeth at hind margin, each bearing a particularly long tergal seta (Fig. 29). Body well polydesmoid, gradually broadens till segment 6, onward parallel-sided until rings 15 or 16 to become quite abruptly tapering further on. Paraterga very well developed (particularly in ♂), set high and obliquely (dorsum but slightly convex), laterally rimmed and indentated (two or three denticles on poreless and pore-bearing rings, respectively), caudal angles subrectangular on segment 2, onward increasingly acute and projecting in the form of a triangle, still within hind tergal contour until ring 11, onward growing increasingly beak-like and protruding caudad beyond the contour to become best developed on ring 17, but much worse on ring 18 (in ♂). Tergal microsculpture finely shagreened, macrosculpture almost wanting, but still expressed as a polygonal row at hind margin and a very well developed sulcus beginning already from metazonite 2 (poorer) and lying at ½–⅔rds of metazonital length. Tergal setae very long, bacilliform, each on a small knob, situated in usual two rows of 3 + 3 or 4 + 4 divided by sulcus; hind row of setae somewhat irregular, close to hind tergal limbus; setae particularly long in hind row on collum and on terga of hind body third. Pores large, rather distinct, lie dorso-laterally. Pleural keels present till the middle of body, onward as rather poorly developed swellings. Epiproct rather long, in dorsal view with slightly convex sides, apically broadly and

[2]Though there are no adult ♀ in this type series, as well as in that of *M. excornis* n. sp. (see above), I am fairly sure that, like in other congeners, they have 20 body segments. At least the only adult ♀ of a closer unidentifiable *Martensodesmus* present in the studied Bhutanese material possesses 20 body rings.

roundly truncate, finger-shaped, in lateral view somewhat curved downward. Anal valves margined.

Legs very long and slender, particularly due to tarsi; no sphaerotrichs; in both ♂ and (juvenile) ♀ legs subequal, practically not incrassate. Sterna without modifications, modestly setose.

Gonopods (Figs 30–31) with relatively small coxae, telopodites in situ directed laterad, each suberect, at inner margin distally with a couple of spines and apically with a minute tooth; seminal groove runs along inner (frontal) side to end subterminally on a small separate lobe carrying at base a couple of cuspidate outgrowths.

Types: Holotype ♂ (NHM-Basel), 1 paratype ♂ (coll. Golovatch) and 12 juv. (NHM-Basel); locality: Bhutan, 87 road-km from Phuntsholing to Thimphu [2], 1650 m, upper border of evergreen forest, 21.–23.V.1972, Naturhist. Mus. Basel Expedition (No. 30); 1 paratype (NHM-Basel); locality: Bhutan, 21 road-km from Wangdiphodrang to Tongsa [6], 1700–2000 m, rich mountainous forest, 25.VI.1972, Naturhist. Mus. Basel Expedition (No. 53).

Remarks: The genus *Martensodesmus* Golovatch, 1987 has hitherto been known by three barely distinguishable Nepalese species (Golovatch, 1987a), which all carry a relatively simple, setiferous tubercle in ♂. Thus, the finding of the Bhutanese *M. excornis* n. sp., devoid of any vertigial modifications in ♂, and *M. bicuspidatus* n. sp., provided with the highly complicated vertigial structure in ♂, necessitates the amendation to be introduced into the original generic diagnosis that the presence of a vertigial tubercle in ♂ is not obligatory.

Unfortunately, the entire generic classification of Opisotretidae is far from satisfactory (Golovatch, 1987a) to appreciate fully the fact that the vertigial modifications in ♂ opisotretids are at least sometimes only species characteristic. Taking this into account, *Martensodesmus* seems especially closely related to *Opisthoporodesmus* Silv. (six nominal forms from New Guinea, Java, and Celebes) and *Retrodesmus* Chamb. (a single species from Java), as witnessed by the absence of both accessory seminal chamber and process at the base of the gonopod femorite. However, a better outline of these three genera in question is impossible prior to a thorough revision of Chamberlin's (1945) numerous (and dubious) opisotretid taxa.

It is also noteworthy that, along with the removal of *Nepalotretus* from Opisotretidae (see above), this family regains its fair morphological and biogeographical homogeneity.

Family **Fuhrmannodesmidae**

Magidesmus n. gen.

Body small (less than 1 cm long), well polydesmoid, of 20 segments. Antennae relatively short, joints 5 and 6 each with a poor and good disto-dorsal group of sensillae, respectively, joint 7 with a tiny dorsal tubercle. Paraterga well-developed, set rather high; metazona with three usual rows of setae, macrosculpture present. Pore formula normal. Pleural keels absent. Legs somewhat incrassate (at least in ♂), without tarsal sphaerotrichs. Sterna usual, without modifications.

