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Comité de lecture

Il est constitué en outre du président de la Société suisse de Zoologie, du directeur du Muséum de Genève et de représentants des Instituts de zoologie des universités suisses.

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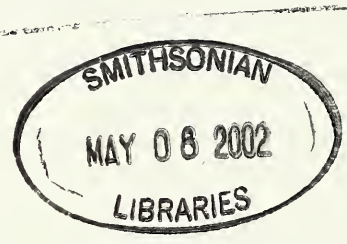

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Smodicinodes schwendingeri sp. n. from Thailand and the first male of *Smodicinodes* Ono, 1993, with notes on the phylogenetic relationships in the tribe Smodicinini (Araneae: Thomisidae)

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***Smodicinodes schwendingeri* sp. n. from Thailand and the first male of *Smodicinodes* Ono, 1993, with notes on the phylogenetic relationships in the tribe Smodicinini (Araneae: Thomisidae). -** A new species of the enigmatic genus *Smodicinodes* Ono, 1993 is described from a single male from Thailand. *Smodicinodes schwendingeri* sp. n. is characterised by the presence of strong, sclerotized tubercles on the prosomal crest and by an oval opisthosoma. Relationships within the tribe Smodicinini are discussed; *Smodicinodes* Ono, 1993 and *Parasmodix* Jézéquel, 1966 may be regarded as junior synonyms of *Smodicinus* Simon, 1895.

Key-words: *Smodicinodes* – *Parasmodix* – *Smodicinus* – Smodicinini – Thomisidae – Araneae – tropical montane forests – Thailand.

INTRODUCTION

The Thomisidae, commonly called crab spiders because of their crab-like appearance and ability to move side-ways, is the sixth largest spider family. It includes 2007 described species in 165 genera (Platnick, 2001), with many more species remaining to be described. Crab spiders are normally sit-and-wait predators and do not build webs. They are mainly active during the day and, with the help of cryptic colour, large body size, strong front legs and potent venom, are very successful predators. Not surprisingly, they are an important component of terrestrial ecosystems (Riechert, 1974). As predators of agricultural pest, thomisids play an important role in natural pests control (Young & Edwards, 1990; Wise, 1993; Uetz *et al.*, 1999).

However, the exact taxonomic limits of this large family remain an unresolved problem. This may be due to the fact that most taxonomic work is based on Holartic species, although thomisid diversity is predominant in tropical habitats (Benjamin, 2000a). See for example the inference of relationships of thomisids in the study on *Misumena vatia* by Loerbroks (1984). Furthermore, tropical habitats are in the process of being destroyed and there is an immediate need for intensifying taxonomic studies of tropical species.

Ono (1988) erected the tribe Smodicinini [Original name Smodicini, incorrectly spelled (ICZN Article 32.5.3.1): the stem of *Smodicinus* Simon, 1895 is Smodicin-, together with the tribe suffix -ini, the taxon name should read Smodicinini] to

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accommodate the monotypic genera *Smodicinus* Simon, 1895 and *Parasmodix* Jézéquel, 1966, to which he added the genus *Smodicinodes* in 1993 (Ono, 1993). Smodicinini have a rather peculiar habitus characterized by prosomal modifications. The posterior part of the carapace is raised and sclerotized to from a crest, which is furnished with four to six tubercles with strong seta (Jézéquel, 1966: figs 15, 19; Dippenaar-Schoeman, 1980: figs 6, 7; Ono, 1993: figs 1, 2). These spiders also have a clypeus with distal projections (Fig. 1; Jézéquel, 1966: fig. 19) and the male palpal cymbium has a dorsal outgrowth (do in Figs 3, 4; Jézéquel, 1966: fig. 22a, b). Smodicinini are supposed to live in close association with ants (Lessert, 1943; Dippenaar-Schoeman, 1980; Ono, 1993) but no observations on their behaviour are known.

A recent collection in Doi Chiang Dao Wildlife Sanctuary, Chiang Mai Province, Thailand, revealed the presence of a new species of this enigmatic genus. Unfortunately only a single male was collected, making a detailed study of character systems other than genital morphology unpractical. The type species of the genus, *S. kovaci* Ono, 1993, is from Selangor, West Malaysia, and it is only known from a single female specimen.

In this contribution to thomisid taxonomy a second species and the first male of the monotypic genus *Smodicinodes* Ono, 1993 is described and phylogenetic implications and the monophyly of *Smodicinodes* is discussed.

METHODS

Structures were examined in temporary mounts embedded in glycerin. All drawings were made with a Nikon Labophot-2 and a Nikon SMZ-U microscope with drawing tube. The methods are described in detail in Benjamin (2000b). Measurements are in mm. The specimen examined is deposited in the "Muséum d'histoire naturelle, Genève" (MHNG). Abbreviations used in the text and figures: AER anterior eye row; ALE anterior lateral eyes; AME anterior median eyes; do dorsal extension of the cymbium; e embolus; MOA-WA anterior width of median ocular area; MOA-L length of median ocular area; pe proximal extension of the cymbium; PER posterior eye row; PLE posterior lateral eyes; PME posterior median eyes; rta retrolateral tibial apophysis; vta ventral tibial apophysis.

TAXONOMY

Smodicinodes Ono, 1993

Type species: By original designation, *S. kovaci* Ono, 1993, from Selangor, West Malaysia.

Diagnosis: See Ono (1993) and discussion.

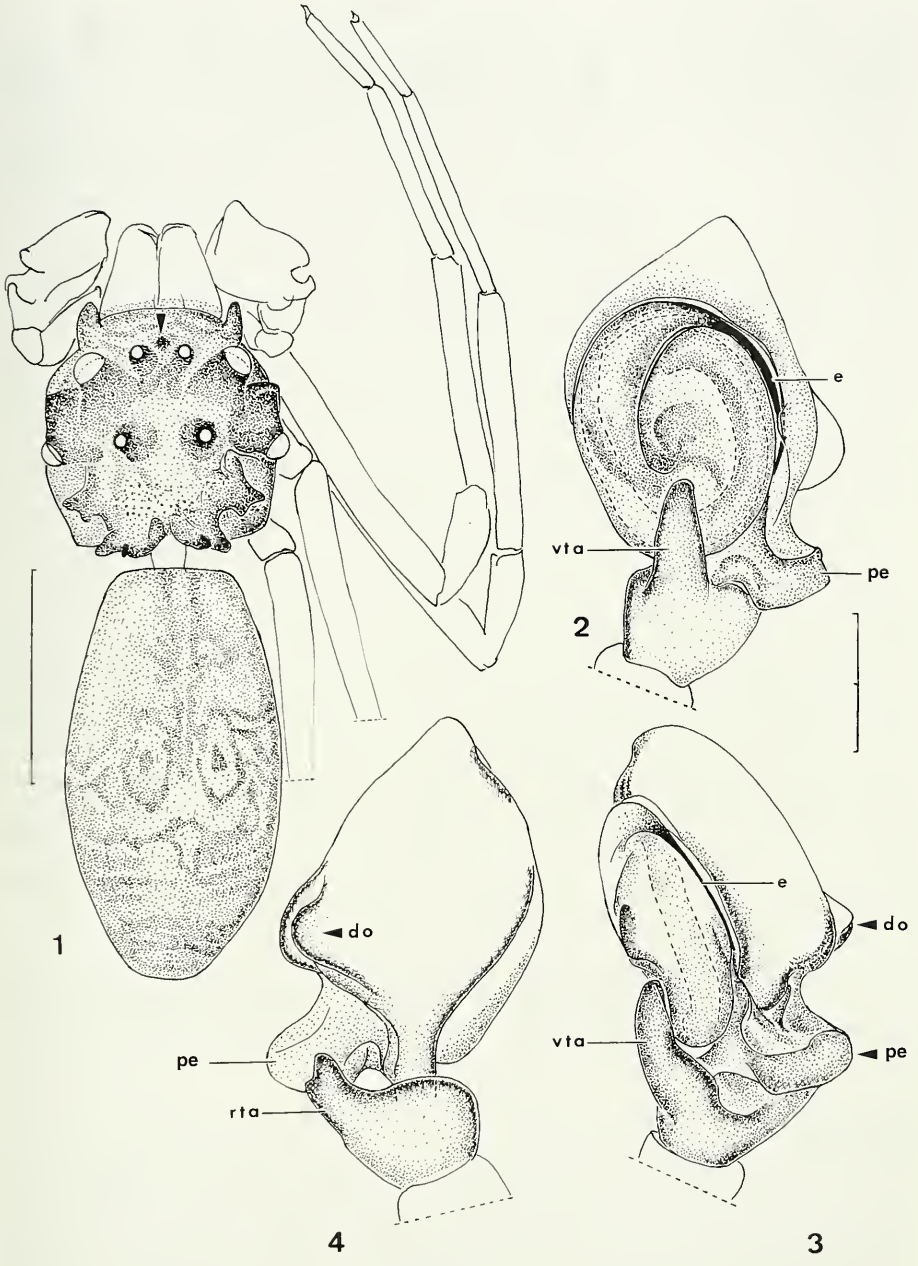
Composition: Two species; *Smodicinodes kovaci* Ono, 1993 and *S. schwendingeri* sp. n.

Phylogenetic relationships: Unknown.

Smodicinodes schwendingeri sp. n. Figs 1-4

Holotype ♂: Thailand, Chiang Mai Province, Doi Chiang Dao Wildlife Sanctuary, 1060 m, 1995-1996, leg. S. Gardner (MHNG).

Etymology: The specific name is a patronym in honor of my former lecturer Peter Schwendinger who made the type specimen available for study.



FIGS 1-4

Smodicinodes schwendingeri sp. n. 1. Habitus of male holotype, dorsal view. 2. Male palp, ventral view. 3. Ditto, ectal view. 4. Ditto, dorsal view. Abbreviations: do dorsal extension of cymbium; e embolus; pe proximal extension of cymbium; rta retrolateral tibial apophysis; vta ventral tibial apophysis. Scale line: 0.2 mm (2-4), 1.0 mm (1).

Diagnosis: *Smodicinodes schwendingeri* sp. n. is distinguished from *S. kovaci* Ono, 1993 by the strong, sclerotized tubercles of the prosomal crest. *S. kovaci* possesses strong setae surrounded by much less developed tubercles, cf. Ono (1993: fig. 2). *S. kovaci* has an elongated opisthosoma with parallel borders, whereas in *S. schwendingeri* sp. n. it is oval. *S. schwendingeri* sp. n. can be distinguished from *Smodicinus coroniger* Simon, 1895 by the presence of a tubercle between the AME, by the absences of tubercles between AME and ALE and by the oval opisthosoma. *Parasmodix quadrituberculatus* Jézéquel, 1966 differs from *S. schwendingeri* sp. n. by the longer dorsal extension of the cymbium, tapering to a fine, sclerotized hook.

Description: Total length 3.0; prosoma length 1.1, width 0.7; opisthosoma length 1.8. Leg I: femur 1.6, patella 0.6, tibia 1.2, metatarsus 1.0, tarsus 0.4. Colouration and markings of the specimen preserved in alcohol: prosoma dark brown, sides darker; eyes surrounded by black rings; ventrally invariably brown; palps dark brown. Opisthosoma dark brown to black, centre yellow, folium as in Fig. 1. Legs unpigmented except for black lateral markings (possibly green in live specimens). Prosoma and opisthosoma with fine colourless hairs. Prosoma ventrally broad-based, projecting upwards. AER recurved, PER slightly recurved. All eyes on distinct tubercles; ALE and PLE tubercles being the largest. PLE tubercles projecting laterally away from prosoma. AME ≤ PME< PLE ≤ ALE, MOA-WA two-times that of MOA-L. Prosoma with four pairs of projections, the two posterior ones bifurcate, and with a single projection between AME (see arrow in Fig. 1). The projections may have carried strong spines, which were presumably lost in the holotype. Lateral sides of clypeus with a pair of anterior-directed projections (Fig. 1). Legs with a single spine on dorsal femur III and IV, otherwise spineless.

