New species and new data on Protrinemuridae and Nicoletiidae (Zygentoma) from Eastern Asia and Pacific islands

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Abstract – Four new genera and eleven new species of Zygentoma thysanurans (families Protrinemuridae and Nicoletiidae) are described and some faunistic novelties reported from Oriental and Australian Regions, viz.: *Protrinemura leclerci* n. sp., from northern Thailand, *Protrinemurella allacrotelsoides* n. gen. n. sp., from southern Thailand, and *Protrinemuroides celebensis* n. gen. n. sp., from the Celebes islands (Protrinemuridae), *Lepidospora (L.) digitata* n. sp., from northern Thailand, *L. (L.) deharvengi* n. sp., from the Celebes, and *Pseudobrinckina anempodiata* n. gen. n. sp., from northern Thailand (Nicoletiidae: Coletiniinae), *Gastrotheus (G.) papuanus* n. sp., from Papua-New Guinea (Nicoletiidae: Atelurinae), and *Metrinura celebensis* n. sp., from the Celebes, *Trinemurodes anomalocoxa* n. sp., from southern Thailand, *T. bedosae* n. sp., from northern Thailand, and *Allotrinemurodes thai* n. gen. n. sp., from northern Thailand (Nicoletiidae: Subnicoletiinae). *Bharatatelura malabarica* Mendes is reported for the first time off the Indian sub-continent (in Suva). *Proatelura jacobsoni* Silvestri is recorded in Macao (southern China) and in the Moluccas islands and notes are presented on its male sex. *Gastrotheus (Lasiotheus) nanus* (Escherich) is found for the very first time in Macao, in Cook islands and in Niue. Identification keys are provided to Protrinemuridae genera and to species of *Trinemurodes*, and modifications are suggested to previously presented keys to Nicoletiidae genera and to *Lepidospora* and *Metrinura* species.

Résumé – **Nouvelles espèces et nouvelles données sur les Protrinemuridae et les Nicoletiidae (Zygentoma) du sud-est de l'Asie et des îles du Pacifique**. – Quatre nouveaux genres et onze espèces nouvelles de Thysanoures Zygentoma (familles des Protrinemuridae et des Nicoletiidae) sont décrites et quelques nouveautés faunistiques signalées des Régions Orientale et Australienne: *Protrinemura leclerci* n. sp., du Nord de la Thaïlande, *Protrinemurella allacrotelsoides* n. gen. n. sp., de la Thaïlande méridionale et *Protrinemuroides celebensis* n. gen. n. sp. de l'archipel des Celèbes (Protrinemuridae), *Lepidospora (L.) digitata* n. sp. de la Thaïlande septentrionale, *L. (L.) deharvengi* n. sp. des Celèbes et *Pseudobrinckina anempodiata* n. gen. n. sp. du Nord de la Thaïlande (Nicoletiidae: Coletiniinae), *Gastrotheus (G.) papuanus* n. sp. de Papua-Nouvelle Guinée (Nicoletiidae: Atelurinae) et *Metrinura celebensis* n. sp. des Celèbes, *Trinemurodes anomalocoxa* n. sp. du Sud de la Thaïlande, *T. bedosae* n. sp. du Nord de la Thaïlande et *Allotrinemurodes thai* n. gen. n. sp. aussi de la Thaïlande septentrionale (Nicoletiidae: Subnicoletiinae). *Bharatatelura malabarica* Mendes, est signalée pour la première fois au dehors du sub-continent indien (à Suva). *Proatelura jacobsoni* Silvestri, est signalée à Macao (Sud de Chine) et aux îles Moluques et quelques caractères du mâle sont presentées. *Gastrotheus (Lasiotheus) nanus* (Escherich) est signalé pour la première fois à Macao, aux îles Cook et à Niue. Des clés dichotomiques sont présentées pour les genres de Protrinemuridae et pour les espèces de *Trinemurodes*, et des modifications sont proposées pour des clés d'identification déjà publiées pour les genres de Nicoletiidae et pour les espèces de *Lepidospora* et de *Metrinura*.

The present paper deals with the study of several samples of Protrinemuridae and Nicoletiidae thysanurans (Insecta: Zygentoma) collected in eastern Asia (Thailand, Southern China), Indonesia (Sumatra, Moluccas, Celebes (= Sulawesi) and Tanimbar island), Papua-New Guinea, Polynesia and Melanesia. Four new genera and eleven new species are described and some new data reported.

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Material

The samples belong to the Musée d'Histoire Naturelle de Genève, Geneva, Switzerland (MHNG), Univer-

sitetets Zoologiske Museum, Copenhagen, Denmark (UZM) and Centro de Zoologia do IICT, Lisbon, Portugal (CZ). The material from MHNG was loaned by Dr. Bernd Hauser and that of UZM by Dr. Henrik Enghoff, to whom we are deeply thankful. The samples deposited in CZ, with exception of those coming from Macao Territory (then under Portuguese administration and collected during the first Mission of the CZ to Macao –Travassos-Dias *et al.* 1994), have been offered by several colleagues to whom we want to express our

Figures 1-9
Protrinemura leclerci n. sp. ♀ . – 1, head (damaged). – 2, maxilla. – 3, maxillary palp. – 4, *ibid.*, apex of distal article. – 5, labial palp. – 6, pronotum. – 7, mesonotum. – 8, metanotum. – 9, P II. (Scales: 0.1 mm)

gratitude, namely: Dr. Louis Deharveng and Dr. Anne Bedos, from the Université Paul Sabatier, Toulouse, France; Dr. Philippe Leclerc, from Villejuif, France; Dr. Antonius van Harten, now at Yemen-German Plant Protection Project in Sana'a, Yemen, at the time in SPC-German Biological Control Project, Suva, Fiji; Dr. António Bivar de Sousa, of the Sociedade Portuguesa de Entomologia; and late Prof. Riozo Yoshii, then in Centre for Southeastern Asian Studies of the Kyoto University, in Jakarta, Indonesia.

Fam. **PROTRINEMURIDAE**

Protrinemura leclerci n. sp.

Type-specimen – Holotype ♀: Thailand: Prov. Changwat Mae Sai. Tham (= Grotte) Ku Kan cave, near the village of Ban Tham, coll. P. Leclerc, leg. *L. Deharveng*, 24/VI/1986, n. THAI-86 (CZ).

Description – Body length: 7.8 mm; thorax length: 2.3 mm; thorax width: 1.4 mm; antennae and terminal filaments damaged. Body thin and elongate, scales and pigment lacking.

Head as in fig. 1, damaged, wider than long, with numerous discal setae and marginal macrochaetae. Antennae unknown, only preserved rounded scapus and pedicellus. Mandibles devoid of special characteristics. Maxillae (fig. 2) with equally developed galea and lacinia, former with 2 apical large conules and a small cylindrical sensillum, lacinia with 3 apical teeth, devoid of prostheca, with 6 lamellar processes and 3-5 big, strong macrochaetae and some setae; maxillary palp (figs. 3, 4) robust, with some strong apical and ventral setae on second division, distal article cylindrical, about 1/5 longer than preceding and 5.5-6 times longer than wide, its apical area with 6 large, ramous and several minute ovoid sensilla. Labium typical, labial palp (fig. 5) elongate, with ovoid, almost twice longer than wide, apical article.

Thorax much shorter than abdomen, clearly longer than wide. Pro- (fig. 6) and mesonotum (fig. 7) with almost straight posterior border, metanotum (fig. 8) more clearly (though not strongly) concave. Legs as in figs. 9, 10; P I lost on both sides; tibia II about 1/3 shorter than tibia III; praetarsus (fig. 11) simple and complete, claws robust, empodium thinner, all smooth.

Urotergites as usual in the genus (figs. 12, 13), with abundant discal setae and hind marginal macrochaetae, X (fig. 14) much wider than long, with some short posterior macrochaetae.

All urosternites entire, setose and with posterior stronger setae. Stylets on II-IX (figs. 15-17), all vesicular structures lacking. Subgenital plate absent; ovipositor (fig. 17) setose from its base, surpassing apex of stylets IX by almost 4 times their length. Gonapophyses VIII with 37, IX with 36 divisions, last ones with non-modified inner distal area, their terminal divisions as in figs. 18, 19.

Terminal filaments damaged, preserved part without special characteristics.

Male sex unknown.

Etymology – The species is dedicated to its collector, Dr. Philippe Leclerc.

Discussion – *Protrinemura* Silvestri, 1942 was known by two species only, *P. orientalis*, its type-species from Fukien Province, Eastern China, and *P. mediterranea* Mendes, 1988 from Cyclades archipelago, Greece. The former, an edaphic (?) species, recorded as collected "... sub saxo in humus infossa...", is much smaller (5-6 mm), with clearly shorter ovipositor surpassing stylets IX by about once their length only, and with much lower number of divisions (Silvestri 1942 represents 15 annuli which must approach the real number); furthermore, maxillary palp is distinct, tarsal claws quite different and urotergite X wider. The second species, a troglobiont from Iraklia island, is bigger than *P. leclerci* n. sp., shows much more robust praetarsal claws and empodium, distinct X urotergite (distance between inner macrochaetae clearly shorter and posterior border straight) and longer ovipositor, with higher number of divisions.

Protrinemurella n. gen.

Type-species : *Protrinemurella allacrotelsoides* n. sp.

Description – Body long and thin, devoid of scales and lacking pigment.

Head wider than long, with setae and macrochaetae. Antennae elongate, shorter than body and without peculiar features. Mandibles robust, with well developed incisive and molar areas. Galea with 2 apical conules and as long as lacinia, the latter lacking prostheca; maxillary and labial palps typical.

Thorax longer than wide, with numerous discal setae and marginal macrochaetae. Legs robust, the male P I with a tibial ventral field of setulae; tarsus 4-segmented, praetarsus simple and complete, with 2 lateral claws and a shorter unguiform empodium, all smooth.

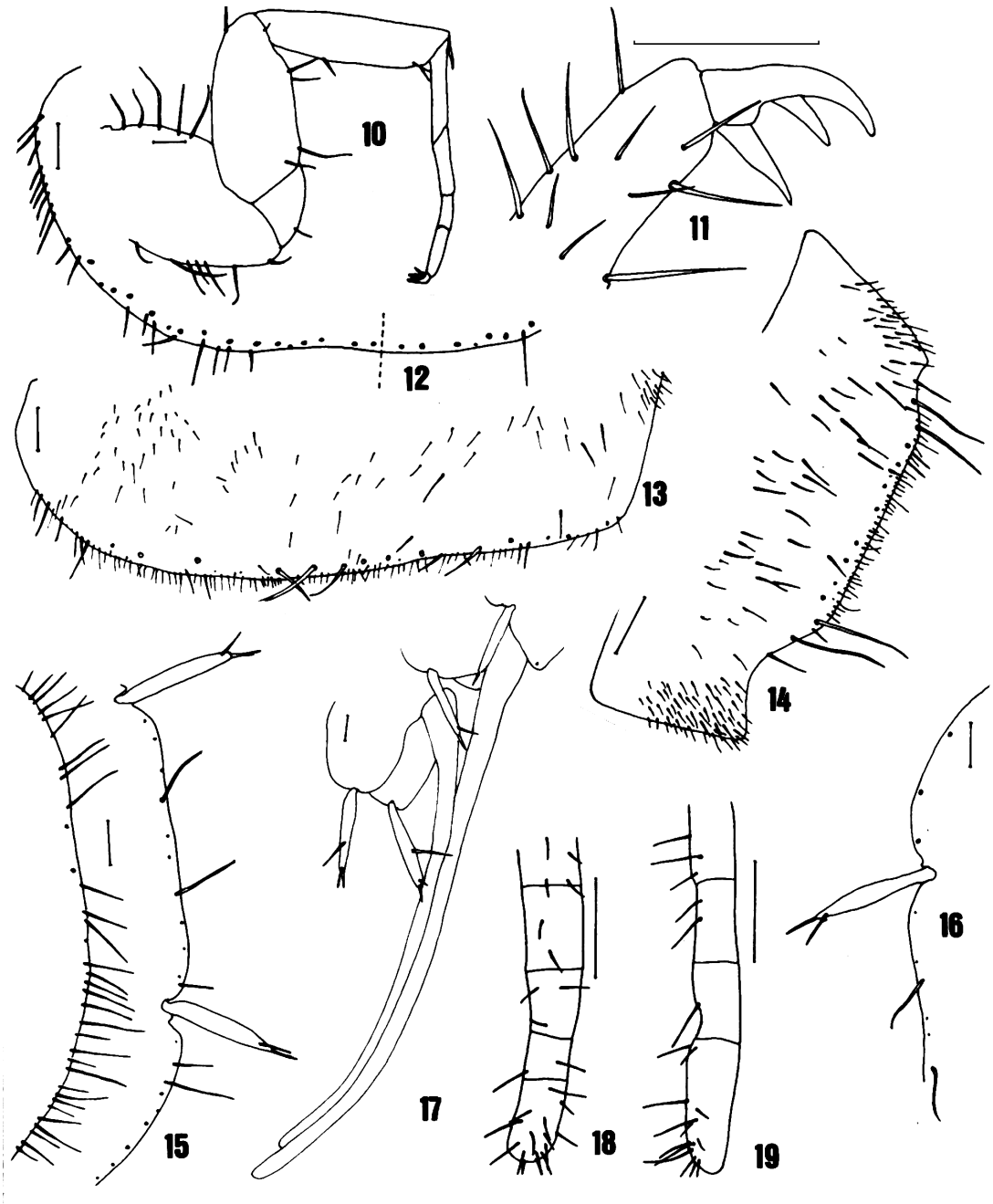
Urotergites with abundant discal setae and some posterior macrochaetae, X short and lacking modified chaetotaxy on male. Urosternites like urotergites, all entire, devoid of vesicular structures; stylets on II-IX. Male coxites IX free; paramera large, pseudarticulated and setose; penis round, very large, with minute rounded distal ventral opening. Female subgenital plate lacking; ovipositor thin and long; gonapophyses IX without modified inner distal area.

Cerci and paracercum similar in both sexes, devoid of specialized chaetotaxy.

Etymology – The new genus is named after its almost certain closeness to *Protrinemura* Silvestri.

Discussion – *Protrinemurella* n. gen. is a typical representative of Protrinemuridae (*sensu* Mendes 2001c)

due to a set of characteristics shared with the other genera known in the family, namely: scales absent; maxilla lacking prostheca; compound eyes and ocelli non-existent; subgenital plate wanting; vesicular structures lacking; male without transformed terminal filaments chaetotaxy; and gonapophyses IX devoid of spinulated inner distal area. It is quite different, however, from both described genera – *Protrinemura* Silvestri, 1942 and *Trinemophora* Schaeffer, 1897 – by paramera type, multi-divided and similar to those of

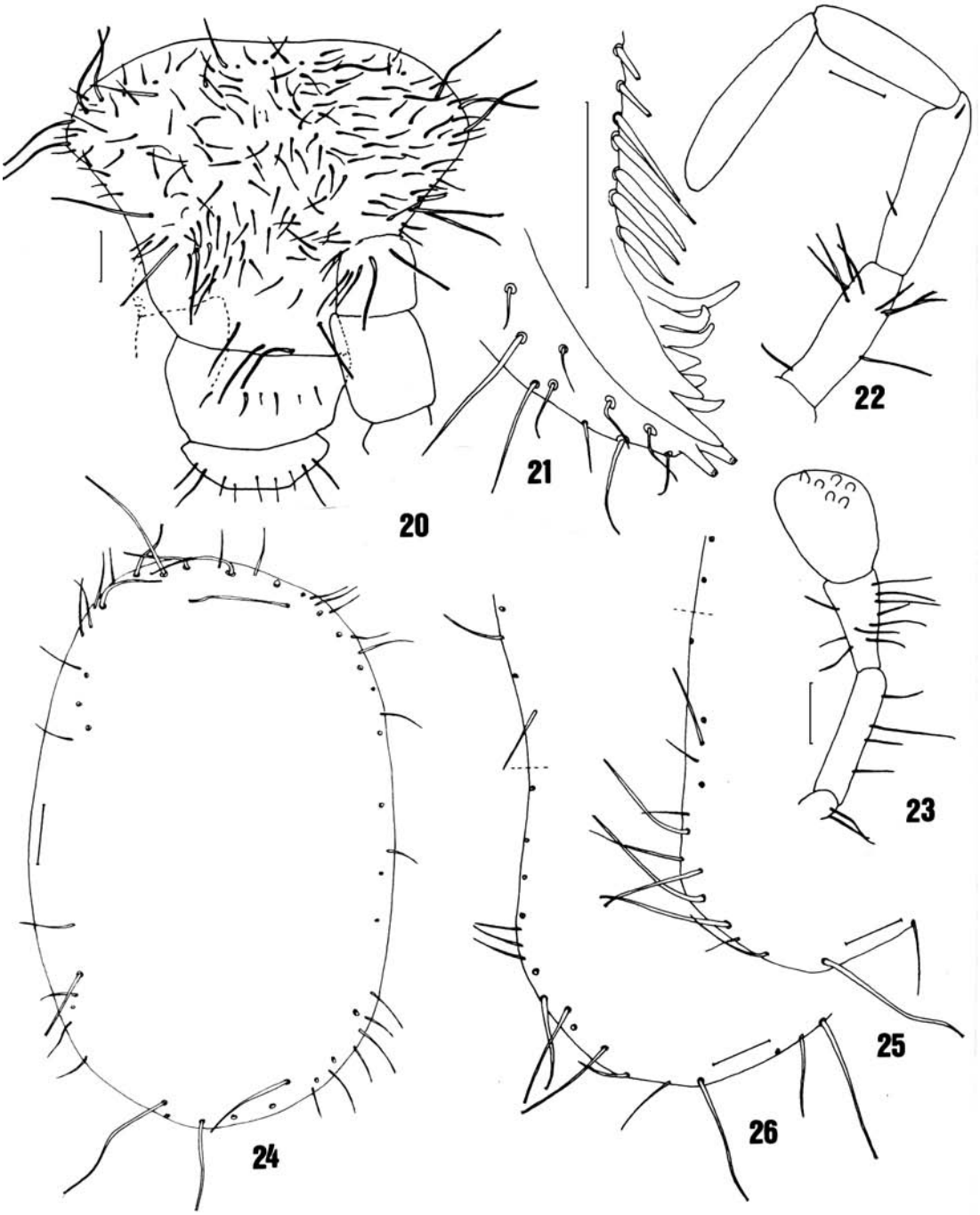


Figures 10-19
Protrinemura leclerci n. sp. ♀. – 10, P III. – 11, praetarsus. – 12, urotergite I. – 13, urotergite IX. – 14, urotergite X. – 15, urosternites I-II. – 16, urosternite V. – 17, posterior ventral abdomen. – 18, gonapophyses VIII, distal divisions. – 19, gonapophyses IX, distal divisions. (Scales: 0.1 mm)

Machilidae and of some rare Lepismatidae, very little penial opening, enormous round penis, and male P I tibial setal field; number of abdominal stylets is similar to *Protrinemura*, as *Trinemophora* presents one or two pairs only.

Protrinemurella allacrotelsoides n. sp.

Type-specimens – **Holotype** ♂: Thailand: Prov. Changwat Krabi. Endogeous among rock fall, under forestry cover, down a small limestone hill surrounded by mangrove forest, near Ban Ao Luk village, coll.