Gonopods very stout, with good coxal cannulae; telopodites very short, hold more or less parallel to main axis, almost entirely sunk in coxal cavity, each with a cavity itself, which is almost surrounded by a higher inner and a lower outer lobe. Seminal groove loop-like, runs along bottom of the cavity to end on a small tooth lying on outer side of higher inner lobe. Coxae medially fused. Type species: *Magidesmus bhutanesis* n.sp.

Remarks: Judging from the gonopod structure, particularly due to the shape of the seminal ampule, absence of an accessory seminal chamber, and presence of a separate tooth terminating the seminal groove, *Magidesmus* n. gen. is an indisputable member of the family Fuhrmannodesmidae. By its particularly short and stout gonopod telopodite and the presence of a peculiar cavity harbouring the terminal tooth of the seminal groove the new genus seems very well distinguishable from the other fuhrmannodesmids (Hoffman, 1979). In the superficially similar genera *Cryptogonodesmus* Silv., *Brachycerodesmus* Carl, *Gyrophallus* Carl, *Fuhrmannodesmus* Carl, all from northern South America (Carl, 1914), in which the gonocoxae sometimes also almost sheathe the acropodites, there is no cavity of the gonotelopodite proper, and the seminal groove does not make a distal loop. The same holds true for a number of Indian and/or Himalayan fuhrmannodesmid genera, i.e. *Ootacodesmus* Carl, *Pseudosphaeroparia* Carl, *Kukkalodesmus* Carl, *Sholaphilus* Carl, *Hingstonia* Carl, etc. (Carl, 1932, 1935; Golovatch, 1986, 1987a).

So far, *Magidesmus* n. gen. contains two species, *M. bhutanensis* n. sp. and *M. affinis* n. sp., both from the Bhutan Himalayas.

Magidesmus bhutanensis n. sp. Figs 32–35.

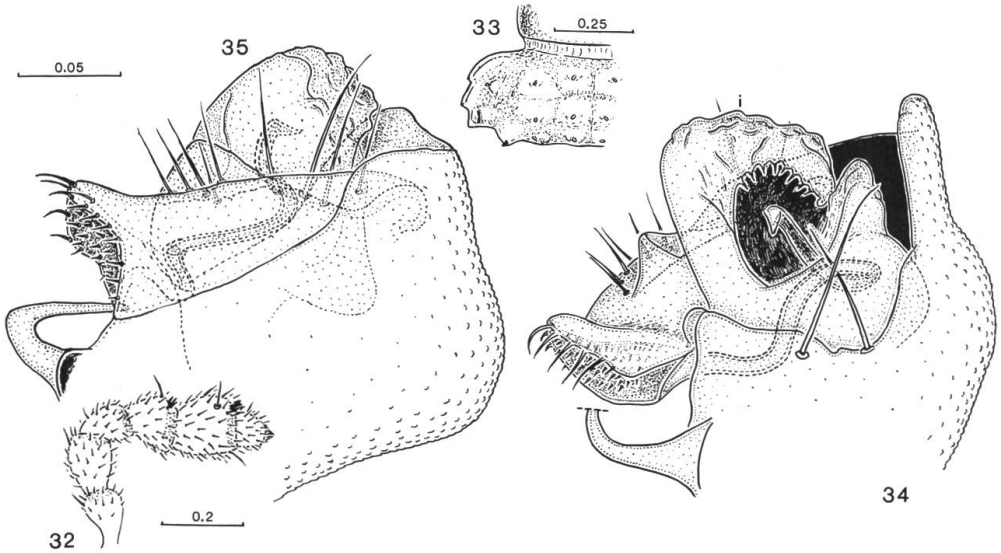
Diagnosis: Differs from *M. affinis* n. sp. (see below) by the proportions of the head vs. several anteriormost body segments, shape of the epiproct, as well as by certain minor details of the gonopod structure.

Description: Length of holotype ca. 6.0 mm, width of midbody pro- and metazona 0.55 and 0.8 mm, respectively. Colour pale pinkish-yellowish-brown; head, legs and ventrum whitish, antennae pale pinkish. 20 body segments.