Palp (Figs 2-4): Tibia with stout, blunt ventral tibial apophysis (vta), retrolateral tibial apophysis (rta) bifurcate. Cymbium modified, with a proximal extension (pe) containing the embolus and a dorsal outgrowth (do); retrolateral tibial apophysis covered by proximal cymbial extension. Tegulum disk-shaped, without apophysis. Embolus with a wide base, tapering, winding half way around tegulum (Figs 2, 3).

Female: Unknown.

Distribution: Known only from the type locality.

Natural history: Collected from a tropical montane forest (label: dense evergreen hill forest). The only other known species of the genus was collected from the internode of a bamboo (Ono, 1993).

DISCUSSION

The descriptions of *S. schwendingeri* sp. n. and *S. kovaci* are based on single specimens of the opposite sex. The characters used to distinguish *S. schwendingeri* sp. n. from *S. kovaci* may thus be attributed to sexual dimorphism. However, the distance between the two type localities, the different habitats in which the types were found and the distinctive natural histories of the species justify the recognition of a new species. Nevertheless, the relationships of *S. schwendingeri* sp. n. and *S. kovaci* should be reassessed after the discovery of either the female of *S. schwendingeri* sp. n. or the male of *S. kovaci*.

The differentiation of the "sister" genera *Smodicinus* Simon, 1895, *Parasmodix* Jézéquel, 1966 and *Smodicinodes* is ambiguous. Likewise, the monophyly of *Smodicinodes* is unclear. Ono (1993) suggested the following diagnostic characters for *Smodicinodes*: long maxillae and labium, slender legs, presence of a clypeal tubercle, long opisthosoma. However, none of these characters is apomorphic for *Smodicinodes*.

Although the available information is minimal, it is reasonable to predict that *S. coroniger* and *P. quadrituberculatus* do possess elongated maxillae and labium. Both species have anteriorly flattened chelicerae and a clypeus that slopes forward, similar to individuals of *Smodicinodes* (Jézéquel, 1966; Dippenaar-Schoeman, 1980). Species of all three genera possess slender legs without spines, except for one or two dorsal spines on femora I-IV (Jézéquel, 1966; Dippenaar-Schoeman, 1980; Ono, 1993). The presences of a clypeal tubercle is also known in *P. quadrituberculatus*; see Jézéquel (1966). The only remaining relevant character is the elongated opisthosoma. If we consider *Smodicinodes* to be close to the Tamarini of the subfamily Thomisinae as suggested by Ono (1993), then outgroup comparison indicates that an elongated opisthosoma is plesiomorphic for *Smodicinodes*. Hence, all three genera of Smodicinini might be ill-founded taxa.

Thus, *Smodicinodes* is most probably paraphyletic and should be considered as a junior synonym of *Smodicinus*. The same can be said for *Parasmodix*. A single genus including all four species is supported by the following apomorphic characters: modified prosoma with spines; long maxillae and labium; slender legs without spines, except for one or two dorsal spines on femora I-IV; presence of a cymbial dorsal outgrowth (do in Figs 3, 4; Jézéquel (1966: fig. 22)). However, only a phylogenetic analysis would reveal the monophyly of that taxon. Thus, I refrain from effecting the new taxonomic combinations.

ACKNOWLEDGEMENTS

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Molecular identification of an endemic Alpine mammal, *Apodemus alpicola*, using a PCR-based RFLP method

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Molecular identification of an endemic Alpine mammal, *Apodemus alpicola*, using a PCR-based RFLP method. - The ability of a PCR-based restriction fragment length polymorphism (RFLP) analysis of the cytochrome *b* (mtDNA) to distinguish *Apodemus alpicola* from two other *Apodemus* species was investigated. The partial sequencing of the cytochrome *b* allowed the identification of one enzyme as being potentially diagnostic. This was supported by an analysis of 131 specimens previously identified using morphometric and/or allozymic data, indicating that the PCR-based RFLP method provides a rapid and reliable tool for distinguishing *A. alpicola* from its two co-occurring congenerics. The method is applicable to samples taken in the field for ecological studies, and could easily be adapted to the identification of museum samples.

Key-words: *Apodemus* - mtDNA - PCR - RFLP - identification.

INTRODUCTION

The species *Apodemus alpicola* Heinrich, 1952 is endemic to the Alps, often being found in sympatry with *A. sylvaticus* (Linnaeus, 1758) and *A. flavicollis* (Melchior, 1834). *A. alpicola* was originally considered as a high-altitude subspecies of *A. flavicollis* (Heinrich, 1951, 1952) and later described as a new species by Storch and Lütt (1989) based on morphological criteria. A biochemical confirmation was given by Vogel *et al.* (1991) and Filippucci (1992). In certain regions the overlap of the phenotypes is important (Yoccoz, 1992). Thus, the recognition of *A. alpicola* as a new species with some intermediate characteristics does not facilitate the identification problem, particularly when juvenile individuals are concerned.

Multivariate skull morphometrics separates 97 % of adult specimens (Reutter *et al.*, 1999). While this technique is indeed a good tool to identify museum material, it does not solve the problem of identifying juveniles and living individuals during

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field studies. Protein electrophoresis has proved to be more useful to distinguish the three *Apodemus* species without the need to sacrifice individuals and is applicable to young specimens (Reutter *et al.,* 2001). However, it requires to use fresh or frozen blood samples.

Although morphologic (Storch & Lütt, 1989; Spitzenberger & Englisch, 1996; Reutter *et al.,* 1999), karyotypic (Reutter *et al.*, in press) and allozymic studies (Vogel *et al.,* 1991; Filippucci, 1992; Filippucci *et al.,* 1996) have provided a new perspective on the systematics of *A. alpicola*, it does not solve the problem of the identification of living young animals in the field, a point that is important within the frame of population monitoring or ecological studies. Therefore, a technique is needed which is based on non-destructive sampling, small amounts of biological material, and which leads to a reliable identification of adult as well as young animals. A suitable candidate is the PCR-based restriction fragment length polymorphism technique (RFLP). This technique consists of three steps. First, a suitable part of the genome is amplified through polymerase chain reaction (PCR). Second, the PCR product is digested using endonucleases, which, for the purpose of species identification, should cut the amplified DNA fragment at different sites in the different species. Third, the digested DNA fragments are separated by electrophoresis and visualised (various staining protocols are available), revealing the restriction patterns. It is worth noting here that this technique requires only minute amount of DNA.

Previous surveys of total mitochondrial DNA variability have revealed that *A. sylvaticus* and *A. flavicollis* show much higher inter- than intraspecific variation (Tegelström & Jaarola, 1989; Michaux *et al.,* 1996, Michaux *et al.,* 1998). Furthermore, a recent analysis of cytochrome *b* sequences indicated that the divergence between *A. alpicola* and each of the two other species equals the divergence between *A. sylvaticus* and *A. flavicollis*, which is approximately 10 % (Martin *et al.,* 2000). Therefore, owing to the availability of cytochtome *b* sequences for various *Apodemus* species (Martin *et al.,* 2000), this gene was chosen to investigate the ability of mitochondrial DNA polymorphisms to discriminate *A. alpicola* from the other sympatric species. Such a technique could not only be used in the identification of living animals in the field, but also for museum specimens preserved in ethanol.

MATERIAL AND METHODS

Specimens Examined

Tissues samples (frozen liver or toe-clips) were obtained from a total of 131 specimens (46 *A. sylvaticus*, 45 *A. flavicollis*, and 40 *A. alpicola*) from 15 localities in Switzerland, France, Italy, Germany and Austria. The localities sampled (Fig. 1) cover more or less the range of the three *Apodemus* species in the alpine region. Sample sizes and locality names are indicated in Tab. 1. All specimens were assigned to species using skull morphology (Reutter *et al.,* 1999) and/or protein electrophoresis (Vogel *et al.,* 1991; Reutter *et al.,* 2001).

FIG. 1
Geographic distribution of the sampled localities.

TABLE 1
A survey of material examined (sampling localities and number of individuals). All specimens were previously identified using morphometric [(m)] and/or allozymic [(a)] methods.

Locality (map symbol)	*A. sylvaticus*	*A. flavicollis*	*A. alpicola*
Switzerland			
Gordevio TI (S1)		4 (a)	
Prosito TI (S2)	3 (a)		
Martigny VS (S3)		4 (a)	
Sanetsch VS (S4)	1 (a)	1 (a)	6 (a)
Bourg St. Bernard VS (S5)	1 (m)	2 (m)	2 (m)
Chur GR (S6)	10 (m)	10 (m)	
Haslital BE (S7)	3 (a)	1 (a)	2 (m)
Germany			
Garmisch (G)		6 (a)	
Austria			
Silbertal (A1)	1 (a,m)	2 (a,m)	9 (m)
Hohe Tauern (A2)		5 (m)	7 (m)
Italy			
Valle d'Aosta (I1)	7 (a,m)	1 (a)	3 (a,m)
Gran Paradiso NP (I2)	7 (m)	7 (m)	2 (m)
Vinschgau (I3)	8 (m)	1 (m)	5 (m)
France			
Morzine (F1)		1 (m)	
Mt. Cenis (F2)	5 (m)		4 (m)

DNA Extraction and Amplification

Genomic DNA was isolated from either liver, heart or kidney preserved in 80% ethanol following a salt/chloroform procedure modified from Miller *et al.* (1988) but with an additional chloroform/isoamylalcohol (24/1) extraction.

Available sequences (GenBank Accession Nos. AF 159395, AF 159392, and AF 159391) of rodent cytochrome *b* genes (Martin *et al.* 2000) were used to design primers that are specific to the genus *Apodemus*: CB-AF (5'-ATCAGACACAA-TAACAGCATT-3') and CB-AR2 (5'-GTTCTACTGGTTGACCTC-3'). These primers allowed the double stranded amplification of an 866 bp-fragment. The 25 µl reaction mixture contained the two primers (1 µM each), 2.5 mM $MgCl_2$, 0.25 mM each dNTP, 2.5 µl reaction buffer, 5 µl Q solution (Qiagen), and 1 unit Taq polymerase (Qiagen). The polymerase chain reaction (PCR) was performed on a thermal cycler UNO-Thermoblock (Biometra) and consisted, after 3 min denaturation, of 35 cycles of 93°C for 45 sec, 47°C for 45 sec, and 72°C for 1 min.

DNA Sequencing

The PCR products of 3 individuals from each of the three species were sequenced in order to identify restriction enzymes that would be potentially diagnostic, i.e. with interspecific but no intraspecific variability. PCR products were first purified using the Qiaquick purification kit (Qiagen) according to the manufacturer's instructions. The purified products were then sequenced with the Dye Mix 2.0 sequencing kit (Perkin Elmer). The reactions were carried out in a 10 µl volume consisting of 0.5 µM primer, 4 µl Dye mix, and 5.5 µl PCR product (which corresponds to 30-70 ng DNA). The sequencing reaction consisted, after 3 min denaturation, of 25 cycles of 96°C for 20 sec, 50°C for 15 sec, and 60 °C for 4 min. Sequences were then precipitated and run on a 6% polyacrylamide gel on an ABI 373 sequencer (Perkin Elmer). Each PCR product was sequenced using the two primers CB-AF and CB-AR2 in order to sequence both strands. The alignment of sequences and search for restriction sites were carried out using Sequencher 3.0 (Gene Codes Corp.).

Digestion with Restriction Enzyme

The enzyme *SpeI* was identified as being potentially diagnostic to discriminate *A. alpicola* from the other two species (see Results), and tested on 131 individuals. Each of these samples were analysed with *SpeI* according to the following protocol: 10 µl of the amplified DNA were digested in a 25 µl reaction mixture comprising 2.5 units *SpeI* (A//CTAGT) (Life Technologies) and 2.5 µl REACT®4, the digestion buffer, according to the manufacturer's instructions. The digested samples were subsequently run on a 1% agarose (BioRad) gel (120x200 mm, 150 ml) during 1-2 h at 120 V, and stained with ethidium bromide.