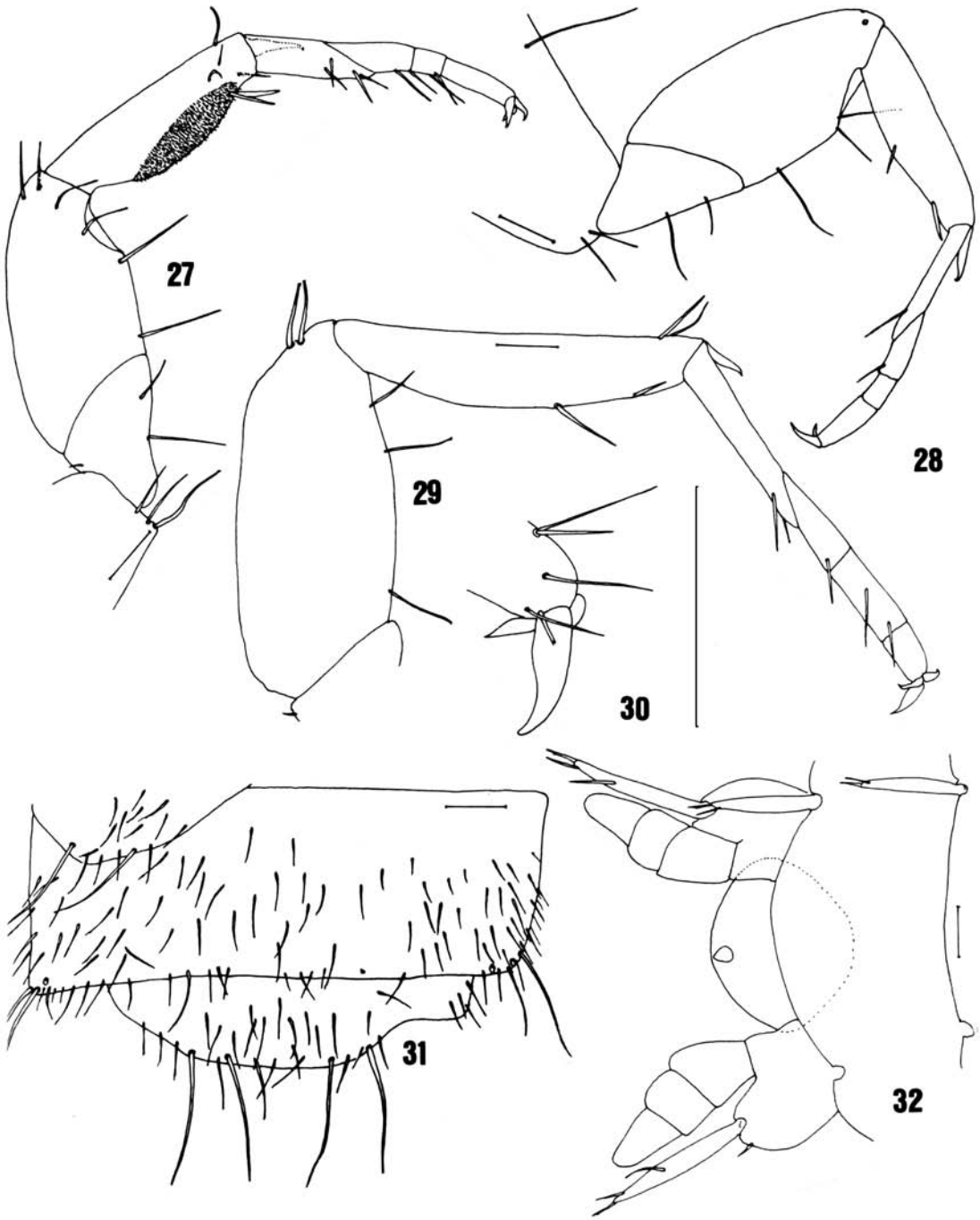


Figures 20-26
Protrinemurella allacrotelsoides n. gen. n. sp. – 20, head. – 21, maxilla. – 22, maxillary palp. – 23, labial palp. – 24, pronotum. – 25, mesonotum. – 26, metanotum. (Scales: 0.1 mm)

P. Leclerc, leg. *L. Deharveng*, 12/VIII/1985, n. THAI-85 (CZ). – **Allotype** ♀: same data as holotype.

Description – Body length: 6.3 mm (♂) 5.5 mm (♀); thorax length: 1.6 mm (♂) 1.7 mm (♀); thorax width: 1.4 mm (♂) 1.3 mm (♀); antenna: maximum preserved of 4.3 mm on holotype; terminal filaments always partially damaged. Body long and narrow, without pigment and devoid of scales.

Head wider than long, with setae and some marginal macrochaetae (fig. 20). Antennae shorter than body, similar in both sexes, without peculiar characteristics; scapus and, mainly, pedicellus, with strong apical macrochaetae. Mandibles with well



Figures 27-32
Protrinemurella allacrotelsoides n. gen. n. sp. – 27, P I of ♂, inner surface. – 28, P I of ♀. – 29, P III. – 30, praetarsus. – 31, urotergites IX-X. – 32, posterior ventral abdomen of ♂. (Scales: 0.1 mm)

developed incisive and molar areas. Maxillae (fig. 21) lacking prostheca, with equally elongate lacinia and galea, former with one apical and one preapical tooth, 6 lamellated simple processes and 7 strong setae, the latter with 2 well developed apical conules; maxillary palp (fig. 22) robust, second division with some strong, long setae, apical article 1/4 longer than preceding and 5 times longer than wide. Labium posteriorly rounded, labial palp (fig. 23) elongate, thin, distal article clavate and not much longer than wide.

Thorax 1/4-1/3 of body length. Pro- (fig. 24) and mesonotum (fig. 25) with almost straight posterior border, metanotum (fig. 26) poorly concave, all with numerous discal setae and marginal macrochaetae. Legs robust; male tibia I, 3 times longer than wide (fig. 27), ventrally widened and with ventral field of minute setulae, that of female (fig. 28) with typical setation and 3.5 times longer than wide; P II and P III (fig. 29) in both sexes not modified, tibia III 5 times longer than wide and about 1/3 longer than tibia I; praetarsus (fig. 30) simple and complete, with bigger lateral claws and unguiform empodium, basal half of claws and entire empodium spinulated.

Urotergites like nota, with abundant thin setae and some posterior macrochaetae, X (fig. 31) very short and wide, with straight posterior border and 2+2 posterolateral strong macrochaetae.

Urosternites I-VII (I-VIII on male) entire, setose. Stylets on II-IX, vesicular structures lacking. Male coxite VIII (fig. 32) posteriorly convex. Paramera (figs. 32, 33) very big, reaching 5/6 of stylets IX length and with 3 very clear transverse divisions, with abundant short setae; penis big, round (figs. 32, 34) with extremely numerous short, glandular setulae, its opening little, round, ventral distal. Subgenital plate absent. Ovipositor very thin and long (fig. 35), exceeding level of stylets IX by 5 times stylets length; gonapophyses VIII with 45-46, IX with about 35 divisions and without modified inner distal integument; apical divisions of gonapophyses VIII and IX as in figs. 36, 37.

Terminal filaments damaged, preserved portion similar in both sexes and without modified shape and chaetotaxy.

Etymology – The new species is named after its paramera pseudarticulation, similar to that of most Machilidae (Microcoryphia) and to condition found on Lepismatidae (Zygentoma) genera *Allacrotelsa* Silvestri and *Anallacrotelsa* Mendes.

Protrinemuroides n. gen.

Type-species : *Protrinemuroides celebicus* n. sp.

Description – Body elongate and thin, without scales and devoid of pigment.

Head with setae and macrochaetae, wider than long. Antennae without special features, distally damaged but probably shorter than body. Mandibles as usual. Maxillae with equally developed lacinia and galea, the former without prostheca, galea with 2 large apical conules; maxillary and labial palps as usual.

Thorax much longer than wide, nota with discal setae and marginal macrochaetae. Legs robust, with denticulated tibial spur; tarsus 4-segmented, praetarsus simple and complete, empodium smaller than lateral claws and somewhat leaf-like, clearly narrowed at apical extreme.

Urotergites like nota, the X short.

Urosternites entire, with usual setation; 6 pairs of stylets (IV-IX); all vesicular structures lacking. Subgenital plate absent. Ovipositor apically damaged.

Terminal filaments lacking specialized chaetotaxy.

Male unknown.

Etymology – The new genus is named after its suspected closeness relatively to *Protrinemura* Silvestri.

Discussion – *Protrinemuroides* n. gen. seems to approach *Protrinemura* Silvestri, 1942, from which it is easily distinguishable by reduced number of abdominal stylets (6 pairs *versus* 8), quite distinct shape of empodium (short, leaf-like, instead of long and claw-like) and clearly less dense urotergal macrochaetae. It approaches also the just described *Protrinemurella* n. gen., from which it can be distinguished by the number of abdominal stylets (9, like in *Protrinemura*), though *Protrinemuroides* male sex remains unknown and, so, male genitalia not described. It is also close to *Trinemophora* Scheffer, 1897, a genus with only one or two pairs of abdominal stylets. The diagnosis of the described genera of Protrinemuridae will become easier accordingly to the following key:

1. Stylets on urosternites II-IX (8 pairs). Paramera with at least two divisions 2
– Stylets less numerous. Paramera (unknown in *Protrinemuroides*) entire 3
2. Paramera ovoid, with two divisions. Legs with non-modified chaetotaxy. Penis big, rounded, with large ovoid opening . . . . . ***Protrinemura*** Silvestri, 1942
– Paramera longer, with more than two divisions. P I of male (always ?) with tibial ventral setal field. Penis rounded, very big, with minute round opening . . . . . ***Protrinemurella*** n. gen.
3. Stylets on abdominal segments IX or VIII and IX (1-2 pairs). Paramera ovoid or elongate, penis round, with sub-triangular opening . . . . . ***Trinemophora*** Schaeffer, 1897
– Stylets on abdominal segments IV-IX (6 pairs). Male sex unknown . . . . . ***Protrinemuroides*** n. gen.

Protrinemuroides celebicus n. sp.

Type-specimen – **Holotype** ♀: Indonesia: Sulawesi (= Celebes): District of Camba. Endogeous under rock, under dry forest, near Samdenre village, coll. P. Leclerc, leg. *L. Deharveng*, 12/VIII/1988, n. 2 (CZ).

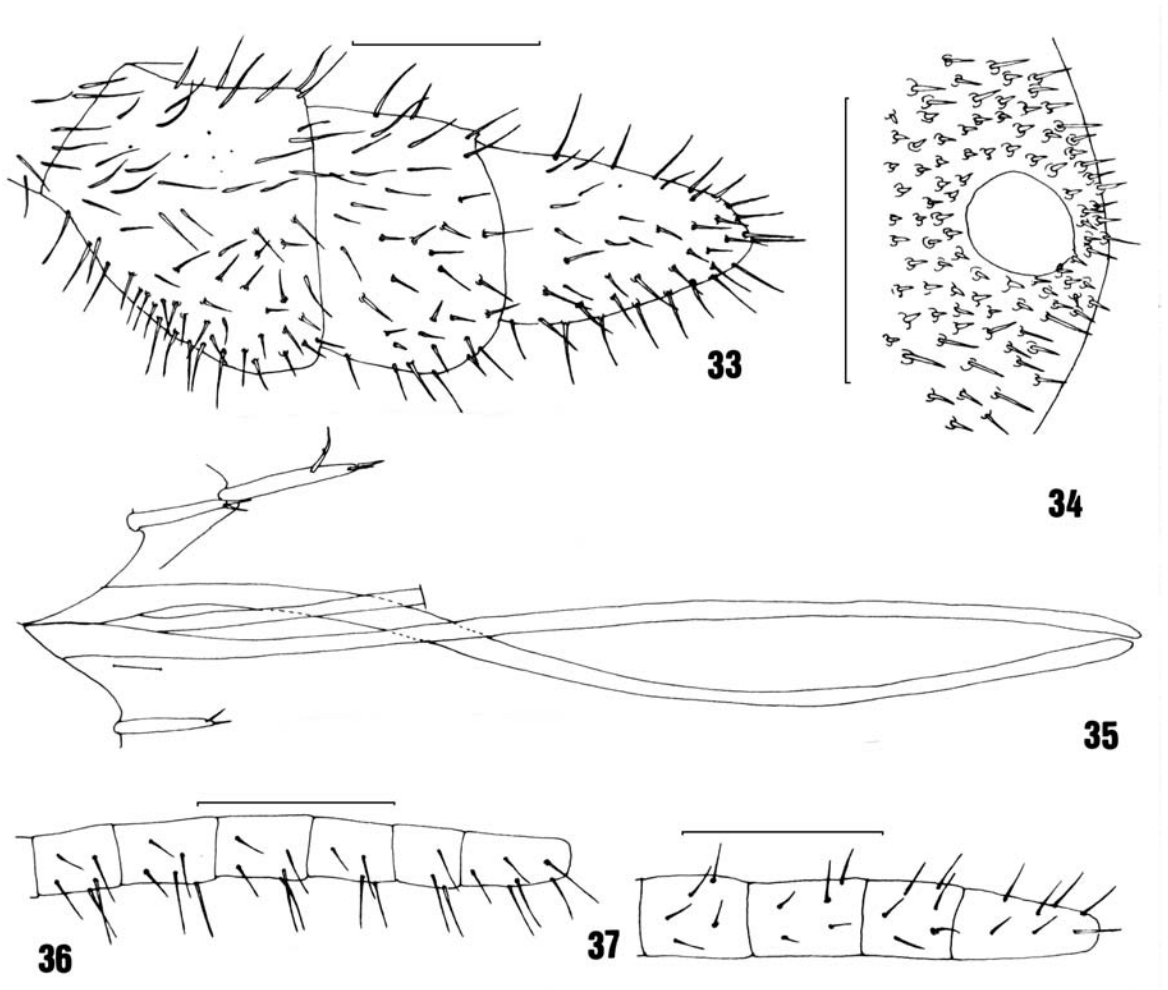
Description – Body length: 6.4 mm; thorax length: 1.8 mm; thorax width: 1.1 mm; antenna length: 2.6 mm (apically damaged); cerci lost, paracercus partially destroyed. Body narrow and elongate, covered with setae; scales and pigment absent.

Head wider than long (fig. 38) with discal setae and marginal macrochaetae. Antennae without peculiar features. Mandible with well developed incisive and molar areas. Maxillae lacking prostheca, like in genus description; maxillary palp (fig. 39) robust, apical article 1/4 longer than preceding and more than 5 times longer than wide. Labium and labial palp (fig. 40) typical, palp distal article ovoid, longer than wide.

Thorax much longer than wide, about 1/3 of body length; pro- (fig. 41), meso- (fig. 42) and metanotum (fig. 43) progressively more concave along posterior margin, with abundant thin discal setae and a series of marginal delicate macrochaetae. Legs robust, tibial spur ventrally indentated (figs. 44, 45), both P III lost; tibia I (fig. 46) not much shorter than tibia II (fig. 47), both ca. 3 times longer than wide; praetarsus simple and complete (fig. 48), empodium suddenly narrowed at apical area, smooth as claws.

Urotergites (fig. 49) with abundant short setae on disc and a row of posterior macrochaetae, X (fig. 50) very wide and short, with 2+2 posterolateral macrochaetae, outer ones clearly stronger and more elongate.

Urosternites I-VII entire, with numerous setae on disc, I with several very strong marginal setae, remaining (fig. 51) with 1+1 delicate submedian macrochaetae also. Stylets on IV-IX (6 pairs), all vesicular structures absent. Subgenital plate lacking (fig. 52). Coxites VIII and IX as in figs. 52, 53, gonapophyses regenerating along most of their length.

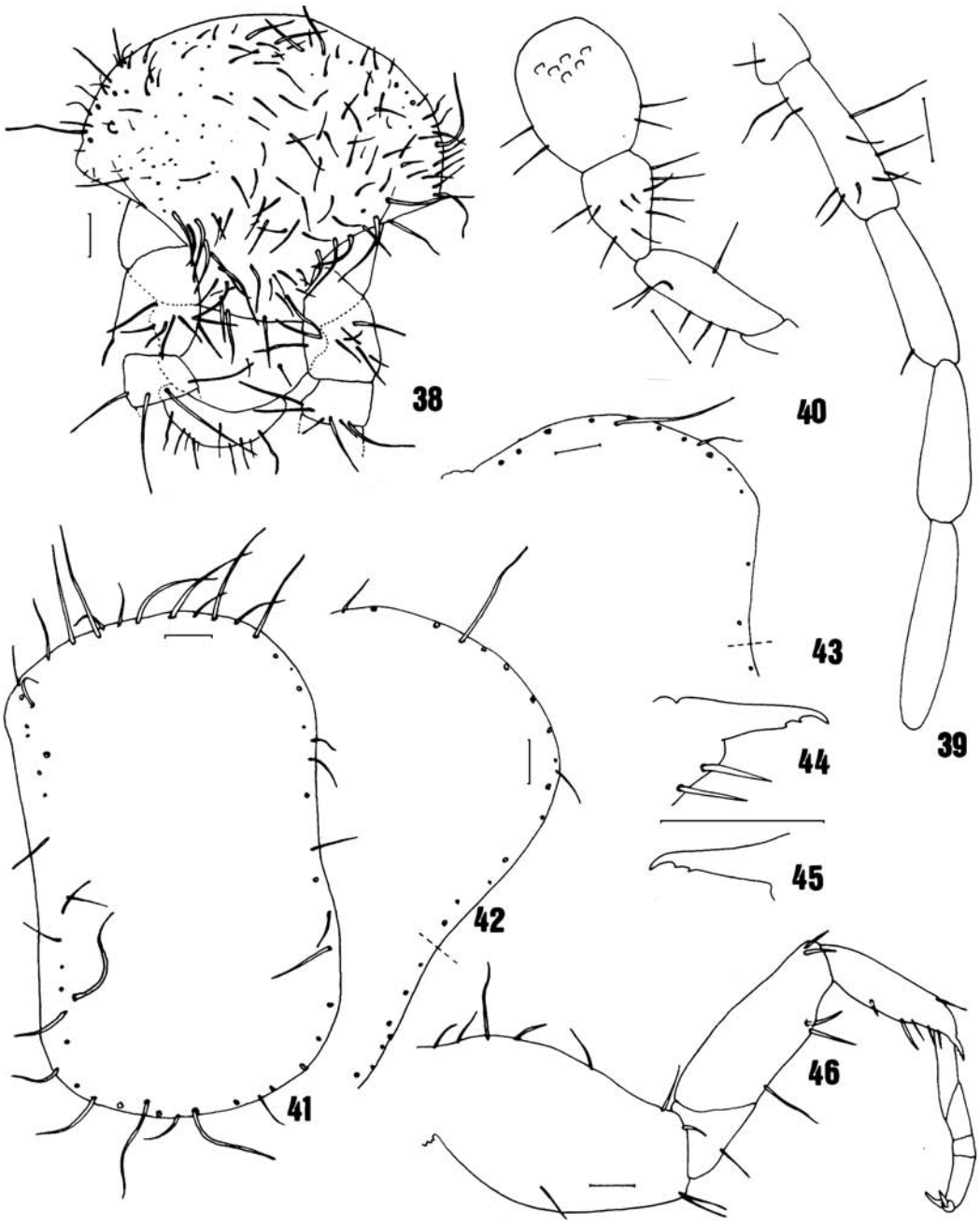


Figures 33-37
Protrinemurella allacrotelsoides n. gen. n. sp. – 33, paramerum. – 34, detail of penis opening. – 35, posterior ventral abdomen of ♀. – 36, gonapophyses VIII, distal divisions. – 37, gonapophyses IX, distal divisions. (Scales: 0.1 mm)

Terminal filaments damaged; cerci lost; preserved area of paracercus without special characteristics.

Male unknown.

Etymology – The species is named according to geographical origin of its type-specimen, the Celebes (= Sulawesi) archipelago.