Head somewhat broader than collum and a little narrower than subequal segments 2 and 4. Antennae (Fig. 32) short and stout, in situ reaching only to end of body segment 2; joints 5 and 6 with a loose and a well-developed disto-dorsal group of sensillae, respectively; joint 7 with a poorly-developed, tiny middorsal tubercle. Body well polydesmoid, segment 3 a bit narrower than either 2nd or 4th and well narrower than 5th; from ring 6 body parallel-sided until segment 17, onward abruptly tapering. Paraterga very well developed (Fig. 33), set high (dorsum relatively slightly convex) and subhorizontally, laterally rimmed and indentated (one denticle on each side of collum, two incisions on subsequent terga but telson); caudal angle more or less subrectangular till rings 9–10 (Fig. 33), onward increasingly acute and better projecting caudad to become almost reaching to hind tergal contour (which is in the form of a decreasingly developed triangle from each side of hind limbus) until rings 13–14, already reaching the level of the limbal triangles on segment 15, well beak-like and protruding caudad beyond hind tergal contour from ring 16 (particularly well on segment 17), but already as small spines on tergum 19. Tergal microsculpture finely shagreened (surface dull), macrosculpture well-developed, usual three rows of polygonal tubercles (somewhat better developed on anterior body third) surmounted by tiny, clavate setae sitting on a little knob each; tergal setae a bit longer in hind row on metazonite 19 and even longer, subbacilliform, in foremost row on collum. Pores rather vague, open dorso-laterally, lie near paratergal caudo-lateral corner; pore formula normal. Pleural keels absent. Epiproct short, in dorsal view triangular, but with a rather broadly truncate tip, in lateral view somewhat curved downward. Anal valves margined.

Legs thick and long, only tarsi particularly slender and long, devoid of sphaerotrichs; perhaps legs of ♂ incrassate compared to those of ♀, invariably growing somewhat longer and slenderer toward telson. Sterna without modifications, modestly setose.

Gonopods (Figs 34–35) complex, coxites very large, medially fused, each with a good cannula and a large cavity almost entirely harbouring (and concealing) telopodite. Latter very short and stout; seminal ampule normal, though a little enlarged; acropodite hollow in the middle, the cavity being almost surrounded by simple and lobular structures, the highest of which is inner *(i)*, apically somewhat wrinkled and on outer side hollow in itself to carry at bottom a small tooth terminating a long and loop-like seminal groove and to be surrounded by a row of tiny setoids.



Figs 32–35. *Magidesmus bhutanensis* n. gen., n. sp., ♂ holotype: 32, antenna, 33, left half of metasomite 9 (dorsal view). 34–35, gonopods (submesal and sublateral views respectively).

Types: Holotype ♂ (NHM–Basel) and 1 juv. ♀ (NHM–Basel); locality: Bhutan, Pass Dorju-la [5], 3100 m, *Rhododendron*-conifer forest in mist belt, 6.VI.1972, Naturhist. Mus. Basel Expedition (No. 35).

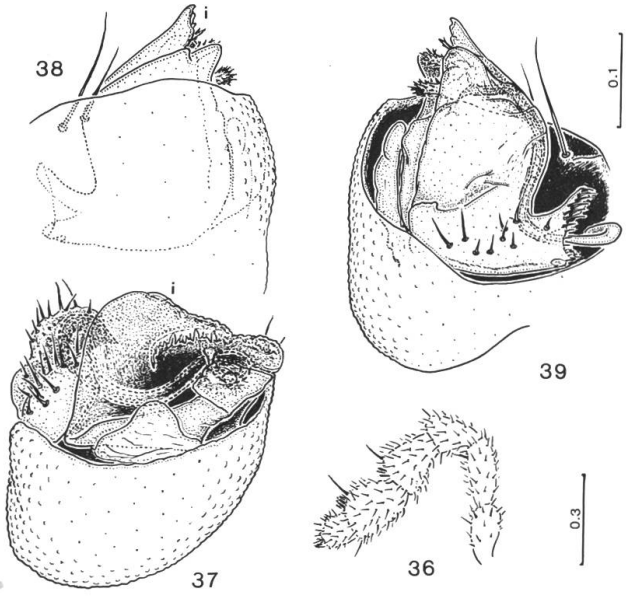
Magidesmus affinis n. sp. Figs 36–39.

Diagnosis: See under *M. bhutanensis* n. sp.

Description: Length ca. 7.0 mm, width of midbody pro- and metazona 0.6 and 0.9 mm, respectively. Colour pale yellowish-pinkish-brown; legs and ventrum paler. 20 body segments.

Head well broader than collum and subequal to segment 2. Antennae (Fig. 36) stout and clavate, in situ reaching only to beginning of body segment 3; joints 5 to 7 as in *M. bhutanensis* n. sp. Body well polydesmoid, segment 3 a bit narrower than 2nd and subequal to ring 4, though somewhat narrower than segment 5; from ring 6 body parallel-

sided till segment 16 to become rather gently tapering further on. Paraterga very well developed, almost like in *M. bhutanensis* n. sp.; caudal angle also subrectangular till ring 10, increasingly acute and almost reaching to decreasing limbal triangles until somite 14, on ring 15 reaching to hind tergal contour, onward particularly beak-like and projecting beyond the contour. Tergal micro- and macrosculpture, as well as setae like in *M. bhutanensis* n. sp. Pleural keels wanting. Epiproct rather short, with a pair of good pre-apical lateral incisions, apically very narrowly truncate. Anal valves margined.