RESULTS

For each of the three species, three individuals taken from alpine populations were sequenced in order to identify restriction sites that are fixed within species and variable between species in the area of sympatry. A site cut by the enzyme *SpeI* was

found to meet these criteria. *SpeI* cleaved the amplified part of the cytochrome *b* gene at the position 723 into two fragments of 311 and 555 bp for *A. alpicola* (positions are given according to the standard human mtDNA numbering from Anderson *et al.*, 1981), while *A. flavicollis*, and *A. sylvaticus* remained both uncut. Hence, all individuals that showed two fragments on the *SpeI*-gel could be attributed to *A. alpicola*, and those that showed no fragmentation at all to *A. flavicollis* or *A. sylvaticus* (Fig. 2). The PCR-based RFLP protocol presented here indeed correctly discriminated 100 % of the *A. alpicola* individuals from the two other species in a sample of 131 wood mice previously identified using skull morphology and/or protein electrophoresis.

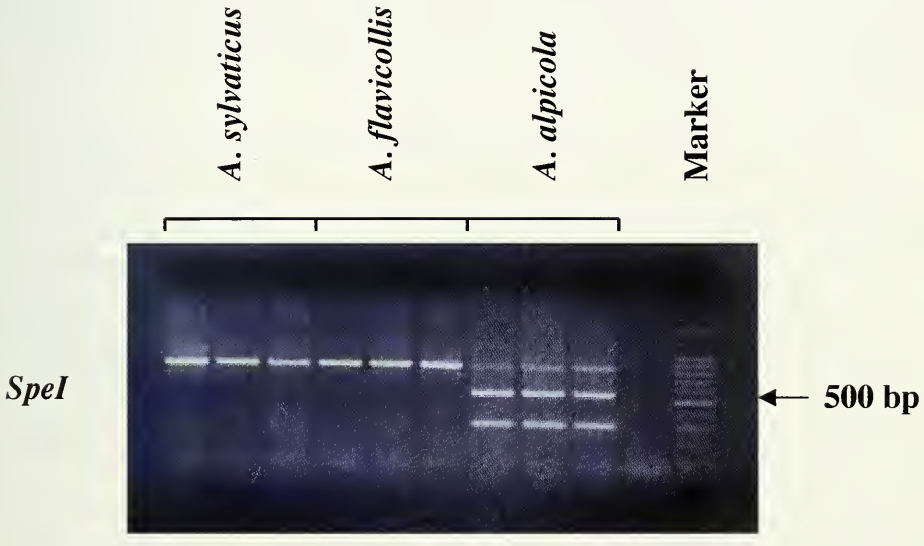

FIG. 2

Representative examples of fragment patterns after *SpeI* endonuclease digestion of an 866 bp fragment of the cytochrome *b* gene. *Apodemus alpicola* showed two fragments after *SpeI* digestions, *A. flavicollis*, and *A. sylvaticus* remained uncut.

DISCUSSION

To our current knowledge, the alpine mouse *Apodemus alpicola* is the only mammal endemic of the Alps. For promoting its conservation, a better knowledge of its status and ecology is needed. However, any progress is currently impeded by the problem of identification, which concerns the three sympatric species *A. sylvaticus*, *A. flavicollis* and *A. alpicola*. Our initial aim was therefore to provide mammalogists and ecologists with an identification technique based on non-destructive sampling that would permit to discriminate *A. alpicola* from the other two wood mouse species in

the field. The here presented PCR-based RFLP method fulfil this condition, allowing a reliable identification of *A. alpicola*.

One potential problem of the method is that, as seen on Fig. 2, a faint band of uncut DNA is visible in all cases. Rather than an excess of DNA, this probably results from the coamplification of a nuclear copy of the cytochrome *b*, which has lost the restriction site used in this study, together with the targeted original mitochondrial cytochrome *b* (Zhang & Hewitt, 1996). One may wonder whether such a pattern could be reversed in *A. alpicola* (a strong band of uncut DNA and hardly visible bands of digested DNA), leading to a pattern that would be difficult to interpret. First, this reversed pattern was never observed in our sample of 40 alpine mice. Second, each cell contains only two copies of each nuclear gene for several thousands copies of mitochondrial DNA. Because the PCR mechanism is actually linear (Rameckers *et al.*, 1997), the ratio of nuclear to mitochondrial copies should be of the same order of magnitude before and after PCR. Hence, the restriction pattern of alpine mice individuals should consistently show a faint band of uncut DNA together with two strong bands of cut DNA.

The main limitation of the RFLP methodology applied to species identification is the possibility that the considered polymorphism is not fixed. This problem can be circumvented by multiplying the number of polymorphisms surveyed. However, each endonuclease added to the protocol also adds costs to the analysis. An alternative is to try to validate the method using samples that are representative of the area where one wishes to apply it. We chose the second option, and the results are rather convincing: 100 % of specimens that originate from 15 localities covering about 75 % of the area of sympatry were correctly discriminated. The method is therefore robust to possible geographic variation, and, because it is based on PCR technology of mtDNA variation, it can be applied to slightly invasive (e.g. toe clipping, ear punch) or non-invasive (e.g. hair follicles) ecological samples (Taberlet *et al.*, 1999), as well as to museum specimens (Thomas *et al.*, 1990). However, because DNA extracted from museum samples is usually degraded, primers that lead to the amplification of a shorter piece of cytochrome *b* around the restriction site could be designed to increase the probability of successful amplification.

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Proportionsänderungen beim M_1 im Gebiss des mitteleuropäischen Dachses *Meles meles* (Mammalia, Carnivora)

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Changing proportions in M_1 in the European badger, *Meles meles* (Mammalia, Carnivora). - We measured M_1 trigonid- and talonid-length in 62 recent and 110 neolithic badger *Meles meles* mandibles with fully erupted teeth from the Swiss midlands. The results show an increase in the size of the cutting trigonid and a decrease in the length of the talonid within the last 5000 to 6000 years. This is somewhat in contrast to the overall pattern of evolution of these teeth in badgers (Melinae) in general and within the genus *Meles* in particular.

Key-words: badger - teeth - Swiss midlands - neolithic - recent - food.

EINLEITUNG

Der erste untere Backenzahn M_1 der Carnivora besteht in der Regel aus zwei Teilen, einem vorderen, schneidenden (Trigonid) und einem hinteren, mahlend/ kauenden (Talonid). Das Längenverhältnis zwischen diesen beiden Teilen des M_1 ermöglicht Hinweise auf die Nahrung einer Tierart: je mehr das Talonid dominiert, desto stärker scheint sich eine Art von der reinen oder dominierenden Aufnahme von Fleisch entfernt zu haben (van Valkenburg, 1989). Bei den Melinae hat sich das Verhältnis von Trigonid zu Talonid im Verlauf der Evolution deutlich zugunsten des Talonid verschoben (Petter, 1971). Auch für die relativ kurze Zeitspanne von maximal 8000 Jahren seit dem frühen Neolithikum lassen sich solche Anpassungen des Gebisses in Richtung "Allesfressertum" feststellen, wie Degerbøl (1933) bei Dachsen aus Dänemark zeigen konnte.

Analog zu Degerbøl bei den dänischen Dachsen, fanden Grundbacher *et al.* (1990) bei Dachsen aus dem schweizerischen Mittelland für rezente Tieren grössere Werte in mehreren Skelett-, Schädel- und Zahnmassen als für solche aus der Jungsteinzeit (Seeufer-Siedlung Twann). Eine solche Längenzunahme im Verlaufe von rund 5500-6000 Jahren ist auch bei der oberen Prämolarenreihe zu beobachten. Keine Längenzunahme dagegen weist der untere Molar M_1 auf. Da der P^4 mit dem M_1-Trigonid ein gut harmonierendes Kauwerkzeug bildet, stellt sich die Frage nach allfälligen Veränderungen der prozentualen Anteile von Trigonid und Talonid unter der Voraussetzung des gleich lang gebliebenen Zahnes.

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Beim Vorliegen solcher Veränderungen könnten auf der Basis der Kenntnis der heutigen ökologischen Stellung des Dachses allenfalls Hinweise auf seine damalige Ernährungssituation gewonnen werden. Zur Klärung dieser Fragen werden hier die Resultate von Zahnmessungen an jungsteinzeitlichen und rezenten Dachsen verglichen.

BEARBEITETE ZÄHNE

Folgende Unterkiefer aus dem bernischen Mittelland (Raum Biel-Neuenstadt-Bern-Thun-Langnau-Burgdorf) wurden bearbeitet:

1. Intakte Kiefer rezenter, als Unfallopfer und Hegeabschüsse in den Jahren 1967-1982 gesammelter Dachse (Sammlung Naturhist. Museum Bern, Lüps, 1984):
   - je 12 ♂ und ♀ im Alter von 6 - 12 Monaten, d.h. Tiere mit völlig entwickeltem, aber noch wenig abgenutztem Gebiss (Lüps & Roper, 1988a)
   - 21 ♂ und 17 ♀, mindestens 13 Monate alt (vgl. Lüps *et al.*, 1987, Grundbacher *et al.*, 1990)

2. Unterkiefer aus zwei neolithischen Stationen:
   - Seeberg Burgäschisee-Süd (ca. 3750 - 3700 v. Chr., Schibler & Suter, 1990): 16 Unterkieferäste (s. Jéquier, 1963)
   - Twann (ca. 3840 - 3530 v. Chr., Suter & Schifferdecker, 1986): 94 Unterkieferäste (vgl. Grundbacher *et al.*, 1990). Dieses Fundgut war durch die Archäologen in drei Gruppen, entsprechend den gefundenen Schichtpaketen, unterteilt worden.

Die Distanz (Luftlinie) zwischen den beiden neolithischen Siedlungen beträgt 40 km, diejenige zwischen Twann und Worb, dem geographischen Herkunfts-Zentrum der rezenten Tiere, 35 km.

METHODEN

Messungen (Abb. 1): Gesamtlänge des M_1, je die auf der buccalen Seite des Zahnes gemessene Länge von Trigonid und Talonid, und die grösste Breite dieser beiden Bereiche. Die buccale Seite wurde gewählt, weil bei alten Tieren mit stark abgekautem M_1 die Trennung zwischen Trigonid und Talonid lingual kaum mehr erkennbar ist, und weil die Messung von buccal bei rezenten Tieren bei intakter Unterkiefer-Oberkieferverbindung besser durchführbar ist. (Vergleichende Messungen auf der lingualen und buccalen Seite des Zahnes haben gezeigt, dass die Resultate in Bezug auf die vorgelegte Fragestellung betreffend Veränderungen der Talonid- und Trigonidlänge nur unwesentlich voneinander abweichen). Jeder Zahn wurde mit einer Schieblehre (Digitalanzeige: 1/100 mm) zweimal gemessen (für die Auswertung wurde der Durchschnittswert verwendet).

Bei den Schädeln der rezenten Tiere wurde durch Zufall festgelegt, welche Kieferhälfte vermessen werden sollte. Bearbeitet wurden die Daten aller neolithischen Kiefer, auch wenn bei einigen linken und rechten Mandibeln nicht ausgeschlossen werden konnte, dass sie von ein und demselben Tier stammen.

Die statistischen Berechnungen wurden mit Hilfe der Statistikprogramme Systat/Sygraph durchgeführt. Für die angewandten t-Tests wurde die Signifikanzschwelle bei $p<0.05$ festgelegt.