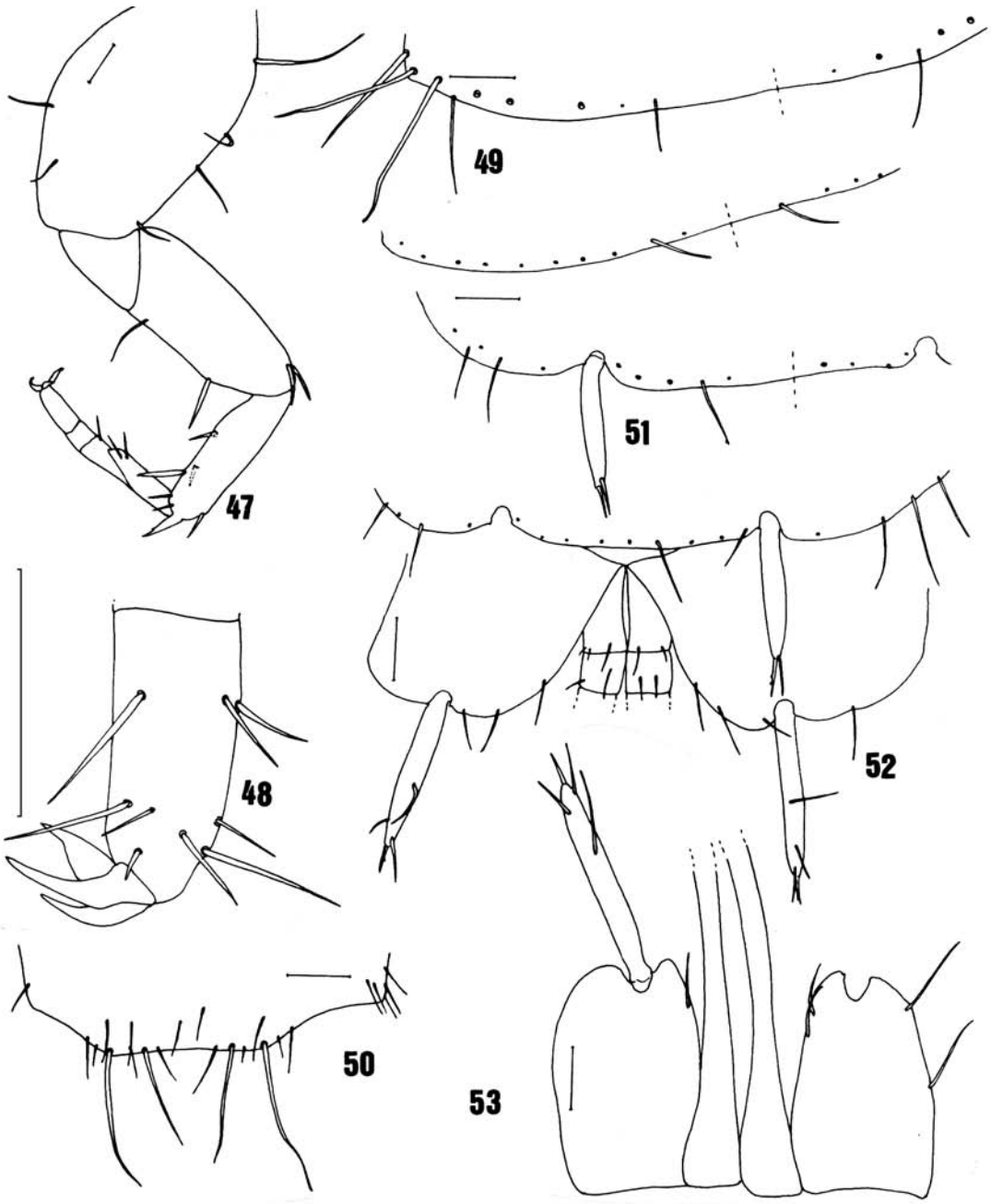
Figures 38-46
Protrinemuroides celebicus n. gen. n. sp. ♀. – 38, head. – 39, maxillary palp. – 40, labial palp. – 41, pronotum. – 42, mesonotum. – 43, metanotum. – 44, tibial spur of P I. – 45, *ibid.*, of P III. – 46, P I. (Scales: 0.1 mm)

Fam. **NICOLETIIDAE**
Sub-fam. COLETINIINAE

Lepidospora (L.) digitata n. sp.

Type-specimen – **Holotype** ♂: Thailand: Prov. Changwat Mae Sot. Endogeous among rock fall, under high forest in the place named San Chao Pho Phawo, coll. P. Leclerc, leg. *L. Deharveng*, 4/VII/1987, no number (CZ).

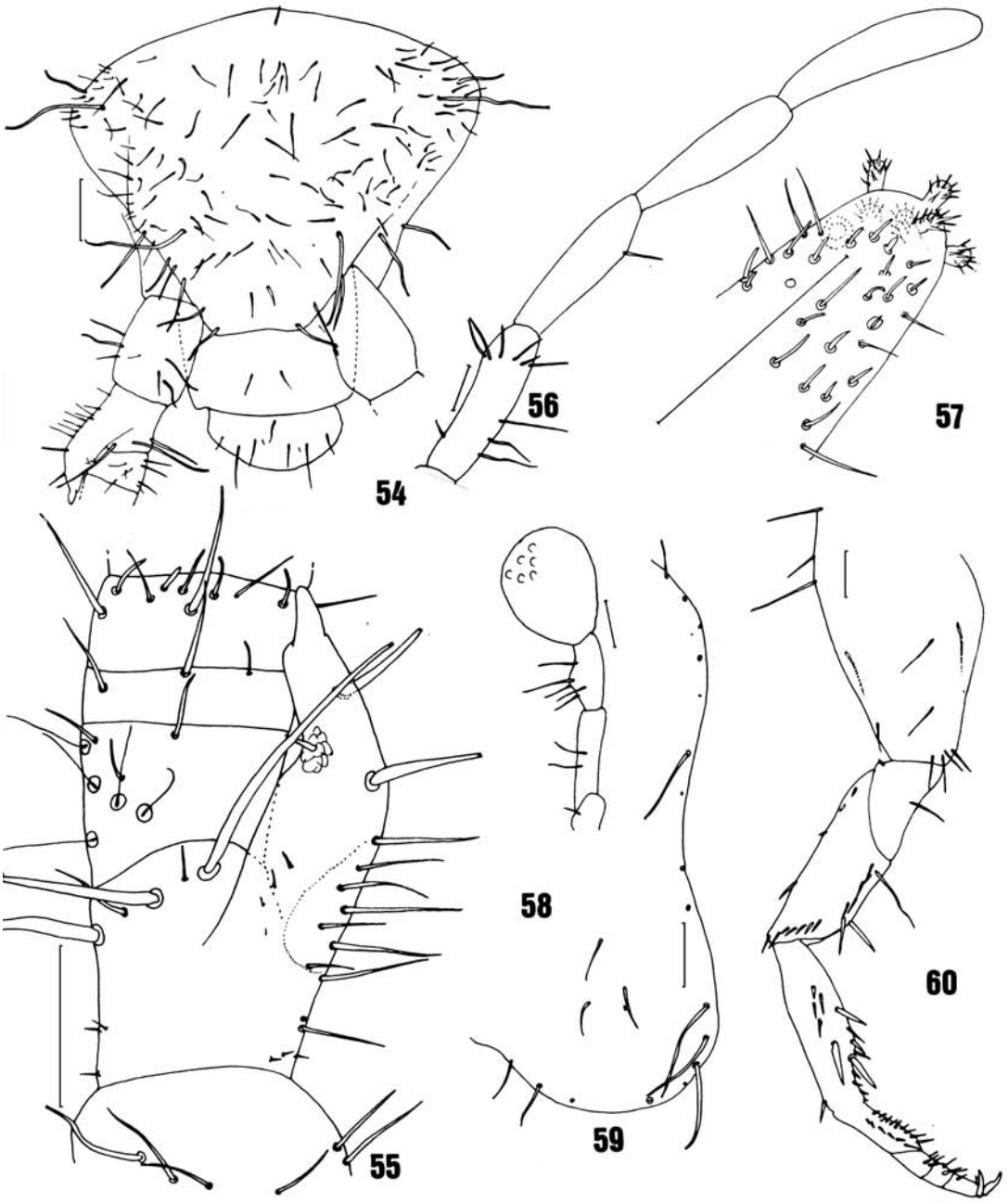
Description – Body length: 6.9 mm; thorax length: 1.6 mm; thorax width: 1.4 mm; preserved antenna length: 2.6 mm; cercus



Figures 47-53
Protrinemuroides celebicus n. gen. n. sp. ♀. – 47, P III. – 48, praetarsus. – 49, urotergite V. – 50, urotergite X. – 51, urosternites III-IV. – 52, urosternite VII, coxites VIII and preserved portion of gonapophyses VIII. – 53, coxite IX and preserved area of gonapophyses IX. (Scales: 0.1 mm)

length: 2.3 mm (apical area damaged); total body length: 10.6 mm. Body long and thin, lacking pigment, with typical scales and setae.

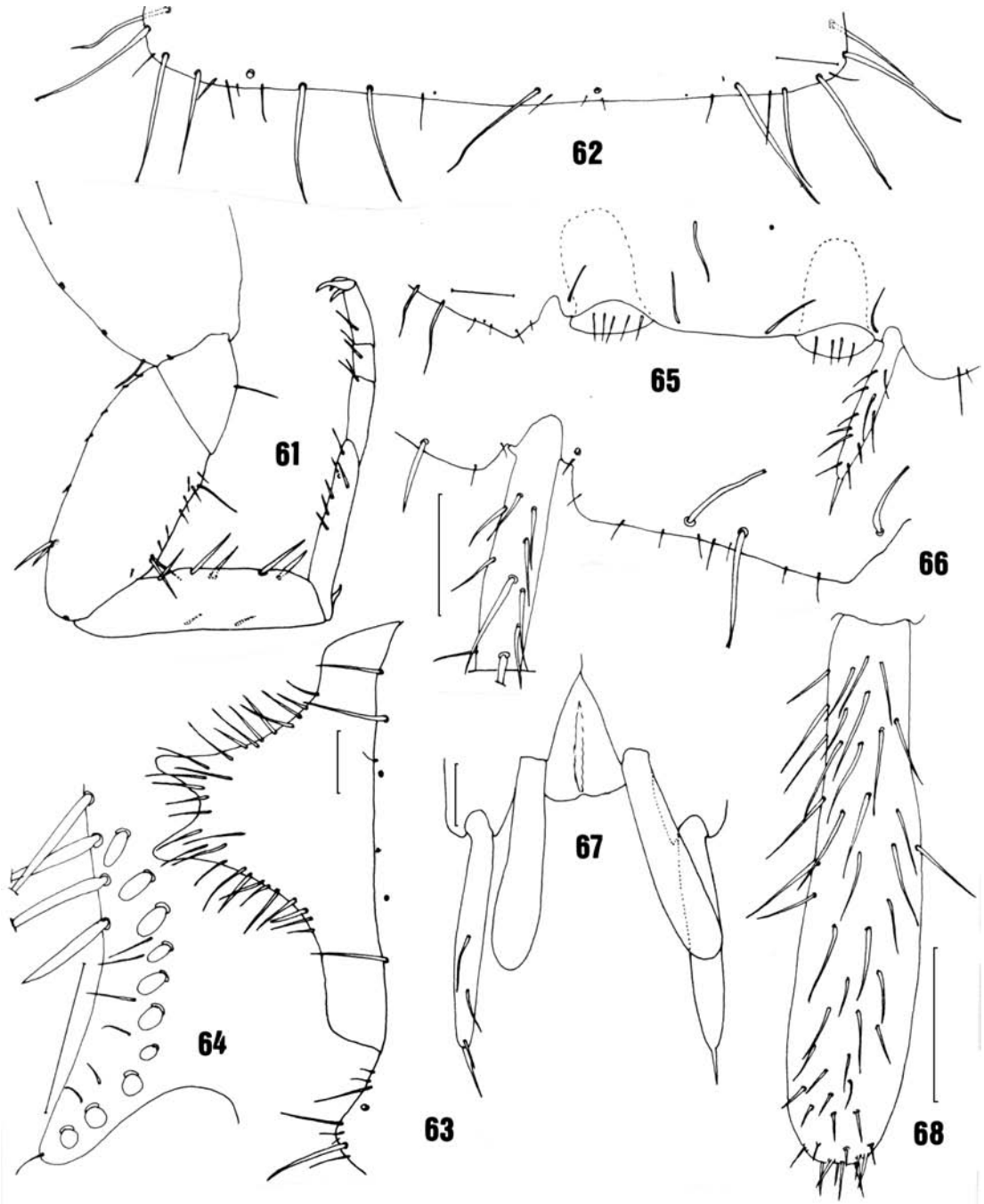
Head wider than long (fig. 54), with discal scales plus short setae, and marginal macrochaetae. Antennal flagellum damaged, scapus robust with some apical strong setae; pedicellus (fig. 55) with very long and strong inner dorsal apophyses; terminal sensillum at level of first flagellar division in antedistal inner position, extreme part of apophyses suddenly narrowed as a short sclerotised finger, surpassing base of fourth flagellar division; dorsally, a fovea, some basal and medial thin, pointed setae and 2 more distal (one inner, other outer) macrochaetae; ventral area with 2 much longer and robust macrochaetae. Mandibles without special features. Maxillae as usual; maxillary palp (figs. 56, 57)



Figures 54-60
Lepidospora (L.) digitata n. sp. ♂. – 54, head. – 55, base of antenna. – 56, maxillary palp. – 57, *ibid.*, apex of distal article. – 58, labial palp. – 59, metanotum. – 60, P I. (Scales: 0.1 mm)

elongate, robust, with some strong setae on second division distal area, apical article ca. 1/7 longer than preceding and 4.5 times longer than wide, with numerous apical various sensilla. Labium typical, labial palp (fig. 58) with some strong elongate setae on median division, distal article ovoid, not much longer than wide.

Thorax shorter than 1/4 of body length, nota as usual, with discal setae and scales and marginal macrochaetae, all concave along posterior margin (fig. 59). P I (fig. 60) with numerous tarsal spines, P II and P III (fig. 61) with lower number of spines; tibia I about twice longer than wide and 1/3 shorter than tibia III,



Figures 61-68
Lepidospora (L.) digitata n. sp. ♂. – 61, P III. – 62, urotergite VI. – 63, urotergites IX-X, dorsal. – 64, urotergite X, ventral. – 65, urosternite IV. – 66, coxite VIII. – 67, coxites IX and genitalia. – 68, paramerum. (Scales: 0.1 mm)

this one more than 3 times longer than wide; praetarsus as usual, simple and complete, with two claws and unguiform empodium, all smooth.

Urotergites I-VIII typical (fig. 62) scaly and with a row of posterior macrochaetae; urotergite IX (fig. 63) also with posterior macrochaetae, X (figs. 63, 64) with numerous dorsal marginal strong setae; lateral margins convergent, posterior notch deep; ventrally, 9+10 cylindrical pegs arranged, each side, as an arched row more or less parallel to lateral margin.

Urosternite I divided in 1 sternite plus 1+1 coxites, II-VIII entire and with 2+2 submedian (1+1 antemarginal, 1+1 marginal) macrochaetae (fig. 65). Stylets on II-IX, vesicles on II-VI, pseudovesicles on VII. Coxite VIII median area (fig. 66) poorly concave, protruding. Paramera (figs. 67, 68) ca. 4.5 times longer than wide, sub-cylindrical (though somewhat narrowed at proximal area), with numerous setae and few apical, long, glandular setulae, almost reaching 2/3 of stylets IX length.

Cerci (fig. 69) with 1-3 pegs on second division, 2 on third and 2 on fourth. Paracercum (fig. 70) with 3+3 thinner pegs on proximal division and 2+2 stronger, ovoid pegs on second division.

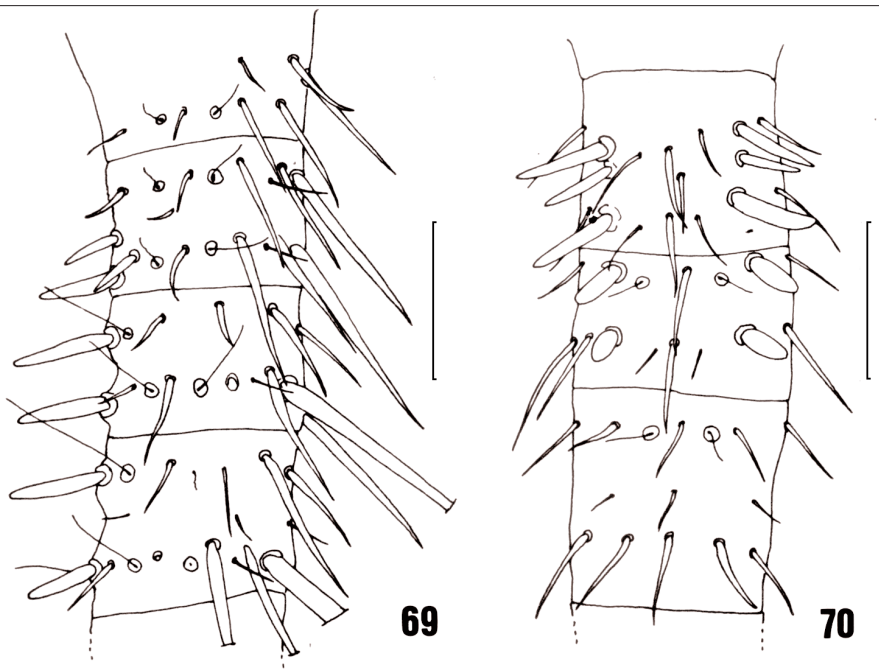
Female unknown.

Etymology – From the Latin *digitus*: finger, alluding to sclerotised cylindrical, distal expansion of male antennal pedicellar apophyses.

Discussion – *Lepidospora (L.) digitata* n. sp. though known by male sex only, seems well individualised inside the genus by its quite typical antennal pedicellus. Shape of urotergite X resembles (though with a different design) that of *L. (L.) angustotergum*, from Oman (Mendes 2001a) but new species is much smaller, with proportionally shorter legs, shorter paramera and different terminal filaments specialized chaetotaxy. It will approach also: 1) *L. (L.) braunsi*, described (Escherich 1905) from Seychelles, noted by Carpenter (1916) and recently redescribed by Mendes (2001b) upon topotypical material, with quite distinct pedicellar apophyses and very different cercal and paracercal pegs; 2) *L. (L.) notabilis* from Burma (Silvestri 1913), with a very unique maxillary palp setation and much lower number of urotergite X ventral pegs and, 3) *L. (L.) ceylonica* from Sri Lanka (Silvestri 1911b) and (?) India (Silvestri 1913), with much longer distal maxillary palp article, different pedicellus and distinct posterior abdomen.

The new species enters identification key proposed to the genus (Mendes 2001b) on number 15, which will become as follows:

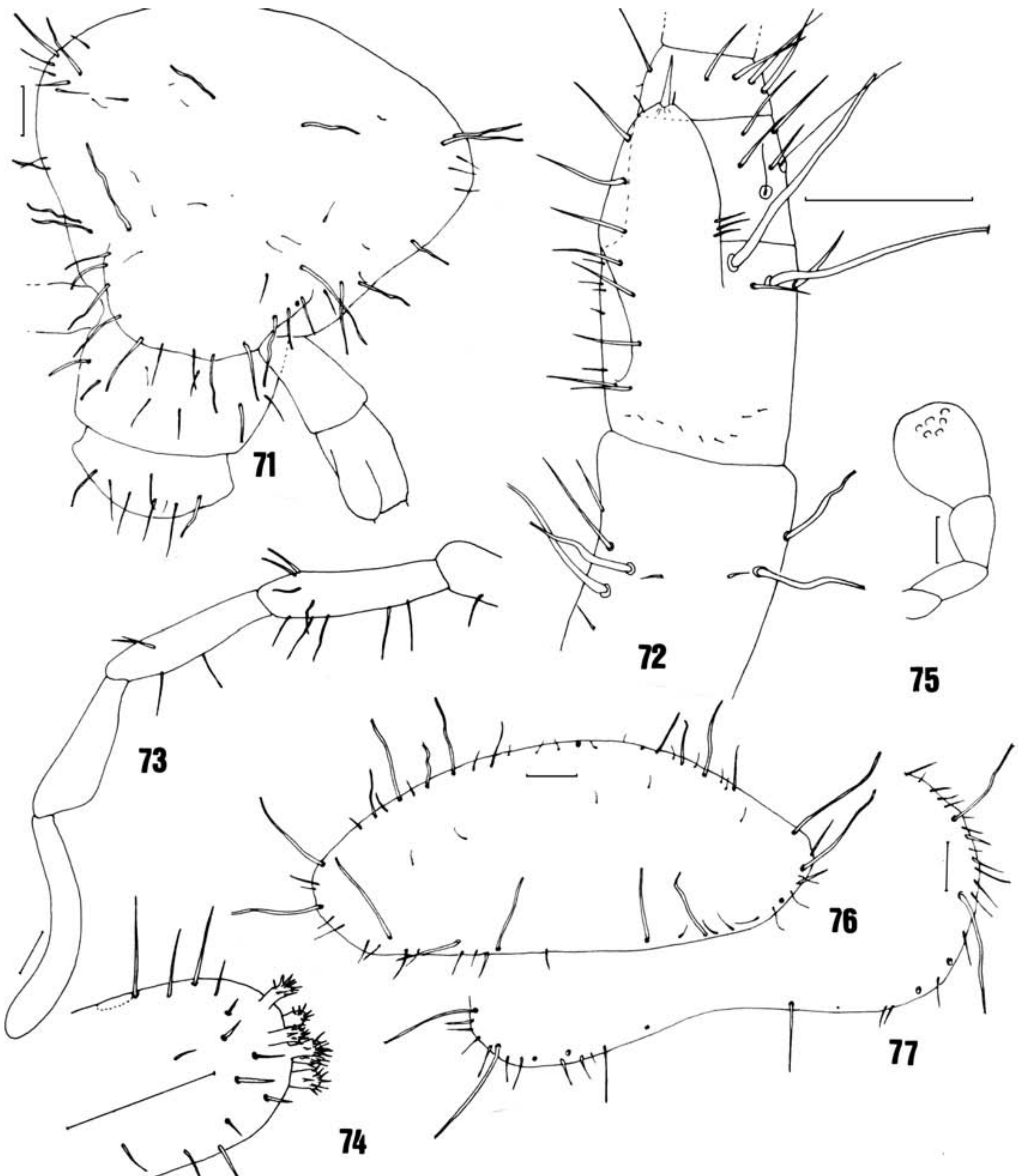
15. Pedicellar apophyses conical, elongate, attaining or surpassing level of 3rd flagellar division. Paramera 4-4.5 times longer than wide, surpassing half stylets IX length 15A
– Id. (unmodified) 16
15A. Pedicellar apophyses conical, simple, with apical sensillum in distal position. Maxillary palp distal article



Figures 69-70
Lepidospora (L.) digitata n. sp. ♂. – 69, right cercus base, dorsal. – 70, base of paracercum, dorsal. (Scales: 0.1 mm)

about 6 times longer than wide. Paramera about 4 times longer than wide, not much longer than half of stylets IX. Urotergite X apical notch wide, parabolic . . . . ***L. (L.) ceylonica*** Silvestri, 1911 [Sri Lanka and, same species ?, India (E)]

– Pedicellar apophyses conical, distally curved and prolonged by one finger-like excrescence, the apical sensillum in clear antedistal position. Maxillary palp distal article and paramera about 4.5 times longer than wide, last ones almost reaching 2/3 of stylets IX. Urotergite X apical notch much deeper and narrower . . . . ***L. (L.) digitata*** n. sp. [Thailand (E)]



Figures 71-77
Lepidospora (L.) deharvengi n. sp. ♂. – 71, head. – 72, base of antenna. – 73, maxillary palp. – 74, *ibid.*, apex of distal area. – 75, labial palp. – 76, pronotum. – 77, metanotum. (Scales: 0.1 mm)

Lepidospora (L.) deharvengi n. sp.