Figs 36–39: *Magidesmus affinis* n. sp., ♂ holotype: 36, antenna: 37–39, gonopods (ventromesal, frontal, and caudasl views, respectively).

Legs and sterna like in *M. bhutanensis* n. sp.

Gonopods (Figs 37–39) like in *M. bhutanensis* n. sp., but inner lobe *(i)* of telopodite carries a row of small irregular teeth around its cavity, while outer lobe distinctly bilobate.

Holotype ♂ (NHM-Basel); locality: Bhutan, Dechhi Paka, 5 km E of Pele-la [9], on Tongsa side, 3300–3400 m, *Rhododendron*-conifer forest, 19–20.VI.1972, Naturhist. Mus. Basel Expedition (No. 48).

Hingstonia gogonana n. sp. Figs 40–41.

Diagnosis: See key below.

Description: Length ca. 17 mm (holotype) and 15–16 mm (para-

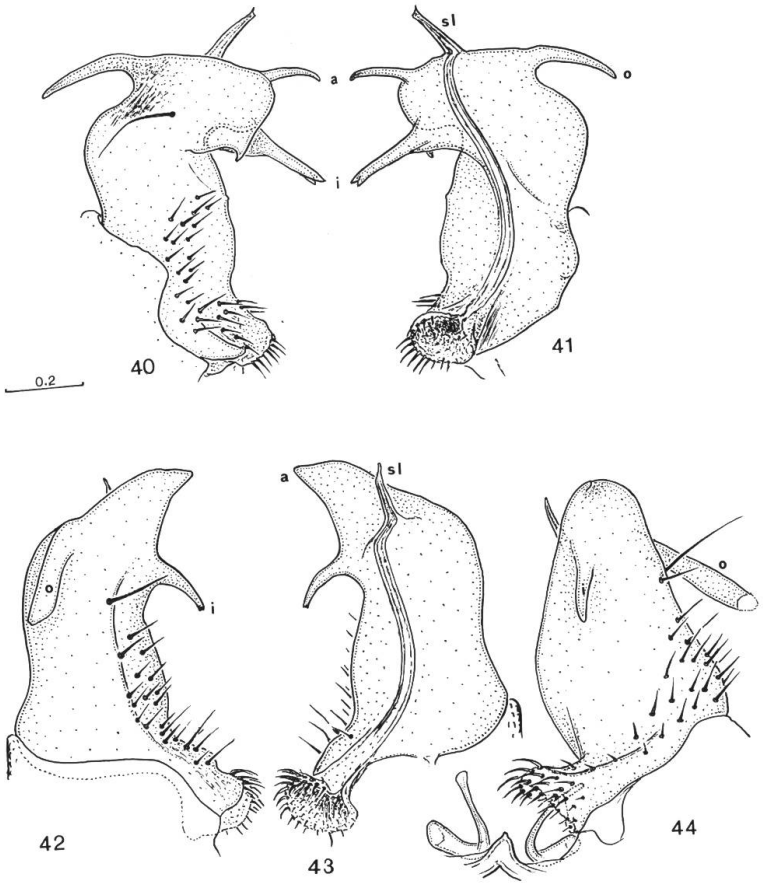
types), width of midbody pro- and metazona 1.65 and 2.5 mm, respectively, in holotype and 1.8 and 2.5 mm, respectively, in paratypes. Colour marble brown, rather pale; legs and ventrum pale yellowish. 20 body segments.

Head narrowed at base of labrum, beset with short setae, ca. 1.5 times as broad as oblong-oval collum, a little broader than subequal somites 2 and 3, and subequal to segment 4. Antennae very long and slender, slightly clavate, in situ reaching to middle of body segment 4 (♂) or to end of segment 3 (♀); joints 5 and 6 each with a well-developed disto-dorsal group of sensillae. Body well polydesmoid, parallel-sided on rings 6–7 to 16 to become quite abruptly tapering onward. Paraterga very well developed, set rather high (dorsum rather slightly convex), at about 1/3rd of metasomite height, caudad directed slightly obliquely; in dorsal view lateral margin rimmed, poorly indentated (two or three incisions, sometimes additional one to three almost wanting ones at particularly well and gently rounded anterior portion); caudal angle always well obtuse and not pointed (particularly on poreless segments) till ring 13 or 14, almost pointed, though still within hind tergal contour on somite 15, increasingly beak-like in the form of a triangle projecting beyond the contour on rings 16 to 18 (particularly well on 17th), again much poorer on segment 19 (as minute spinicles from each side). Pores lie dorso-laterally near caudal corner. Tergal microsculpture finely shagreened (surface very modestly shining), macrosculpture as usual three rows of rather well developed polygonal tubercles (hind row and swellings at base of paraterga particularly pronounced) each surmounted by a minute, bacilliform or slightly clavate seta; sulcus between rows 1 and 2 rather well developed, expressed better than that between rows 2 and 3; a fine rugosity below paraterga. Hind tergal margin very slightly bisinuate. Pleural keels absent. Epiproct rather long, in dorsal view with slightly convex sides, rather narrowly and somewhat concavely truncate at tip, in lateral view modestly curved downward. Anal valves margined.