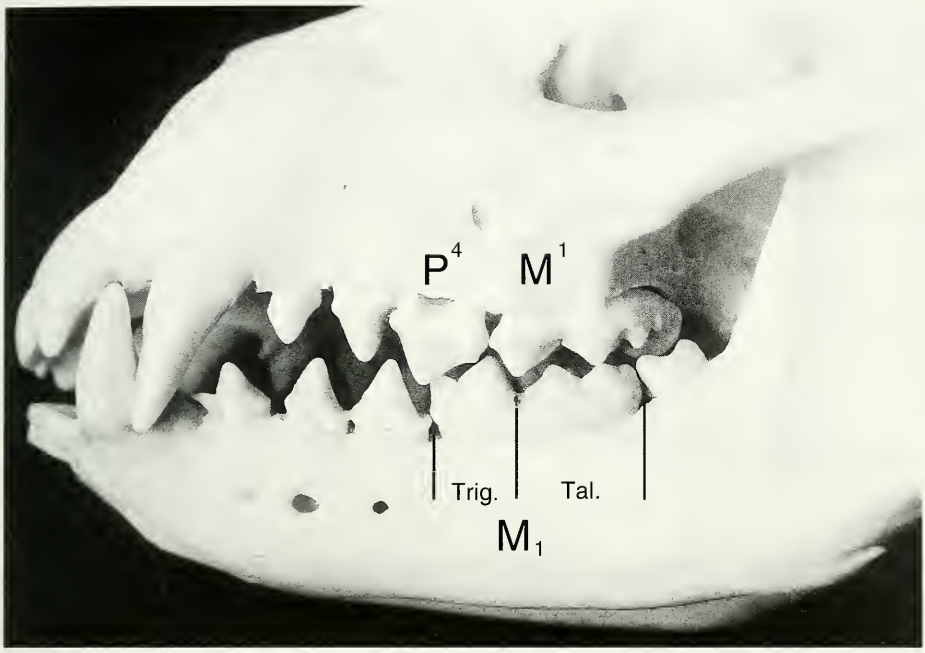

ABB. 1
Linke Vorbacken- und Backenzahnreihe (Ansicht buccal) eines rezenten männlichen Dachses, mit eingezeichneten Messstrecken am M_1.

RESULTATE

Weder bei den Zähnen der adulten, noch bei denjenigen der 6 bis 12 Monate alten rezenten Dachse liess sich bei einem der fünf Masse ein Geschlechtsdimorphismus nachweisen. Somit sind die Voraussetzungen gegeben, männliche und weibliche Tiere zusammenzufassen, und sie mit den neolithischen, deren Zusammensetzung hinsichtlich Geschlecht nicht bekannt ist, zu vergleichen. Das Fehlen von Unterschieden zwischen den Zahnmassen juv. und ad. Tiere zeigt, dass beide Serien als Gesamtheit den neolithischen Mandibeln, deren Alterszusammensetzung nicht bekannt ist, gegenübergestellt werden kann.

Signifikante Unterschiede ergaben sich zwischen den Durchschnittswerten der neolithischen und der rezenten Dachse bei der Länge des Trigonids (Zunahme 2.7 %), der Breite des Talonids (2.4 % breiter) und der Länge des Talonids (5.7 % kürzer als bei den neolithischen).

DISKUSSION

Das Fehlen von Unterschieden zwischen den Geschlechtern in allen fünf untersuchten Massen entspricht früheren Befunden am M_1 (Gesamtlänge, grösste Breite und Höhe: Lüps & Roper, 1988a; Gesamtlänge und Breite: Grundbacher *et al.*,

TAB. 1
Messwerte am M_1 für neolithische und rezente Dachse in mm.
(Student T-Test für unabhängige Stichproben)

		Dachse neolithisch	Dachse rezent	p	Zunahme/Abnahme %
Gesamtlänge	n	94	62	0.136	-
	$\bar{x}$	16.45	16.27		
	s	0.70	0.78		
Trigonid Länge	n	92	62	0.025	+2.7
	$\bar{x}$	8.26	8.49		
	s	0.69	0.45		
Trigonid Breite	n	93	62	0.165	-
	$\bar{x}$	5.23	5.29		
	s	0.31	0.23		
Talonid Länge	n	92	62	0.000	-5.5
	$\bar{x}$	9.01	8.52		
	s	0.63	0.54		
Talonid Breite	n	94	62	0.032	+2.4
	$\bar{x}$	7.40	7.58		
	s	0.52	0.48		

1990). Männliche Dachse aus dem schweizerischen Mittelland sind zwar schwerer und grösser als die Weibchen (auch in den meisten Schädelmassen), Hinweise auf eine unterschiedliche Ernährungsweise der Geschlechter konnten aber bisher weder durch Untersuchungen am Gebiss (Lüps & Roper, 1988b) noch mittels Nahrungsanalysen (vgl. Stocker & Lüps, 1984) gewonnen werden.

Dachse sind seit dem Neolithikum grösser geworden (Daten für Dänemark: Degerbøl, 1930, für das Schweizerische Mittelland: Clutton-Brock, 1990, Grundbacher *et al.*, 1990). Für den M_1 liess sich nur bei den dänischen Dachsen eine Zunahme nachweisen. Bei den schweizerischen Dachsen hat sich lediglich das Verhältnis zwischen Trigonid und Talonid verändert. Sowohl die zahlenmässig kleine und geographisch heterogene Serie Clutton-Brocks (neolithisch: Yvonand/Lac de Neuchâtel, 45 km westlich von Twann, rezent: Frankreich) wie auch die hier vorgelegten Daten belegen eine Abnahme der mittleren Talonid-Länge und eine leichte Zunahme der Talonid-Breite und der Trigonid-Länge.

Dieser Befund wirft Fragen hinsichtlich der Evolution des Dachs-Gebisses auf, die auf Kosten des P^4 zu einem grossflächigen M^1 geführt hat (Petter, 1971, Baryshnikov & Potapova, 1990). Der Metaconus des reduzierten P^4 steht dem M_1 -Trigonid

gegenüber, der Metaconus des M^1 opponiert zum Talonid des M_1. Zu dieser längerfristigen Entwicklung und derjenigen in viel kürzerer Zeitspanne in Dänemark (rund 10'000 Jahre, vgl. Kurtén, 1967) steht der hier dargestellte Schritt für die letzten 5-6000 Jahre in Widerspruch. Den Verhältnissen im Oberkiefer (Zunahme der Prämolarenreihe, Abnahme der M^1-Länge) entsprechen die Verhältnisse am M_1: Zunahme des Trigonids und Abnahme des Talonids.

Das heute aus vielen Teilen Europas bekannte Bild des Dachses als ein an das Leben in der Landwirtschaftszone gut angepassten Nahrungsopportunisten, mit einer hohen Bedeutung von Regenwürmern und pflanzlicher Nahrung, passt schlecht zu den anhand der Trigonid-Zunahme zu postulierenden Zunahme der Carnivorie.

Es bestehen verschiedene Erklärungsmöglichkeiten für diesen scheinbaren Widerspruch. 1) durch ein im Neolithikum noch stärker ausgeprägters Alles- oder Pflanzenfressertum als dies heute der Fall ist. 2) muss berücksichtigt werden, dass das zwischen 1975 und 1999 gewonnene Bild der Dachs-Nahrung im schweizerischen Mittelland (vgl. Stocker & Lüps, 1984, Ferrari, 1997, Fischer, 1997) aus einer Zeit stammt, in welcher der starke Strukturwandel in der Landwirtschaft bereits voll im Gange war (z.B. Verdreizehnfachung der Anbaufläche von Futtermais von 1955 bis 1990). Dieses intensive Ausnutzen eines durch die Landwirtschaft geprägten Angebotes könnte durchaus eine Frage von weniger als 30 Dachs-Generationen sein. 3) ein Hinweis auf eine zunehmende Carnivorie mag auch aus der durch den Vergleich von Alveolarmassen postulierten Grössenzunahme des Caninus zu entnehmen sein (Grundbacher *et al.*, 1990). Bei einer solchen Interpretation gilt es aber zu berücksichtigen, dass der Caninus nicht nur in Bezug auf die Ernährung, sondern auch unter dem Aspekt des bei Fähen und Rüden unterschiedlichen Territorial- und Sexualverhaltens zu betrachten ist (Lüps & Roper, 1988a).

Die Resultate weisen aber auch darauf hin, wie vorsichtig mit verallgemeinernden Aussagen wie „Grössenzunahme", „Tendenz zum Allesfresser" u.s.w. umgegangen werden muss: 1) Grössenveränderungen erfolgen oft nicht proportional für alle Körperteile; 2) das in den letzten Jahren gewonnene Bild einer Tierart muss nicht für Jahrzehnte oder Jahrhunderte Gültigkeit haben.

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A revision of the genus *Heteroparasitus* new status, with the description of *Heteroparasitus (Medioparasitus) athiasae* subgen. n., sp. n. from Spain and with a key to the genera of Pergamasinae (Acari, Gamasida, Parasitidae)

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A revision of the genus *Heteroparasitus* new status, with the description of *Heteroparasitus (Medioparasitus) athiasae* subgen. n., sp. n. from Spain and a key to the genera of Pergamasinae (Acari, Gamasida, Parasitidae). - The subgenus *Heteroparasitus* Juvara-Bals, 1976 is redefined and raised to genus rank. *Heteroparasitus (Medioparasitus) athiasae* subgen. n., sp. n. from Spain is described. Taxonomic problems concerning the genera *Leptogamasus* Trägardh, 1936, *Paragamasus* Hull, 1918 and *Ologamasiphis* Athias-Henriot, 1971 are discussed. The genus *Ologamasiphis* is divided into two subgenera *Ologamasiphis* s. str. and *Holzmannia* subg. n. *Valigamasus* Karg, 1993 syn. n. is a junior objective synonym of *Ernogamasus* Athias-Henriot, 1971. A key to the genera of Pergamasinae Juvara-Bals is presented.

Key-words: Acari - Gamasida - Parasitidae - Pergamasinae - *Heteroparasitus* - new subgenera - new species - taxonomy - key.

INTRODUCTION

The genus *Holoparasitus* Oudemans, 1936, widely distributed in the Palearctic region, presently includes 32 species. Additional species are likely to be found in areas of the northern hemisphere, which have not been adequately investigated.

Holoparasitus Oudemans was studied and revised by Oudemans (1936), Micherdzinski (1969), Holzmann (1969), Karg (1971, 1993), Juvara-Bals (1975) and Hyatt (1987). Holzmann (1969) erroneously used the name *Ologamasus* Berlese 1906 instead of *Holoparasitus* and recognized two subgenera: *Ologamasus* s. str. and *Ologamasiphis* Holzmann, the latter with dorsal and ventral shields separated in females. She included two species in *Ologamasiphis,* i.e.: *Ologamasus rotulifer* Willmann, 1940 and the new *Ologamasus minimus* Holzmann, 1969, but failed to designate a type species.

Micherdzinski (1969) followed Oudemans in using the name *Holoparasitus* and divided this genus into three species groups, i.e: the *H. calcaratus* group, the *H. pollicipatus* group and the *Ologamasiphis* group. He agreed with Holzmann's sub-

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genera but suggested that either *Ologamasiphis* should be raised to genus rank or the diagnosis of *Holoparasitus* should be extended. Karg (1971) modified the diagnosis of *Holoparasitus* to include the subgenus *Ologamasiphis* Holzmann. Athias-Henriot (1971a) considered *Ologamasiphis* as a distinct genus rather than a subgenus of *Holoparasitus*. She pointed out that the subgenus *Ologamasiphis* of Holzmann is unavailable because Holzmann did not designate a type species and designated *Pergamasus epigynalis* Willmann, 1940 as the type species of this genus.

Juvara-Bals (1975) distinguished two subgenera of *Holoparasitus*, *Holoparasitus* s.str. and *Heteroparasitus* Juvara-Bals, but considered *Ologamasiphis* as a separate genus rather than a subgenus of *Holoparasitus*. Hyatt (1987) reviewed and redefined *Holoparasitus* to include three subgenera, *Holoparasitus* s.str., *Ologamasiphis* and *Heteroparasitus*.

I have identified a new species from Spain in the Athias collection, which possesses a distinctive combination of characters that places it intermediate between *Heteroparasitus, Paragamasus* Hull, 1918 and *Ologamasiphis* Athias-Henriot, 1971. Consequently, *Heteroparasitus* is raised to genus rank and a new subgenus, *Medioparasitus* subgen. n., with *H. (Medioparasitus) athiasae* sp. n. as type species, is defined in the genus *Heteroparasitus*.

The confusions and the new data require a discussion of the generic and subgeneric concept of *Paragamasus* and *Ologamasiphis*.