Type-specimen – **Holotype** ♂: Indonesia: Sulawesi (= Celebes). Bantumurung, Forest, coll. L. Deharveng, 24/VII/1986, n. INDO-158 (CZ)

Description – Body length: 5.3 mm; thorax length: 1.6 mm; thorax width: 1.1 mm; antenna length (damaged): 2.8 mm; cercus length: 3.1 mm; total body length: 7.7 mm (paracercum incomplete). Body thin and long, with setae and scales, lacking pigment.

Head (fig. 71) wider than long, typical. Antennae apically incomplete, scapus robust and with crown of distal dark macrochaetae; pedicellus (fig. 72) with ovoid, short apophyses scarcely surpassing base of second flagellar division, with large apical sensillum, several outer dorsal straight setae and 3-4 ventral short stiff setulae, and 2 distal ventral long macrochaetae. Mandibles and maxillae typical; maxillary palp (fig. 73) large, with some strong setae along second and third divisions, apical article ventrally incurved, 2/3 longer than preceding and ca 7.5 times longer than wide, the apical area (fig. 74) with scarce sensilla. Labium as usual, labial palp (fig. 75) robust, distal article ovoid, longer than wide.

Thorax narrow, longer than wide. Pronotum (fig. 76) posterior border straight, disc with abundant scales and some setulae, marginal areas with short setae and macrochaetae; meso- and metanotum (fig. 77) with concave posterior margins, discal setae even less numerous. Legs without peculiar features, with some tibial ventral long spines –in P I attaining tibial diameter (fig. 78); tibia I, 3 times longer than wide and ca. 1/4 shorter than tibia III (fig. 79); praetarsus (fig. 80) as usual, the empodium unguiform and distally acute; claws with numerous microtrichia as complete empodium.

Urotergites typical, IX (fig. 81) like preceding ones, with posterior macrochaetae; urotergite X (figs. 81, 82) with some marginal dorsal strong setae and deep posterior notch, ventrally with 21+24 long, ovoid pegs, distributed along 2 (proximal) to 1 (distal) row(s), the most apical conule the bigger.

Urosternites typical; coxite VIII median area (fig. 83) strongly convex, protruding. Paramera (figs. 84, 85) cylindrical, ca 6.2 times longer than wide, with 2-3 longitudinal rows of delicate setae and few apical glandular setulae, reaching half stylets IX.

Cerci with 1 ovoid peg on distal inner area of proximal division, 2 on second, and 1 on third division, as in fig. 86. Paracercum (fig. 87) with 3+3 similar pegs on proximal and 2+3 on second division.

Female unknown.

Etymology – The new species is dedicated to its collector, Dr. Louis Deharveng, collembologist of the Université Paul Sabatier in Toulouse, France.

Discussion – New species seems to approach particularly two Afrotropical taxa, *L. (L.) "afra"* Silvestri (Silvestri 1908a *sensu* Silvestri 1918b : see Mendes 2001b), from Kenya, and *L. (L.) worunzire* Mendes (Mendes *op. cit.*) from Ruwenzori range in Eastern Congo, with which it shares elongate paramera (5-6 times longer than wide), high number of urotergite X ventral pegs and sclerotised pegs along all terminal filaments. The Congolese species shows clearly higher number of X urotergal pegs and shorter paramera (about 5 times as long as wide) that exceed, however, middle of stylets length. The Kenyan species, with almost identical paramera and X urotergal pegs, is larger (Silvestri 1918b, registers 9 mm to the female), shows longer pedicellar apophyses attaining third flagellar division, and presents much wider X urotergal notch.

The new species will enter at number 12 of the key proposed to the genus (Mendes 2001b), which will become modified as follows:

12. Urotergite X apical notch wide, parabolic, the sclerite ventral surface with about 20 + 20 sclerotised pegs. Posterior border of coxite VIII protruding, straight. Paramera 6.5-7 times longer than wide, reaching middle of stylets IX . . . . . ***L. (L.) "afra"*** Silvestri, 1908 *sensu* Silvestri 1918 [Kenya (E)]

– Urotergite X apical notch much narrower, sclerite ventral pegs more abundant. Posterior border of coxite VIII protruding, convex. Paramera 5-6.5 times longer than wide, reaching or surpassing middle of stylets IX 12A

12A. Maxillary palp distal article robust, similar to preceding one or poorly longer, cylindrical. Legs, mainly tibia III, with numerous strong apical ventral spines. Submedian macrochaetae of abdominal tergite IX lacking. Urotergite X with about 30+30 pegs. Paramera 5 times longer than wide, surpassing middle of stylets IX length . . . . . ***L. (L.) worunzire*** Mendes, 2001 [Eastern Congo D. R. (E)]

– Maxillary palp distal article curved downwards, much longer than preceding. Legs with rare spines. Urotergite IX with 1 + 1 submedian macrochaetae. Urotergite X with 21-24 pairs of sclerotised pegs. Paramera more than 6 times longer than wide, attaining middle of stylets IX length . . . . . ***L. (L.) deharvengi*** n. sp. [Indonesia: Sulawesi (E)]

Genus ***Pseudobrinckina*** n. gen.

Type-species : *Pseudobrinckina anempodiata* n. sp.

Description – Body thin and long, devoid of pigment; typical scales on body and coxae of legs, lacking on head.

Antennae (almost) as long as body, without peculiar features. Mandibles typical, with numerous acute teeth, molar area also well developed. Maxillae with similarly developed galea and lacinia, former with two large apical conules, latter with prostheca, apical tooth acute and much more evident than short praeapical tooth; maxillary palp elongate, typical. Labium and labial palp without special characteristics.

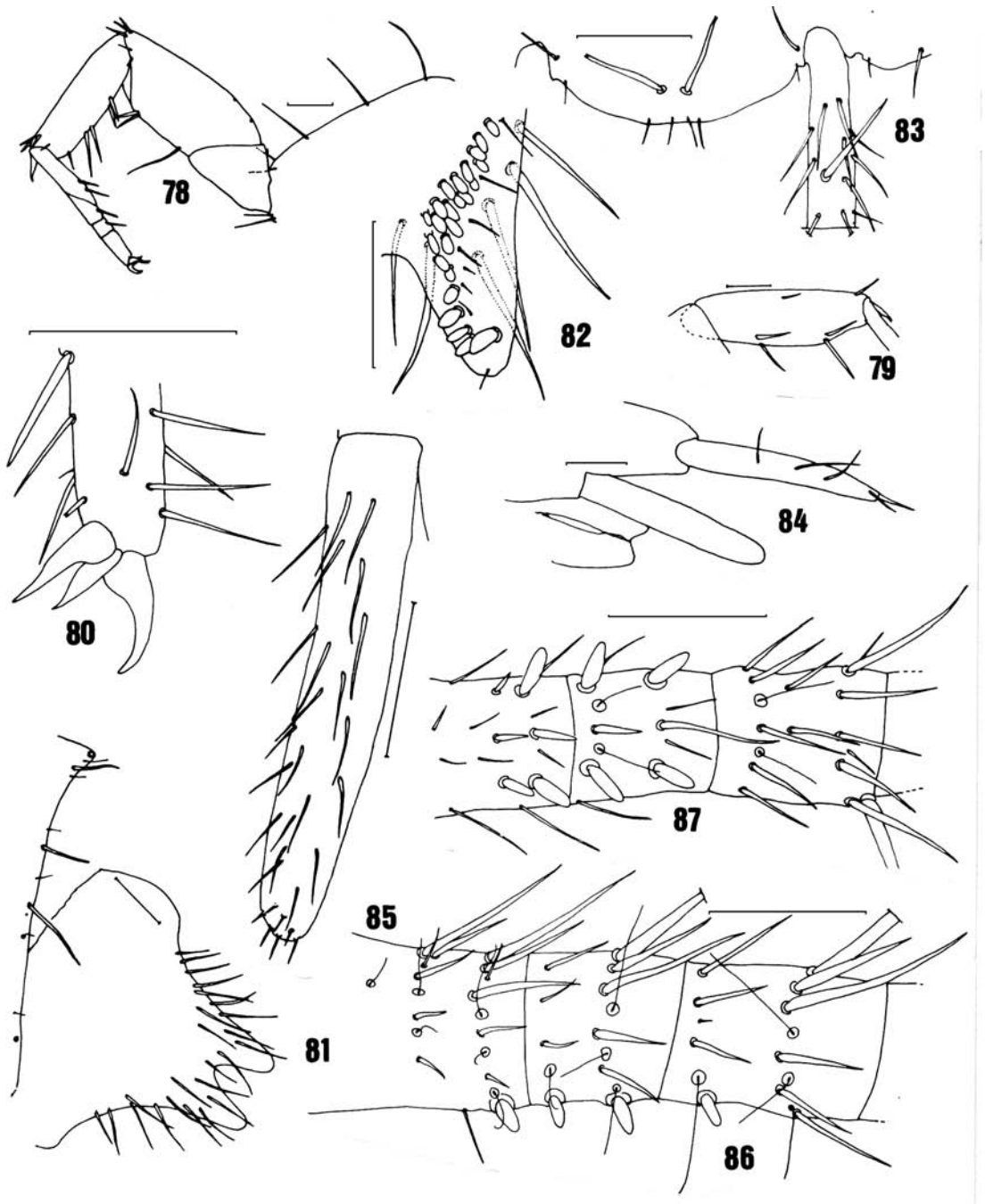
Thorax longer than wide, as usual. Legs robust, with numerous spines; praetarsus with 2 claws, devoid of empodium.

Urotergites with scales and marginal setae and macrochaetae, X deeply excavated and with 2+2 posterolateral macrochaetae.

Urosternite I divided on 1 sternite plus 1+1 coxites, remaining entire; stylets on II-IX, vesicles on II-VI, pseudovesicles on VII. Subgenital plate wide, elliptic. Ovipositor spindle-shaped, without peculiar features, gonapophyses IX with antedistal inner transformed area.

Terminal filaments devoid of special characteristics.

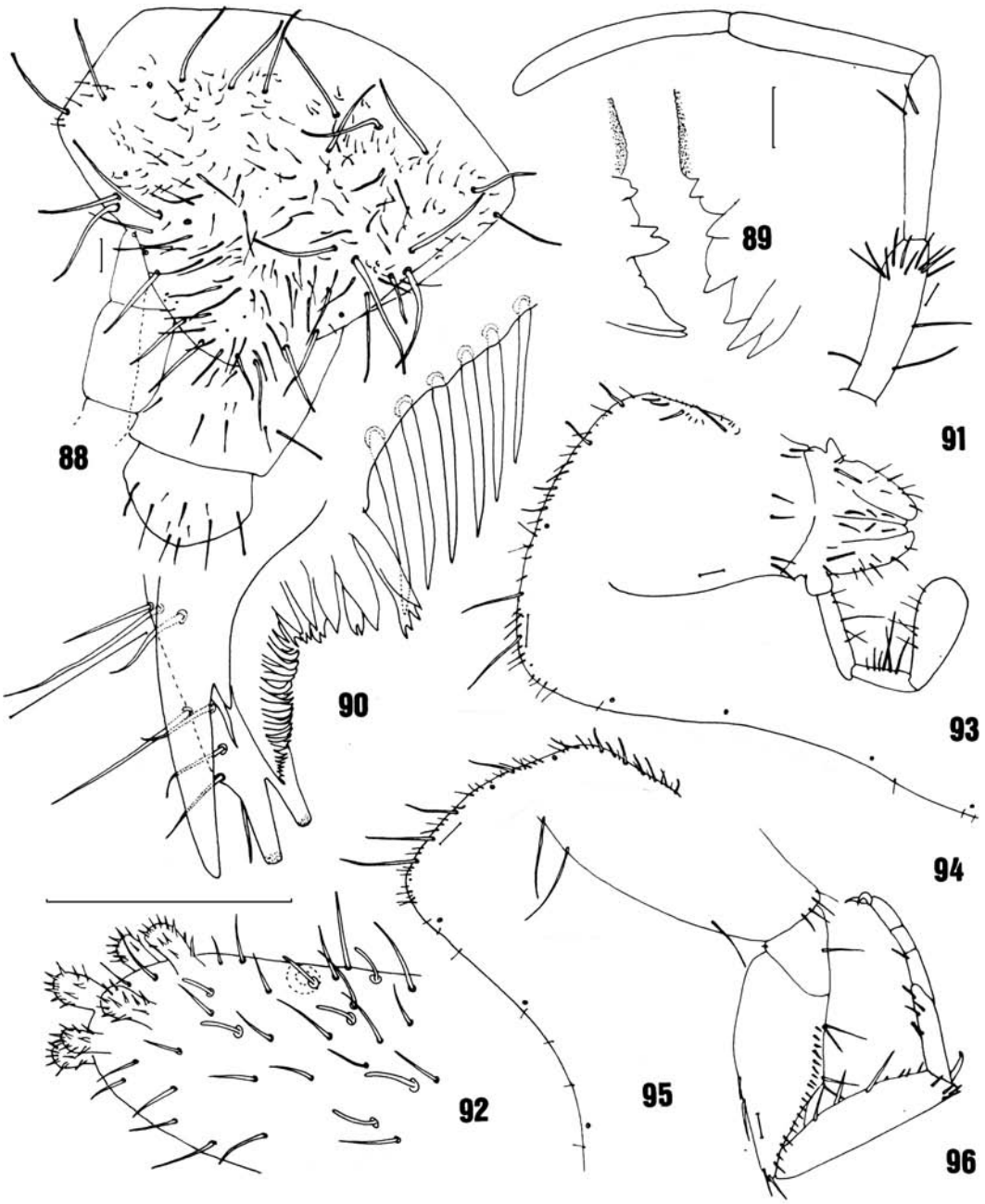
Male unknown.



Figures 78-87
Lepidospora (L.) deharvengi n. sp. ♂. – 78, P I. – 79, tibia of P III. – 80, praetarsus. – 81, urotergites IX-X, dorsal. – 82, urotergite X, ventral. – 83, coxite VIII. – 84, coxite IX and genitalia. – 85, paramerum. – 86, right cercus base, dorsal. – 87, terminal filament base, dorsal. (Scales: 0.1 mm)

Etymology – The new genus is named after its probable closeness to *Lepidospora (Brinckina)* Wygodzinsky.

Discussion – *Pseudobrinckina* n. gen. is the only described Coletiniinae devoid of empodium, a clear homoplasy relatively to condition of *Trinemurodes* Silvestri, part of a completely distinct evolutionary line. The new genus seems particularly close to *Lepidospora* s. l. (Escherich, 1905) and more specially to *Lepidospora (Brinckina)* (Wygodzinsky, 1955), due to complete absence of cephalic scales; in addition to lack of



Figures 88-96
Pseudobrinckina anempodiata n. gen. n. sp. ♀. – 88, head. – 89, mandibles. – 90, maxilla. – 91, maxillary palp. – 92, *ibid.*, detail of distal article. – 93, labium and labial palp. – 94, pronotum. – 95, metanotum. – 96, P I. (Scales: 0.1 mm)

empodium, it shows less dense urotergal setation, one pair only of submedian macrochaetae per urosternite (only posterior ones present), distinct cephalic setation and 2+2 macrochaetae on urotergite X.

Pseudobrinckina anempodiata n. sp.

Type-specimen – **Holotype** ♀: Thailand: Province de Mae Hong Son. 17 Km au Nord de Mae Hong Son, Tham (= Grotte) Nam Ru Hoa Koa (réseau actif), coll. L. Deharveng, 1/VII/1987, n. THAI-87, MHS-7 (CZ)

Description – Body length: 9.4 mm; thorax length: 3.5 mm; thorax width: 2.4 mm; antenna length (incomplete): 9.1 mm; cercus length: 7.2 mm; total body length: 16.5 mm. Body long, wanting pigment; scales (lacking on head) ovoid and with numerous thin longitudinal rays not exceeding posterior margin.

Head (fig. 88) wider than long, with setae and macrochaetae. Mandibles (fig. 89) with developed incisive and molar areas. Maxillae (fig. 90) with equally elongate lacinia and galea, the latter with 2 large apical conules, former with prostheca, the teeth very unequally developed, apical one much longer; maxillary palp (figs. 91, 92) robust, with some strong macrochaetae on second and third divisions, apical article cylindrical, a little arched ventrally, 1/7 longer than preceding and delicate, ca 8.5 times longer than wide. Labium typical, labial palp (fig. 93) elongate, distal article ovoid and 2.5 times longer than wide.

Thorax less than 1/3 of body length; nota with progressively more concave posterior margin, pronotum (fig. 94) with rare discal setae, metanotum (fig. 95) with lower number of setae. Legs with row of little spines along femur inner ventral surface (figs. 96-99); tibia I (figs. 96, 97, 100) with row of outer delicate spines, as long as tibia III and 3.5 times longer than wide; praetarsus (fig. 101) as in genus description, with lateral claws covered by microtrichia on their basal half, devoid of empodium.

Urotergites with 1 + 1 infralateral, 1+1 lateral and 1 + 1 submedian strong macrochaetae; infralateral and lateral pairs are quite close on I-II (fig. 102) and removed on III-IX (figs. 103, 104); urotergite X (fig. 104) wider than long, with clear posterior notch and 2 + 2 long and robust posterolateral macrochaetae.

Urosternite I divided in 1 sternite plus 1+1 coxites, remaining entire, with 1+1 submedian posterior short and robust macrochaetae. Stylets on II-IX, vesicles on II-VI, pseudovesicles on VII (fig. 105). Subgenital plate much wider at base than long, elliptic, with fringe of marginal setae (fig. 105). Ovipositor spindle-shaped, not specially longer than stylets IX; gonapophyses with 12-14 divisions, without special characteristics, apical divisions as in figs. 106, 107.

Cerci and terminal filament without special features.

Male unknown.

Etymology – The new species is named after its complete lack of empodium.

Subfam. ATELURINAE

Bharatatelura malabarica Mendes, 1992

Material examined – 1 ♂, 1 ♀, 1 young ♀: Melanesia: Fiji: Suva, 29/IV/1996, coll. A. van Harten, n. 413 (CZ); 1 ♀: Ibid., 31/I/1997, n. 549 (CZ); 1 ♂, 1 ♀: Ibid., 25/IV/1997, n. 568 (CZ).

The specimens agree fairly with the types (only known material) from western India (Mendes 1992).