Legs well incrassate in ♂ (particularly pre-gonopodal pairs) as compared to those in ♀, very long and slender (particularly due to tarsi), gradually growing somewhat longer and slenderer toward telson, in ♂ all joints but tarsi of all legs but pairs 1 and 2 beset with minute ventral teeth, tarsal sphaerotrichs present, in ♀ prefemora of leg-pair 2 particularly enlarged. Sterna without modifications, but in ♂ a paramedian pair of rather high and setose tubercles between coxae 7, while in ♀ a prominent transverse ridge behind coxae 2.

Gonopods (Figs 40–41) rather complicated, solenomerite *(sl)* not particularly long, distal part of telopodite with a bifid inner process *(i)*, an anterior *(a)* and a cephalic *(o)* slender outgrowth.

Types: Holotype ♂ (NHM–Basel) and 2 paratypes ♀ (NHM–Basel); locality: Bhutan, Sha Gogona, Muelhagang [8], 3650–4000 m, subalpine *Rhododendron*-conifer forest, 12.VI.1972, Naturhist. Mus. Basel Expedition (No. 43).



Figs 40–44: 40–41. *Hingstonia gogonana* n. sp., ♂ holotype and 42–44. *Hingstonia pelelana* n. sp., ♂ paratype: gonopods (lateral, mesal, lateral, mesal and caudal views, respectively).

Hingstonia pelelana n. sp. Figs 42–44.

Diagnosis: See key below.

Description: Length ca. 20–21 mm in ♂ and 20–22 mm in ♀, width of midbody pro- and metazona 1.7–1.85 and 2.7–3.0 mm, respec-

tively, in ♂ and 1.8–2.0 and 2.7–3.0 mm, respectively, in ♀. Holotype ♂ ca. 21 mm long and 1.75 and 2.9 mm wide on midbody pro- and metazona, respectively. Colour pale marble brown to marble brown; dorsal axis, legs, tip of antennomere 7, ventrum paler, yellowish. 20 body segments.

Head ca. 1.5 times as broad as collum and somewhat broader than body somite 2, subequal to segment 3 and a little narrower than ring 4. Antennae very long and slender, in situ reaching to middle of body segment 5 (♂) or to end of somite 4 (♀); joints 5 and 6 like in *H. gogonana* n. sp. Body well polydesmoid, parallel-sided on rings 6–7 to 15, onward gently and gradually tapering. Paraterga developed very well, set almost horizontally (at about 1/4th to 1/5th of midbody height) and high (dorsum slightly convex), anteriorly very regularly rounded (typical for the genus); lateral margin rimmed and indentated (three good incisions on somite 2, two or three ones on subsequent terga, besides sometimes one to three additional almost wanting ones at anterior portion of margin); caudal angle more or less pointed, obtuse till about ring 11 (especially on poreless somites), subrectangular on segments 12 and 13, projecting in the form of a triangle (poorly) beyond hind tergal contour on segment 14, onward increasingly beak-like and well protruding caudad beyond the contour (reaching maximum on ring 17), somewhat poorer developed on somite 18 (though with a particularly large lateral indentation at about 1/3rd of beak), and as a little spinicle on ring 19. Pores quite large, lie dorso-laterally near caudal corner. Tergal microsculpture very finely shagreened (surface poorly shining), macrosculpture developed, better expressed at base of paraterga and as a hind row of polygonal tubercles; three usual rows surmounted by minute setae (usually bacilliform, more rarely poorly claviform, somewhat longer only on collum and in hind row of somite 19); sulcus between rows 1 and 2 again a little better developed than that between rows 2 and 3; fine rugosity below paraterga, as well as on collum. Hind tergal margin very slightly bisinuate. Pleural keels wanting. Epiproct long, slender, in dorsal view sides almost not concave, apex very narrowly and roundly truncate, in lateral view slightly curved downward. Anal valves margined.