The generic concept proposed by Juvara-Bals (1975) was the only one based on the differences in idionotal systems such as chaetotaxy, adenotaxy (gland pores), poroidotaxy (poroids), as well as on morphological characters used by other authors. The importance of these characters in taxonomy, as well as the notation employed for adenotaxy and poroidotaxy, was discussed for the first time by Athias-Henriot (1969, 1971b). Her observations have been further considered and the importance of idionotal systems in the taxonomy of the Gamasina and Ixodida has been recognized again (Krantz & Redmond, 1987; Johnston & Moraza, 1991; Klompen *et al.*, 1996; Lindquist & Moraza, 1998).

In the taxonomic part below I update the notation of the idionotal systems as applied to pergamasine mites, so as to redefine the genus *Heteroparasitus*, and I add additional characters to the previous descriptions of *H. tiroleusis* (Sellnick, 1968), *H. corouarius* (Karg, 1971) and *H. quadratus* (Witalinski, 1972). *Heteroparasitus* and *Medioparasitus* are integrated in the key of the subfamily Pergamasinae Juvara-Bals (1972) provided below.

MATERIAL AND METHODS

Most of the mites studied (69 specimens on 64 slides) are from the Athias-Henriot collection deposited in the Natural History Museum of Geneva (MHNG). The material was collected by Prof. H. Franz in Spain and Austria. These specimens are mounted in gum chloral and flattened, so that their idiosomal length and width cannot be measured. A few samples are from Germany and Poland (Witalinski leg., deposited in the Zoological Museum, Jagiellonian University, Krakow-ZMJU and in the MHNG) or Romania (Juvara-Bals leg., deposited in the MHNG). Some specimens

are from the Willmann collection deposited in the Zoologische Staatssammlung, Munich, Germany (ZSM).

Generally, the morphological terminology and the system of setal notation for the legs and palpi follows that established by Evans and Till (1979), the system of setal notation for the idiosoma follows that of Lindquist and Evans (1965), with modifications for the chaetotaxy of the opisthogaster as given by Lindquist (1994). The notation of adenotaxy and poroidotaxy follows the system of Johnston and Moraza (1991). Measurements of female structures were taken as follows: Epigynium height (h) is the midline from the tip of this shield to its posterior margin; epigynium basal width (b) represents the length of the posterior margin (Fig. 4D). The distance st-st' is the distance between the two setae of the pair inserted on the sternal and genital shields. Measurements are given in micrometers.

In the description of the opisthogastric shield (ventrianal shield auct.) only the ventral (opisthogastric) pairs of setae were considered, the three circumanal setae were excluded because they are constant among the pergamasine species. The male genital orifice of some genera of Pergamasinae, possesses a structure between the tritosternum and the genital lamina, which I name subgenital sclerite (Fig. 3C, see arrow).

DESCRIPTIONS

Genus ***Heteroparasitus*** Juvara-Bals, 1975, status nov.

Diagnosis. Dorsal shield of adults entire, podonotal region with 18-20 pairs of setae, opisthonotal region with 21-23 pairs of setae. Dorsal adenotaxy with 3 –5 pairs of gland pores, poroidotaxy with 15 pairs. Opisthogastric shield with 7 pairs of ventral setae. Peritrematal shield in females fused or not with dorsal shield; opisthogastric shield separated from dorsal shield; digitus mobilis (d.m.) of chelicera with 4 teeth. Holodorsal shield in males fused with opithogastric region. Femur II with setiform axillary process.

Subgenus ***Heteroparasitus*** s. str.

Diagnosis. Podonotal region with 19 pairs of setae, lacking z3, s2, s3, r1; poroidotaxy with 7 pairs of poroids (idj1, idj3, idr4, idz4, ids4, idj6 and idz6 which migrated onto opisthonotum); adenotaxy with 5 pairs of gland pores (gdj2, gdz5, gds4, gdr4, gdz6). Peritrematal shield fused with dorsal shield, peritrema with three gland pores along peritrematal groove (gp1, gp2, gp3) and with two poroids (ip1, ip2). Opisthonotal region of dorsal shield with 21 pairs of setae; poroidotaxy with 10 pairs of poroids; adenotaxy with one pair of gland pores. Idiosomal venter with gland pores gv1, gv2 and gv3 present. Gland pore gv2 double (with two glands opening through two pores on an ovoidal sclerotization). Presternal sclerite joined to sternal shield in female, two additional small triangular microsclerites remain separate; male with subgenital sclerite ellipsoidal, flanked by triangular presternal platelets. Tectum trifid. Gnathosomal sclerotization, in male, with cuticular break under hypostomatic seta 3; hypognathal groove large, with 12-14 denticled ridges, corniculi with protuberance on

inner face; palptrochanter seta v2 pilose, palpfemur with setae al1simple but with al2 stout and slightly pilose. D.m. of chelicera in females with usually 4 teeth (3 or 4 in *H. quadratus* according to Witalinski, pers. com.). Femur II in males with setiform axillary process, with an apophysis on genu and tibia and with short, simple setae pd1, pd2 on femur IV.

Type species: *Pergamasus tirolensis* (Sellnick, 1968) by original designation. Holotype: one female, collected from "Neuleutasch bei Seefeld, Tirol, 1300m über M. Lärchwiese, VIII. 1964" and deposited in Sellnick's collection, Zoological Institut and Museum, University of Hamburg, Germany.

Other species included: *Holoparasitus coronarius* (Karg, 1971), *Holoparasitus quadratus* (Witalinski, 1972).

Heteroparasitus tirolensis (Sellnick, 1968)

Material examined: AUSTRIA: Niederösterreich: A314, 1♀, 1♂, Wolfsbach near Admont, riverside forest, back-water of the river Enn, sifting of decayed tree stumps, 22.10.1943; X436, 1♀, sifting of fir litter under *Vaccinium myrtillus*, 800 m, road from Mitterdorf im Mürztal to Stallglam, 9.9.1944; X1551, 1♀, litter from *Ericetum* near northern slope, Manhartstal near Grossau, 15.9.1960; – Steiermark: T256, 2♀, fir woods, sifting of moss under *Vaccinium*, 1400-1500m, Seckhauer Zinken above Jörgerhütte, 4.6.1960; X1576, 1♂ forest litter, Lassnitzklamm near Deuschlandsberg, 14.7.1964 ; X1585, 1♀, 1♂, beech and fir litter, forest near the road Salba to Gaberl, 26.7.1964; X1626, 1♀, litter, beech woods, Koralpe, southern slope near Urbani chapel, 18.8.1965; X1575, 1♀, sifting of moss and litter, conifer woods, road to Trahütte and Glashütte, Weststeiermark, 11.7.1964. All this material is in MHNG-Athias collection. – GERMANY: 7♀, 6♂, 1 deutonymph, litter in a mixed forest (*Tilia*, *Fagus*, *Fraxinus*, *Abies*, *Picea*), Petersdorf near Regensburg, 7. 9. 1999, leg. W. Witalinski. Material deposited in ZMJU. – ROMANIA: Meridional Carpathians: 1♀, 1♂, deciduous forest litter, Berzeasca, Almaj Mountain, 15.8.1970, leg. I. Juvara-Bals. Two slides deposited in MHNG. – SLOVENIA: Carniola: 1♂, Radna Cave, 5.3.1918, leg. K. Absolon (no775, Biospeologica Balcanica). One slide deposited in ZSM- Willmann collection.

DESCRIPTION

Only the characters not mentioned in the previous taxa descriptions are noted.

Female

Idiosomal dorsum (Fig. 1B). Podonotal region with 19 pairs of setae (j1-j6; z1, z2, z4-z6, s1, s3, s4-s6, r3, r4, r5). Pore-like structures including 7 poroids and 5 gland pores. Opisthonotal region with 21 pairs of setae, Z2, S6 absent; adenotaxy with one gland pore, poroidotaxy including 10 pairs of poroids (idJ1, idJ2-double, idJ3, idJ4; idZ4, idS4, idZ5, idR1, idS7). Peritrematal region as in figure 1A.

Length of setae: j1 =48-54µm; other j setae about 48µm, setae of s series about 42µm, seta r5 =27-30µm, z1=17µm; setae on opisthonotum uniform, their lengths about 36-42µm.

Idiosomal venter. Sternal shield subrectangular, sternal setae moderately long, st1 =48µm, st2 =36µm, st3 =44µm; gland pore gv1 present. Paragynial shield with small ventral protrusion; metagynial sclerites short, rounded, with a median trapezoidal thickening (Fig. 2 B, C, see arrow). Endogynium a denticulate cup supported by metagynial and inner paragynial sclerites. Epigynium heptagonal, its apex roun-

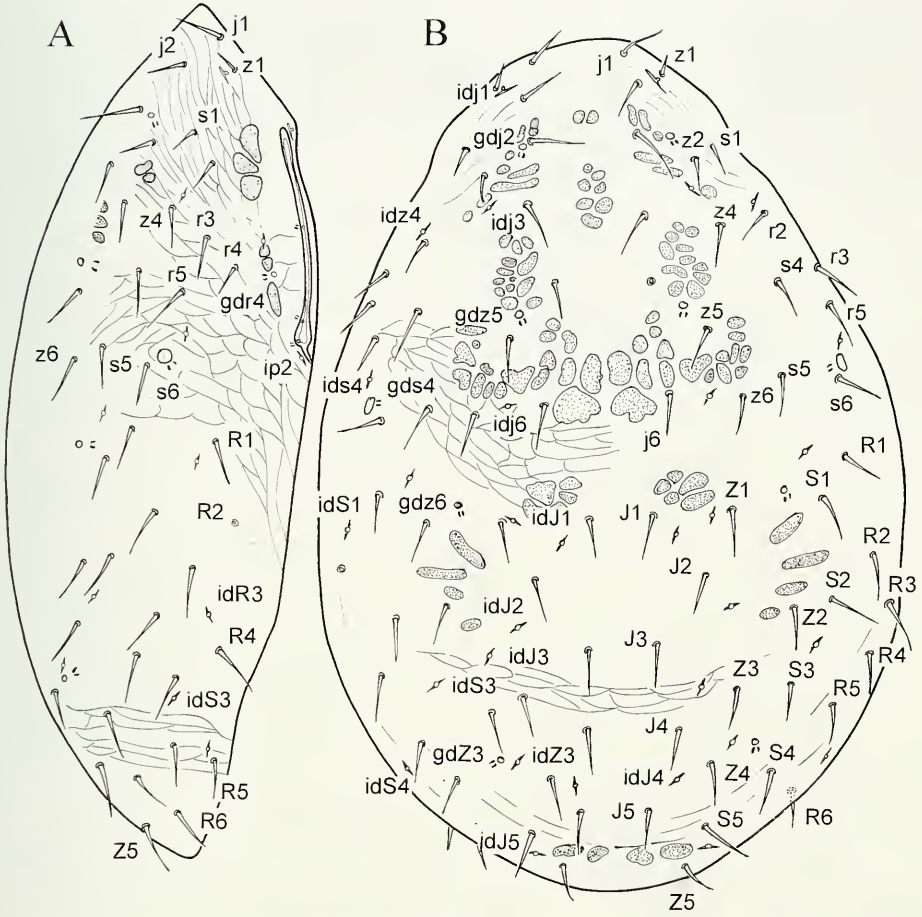

FIG. 1

Heteroparasitus tirolensis (Sellnick). Female: A-idiosoma, lateral view; B-idiosoma, dorsal view (modified after Juvara-Bals, 1975).

ded, with a little, terminal tip on its top; subapical structure conspicuous, hyaline wing-like, its anterior margin with median concavity and two lateral thickenings (Fig. 2A). Opisthogastric shield with 7 pairs of ventral setae and 3 circumanal setae; JV4, ZV5 lacking, JV5 usually inserted on soft cuticule, sometimes on opisthogastric shield. Adenotaxy with two gland pores, gv2 double and gv3; poroidotaxy including ivo2, ivo3 and ivp on soft cuticule. Length of setae: ZV3, JV5 =48μ, JV3 =30μm, others about 36μm.