Proatelura jacobsoni (Silvestri, 1911)

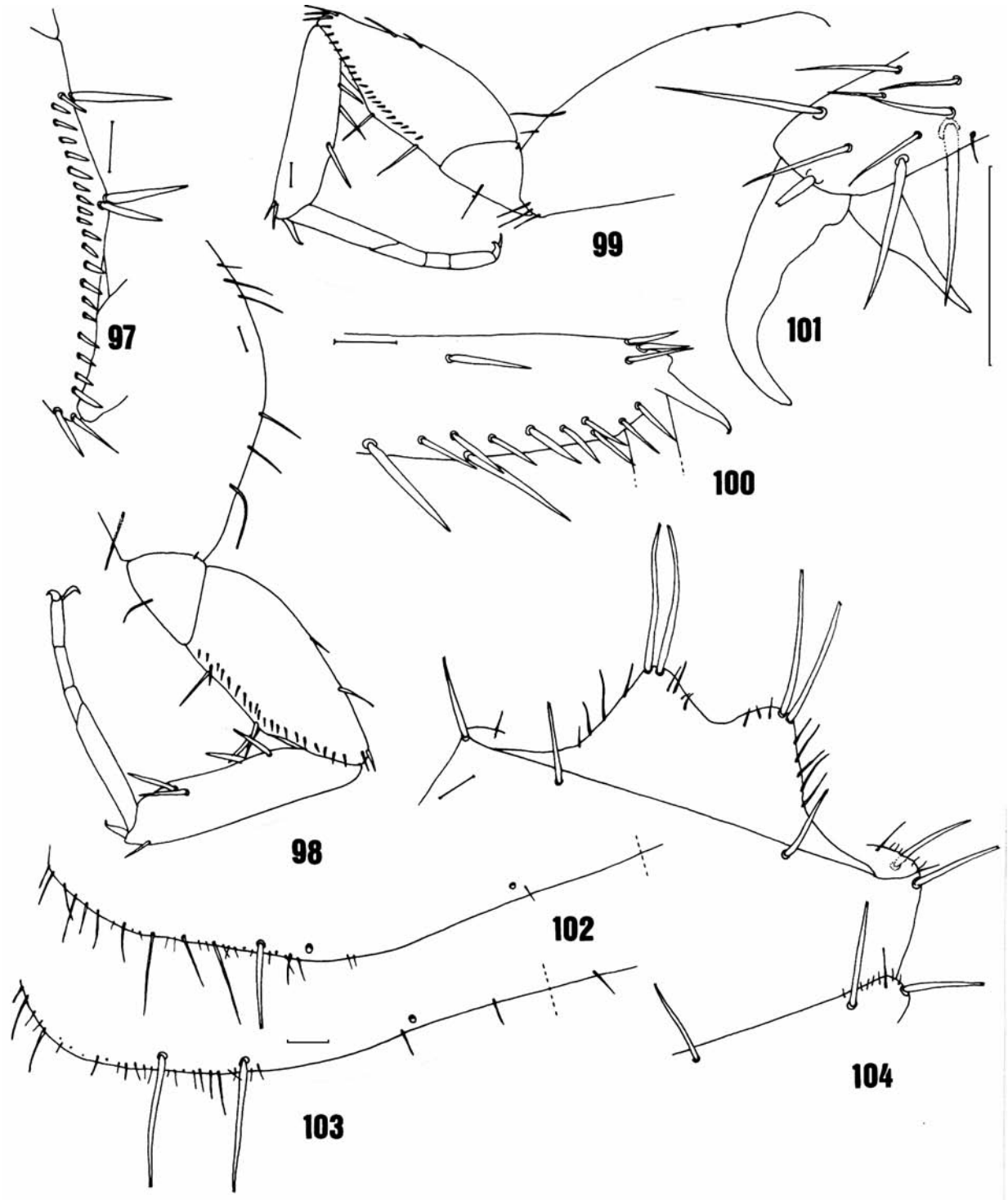
Atelura jacobsoni Silvestri, 1911, Boll. Lab. Zool. gen. agr. Portici, 5: 62.
Proatelura jacobsoni Silvestri, 1916, Boll. Lab. Zool. gen. agr. Portici, 11: 100.
Proatelura odontotermita Uchida, 1968, Mushi, 42: 3.

Material examined – 16 ♂♂, 13 ♀♀ 1 juv.: China: Macao Territory. Coloane island, Hac-Sa, dune area with granite sand, under stones and debris, coll. "I Missão a Macau do CZ", 25/XI/1988, n. 4215 (CZ); 1 ♂: *Ibid.*, Coloane, coll. A Bivar de Sousa, 1/X/19995, no number (CZ). 1 young ♂ 1 ♀ 1 juv.: Indonesia: Moluccas archipelago. Isl. Halmahera (= Jilolo), Jailolo, coll. R. Yoshii, 29/IX/1988, no number (CZ).

Discussion – Described from Java (Silvestri 1911a), *P. jacobsoni* was later reported from China -several localities, including "...nei dintorni di Macao, Taipó (Hong Kong) ..."-, Formosa, Singapore, Malacca, Vietnam and Philippines (Silvestri 1916); Paclt (1982) points its presence on the Solomon island of Guadalcanal and recognises its occurrence at the Sabah area of Northern (Malaysian) Borneo, from where it has been described as *Proatelura odontotermita* (Uchida, 1968).

Despite the two descriptions (Silvestri 1911a and Uchida 1968), several details, mainly relative to male sex, remain to describe or have never been figured. Based on material from Macao, we add to those descriptions some figures that will allow a much clear understanding of male features.

Urotergites are reported (Uchida *op. cit.*) with macrochaetae restricted to posterolateral angles; there is, indeed, one pair only of macrochaetae per urotergite as a rule accompanied by an outer delicate short seta, but laterotergites show 2 (on I, fig. 108), 3 (on II, fig. 109) or 5 (on III-VIII, fig. 110) strong setae. Urotergite X, with sub-semicircular posterior notch, have 1 + 1 robust posterolateral macrochaetae and, along ventral surface (fig. 111), (60-70) + (60-70) delicate pegs inserted on 1+1 dilated areas. Coxite VIII can present almost straight (fig. 112) to slightly convex posterior border (fig. 113). Paramera (fig. 114) are ovoid, 3 times longer than wide, almost attain apex of stylets IX (ca. 7/8 of their length) and show numerous setae.



Figures 97-104
Pseudobrinckina anempodiata n. gen. n. sp. ♀. – 97, P I, detail of inner ventral femur. – 98, P II. – 99, P III. – 100, P I, outer distal tibia. – 101, praetarsus. – 102, urotergite II. – 103, urotergite VI. – 104, posterior border of urotergite VIII and urotergites IX-X. (Scales: 0.1 mm)

All males from Macao present the very same number and distribution of cercal pegs (fig. 115): 6 on basal division, 3 on second, and 2 on third one.

Gastrotheus (G.) papuanus n. sp.

Type-specimen : **Holotype** ♂: Papua-New Guinea: Port Moresby, Waigani, coll. A. van Harten, 27/V/1995, n. 254 (CZ).

Description – Body length: 2.9 mm; thorax length: 1.0 mm; thorax width: 0.8 mm; antenna length (preserved part): 0.8 mm; cercus length: 0.3 mm; total body length: 3.5 mm. Body ateluriform though elongate, lacking pigment, with typical scales.

Head as in fig. 116, wider than long, the setae strong and short, apically bifid, most of them lost. Antannae short, as usual. Mandibles and maxillae without special features; maxillary palp (fig. 117) short and robust, apical article cylindrical, 1/5 longer than preceding and 3 times longer than wide. Labium typical, labial palp (fig. 118) with apical article ovoid, not much longer than wide.

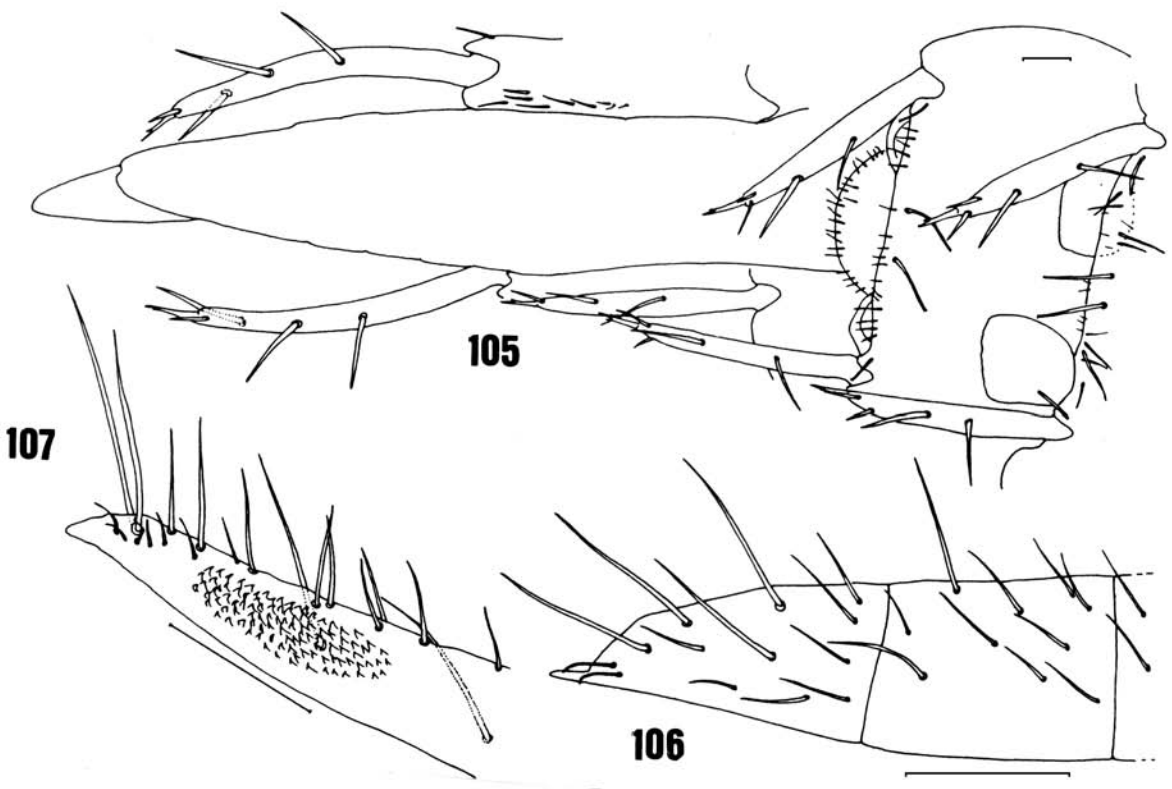
Thorax large, about 1/3 of body length. Nota not much concave along posterior margin, with 20 (pronotum) to 24 (metanotum) posterior very short macrochaetae and some lateral setae. Legs typical, P I tibia (fig. 119) 1/5 shorter than that of P III (fig. 120); praetarsus simple and complete, empodium claw-like, shorter than lateral claws.

Urotergites like nota, with 1+1 posterolateral long macrochaetae plus a row of little, deeply bifid posterior macrochaetae decreasing in number from I (more than 20) to VIII (8-10, difficult to see due to specimen condition). Urotergite IX lacking posterior setation, X (figs. 121, 122) with deep, unsetated posterior notch, 1+1 strong and elongate posterolateral macrochaetae and 1+1 outer marginal setae; ventral surface with 2+2 medioanterior delicate cylindrical pegs and a few cilia.

Urosternites as usual, all with 1+1 submedian thin macrochaetae and 1+1 lateral thin setae, plus 2-3 pairs of infralateral stronger setae (fig. 123), VI (fig. 124) with 1 + 1 globous vesicles with 6-7 long setae. Coxites VIII (fig. 125) with straight, non-protruding, posterior border with 5 thin macrochaetae. Coxites IX (fig. 126) with stronger stylets, paramera cylindrical, poorly setated and about 3.5 times longer than wide, reaching half of stylets length.

Terminal filament without special setation. Cerci (figs. 127, 128) with one peg on basal division and one on second division or 2 on second division.

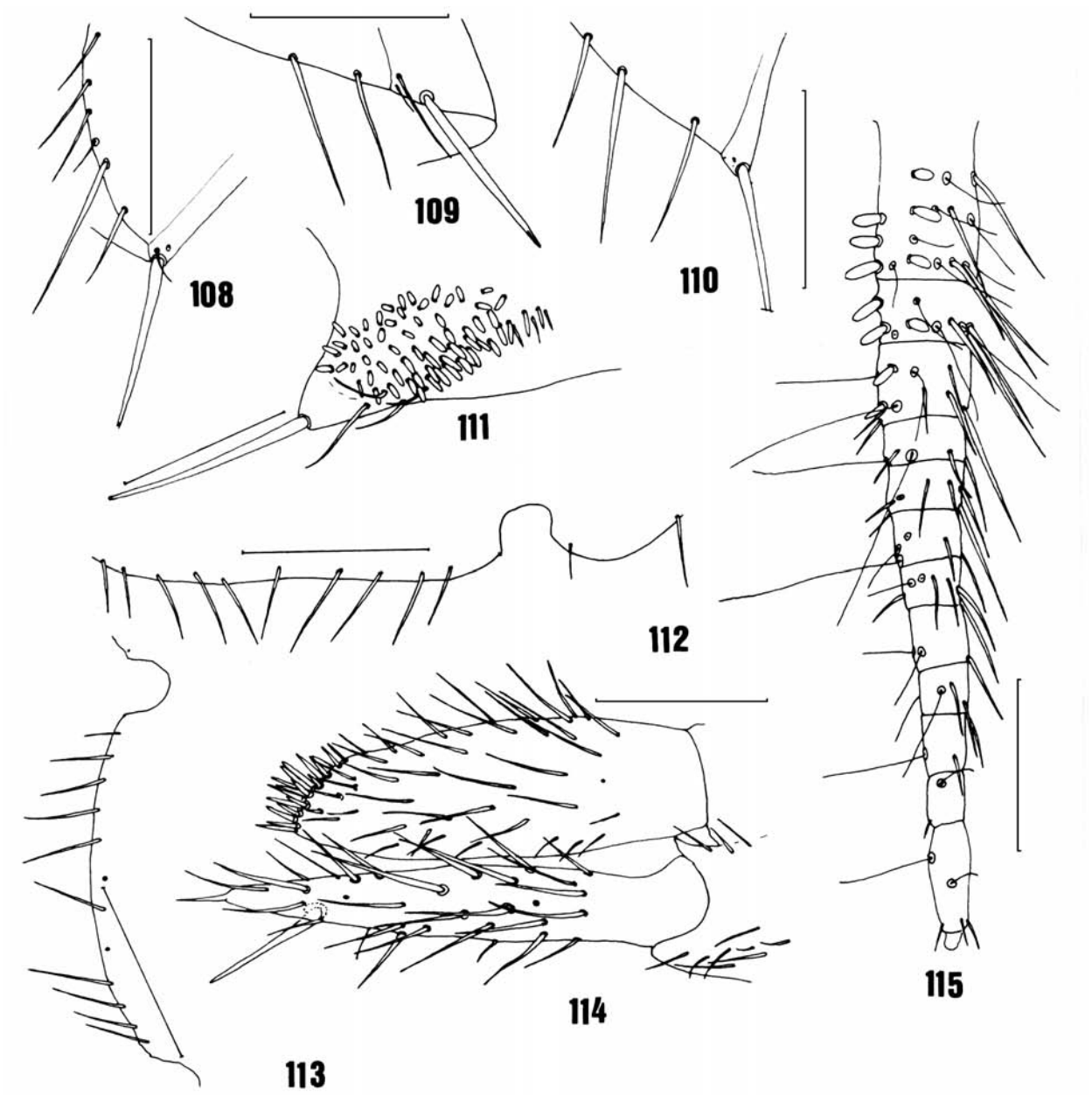
Female unknown.



Figures 105-107
Pseudobrinckina anempodiata n. gen. n. sp. ♀. – 105, posterior ventral abdomen. – 106, gonapophyses VIII, distal divisions. – 107, gonapophyses IX, distal divisions. (Scales: 0.1 mm)

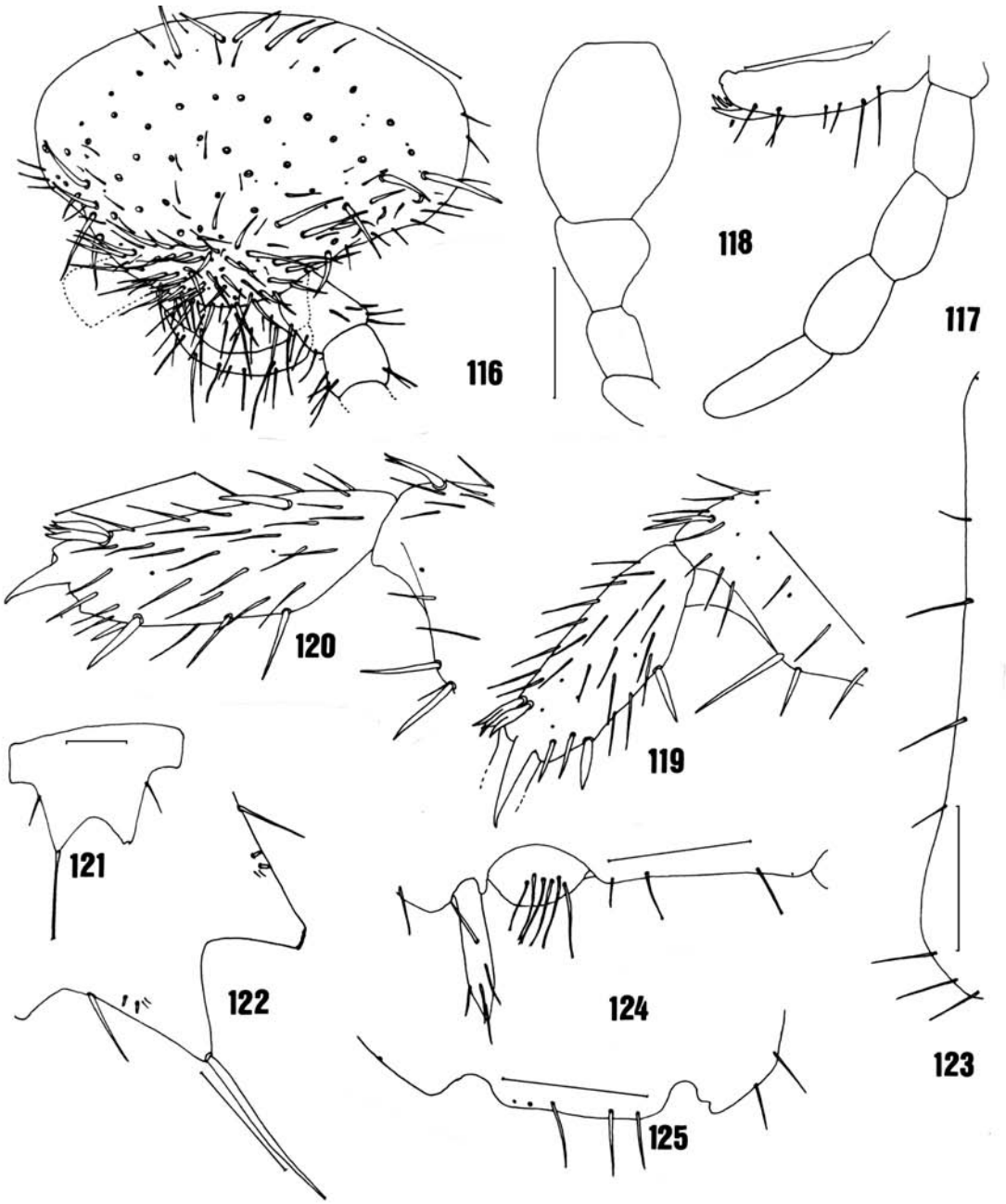
Etymology – The species is named after the geographical origin of its only known specimen, Papua New Guinea.

Discussion – The new species, the first Atelurinae reported to New Guinea, is completely distinct from all *Gastrotheus* s. s. (sensu Paclt 1963) known from Asia to Australia. *G. ceylonicus* described from Sri-Lanka (Silvestri 1916) and recorded also (same species ?) from Thailand (Paclt 1974), shows setae along inner margin of urotergite X posterior notch, apart other dissimilarities. *G. indicus* from Southern India (Silvestri 1913),



Figures 108-115
Proatelura jacobsoni (Silvestri, 1911). – 108, infralateral area of urotergite I. – 109, *ibid.*, of urotergite II. – 110, *ibid.*, of urotergite VIII. 111 – urotergite X of ♂, ventral. – 112, coxite VIII of ♂, posterior border. – 113, *ibid.*, of another specimen. – 114, coxite IX of ♂ and paramerum. – 115, right cercus of ♂, dorsal. (Scales: 0.1 mm)

G. palpiseta described from Sumatra (Silvestri 1916) and redescribed from Southern India (Mendes 1992) and *G. disjuntus* from South Australia (Silvestri 1908b), show a row of macrochaetae along posterior margin of urotergite IX and the last-mentioned species shares, further, with *G. ceylonicus*, setae on inner margins of posterior notch.