Legs very long and slender (particularly due to tarsi), somewhat incrassate in ♂ as compared to ♀. In ♂ all joints but tarsi of all leg-pairs but 1 and 2 beset with minute inner teeth, tarsal sphaerotrichs present. Sterna without modifications, though in ♂ a pair of small paramedian tubercles between coxae 7 and in ♀ a prominent transverse ridge behind coxae 2.

Gonopods (Figs 42–44) relatively simple, solenomerite *(sl)* quite short, outer process *(o)* paddle-shaped, inner one *(i)* subunciform, apical outgrowth *(a)* not differentiated.

Types: Holotype ♂ (NHM–Basel) and 11 paratypes (4 ♂ and 5 ♀, NHM–Basel; 1 ♂ and 1 ♀, coll. Golovatch); locality: Bhutan, Dechhi Paka, 5 km E of Pele-la [9], 3300–3400 m, on Tongsa side, *Rhododendron*-conifer forest, 19–20.VI.1972, Naturhist. Mus. Basel Expedition (No. 48).

Hingstonia dorjulana n.sp. Figs 45–46.

Diagnosis: See key below.

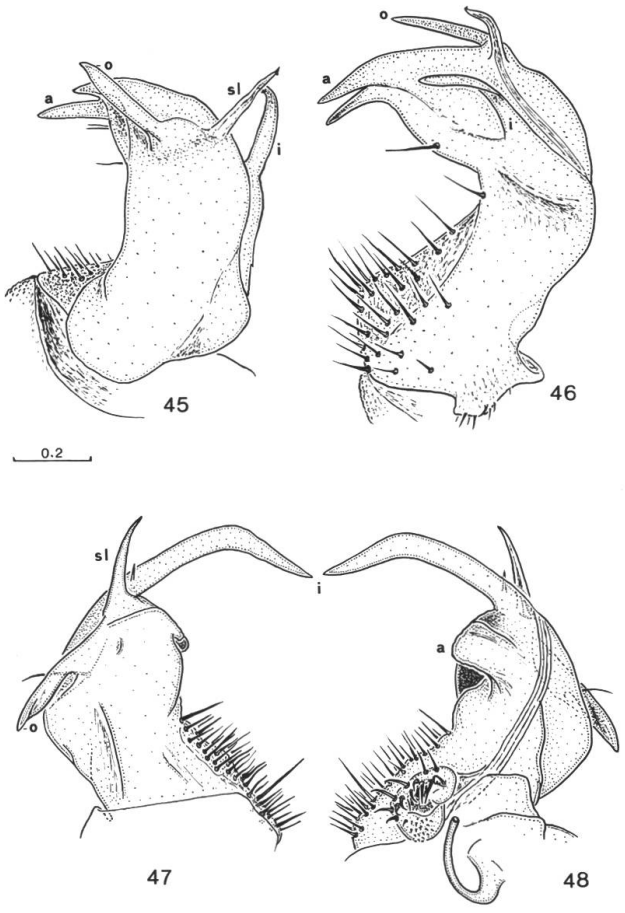
Description: Length ca. 20 mm, width of midbody pro- and metazona 1.6 and 2.9 mm, respectively. Colour pale marble brown; legs, ventrum, dorsal axis, tip of antennomere 7 paler, white to yellowish. 20 body segments.

Head ca. 1.45 times as broad as oblong-oval collum, subequal to body segment 2 and a bit narrower than somite 3. Antennae very long and slender, in situ reaching to middle of somite 4; joints 5 and 6 as in *H. gogonana* n.sp. Body well polydesmoid, broadens till segments 6 and 7, whereupon parallel-sided till ring 16, onward gently and gradually tapering. Paraterga developed very well, laterally rimmed and indentated (two or three incisions, sometimes additional one to three ones, almost wanting and situated at anterior portion of margin), set high (at about 1/5–1/6th of midbody height) and subhorizontally (dorsum very slightly convex); caudal angles pointed, obtuse on poreless rings and subrectangular on pore-bearing ones, begin projecting caudad beyond hind tergal contour from ring 13, beak-like on somites 16–18 (maximum on somite 17), as an almost wanting spinicle from each side of segment 19. Pores large, lie dorso-laterally near caudal corner. Tergal micro- and macrosculpture like in *H. pelelana* n.sp. Tergal setae very short, subbacilliform, a bit longer on collum, somite 2 and in hind row of segment 19; rows 1 and 2 divided by a poorly-developed sulcus, which is still better expressed than that dividing rows 2 and 3. Hind tergal margin very slightly bisinuate. Pleural keels wanting. Epiproct long, in dorsal view as an almost regular triangle (caudal angle ca. 60°), tip narrowly and roundly truncate, in lateral view slightly curved downward. Anal valves margined.