Legs. Coxa II with palmate ridge situated anterolaterally; trochanter IV with setae pd1 and pd2 short, simple. Measurements: Tarsus I =150-172.5μm; tarsus IV = 184-195.5mm. Epigynium: height (h) =179-198μm, length of base (b) =172.5-207μm, st5-st5 '=115-147μm, h/b = about 1. Sternal shield: st1-st1'= 69-75μm, st2-st2' =87-96μm, st3-st3' =97-103μm.

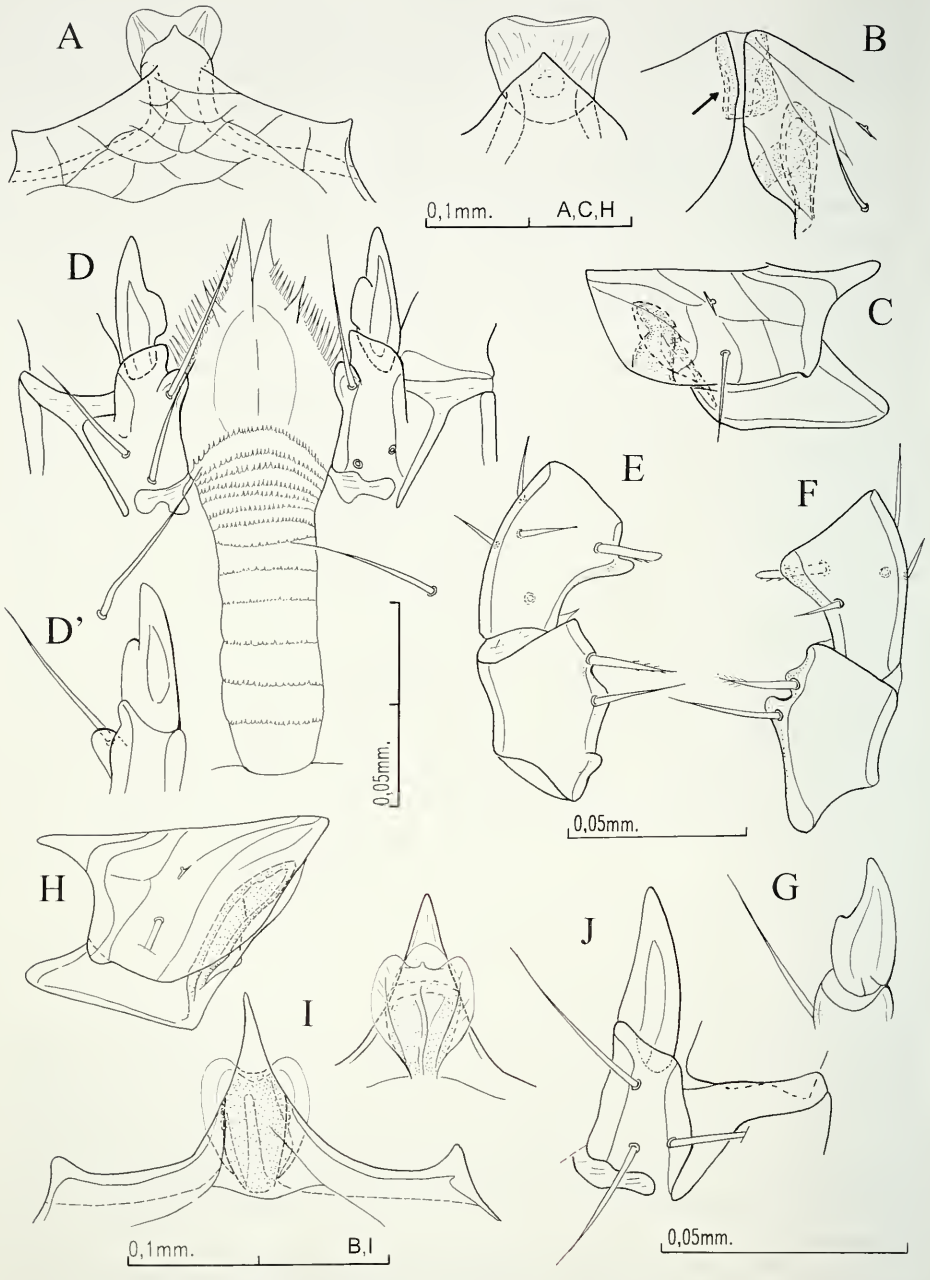

FIG. 2

Heteroparasitus tirolensis (Sellnick): female: A, B, C; male: D, E. *H. coronarius* (Karg): female: H-I; male: F, G. *H. quadratus* (Witalinski): J. Female: A, I- apex of epigynium and subapical structure; B, C. H-paragynia and metagynial sclerite. Male: D-gnathosoma, ventral, D'- corniculus, dorsal; E, F-palptrochanter and palpfemur; G, J-corniculus, ventral.

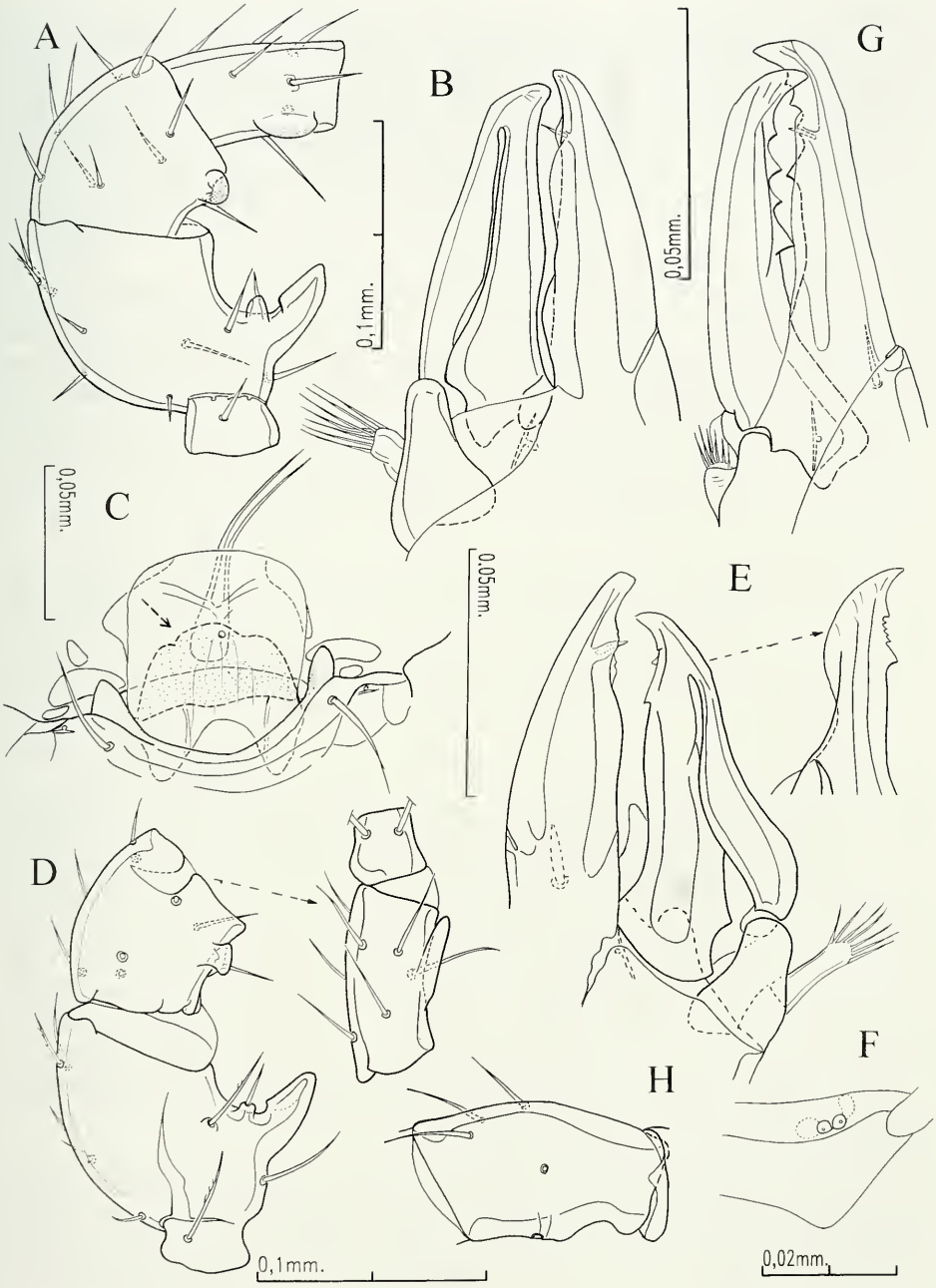

FIG. 3

Male: *Heteroparasitus tirolensis* (Sellnick): A, B. *H. coronarius* (Karg): C-F; H. *quadratus* (Witalinski): H. Female: *H. quadratus* (Witalinski): G. A, D- leg II femur, genu, tibia; C- genital lamina, anterior margin of sternal shield; H-trochanter IV; B, E, G-chelicera, paraxial view; F-opisthogastric glande pore gv2.

Male

Idiosomal dorsum. Idionotal systems as in female, setal lengths: j1 =36-42µm, j2 =48µm, s setae =30-35µm; setae on opisthonotal region 24 - 30µm.

Idiosomal venter. Sternogenital shield reticulated, with a marked convex sclerotized line behind second pair of sternal setae (st2). Genital lamina square, simple, with straight anterior margin and two lateral protuberances. An ellipsoidal sclerite behind genital lamina and between presternal sclerites and base of tritosternum. Genital lamina located in a concavity surrounded by prominent lobes. Sternal setae, st2, st3 length =24µm, st1 = 40µm; opisthogastric setae =24-30µm.

Gnathosoma. Tectum with three short prongs. Palptrochanter with proximal tubercle, v1 simple, v2 pilose, both setae inserted on small protuberances; palpfemur with elongated protuberance near seta al1 (Fig. 2E). D.m. of chelicera with one denticle (two in Romanian specimens), digitus fixus (d.f.) with slightly serrated masticatory ridge; arthrodial cuticule (membrane sensu Evans and Till, 1979) formed by paraxial brush-like and antiaxial setiform processes (Fig. 3B). Corniculi with median protuberance; another protuberance at base of hypostomatic seta 1 (Fig. 2D'); hypognathal groove with extension between corniculi, cuticular break below hypostomatic seta 3 (Fig. 2D).

Legs. Coxa I with denticulate ridge (Fig. 6N). Coxa II with palmate ridge anterolaterally (Fig. 6M). Armature of leg II (Fig. 3A): axillary process of femur with a seta, genu with medially rounded apophysis, and tibia with small blade-like apophysis. Trochanter IV with setae pd1 and pd2 simple and short.

Measurements: tarsus I =149.5-161µm, tarsus IV =172.5-184µm.

Remarks

H. tirolensis was described by Sellnick (1968) based on female specimens from Tirol (Neuleutasch bei Seefeld) and from Markenstein in the Wiener Wald.

Karg (1971) collected *H. tirolensis* adults of both sexes in Germany. He compared his material with *Ologamasus absoloni* Willmann, 1940 described from Slovenia (Carniola) (Biospeologica Balcanica, loc.775) and stated that the male which was originally described under *O. absoloni* is conspecific with the males of *H. tirolensis* from Germany.The female of *O. absoloni,* on which the original description is based (Willmann, 1940) belongs to a different species and is the type of *Holoparasitus absoloni* (Willmann, 1940). Karg (1971) briefly described the male and gave illustrations of the ventral part of the gnathosoma and the armature of the leg II. Juvara-Bals (1975) added some characters to the original description which supported the distinction of two subgenera in *Holoparasitus*.

Karg (1993) considered *H. tirolensis* to be rare in central Europe, with a preference for damp substrates, beech and alder litter. This species was recorded also from other habitats in Austria (Schmölzer, 1995), in Romania (Juvara-Bals, 1975), in Slovenia (Willmann, 1940) and in Poland near Krakow (Witalinski, pers. comm.).