Figures 116-125
Gastrotheus (G.) papuanus n. sp. ♂. – 116, head. – 117, maxillary palp. – 118, labial palp. – 119, distal femur and tibia of P I. – 120, *ibid.*, of P III. – 121, urotergite X, dorsal. – 122, *ibid.*, ventral. – 123, urosternite V. – 124, urosternite VI. – 125, Coxite VIII. (Scales: 0.1 mm)

Gastrotheus (Lasiotheus) nanus (Escherich, 1903)

Grassiella nana Escherich, 1903, Zool. Anz., 26: 352
Atelura nana Escherich, 1905, Zoologica, 43: 127
Gastrotheus sumatranus Silvestri, 1916, Boll. Lab. Zool. gen. agr. Portici, 11: 96
Gastrotheus parvulus Silvestri, 1918, Boll. Lab. Zool. gen. agr. Portici, 12: 324
Gastrotheus afer Silvestri, 1918, Boll. Lab. Zool. gen. agr. Portici, 12: 325
Gastrotheus minutellus Silvestri, 1949, Subs. Est. Biol. Lunda, 6: 78
Cryptocephalina minutella Wygodzinsky, 1958, Bull. IFAN, 20: 120

Material examined – 2 ♀♀: China: Macao Territory, Coloane island. Seac Pai Van, in ant nest under stones on a strongly altered granite area with rare herbs, coll. "I Missão a Macau do CZ", 24/XI/1988, n. 4213 (CZ); 1 ♀: *Ibid.*, 25/XI/1988, ibid., n. 4214 (CZ). 1 ♀: Polynesia: Cook Islands: Totokoitu, Rarotonga, coll. A. van Harten, 11/III/1996, n. 354 (CZ); 1 ♀ 1 juv.: *Ibid.*, 26/VII/1997, n. 600/5009 (CZ). 3 ♀♀: Polynesia: Niue, coll. A. van Harten, 17-23/IV/1996, n. 396 (CZ).

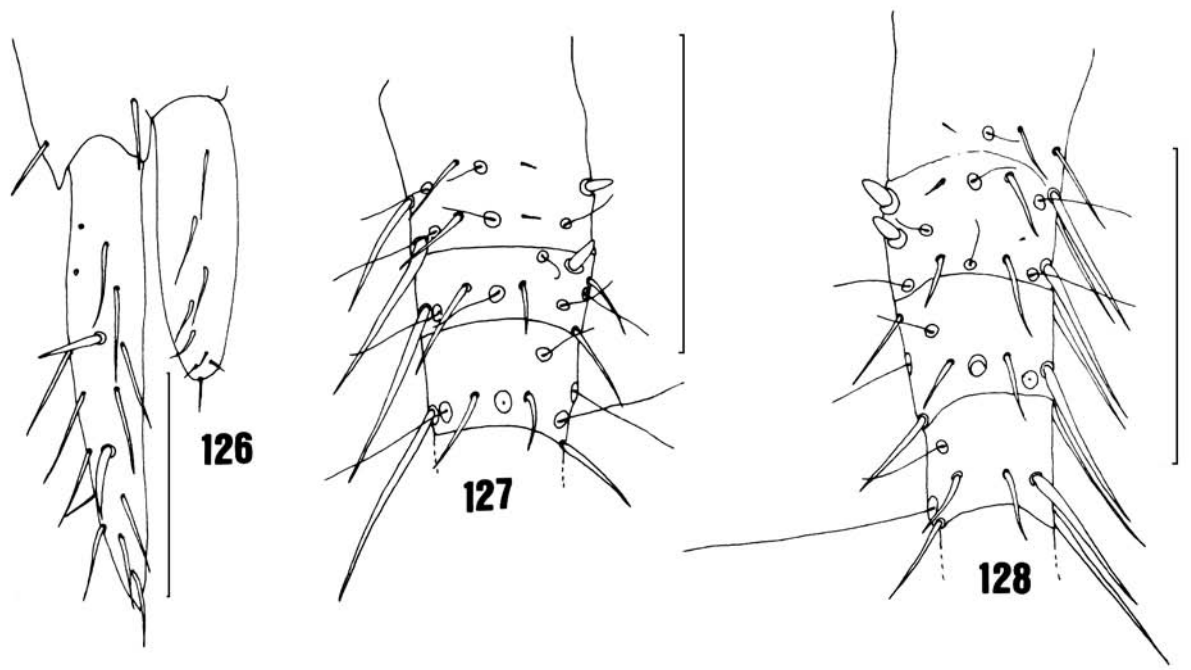
Discussion – The species, with wide inter-tropical range, was known in the Oriental Region from Sumatra only (Silvestri 1916), and was pointed, later, to the Solomon islands (Paclt 1982) – both times as *G. sumatranus*. Known also from Neotropics and found once in Holland, it has been described from South Africa (Escherich 1903), reported in several Afrotropical countries and redescribed upon material obtained on Cape Verde islands (Mendes 1986). The studied females (only known sex) agree fairly with the characteristics of the species.

gen. sp. indet.

Material examined – 1 juv: Indonesia: Sumatra, n. Sum-85/39 (MHNG). 1 young ♀: Thailand: Changwat Kra Buri. Endogeous near Tham (= Grotte) Phrakayang cave, coll. P. Leclerc, leg. L. Deharveng, 23/VII/1987, no number (CZ). 1 ♀: Indonesia: I. Tanimbar. Salimlaki, coll. R. Yoshii, 12/X/1988, no number (CZ).

Discussion – The juvenile from Sumatra, long as 1.5 mm, is provided with setulae only (no scales) and is almost certainly a newly born specimen, which makes impossible a precise determination even at generic level; four species of atelurids have been formerly recorded from the island, viz. *Atelurodes myrmicarius*, *Gastrotheus (G.) palpiseta*, *G. (Lasiotheus) nanus* (as *G. sumatranus*) and *Metriotelura labritermina* (Silvestri, 1916).

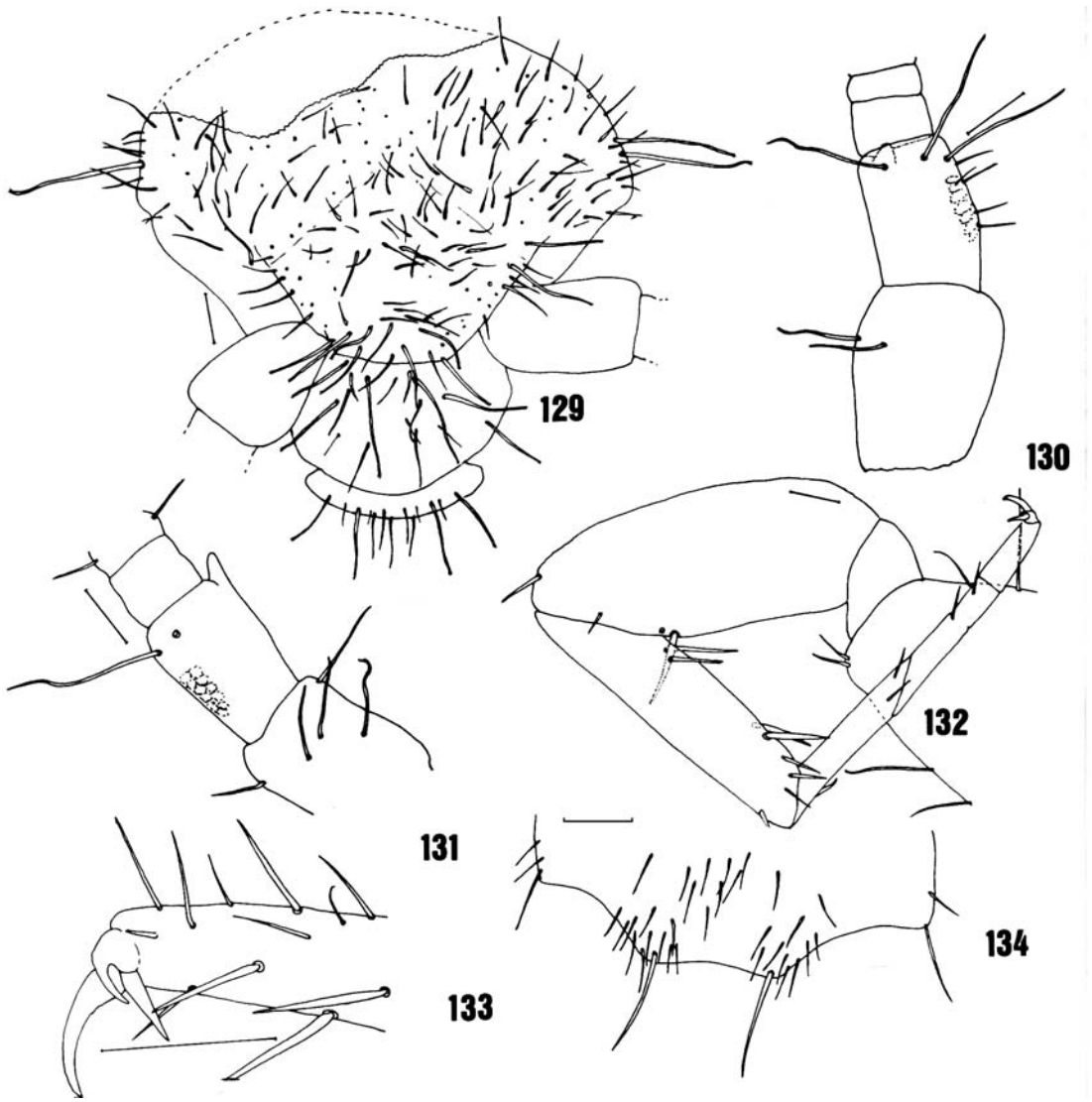
The only female collected near the Kra straight, close to the Burmese border, is far from completely developed, though it certainly belongs to the "*Metriotelura*-group" (Mendes 1987), as there is a submedian pair of pseudovesicles on urosternite II (pseudovesicles on VII and no other vesicles); it shows, further, 3 pairs of stylets



Figures 126-128
Gastrotheus (G.) papuanus n. sp. ♂. – 126, coxite IX and paramerum. – 127, left cercus base, dorsal. – 128, right cercus base, dorsal-oblique. (Scales: 0.1 mm)

(VII-IX), praetarsus with pulvilli and long prostheca. Meso- and metanotum as well as abdominal tergites have a row of long macrochaetae, and pronotum presents 4 rows of similar setae; maxillary and labial palps as well as dorsal chaetotaxy seem quite close to what is known for *Platystylea* (Escherich, 1906), an Oriental genus known by 3 species reported from Southern India and from Sri-Lanka. However, the quite typical lamellar expansions of *Platystylea* claws are completely distinct from poorly developed, round pulvilli presented by the Thai specimen. This single immature female is, so, impossible to include in any known taxon, though it will belong, quite probably, to an undescribed genus. Two Atelurinae species only has been reported from Thailand: *Gastrotheus ceylonicus* (Paclt, 1974) and *Atelurodes myrmicarius* (Mendes, 1992).

The female from Tanimbar, an Indonesian island south-wester off New Guinea in the Arafura Sea, shows 4 pairs of abdominal stylets (VI-IX), pseudovesicles on II (median) and on VII, no other vesicular structures and no dorsal chaetotaxy (setae restricted to cephalic frontal area and to lateral margins of nota and of urotergites); praetarsus is complete, with leaf-like empodium and reduced pulvilli, there is one



Figures 129-134
Metrinura celebensis n. sp. ♂. – 129, head. – 130, right antenna base, dorsal. – 131, left antenna base, oblique. – 132, P III. – 133, praetarsus. – 134, urotergite X. (Scales: 0.1 mm)

isolated galea apical conule and prostheca is not elongated. Apart from some Afrotropical or Western Gondwanian genera, viz. *Allatelura*, *Anarithmeus*, *Cephalocryptina*, *Cryptocephalina*, *Dinatelura*, *Gastrotheus* s.l., *Luratea*, *Olarthrocera* and *Wygodzincinus*, all devoid of submedian pseudovesicles II and part of them only with 4 stylets, the Salimlaki female seems to approach the condition found in *Nipponatelura*, a Japanese genus with a pair of eversible vesicles on urosternite VI. The scarcity of material from Tanimbar, from where no Atelurinae has hitherto been reported (the sub-family has never been recorded in the little islands of Indonesia) prevents description of one species, almost certainly new and probably belonging to a new genus.

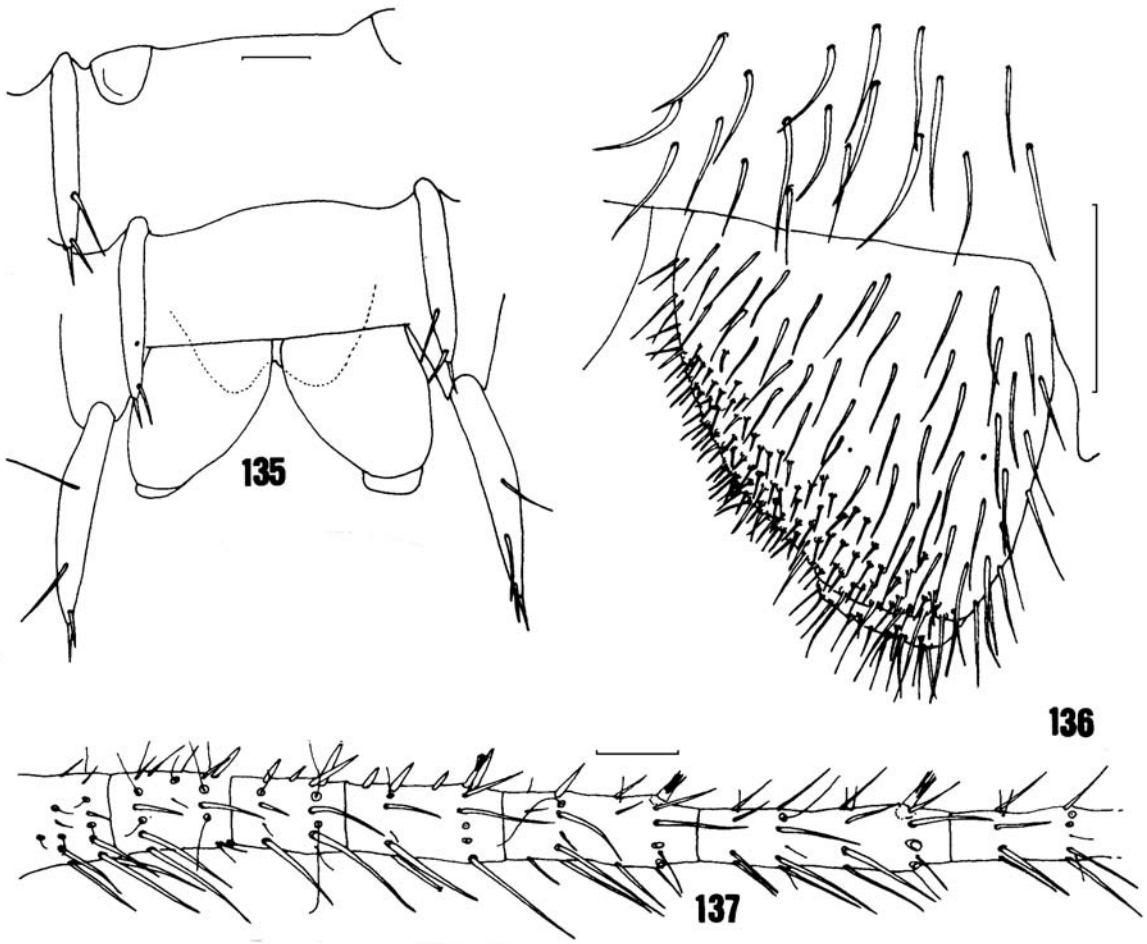
Sub-fam. SUBNICOLETIINAE

Metrinura celebensis n. sp.

Type-specimen – **Holotype** ♂: Indonesia: Sulawesi (= Celebes). Distr. of Maros. Endogeous in Gua Salukkan Kallang cave valley, coll. P. Leclerc, leg. *L. Deharveng*, 11/VII/1986, no number (CZ). – **Other examined material**: 1 young specimen, same data as holotype.

Description – Body length: 5.5 mm; thorax length: 1.6 mm; thorax width: 1.1 mm; cercus length: 2.9 mm; antennae and paracercum partially damaged. Body long and thin, without pigment and setose.

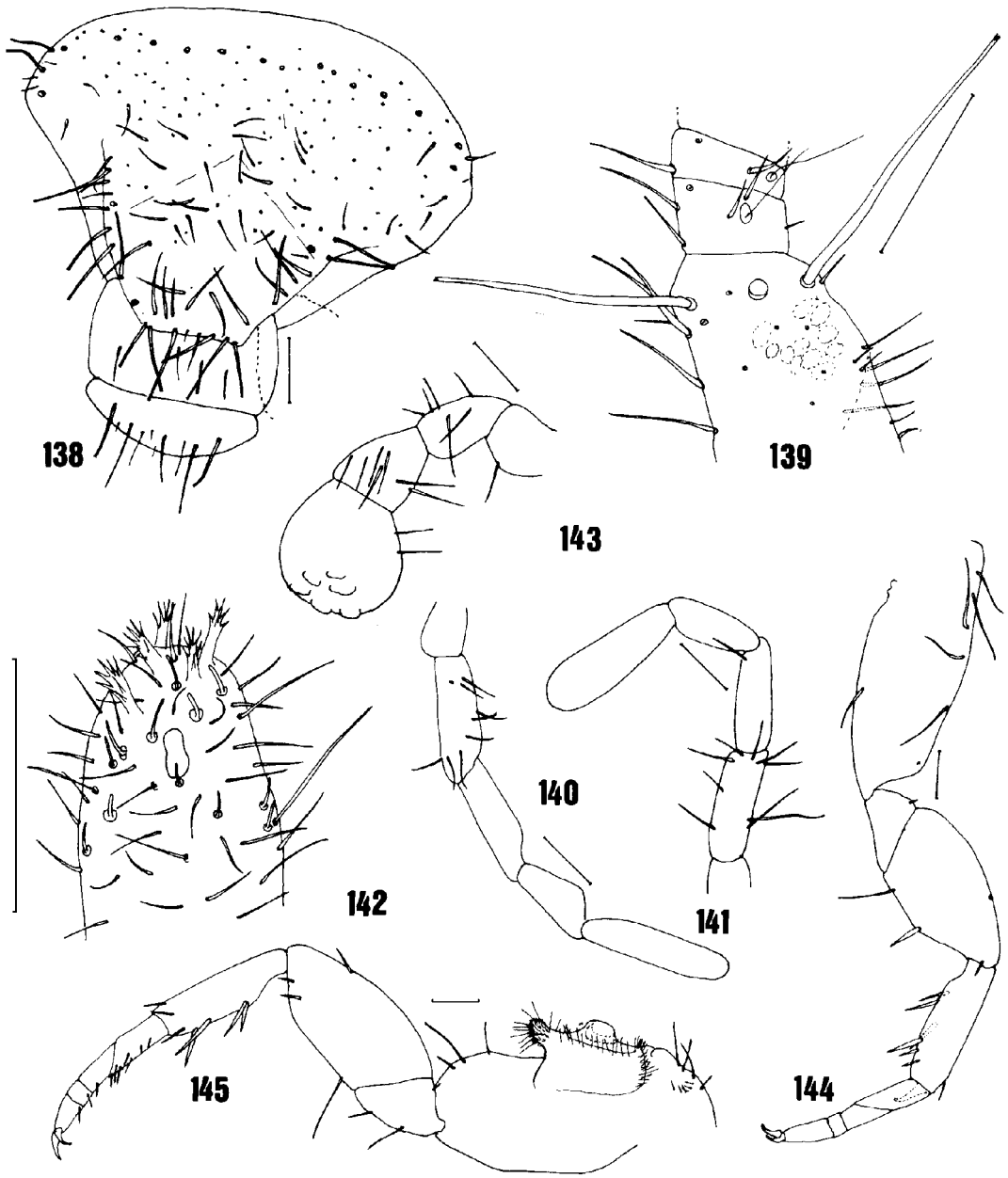
Head as in fig. 129, wider than long, with discal and marginal setae and macrochaetae. Antennae (figs. 130, 131) with sub-



Figures 135-137
Metrinura celebensis n. sp. ♂. – 135, ventral posterior abdomen. – 136, paramerum. – 137, left cercus, dorsal. (Scales: 0.1 mm)

cylindrical scapus, pedicellus not much shorter to almost equal to scapus, with outer median glandular area and one short distal inner ventral, conical, apophyses poorly surpassing base of first flagellar division. Mandibles and maxillae as usual, maxillary palp distal article lost on both sides. Labium typical, labial palp elongate, its apical article missing on one side, impossible to see in detail (oblique on preparation) on the other, ovoid, probably not much longer than wide.