Legs very long and slender (particularly due to tarsi), somewhat longer and slenderer toward telson, perhaps somewhat incrassate as compared to ♀, tarsal sphaerotrichs present, all joints but tarsi of all leg-

pairs but 1 and 2 beset with minute inner teeth. Sterna modestly setose, normal, a small elevation between coxae 7.

Gonopods (Figs 45–46) quite complicated, solenomerite *(sl)* relatively short, inner *(i)* and outer *(o)* processes subspiniform, apical outgrowth biramous *(a)*, in the form of a couple of teeth.



Figs 45–48: 45–46. *Hingstonia dorjulana* n. sp., ♂ holotype and 47–48. *Hingstonia yeti* n. sp.,♂ holotype: gonopods (fronto-lateral, submesal, lateral, and mesal views, respectively).

Holotype ♂ (NHM–Basel); locality: Bhutan, near Pass Dorju-la [5], 2450–3100 m, *Rhododendron*-conifer forest in mist belt, 6.VI.1972, Naturhist. Mus. Basel Expedition (No. 34–36).

Hingstonia yeti n. sp. Figs 47–48.

Diagnosis: See key below.

Description: Length ca. 19 mm, width of midbody pro- and meta-

zona 1.35 and 2.2 mm, respectively. Colour marble brown; legs, ventrum, antennomere 7 (tip) whitish to yellowish, basal half of antennomere 7 dark brown. 20 body segments.

Head beset with short setae, ca. 1.45 times as broad as oblong-oval collum, somewhat broader than body segment 2. Antennae very long and slender, in situ reaching to middle of ring 4; joints 5 and 6 like in *H. gogonana* n.sp. Body well polydesmoid, constricted on segment 3, which is a bit narrower than 2nd, though somewhat broader than collum; body broadens on rings 5 to 8, from segment 8 parallel-sided until ring 16, onward gently and gradually tapering. Paraterga well-developed, set rather high (at about 1/5th of midbody height), subhorizontally (dorsum relatively slightly convex), laterally rimmed and indentated (three nice incisions on somite 2, two or three incisions on subsequent terga, sometimes additional one to three almost wanting denticles at anterior portion of margin); caudal angles pointed, obtuse on poreless and subrectangular on pore-bearing segments until rings 13 and 14, where a rather poorly beak-like triangle begins to reaching to hind tergal contour; from ring 15 already increasingly protruding caudad as a beak beyond the contour, maximum on ring 17, again poorer on somite 18, while as an almost wanting spinicle from each side of segment 19. Pores lie dorso-laterally near caudal corner, large. Tergal microsculpture very finely shagreened (surface poorly shining), macrosculpture moderately developed, present even on collum somewhat better expressed at base of paraterga and as a hind row of polygonal tubercles; a fine rugosity below paraterga. Tergal setae very small, bacilliform, more rarely pointed, somewhat longer in fore row on collum and on ring 19. Pleural keels wanting. Epiproct rather long, finger-shaped, in dorsal view broadly truncate and very slightly concave at tip, in lateral view slightly curved downward. Anal valves margined.

Legs very long and slender (particularly due to tarsi), perhaps somewhat incrassate (particularly pre-gonopodal pairs) as compared to ♀, gently growing somewhat longer and slenderer toward telson; inner sides of all joints but tarsi of all leg-pairs but 1 and 2 beset with minute teeth. Sterna normal, modestly setose, an elevation between coxae 7 poorly expressed.

Gonopods (Figs 47–48) not particularly differentiated, solenomerite *(sl)* quite high, inner process *(i)* huge, twice as long as eigher *sl* or outer process *(o),* anterior swelling *(a)* evident.

Holotype ♂ (NHM–Basel); locality: Bhutan, from Sampa to Kothoka [7], 1600–2600 m, evergreen forest, 9.VI.1972, Naturhist. Mus. Basel

Expedition (No. 40/2).

Remarks: The genus *Hingstonia* Carl, 1935 has hitherto been known by five Nepalese species (Carl, 1935; Golovatch, 1986, 1987a). Having brought now a total of the known *Hingstonia* spp. to nine, I believe another tentative key to all of them warranted to incorporate the above four new Bhutanese forms and to present a better idea of the variability of the genus.