Heteroparasitus coronarius (Karg, 1971)

Only the morphological characteristics not described or illustrated in the previous taxa descriptions are presented.

Material examined: AUSTRIA: Steiermark: A23, 2♀, 1♂ sifting of alder litter, near the Mühlauer river close to a waterfall, Mühlau by Admont, 20.4.1940; A278, 1♀, 1♂, sifting of decayed tree stumps, Leichenberg by Admont, southern slope, 1.11.1942; X582, 1♀, 1♂, sifting litter, beech woods, Damberg near Steyer, northern slope, 27.4.1946; – Burgenland: X1690a, 2♂, 1♀, beech litter, Mandelstein by Weitra, 1.10.1966; – Niederösterreich: X1649, 1♀, litter and decayed tree stumps, Buchenberg by Waidhofen near Ybbs, 18.5.1966.

All the slides are deposited in the MHNG-Athias collection.

Description

Female

Idiosomal dorsum. Length of setae: j1 = 48-50mm; podonotal setae 36-42µm; opisthonotal setae 24-36µm.

Idiosomal venter. Paragynia with small protrusion, metagynial sclerites slender, elongated (Fig. 2H). Epigynium heptagonal, its apex long, triangular, subapical structure round, sclerotized, covered by a fine, hyaline cuticle (Fig. 2I). Length of sternal setae about 92µm; opisthogastric setae about 30µm.

D.m. of chelicera usually with four teeth; one specimen (X582/Q272) with three teeth on one d.m. and four on the other.

Legs. Coxa II and femur IV as in male. Measurements: tarsus I = 147-161mm, tarsus IV = 177-184µm. Epigynium: h =180.5µm, st5-st5' =122µm, b = 149.5µm, h/b =1,21. Sternal shield: st1-st1' = 61µm, st2-st2' = 94.3µm, st3-st3' = 106µm.

Male

Idiosomal dorsum. Length of setae: j1 = 48-54µm, seta s1 =12µm, other s setae 24-36µm; setae on opisthonotum about 24µm.

Idiosomal venter. Genital lamina situated in a slight concavity bordered by two pronounced protuberances; its shape trapezoidal, with lateral corners folded, its anterior margin straight. Ellipsoidal sclerite between genital lamina and tritosternum with ribbon-like base (Fig. 3C). Sternogenital region reticulated, with marked line behind second pair of sternal setae, gland pore gv2 double (Fig. 3F). Length of sternal setae: st1 =42µm, st2 = 36µm, st3 =30µm; length of opisthogastric setae about 24µm.

Gnathosoma. D.m. of chelicera with 3-6 denticles, d.f. oligodont, some denticles beside pilus dentilis; arthrodial cuticle with brush-like process paraxially (Fig. 3E).

Palptrochanter with seta v1 simple and v2 pilose, both situated on rounded protuberances (Fig. 2F). Corniculi with inner protuberance (Fig. 2G).

Legs. Coxa I paraxially with a ridge formed by small and large denticles (Fig. 6K). Leg II: coxa with short rounded denticulated ridge anterolaterally (Fig. 6J); axillary process of femur with seta; genu with small trapezoidal apophysis medioventrally; tibia bearing long blade-like apophysis, its tip reaching distal margin of tibia; base of tarsus humped (Fig. 3D). Femur IV setae pd1 and pd2 simple and short, tarsus IV as in *H. tirolensis* (Fig. 6L).

Measurements: tarsus I =145-152µm; tarsus IV =165.6-177µm.

Remarks

Holzmann (1969) inadvertently indentified specimens found in litter of deciduous forest near Erlangen (Germany) as *Holoparasitus (Ologamasus) rotulifer* (Willmann,1940). On the base of Holzmann's descriptions and drawings Karg (1971) recognized that they belong to a new species, which he named *H. coronarius*. *Holoparasitus rotulifer* is another, valid species related to the *Holoparasitus* s.str. species, whose males are provided with an excipulum. Males of the related *H. tirolensis* and *H. coronarius* can be separated by the characteristics of the armature of leg II, the corniculi and the chelicera. The shape of the epigynial apex, which is triangular in *H. coronarius* and rounded in *H. tirolensis*, distinguishes females; other differentiating characteristics are the shape of the endogynium and of the metagynial sclerites. Karg (1971) thought that *H. coronarius* probably occurs in the litter of deciduous forest in Europe. Koehler (2000) found it in forest soil contamined with TNT in Harz, Germany. I have identified this species only in samples from Austria. The distribution of this species remains poorly known.

Heteroparasitus quadratus Witalinski, 1972

Material examined: POLAND: 2♀, 2♂ Myslenice near Krakow, Southern Poland, type locality, litter in a mixed forest, 10.11.1969, leg. W.Witalinski. Material deposited in MHNG.

Remarks

I studied the material from Poland, kindly send to me by W.Witalinski. The following observations and some measurements are added to the original description (Witalinski, 1972).

In the original description Witalinski noted only 3 teeth on the movable digit of the chelicera. Witalinski and myself checked this character in a greater number of females and found that the number varies between 3 and 4 teeth (Fig. 3G).

The male has the same sclerotization break under the corniculus as males of the other species included in this genus (Fig. 2J). Trochanter IV (Fig. 3H) bears a flat protuberance on its ventral side. The reticulated ridge of coxa I is formed by 3 large denticles above a line of 9 fine denticles (Fig. 6P); coxa II has a short ridge formed by 6-7 denticles (Fig. 6O).

Measurements. Male: tarsus I =138µm; tarsus IV =184-195µm. Female: tarsus I =145-150µm; tarsus IV =196µm; epigynium: h =196µm, b =176µm, h/b =I.I, st5-st5' =127-136µm; length of sternal shield setae 60µm.

Subgenus ***Medioparasitus*** subgen. n.

Type species: *Heteroparasitus (Medioparasitus) athiasae* sp. n., by present designation and by monotypy.

Diagnosis: Dorsum generally with long setae, their tips reaching alveoli of following row of setae. Podonotal region apparently with 20 pairs of setae, opisthonotal region with 23. Tectum triangular. Gland pore gv1 on sternal shield absent. Peritrematal shield of females united with holodorsal shield anteriorly and free posteriorly. Leg II of males with spurs only on femur and genu, femur IV with setae pd1 and pd2 short and pilose; subgenital sclerite with denticles.

Description. Characteristics of the idionotal systems cannot be properly observed because the specimens are mounted and the sclerocuticle is folded or crushed.

Idiosomal dorsum. Dorsal shield setae long, except for z1, s1, s2, their tips reaching following row; setae J5, Z4, Z5, S3, S4, S5 three times longer than the other one. Podonotal region, apparently with 20 setae (z3, r4 lacking); opisthonotal region with 23 setae, S2 and perhaps some submarginal setae (UR) absent. Adenotaxy: gland pores gdz5, gds4, gdZ3 present. Poroidotaxy: podonotum with 5 pairs of poroids, opisthonotum with only 7 poroids observable. Peritrematal shield of females free, gland pore gdr4 and ip2 opening on soft cuticule; two other gland pores, gp1 and gp3 located in peritrematal groove.

Idiosomal venter. Female sternal shield lacking gland pore gv1, opisthogastric shield with 7 pairs of ventral setae. Male with platelets surrounding genital lamina and subgenital sclerite.

Gnathosoma. D.m. of chelicera in females with 4 teeth; d.m. in males with row of 6-7 denticles, d.f. oligodont. Hypostome with short, fan-shaped internal malae. Tectum triangular.

Legs. Armature of leg II in males: tibia without spur, genu with one spur, and axillary process of femur very smal, bearing seta. Leg IV: femur with pd1 and pd2 small and pilose, tibia with seta pl1 stout and pilose, tarsus with seta pd2 very long.

Heteroparasitus (Medioparasitus) athiasae sp. n.

Type material: SPAIN: Sp408 slide J430 1♂, holotype; paratypes: 3♀, 3♂, Montes del Invernardero near Verin (Provincia Orense), Sierra de San Mamed, Campobecerros, sifting of litter near a stream, 24.7.1955 .

Other material: SPAIN: Sp42, 2♂, Ceiro de Mirador, Sierra de Luna near Algesiras (Andalusia), sifting of litter and humus under *Erica* sp., 28.2.1951; Sp211, 2♀, 1♂, surrounding of Pontevedra, Cuesta del Ralo Saluda, sifting of litter under *Cyprus*,1.7.1952; Sp483, 1♂, 1♀, Isela de Onc, Prov. Pontevedra, sifting of litter under *Ulex europaeus*, 4.8.1956; Sp485, 1♀. Near the road Gondomas-Tuy (Sierra de la Grora), Bayona, sifting of litter (*Quercus* sp. forest), 5.8.1956; Sp500, 2♀, surroundings of Ezaro, south of Cabo Fisterra, sifting of litter (*Quercus robur* forest), 15.8.1956; Sp571, 2♂, Sierra de Son (Leon) near San Feliz de las Lavanderas, Astorga, sifting of litter under *Quercus* and *Erica arborea*, 11.8.1957; Sp567, 3♀, 3♂, Rio Duerna valley, Molina Ferreda near Astorga, sifting of litter of *Quercus pyrenica* and *Erica arborea*, 10.8.1957; Sp579 1♂, 4♀ Near San Saturino (Lugo), sifting of litter under *Rubus*, 15.8.1957; Sp587 1♂, El Fito, West of Aviles, (Oviedo), sifting of litter under *Betula* sp., *Quercus* sp., 16.8.1957; Sp496, 6♂, 1♀, Sierra, north-west of Outes, near Noia (La Coruna), sifting litter, oak forest, 13.8.1956.

All the material is deposited in MHNG-Athias collection.

DIAGNOSIS

Adults of this species are readily recognized by the characters given for the subgenus. In females the peritrematal shield free posteriorly, the d.m of chelicera with 4 teeth and the ventrianal shield with 7 pairs of setae. The male's particularities are the shape of the subgenital sclerite, which is rectangular and denticulated, and the leg II with simple triangular spurs on femur and genu.