Nota setose, without special characteristics. Legs preserved on P III only (figs. 132, 133), robust, tibia with delicate, ventral, rare spines; tarsus about 11 times longer than wide, praetarsus simple and complete, claws and empodium delicate and smooth.



Figures 138-145
Trinemurodes anomalocoxa n. sp. – 138, head. – 139, antenna of ♂, pedicellus and flagellum base. – 140, maxillary palp. – 141, *ibid.*, of another specimen. – 142, *ibid.*, detail of apex of distal article. – 143, labial palp. – 144, P I. – 145, P II of ♂, inner ventral. (Scales: 0.1 mm)

Urotergites setose, as usual, X (fig. 134) short and wide, with slightly concave posterior border, with setae and 1+1 posterolateral macrochaetae.

Urosternites without peculiar features (fig. 135), entire; stylets on III-IX, vesicles on II-VI, VII with large pseudovesicles; coxite VIII with poorly concave posterior border, coxites IX fused and with straight posterior margin; paramera (figs. 135, 136) ovoid, apically subdivided, almost reaching half stylets IX length.

Paracercum without special characteristics. Cerci with spines and "anemone-like" structures as in fig. 137.

Female unknown.

Etymology – The species is named after its geographical origin.

Discussion – *Metrinura celebensis* n. sp. seems well individualised inside the genus, mainly due to 1+1 posterolateral macrochaetae only on urotergite X, distal pedicellar apophyses and specialized chaetotaxy along male cerci; these characteristics remind the condition on some species of certainly close *Trinemura* (Silvestri, 1908b) and *Subtrinemura* (Smith, 1998) what seems to disagree with last author's opinion of closer similarity between the two reported genera on account of "... lack of anemone-like sensilla ..." in *Metrinura*. These singular structures do appear in *M. celebensis* sp.n. and shall be considered as a synapomorphic character of "*Trinemura*-group" (Smith, *op. cit.*) with the eventual exception of genus *Hemitrinemura* (Mendes, 1994).

The species will enter proposed keys (Smith 1998: 180) in point 13 -assuming that antennae (badly damaged) will be of more general "short-type", so, distinct from condition in *M. russendenensis*- which will become modified as follows:

13. Id. (unmodified) . . . . . ***M. pedicella*** Smith, 1998
– General expansion of outer side of pedicel of male but much more pronounced distally 13A
13A. Pedicel clearly widened distally, devoid of apophyses. Urotergite X slightly concave, with 2+2 posterlateral macrochaetae. Male terminal filament with modified chaetotaxy ("stout setae" or thin pegs present). Male cerci with delicate pegs on basal divisions, lacking anemone-like sensilla . . ***M. queenslandica*** Smith, 1998
– Pedicel weakly widened distally, with small inner ventral apophyses. Urotergite X almost straight along posterior border, with 1+1 posterolateral macrochaetae only. Male terminal filament lacking modified chaetotaxy, cerci with long, thin pegs, plus anemone-like sensilla . . . . . ***M. celebensis*** n. sp.

Trinemurodes anomalocoxa n. sp.

Type-specimens – **Holotype** ♂: Thailand: Province de Phangna. Près de Phangna, Tham (= Grotte) Tapan, sur un hallus de gravillon, coll. L. Deharveng, 16/VII/1987, n. THAI-87 PAG.1 (CZ). – **Allotype** ♀: same data as holotype. – **Paratypes**: 2 ♂♂, 6 ♀♀, same data as holotype.

Description – Body length: 3.0-3.6 mm (♂) 3.5-3.6 mm (♀); thorax length: 0.7-0.9 mm (♂) 0.8 mm (♀); thorax width: 0.6-0.9 mm (♂) 0.8-0.9 mm (♀); antenna length: maximum preserved of 2.8 mm on holotype; cercus length: maximum of 2.2 mm on allotype; total body length: maximum of 5.7 mm on allotype. Body elongate, lacking scales and without pigment.

Head (fig. 138) wider than long, with setae and macrochaetae. Antennae apically damaged; male pedicellus subcylindrical, with glandular area and antedistal strong 3-4 macrochaetae (fig. 139). Mandible and maxilla typical, last one with 2 well developed galea conules; maxillary palp (figs. 140, 141) with some strong setae on second division, apical article almost twice longer than preceding and 3-4 times longer than wide, its distal area with several minute sensilla (fig. 142). Labium typical, labial palp (fig. 143) with round apical article.

Thorax ca. 1/4 shorter than abdomen, nota without peculiar features, setose, the posterior borders poorly concave. Legs as in figs. 144-148; P I tibia about 3.2 times longer than wide, not much shorter than tibia II and as long as tibia III; coxa of P II of female without special characteristics, of male with dorsal excrescence with one outer sensorial complex: one large fovea with sclerotised border plus one more distal knob with specialized chaetotaxy (10-15 straight setae and thin cilia) as in figs. 145-147; tarsi typical, praetarsus simple (fig. 149), lateral claws poorly arched, empodium lacking.

Urotergites setose with some posterior macrochaetae, X (figs 150, 151) short and wide, with 1+1 posterolateral macrochaetae (shorter on male), posterior border of female less concave.

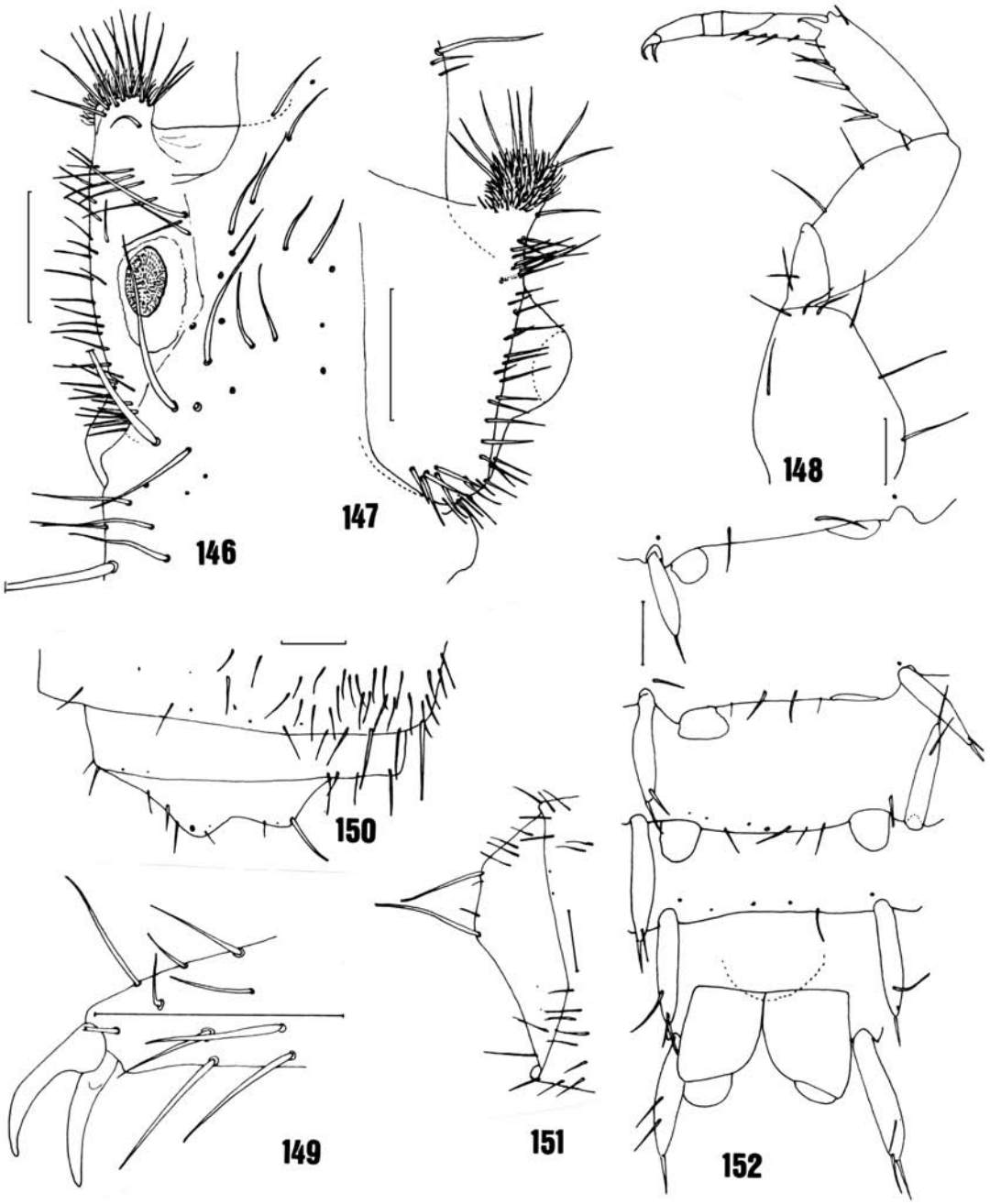
Urosternites typical for the genus (fig. 152); male coxites IX fused, with almost straight posterior border, median distal setae arranged as a not very conspicuous tuft; paramera (figs. 152, 153) ovoid, apically subdivided, exceeding middle of stylets IX; penis as usual. Female subgenital plate (fig. 154) sub-triangular, more than twice wider at base than long, setose. Ovipositor elongate, surpassing stylets IX by 1.5-1.7 times their length (fig. 155); gonapophyses VIII and IX with 7-8 divisions, with usual chaetotaxy.

Terminal filaments of female without special features. Male cerci (figs. 156, 157) with 2-3 pegs on most proximal division and 2 (exceptionally one) on second division. Paracercum (fig. 158) with 2+2 pegs on basal division and 1+1 on proximal second division.

Etymology – From the Latin: *anomalus*: abnormal, irregular, and *coxa*: the first leg division, alluding to the very unique coxa II of male.

Discussion – *Trinemurodes* (Silvestri, 1916) was known by its type-species, *T. malayanus* from Sumatra (Silvestri op.cit.), by *T. mertoni* Paclt, 1961, from Moluccas and by two Dominican amber species, probably 20 MY old,

described by Sturm & Mendes (1998): *T. antiquus* and *T. miocenicus*. The two fossil taxa and *T. mertoni* present 8 pairs of abdominal stylets (II-IX) and only *T. malayanus* share with the new species stylets restricted to urosternites III-IX. Smaller than the Sumatran taxon and lacking pedicellar apophyses, *T. anomalocoxa* sp.n. seems to be the only one, inside the group (and also inside Order), to present oddly transformed male coxa II; males of both amber preserved species remain to describe though, besides the distinct number of abdominal stylets, *T. antiquus* shows a different ovipositor and *T. miocenicus* apically transformed praetarsal claws.

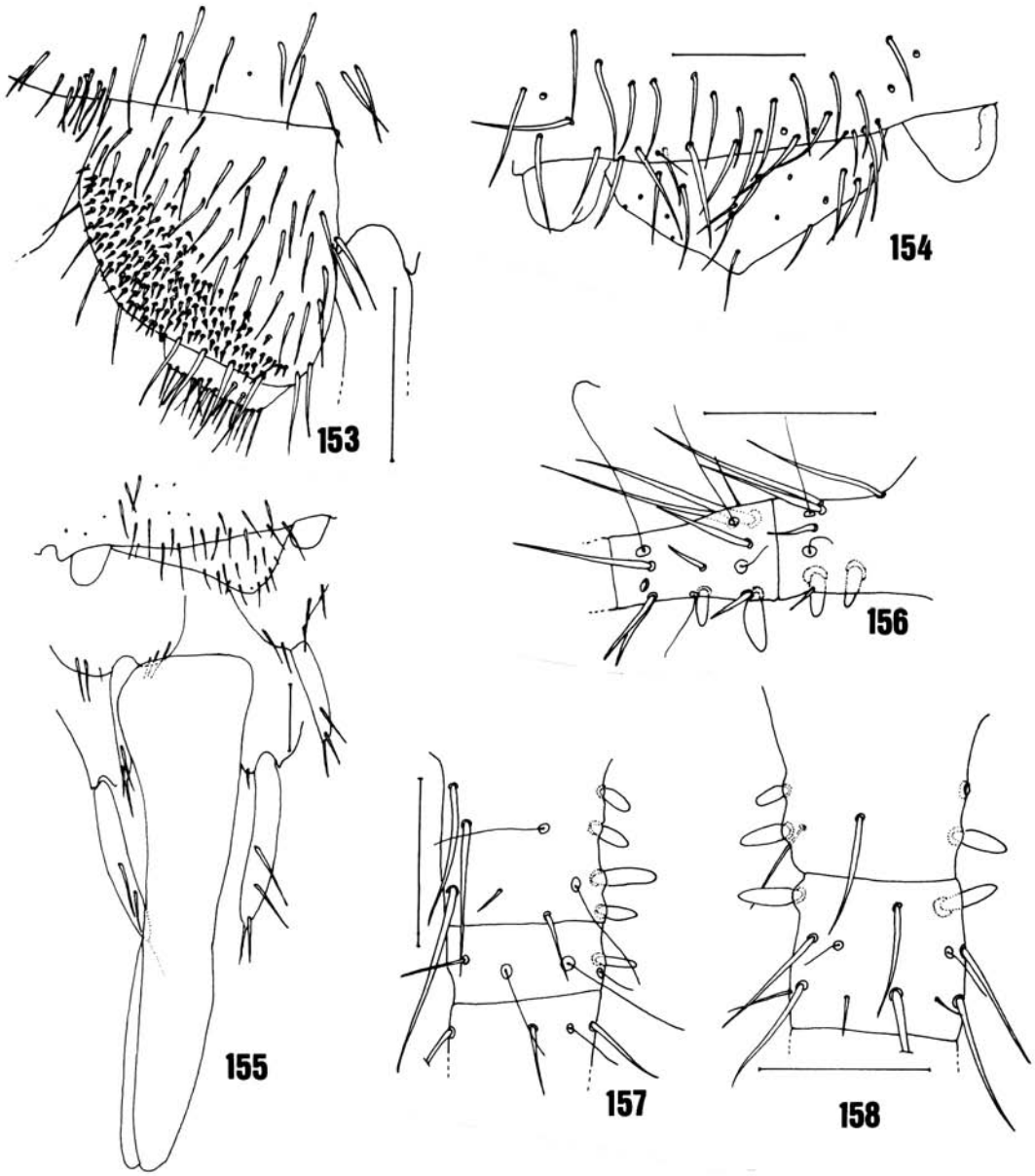


Figures 146-152
Trinemurodes anomalocoxa n. sp. – 146, P II of ♂, detail of outer excrescence, dorsal. – 147, *ibid.*, ventral. – 148, P II of ♀. – 149, praetarsus. – 150, urotergites VIII-X of ♂. – 151, urotergites IX-X of ♀. – 152, median and posterior ventral abdomen of ♂. (Scales: 0.1 mm)

Trinemurodes bedosae n. sp.

Type-specimens – **Holotype** ♂: Thailand: Nam Prov. Pua, Tham (= Grotte) Pa Rai, coll. L. Deharveng & A. Bedos, 8/VI/1989, n. NAN-001 (CZ). – **Allotype** ♀: same data as holotype. – **Paratype**, 1 ♀, same data as holotype.

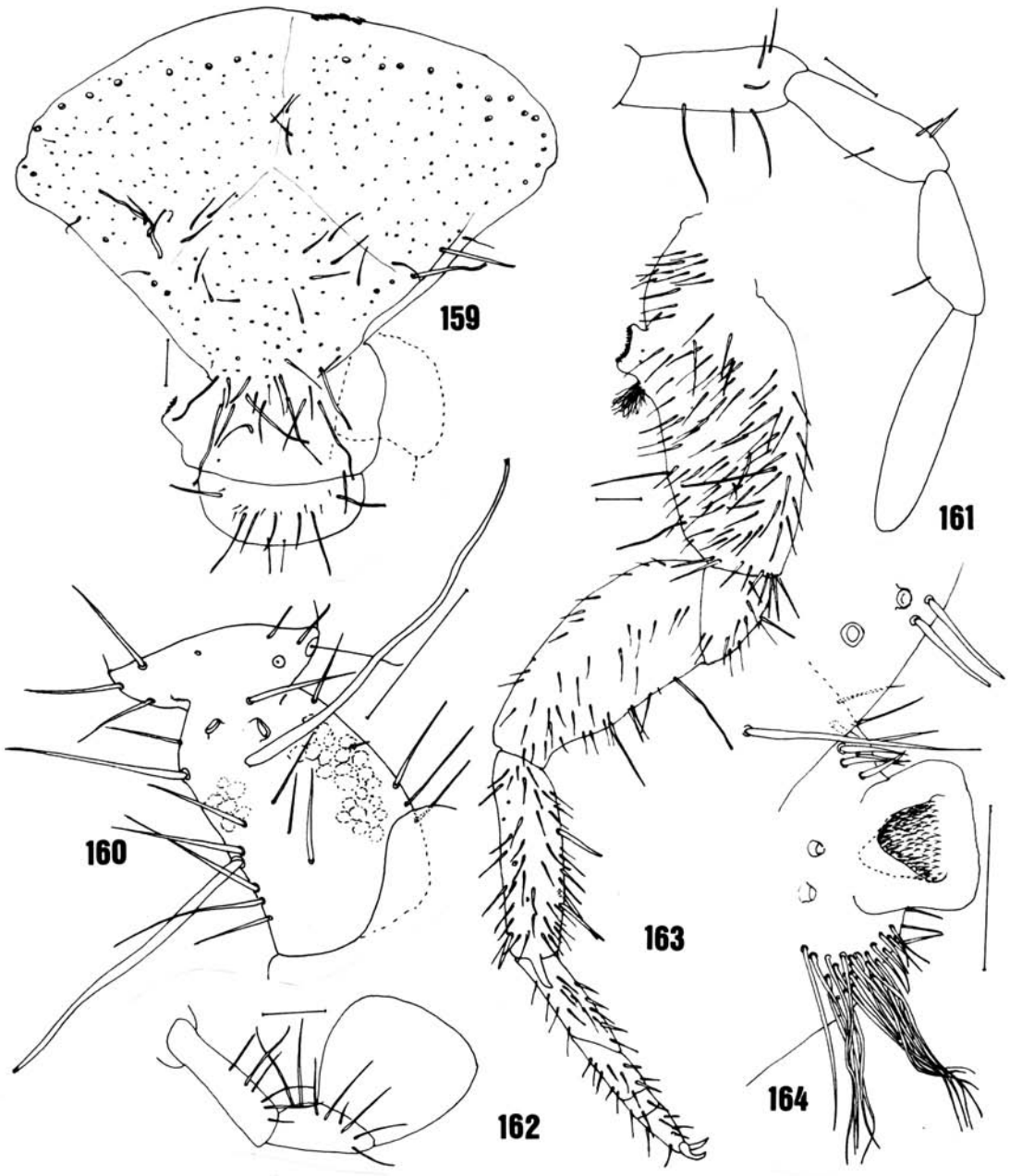
Description – Body length: 5.4 mm (♂) 6.0-7.1 mm (♀); thorax length: 2.0 mm (♂) 2.1-2.5 mm (♀); thorax width: 1.1 mm (♂) 1.2-1.4 mm (♀); antenna length: maximum preserved of 5.5 mm on allotype; cercus length: 3.2 mm (♂) 3.8 mm (♀); total body length: maximum of 8.8 mm on holotype. Body elongate, lacking pigment, the scales absent.



Figures 153-158
Trinemurodes anomalocoxa n. sp. – 153, paramerum. – 154, urosternite VII and subgenital plate of ♀. – 155, posterior ventral abdomen of ♀. – 156, right cercus of ♂, dorsal-oblique. – 157, *ibid.*, of another specimen, ventral. – 158, base of paracercum of ♂, dorsal. (Scales: 0.1 mm)

Head (fig. 159) wider than long, with numerous setae and macrochaetae. Antennae long, scapus sub-cylindrical and much larger than pedicellus, this one on male (fig. 160) with glandular area and devoid of apophyses, with sub-parallel lateral margins and somewhat damaged apically. Mandibles and maxillae typical; maxillary palp (fig. 161) robust, apical article cylindrical, about 1/3 longer than preceding and 4.5 times longer than wide; labium as usual, labial palp (fig. 162) with strong inner setae on basal and medial divisions, apical article as long as wide.