Key to the species of the genus Hingstonia

1. Caudal angle of paratergite 16 beak-like and projecting caudad beyond hind tergal contour 3
– Caudal angle of paratergite 16 not projecting beyond hind tergal contour, at best reaching to it 2
2. Head subequal to or a bit broader than somite 2. Caudal angle of paratergites 12 and 13 still subrectangular. Gonopods not falcate, stout. **H. serrata** Golovatch, 1987
– Head subequal in width to somite 3 and rather well broader than somite 2. Caudal angle of paratergites 12 and 13 already acute. Gonopods well falcate. **H. falcata** Golovatch, 1986
3. Caudal angle of paratergite 16 only a little to a bit projecting caudad beyond hind tergal contour. Body usually less than 17 mm long 4
– Caudal angle of paratergite 16 well projecting caudad beyond hind tergal contour. Body usually over 19 mm long 6
4. Caudal angle of paratergite 15 acute (though subrectangular), as a relatively good beak projecting a bit beyond hind tergal contour. Gonopods without processes lying cephalad of seminal groove. **H. eremita** Carl, 1935
– Caudal angle of paratergite 15, though subrectangular, not properly beak-like, lies within hind tergal contour. Gonopods at least with one good distal process situated cephalad of seminal groove 5
5. Head subequal in width to somite 3. Body ca. 2.0 mm wide. No setiferous sternal tubercles between coxae 7 in ♂. Gonopods with a well-biramous outer process. Nepal. **H. perarmata** Golovatch, 1987
– Head subequal in width to somite 4. Body ca. 2.5 mm wide.

A paramedian pair of fine setiferous tubercles between coxae 7 in ♂. Gonopods (Figs 40–41) devoid of biramous processes. Bhutan. **H. gogonana** n. sp.

6. Caudal angle of paratergite 14 as a poorly-developed beak at best, invariably lying within hind tergal contour 7
– Caudal angle of paratergite 14 already quite beak-like (as a good triangle) and projecting caudad beyond hind tergal contour 8
7. Head a bit narrower than subequal somites 2 and 3. Body 3.0–3.5 mm wide. Caudal angle of paratergite 15 within or just a bit projecting caudad beyond hind tergal contour. Epiproct narrowly truncated. Gonopods with subequal outer and inner processes, both almost equal in length to free solenomerite. Nepal. **H. variata** Golovatch, 1987
– Head somewhat broader than somite 2 and particularly broader than somite 3. Body ca. 2.2 mm wide. Caudal angle of paratergite 15 projecting caudad well beyond hind tergal contour. Epiproct broadly truncate. Gonopods with inner process *(i,* Figs 47–48) about twice as long as either free solenomerite *(sl)* or outer process *(o)*. Bhutan. **H. yeti** n. sp.
8. Head subequal in width to body segment 2 and a bit narrower than somite 3. Caudal angle begins to projecting caudad beyond hind tergal contour as a triangle from paratergite 13. Gonopods more simple (Figs 42–44). **H. dorjulana** n. sp.
– Head subequal in width to segment 3 and a little narrower than somite 4. Caudal angle begins to projecting beyond hind tergal contour as a poorly-developed triangle only from paratergite 14. Gonopods (Figs 45–46) much better differentiated. **H. pelelana** n. sp.

Conclusion

Undoubtedly, the polydesmoid fauna of Bhutan, like that of Nepal, will turn out to comprise lots and lots of other new forms, perhaps even new genera. Judging only from a few closer unidentifiable samples (with ♀) from Bhutan, other *Martensodesmus* spp., *Usbekodesmus* sp., *Magidesmus* sp., *?Hingstonia* sp. occur there as well. On the other hand, *Glenniea* is now more than likely to be found in Nepal in a richer variety than *G. martensi* (Golovatch), while the genus *Himalodesmus* will pro-

bably be discovered in the future east of Nepal, and *Magidesmus,* on the contrary, west of Bhutan.

In general, however scant at the moment seem to be faunistic data on the millipedes of the Himalayas, the general conclusions must nevertheless be drawn that: 1) at a specific level, the fauna is highly endemic, the majority, if not all, of the known Himalayan Polydesmidae, Fuhrmannodesmidae, Opisotretidae and probably some other higher taxa of Diplopoda are highly local in distribution (and taking into account the very complicated history and orography of this huge mountainous system, this means really an immense number of species/subspecies involved), some of them perhaps representing species swarms; 2) at a generic level, the Himalayan fauna seems quite conspicuous (thus, among the studied groups, *Hingstonia, Glenniea, Himalodesmus, Magidesmus, Bhutanodesmus, Martensodesmus* may be expected to be restricted to the Himalayas), though shares certain genera with the Palaearctic (e. g., *Usbekodesmus, Tianella),* and particularly with the Indian (e. g. *Sholaphilus, Trichopeltis)* and Oriental (e. g., *Nepalella)* realms. Of course, a better outline of the zoogeography of Himalayan Diplopoda may be given only upon future extensive investigations of the entire Asian millipede fauna. Something in this respect is certainly known, but too much is still obscure or totally unknown to warrant at present further speculations.

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