Thorax much longer than wide, about 1/3 of body length. Nota without special features. Legs robust; tibias more or less equally elongate, with rare spiniform ventral setae; coxa of P II of male (figs. 163, 164) with complex dorsal structure composed by one proximal cup shaped hollow expansion and an immedi-



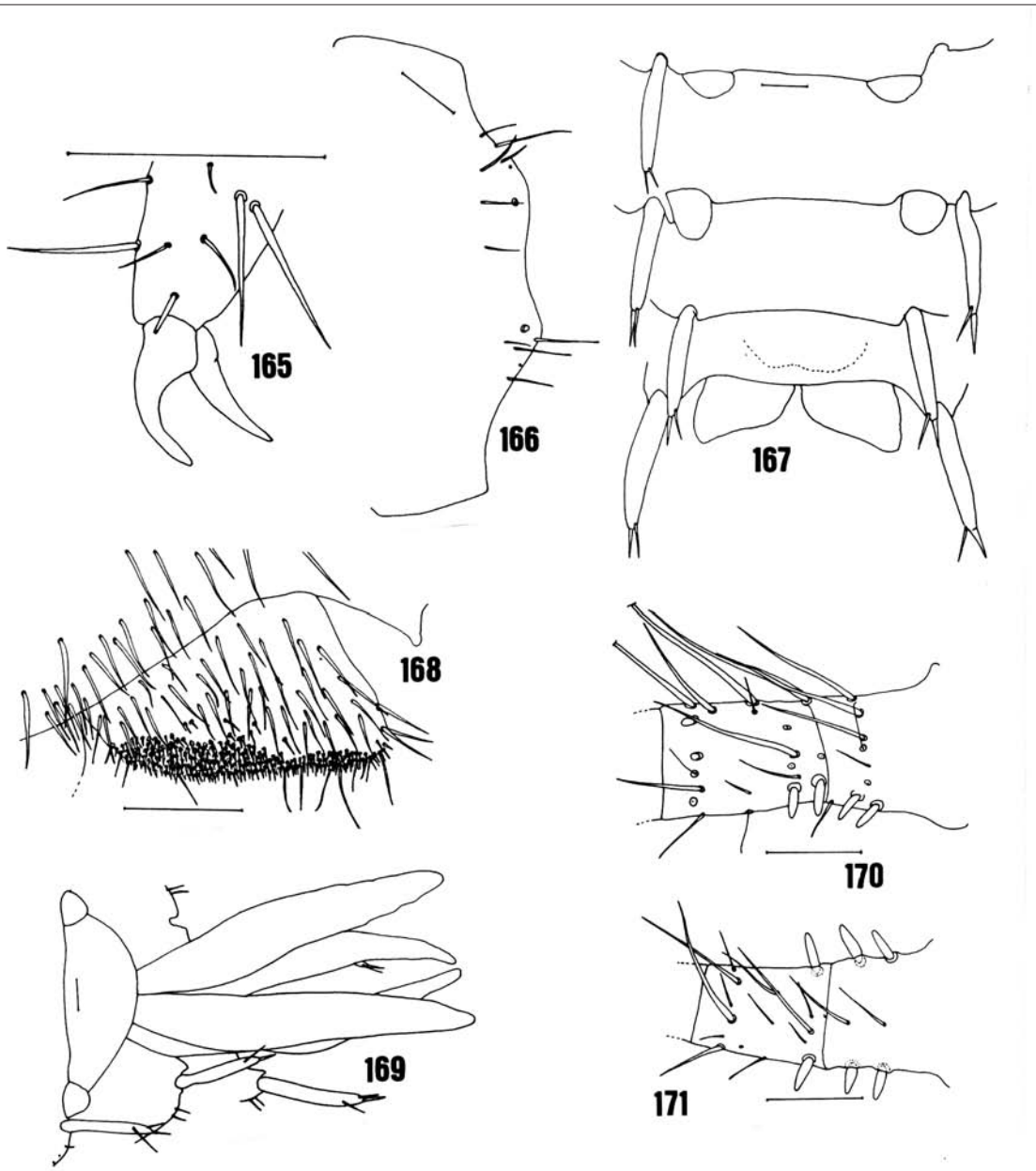
Figures 159-164
Trinemurodes bedosae n. sp. – 159, head. – 160, pedicellus of antenna of ♂. – 161, maxillary palp. – 162, labial palp. – 163, P II of ♂. – 164, *ibid.*, detail of the outer excrescence, dorsal. (Scales: 0.1 mm)

ately distal tuft of ciliate setae; praetarsus (fig. 165) lacking empodium.

Urotergites setose, as usual, X (fig. 166) very wide and shallow emarginated, with 1+1 posterolateral macrochaetae and rare setae.

Urosternites typical for genus (fig. 167); stylets on III-IX; male coxites IX fused, posterior border somewhat curved, with some closer median setae; paramera (figs. 167, 168) wide and very short, sub-triangular, not clearly subdivided at apical area, attaining 1/3 of stylets IX length. Female subgenital plate (fig. 169) parabolic, much wider at base than long. Ovipositor elongate, robust, surpassing stylets IX by once their length. Gonapophyses typical, with 7 divisions.

Female terminal filaments lacking modified setation. Male cerci (fig. 170) with 2 inner distal cylindrical pegs on proximal division and 2 on basal inner second division. Paracercum (fig. 171) with 2+2 pegs on basal division, plus 1+1 on proximal second division.



Figures 165-171
Trinemurodes bedosae n. sp. – 165, praetarsus. – 166, urotergite X. – 167, posterior ventral abdomen of ♂. – 168, paramerum. – 169, posterior ventral abdomen of ♀. – 170, left cercus of ♂, basal dorsal. – 171, base of paracercus of ♂, dorsal. (Scales: 0.1 mm)

Etymology – The new species is dedicated to one of its collectors, Dr. Anne Bedos, collembologist of the Université Paul Sabatier in Toulouse, France.

Discussion – *Trinemurodes bedosae* n. sp. is well individualised within the genus, though it seems particularly close to the just described *T. anomalocoxa* n. sp. due to also transformed (though in a quite distinct way) coxa II of male. Diagnosis of *Trinemurodes* known species can be better understood with following keys:

1. Stylets on urosternites II-IX. Praetarsal claws variable . . 2
– Stylets restricted to urosternites III-IX. Praetarsal claws smooth 4
2. Praetarsal claws smooth. Ovipositor spindle-shaped, with more than 10 divisions, exceeding stylets IX by ca. 1.5 times their length . . ***T. antiquus*** Sturm & Mendes, 1998 [Dominican amber (ca 20 MY)]
– Praetarsal claws with dorsal or with ventral indentation(s). Ovipositor with less than 10 divisions (not explicit in *T. mertoni*) 3
3. Praetarsal claws with one ventral apical tooth. labial palp distal article clavate, clearly longer than wide. Ovipositor robust, spindle-shaped, exceeding stylets IX by once their length . . . . . ***T. mertoni*** Paclt, 1961 [Kai island (Moluccas), Troglobiont?]
– Praetarsal claws with 2-3 dorsal apical indentations. Labial palp distal article ovoid, poorly longer than wide. Ovipositor delicate, cylindrical, exceeding stylets IX by ca. 1.2 times their length . . . . . ***T. miocenicus*** Sturm & Mendes, 1998 [Dominican amber (ca 20 MY)]
4. Pedicellar apophyses short and blunt. Male P II with typical coxa. Antennae very elongate, longer than body. Adult specimens long ca. 4.5 mm. Female unknown . . . . . ***T. malayanus*** Silvestri, 1916 [Sumatra, Termitophile?]
– Pedicellar apophyses absent. Male P II with modified coxa. Antennae shorter than body. Adult specimens clearly bigger or much smaller, cavernicolous 5
5. Adult specimens small, 3.0-3.6 mm long. Male coxa II with very large round, outer complex sensillum, and a protruding, more distal knob, with numerous short thin cilia and 10-15 strong, erect setae. Paramera exceeding half stylets IX length, apically with clear subdivision. Ovipositor exceeding stylets IX by ca. 1.5 times their length . . . . . ***T. anomalocoxa*** n. sp. [Southern Thailand, Troglobiont]
– Adult specimens much larger, 5.4-7.1 mm long. Male coxa II with a much smaller complex sensillum and a tuft of thin ciliate setae. Paramera very short, reaching 1/3 only of stylets IX, their apical area not clearly subdivided. Ovipositor exceeding stylets IX by their own length . . . . . ***T. bedosae*** n. sp. [Northern Thailand, Troglobiont]

Allotrinemurodes n. gen.

Type-species : *Allotrinemurodes thai* n. sp.

Description – Body thin and long, delicate. Scales absent, pigment lacking.

Head with setae and macrochaetae, antennae elongate wanting special features. Mandibles with well developed incisive and molar areas. Maxillae with similarly long galea and lacinia, the former with 2 apical conules, the latter with prostheca, its apical tooth thin and long, the preapical short and acute; maxillary palp short, labium and labial palp without special characteristics.

Nota as usual, with setae and macrochaetae. Legs well developed, with numerous spines; tarsus 4-segmented, praetarsus with 2 smooth claws and lacking empodium.

Urotergites like nota, without peculiar features, X short.

Urosternites entire, setose; stylets on III-IX, vesicular structures restricted to VII pseudovesicles. Subgenital plate big, subtriangular. Ovipositor spindle-shaped and relatively short, gonapophyses typical.

Terminal filaments without specialized chaetotaxy.

Male unknown.

Etymology – From the Greek, *allos*, other, distinct, and *Trinemurodes*, a genus described by Silvestri (1916).

Discussion – *Allotrinemurodes* n. gen. seems particularly close to *Trinemurodes* (Silvestri, 1916), also devoid of empodial claw, but is distinct on account of complete lack of eversible vesicles (only pseudovesicles VII exist). It is certainly also close to *Trinemura* (Silvestri, 1908b) with vesicular structures also reduced, but is easily distinguishable due to incomplete praetarsus.

Relatively to keys proposed for the Nicoletiidae genera (Smith 1988: 142), new genus enters point 5 that will be changed as follows:

5. Tarsi with 2 claws 5A
– Tarsi with 3 claws 6
5A. Vesicular structures on abdominal segments II-VII . . . . . ***Trinemurodes*** Silvestri, 1916
– Only pseudovesicles VII present . . . . . ***Allotrinemurodes*** n. gen.

Allotrinemurodes thai n. sp.

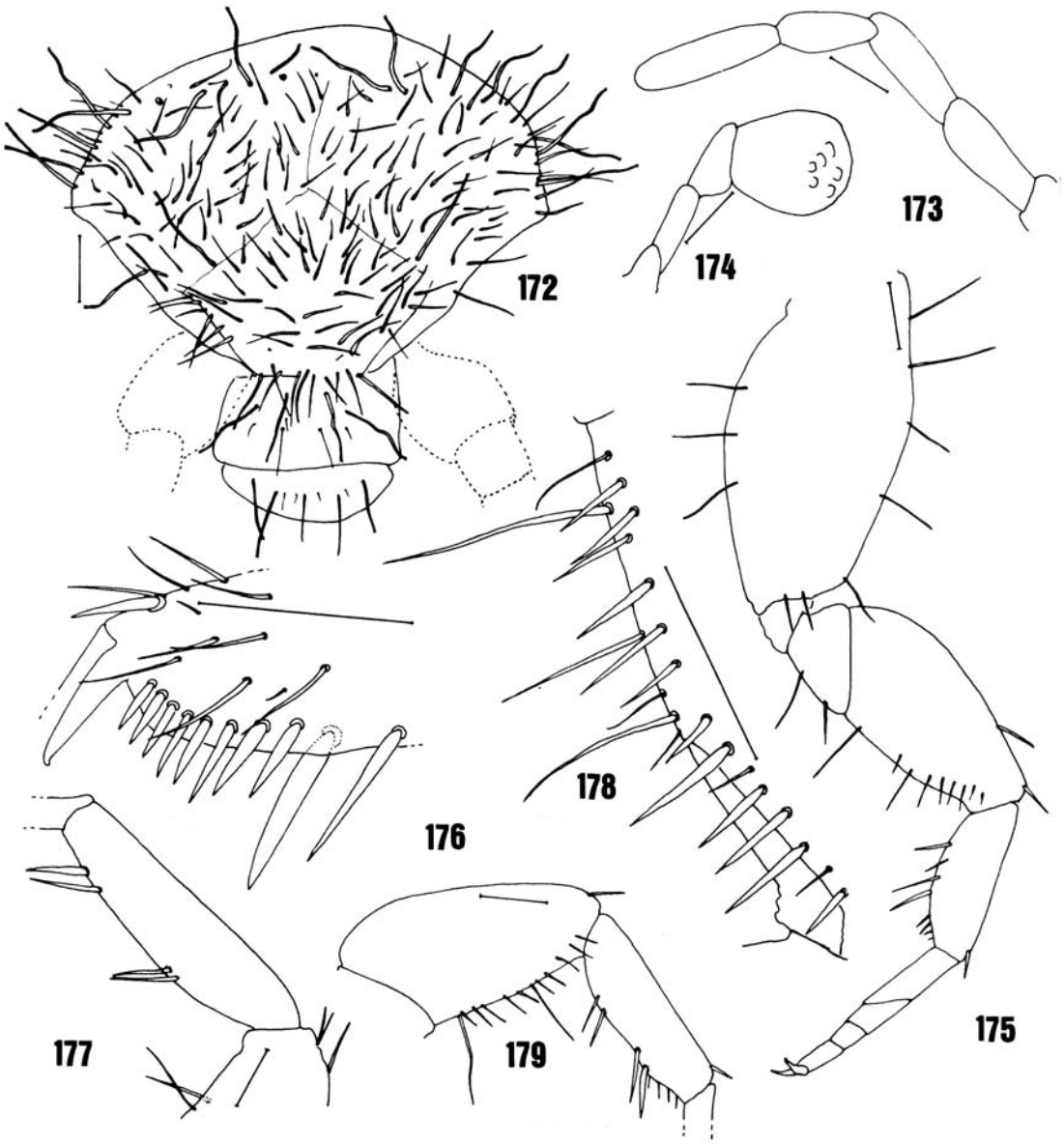
Type-specimen – Holotype ♀: Thailand: Chiang Mai Province. Doi Inthanon N. P.: Mae Ya, 6 700 m, coll. ?, 11/X/1981 (UZM)

Description – Body length: 5.1 mm; thorax length: 1.3 mm; thorax width: 0.9 mm; antenna length: preserved part of 3.4 mm; cercus length: 1.9 mm; total body length: 7.4 mm. Body long and thin, without scales and lacking pigment.

Head as in fig. 172, wider than long and with setae and macrochaetae. Mandibles typical, asymmetric, with equally developed incisive and molar areas. Galea as long as lacinia, former with 2 apical conules, lacinia with prostheca, preapical tooth much smaller than apical one; maxillary palp (fig. 173) delicate, apical article ca. 1/3 longer than preceding and 4 times longer than wide; labium widened, typical, labial palp (fig. 174) with apical article ovoid, not specially longer than wide.

Thorax much longer than wide, about 1/4 of body length; nota with setae and macrochaetae, their posterior border straight. Legs as in figs. 175-182; tibia I (figs. 175, 176) half long as tibia III (fig. 177), with numerous outer distal short spines, femur I (figs. 175, 178) with inner distal ventral row of thin, stiff, acute setulae; tibia II (figs. 179, 180) with less abundant outer distal spiniform setae, tibia III (figs. 178, 181) with 1-2 spines only; praetarsus (fig. 182) simple, lacking empodium, lateral claws smooth, wanting microtrichia.

Urotergites without special features, X badly damaged, though with 2+2 strong posterolateral macrochaetae.

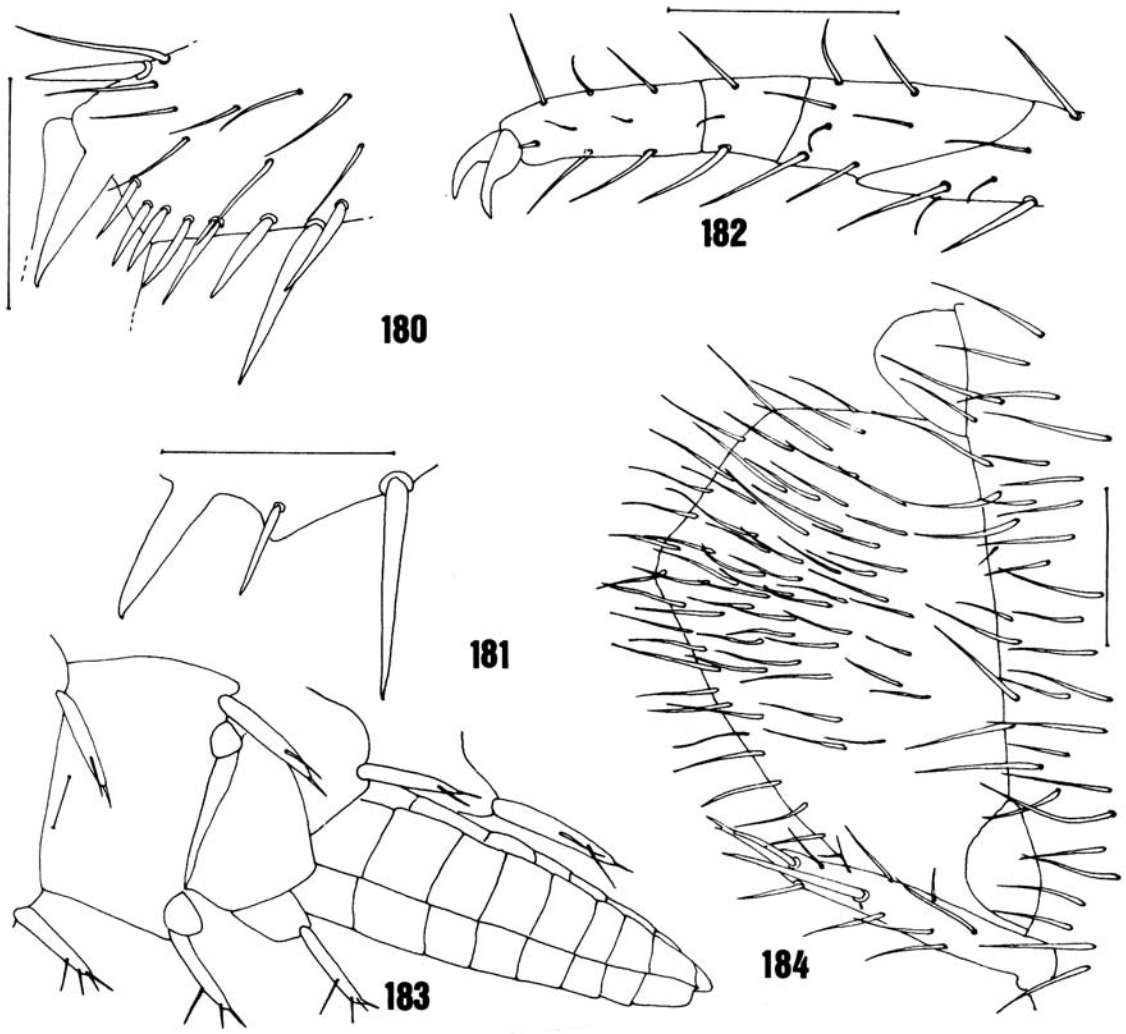


Figures 172-179
Allotrinemurodes thai n. gen. n. sp. ♀. – 172, head. – 173, maxillary palp. – 174, labial palp. – 175, P I. – 176, *ibid.*, detail of outer distal tibia. – 177, tibia of P III. – 178, P I femur, inner ventral. – 179, P II. (Scales: 0.1 mm)

Urosternites I-VII entire; stylets on III-IX, vesicular structures as reported on genus description, restricted to VII pseudovesicles (fig. 183). Subgenital plate (figs. 183, 184) subtriangular, much wider than long. Ovipositor short, exceeding stylets IX by no more than their own length; gonapophyses with 8 divisions, lacking peculiar features.

Terminal filament and cerci not modified.
Male unknown.

Etymology – The new species is named after its geographical origin.



Figures 180-184
Allotrinemurodes thai n. gen. n. sp. ♀. – 180, apex of tibia of P I. – 181, *ibid.*, of P III. – 182, tarsus of P I. – 183, ventral posterior abdomen. – 184, urosternite VII and subgenital plate. (Scales: 0.1 mm)

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