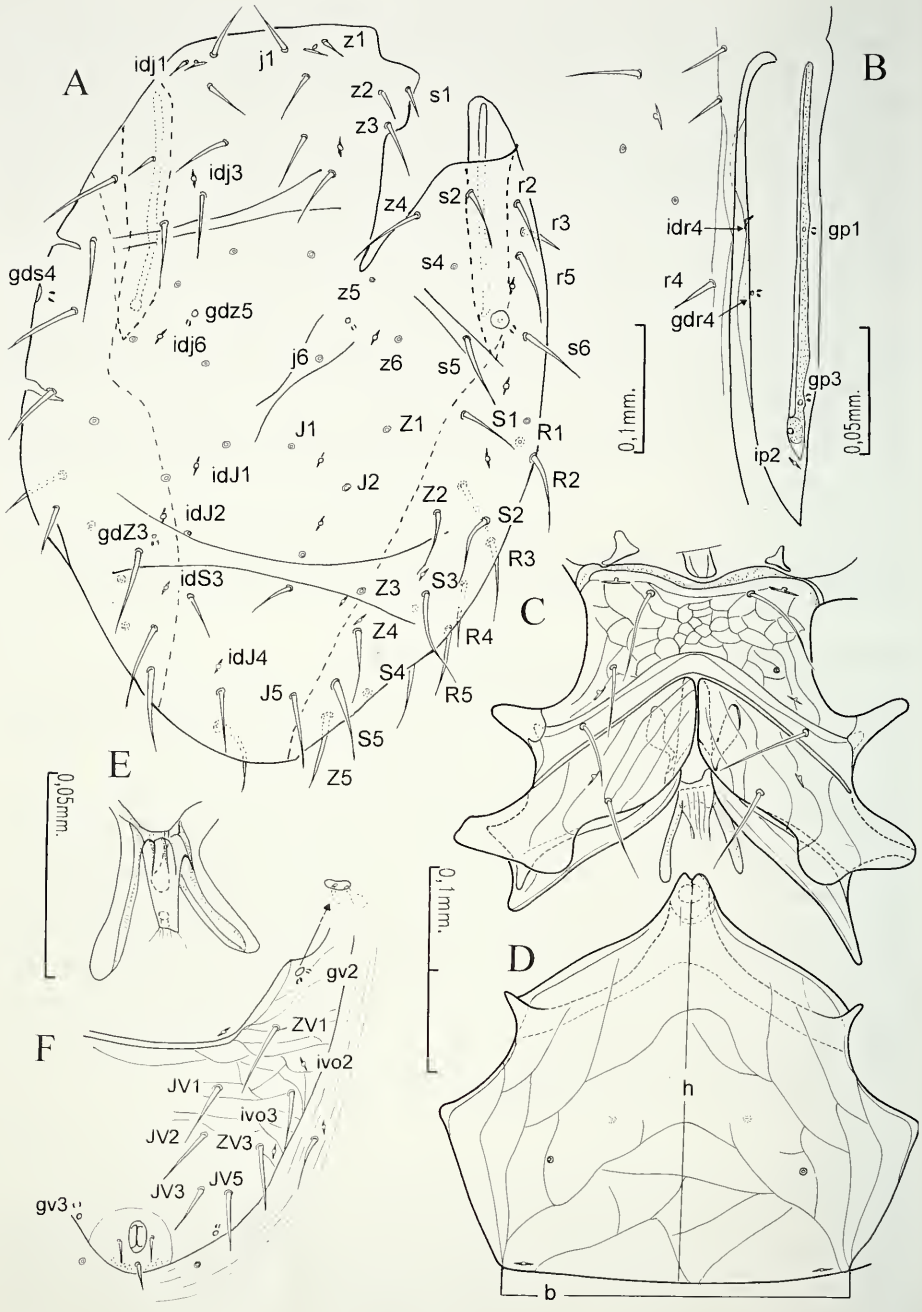

FIG. 4

Medioparasitus athiasae sp. n. Female: A-idiosoma, dorsal view; B-peritrematal region; C-sternal shield, paragynia and endogynium; D- epigynium; E- endogynium, F-opisthogaster.

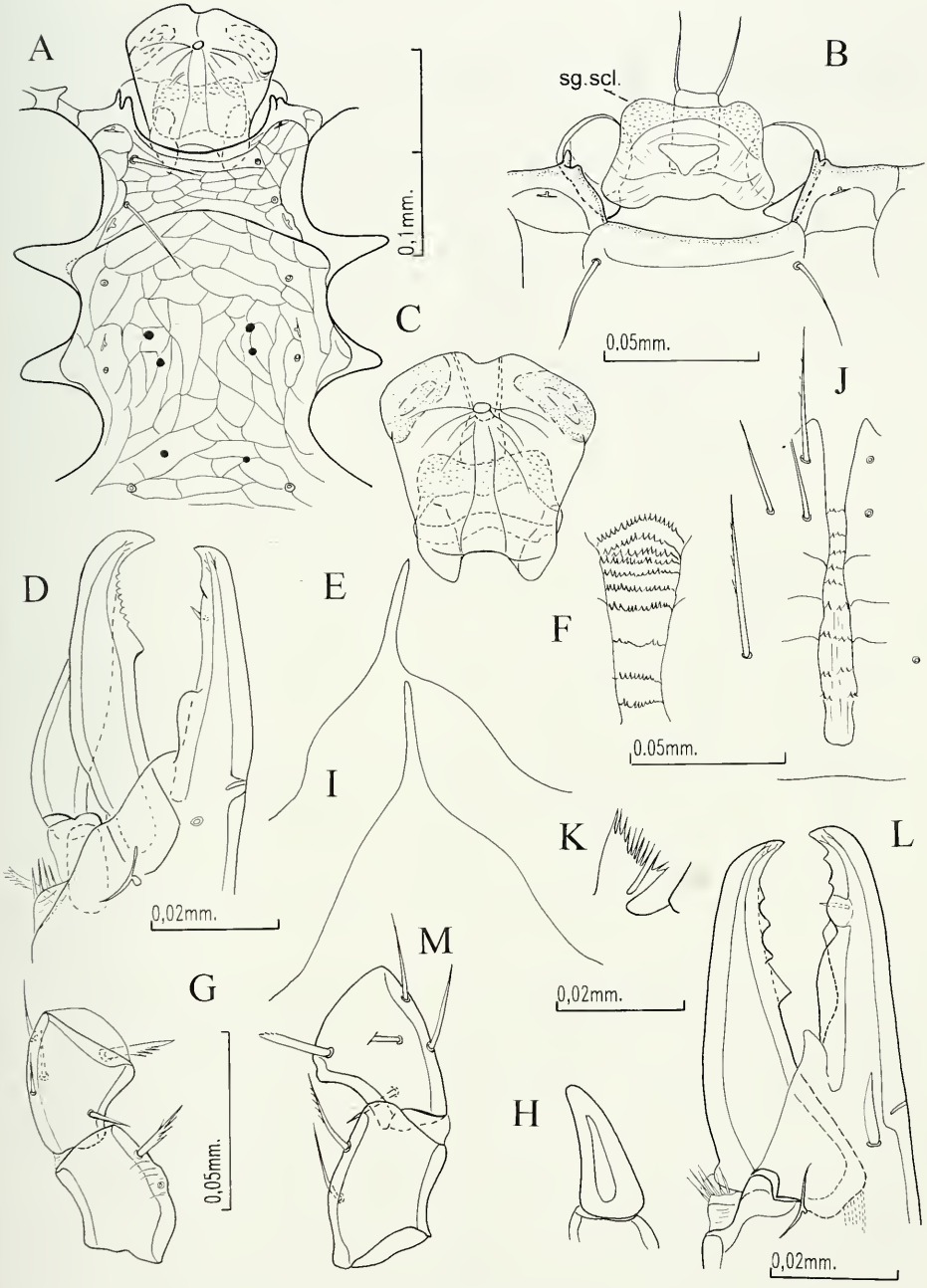

FIG. 5

Medioparasitus athiasae sp. n. Male: A-H. Female: I-M. A-sternogenital region; B-genital region with subgenital sclerite (sg. scl.); C-genital lamina; D, L-chelicera, antiaxial; E, I-tectum; F, J-hypognathal groove; G, M-palptrochanter, palpfemur; H-corniculus; K-internal mala.

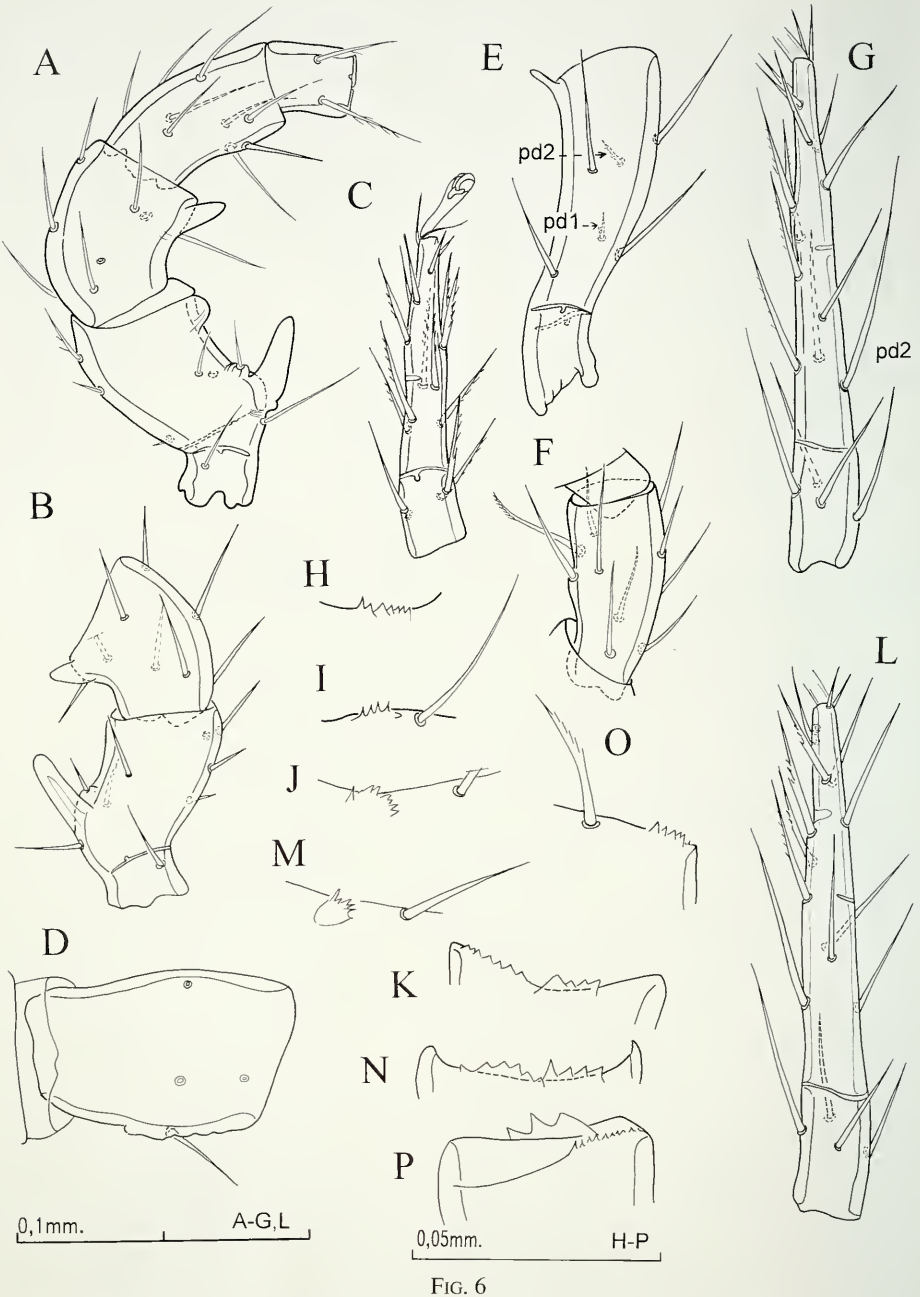

FIG. 6

Male. *Medioparasitus athiasae* sp. n.: A-I; *Heteroparasitus coronarius* (Karg): J, K, L; *H. tirolensis* (Sellnick) : M, N; *H. quadratus* (Witalinski): O, P. Leg II, antiaxial view: A-femur, genu, tibia (Sp 408); B-femur, genu (Sp 496); C-tarsus. Leg IV, ventral view: D-trochanter; E-femur; F-tibia; G, L-tarsus. Denticulated ridge, coxa I-H, K, N, P; idem, coxa II-I, J, M, O.

DESCRIPTION

Female

Idiosomal dorsum (Fig. 4A). Length of idiosomal setae: podonotum j1 =42-45μm, s1 =6-7μm; r2, r3, s2 =13-14μm; other setae about 42-48μm; opisthonotal setae from 48μm (J3, S3, S4) to 54 μm (S5, Z5).

Idiosomal venter. Peritrematal shields free posteriorly (Fig. 4B). Presternal sclerites fused to sternal shield, except for two little pieces. Sternal shield narrow distinctly reticulated, with prominent arched line between st2 and st3 (Fig. 4C). Length of sternal setae: st1 =54μm, st2 =60μm, st3 =48μm. Gland pore gv1 absent. Posterolateral protrusion of paragynial shield large and rounded; metagynial sclerite small, ellipsoidal (Fig. 4C). Epigynium septagonal, central apex with small notch, lateral angles with sharp prongs; subapical structure small, rounded, extended on dorsal side by triangular cuticular formation ending in lateral prongs (Fig. 4D). Endogynium apron-like, flanked by two elongated sclerotized strips (Fig. 4E). Opisthogastric shield with 7 pairs of setae, their lengths 42-48μm, and with 3 circumanal setae; gland pore gv2 (double) and gv3 on cuticule (Fig. 4F).

Gnathosoma. Tectum triangular, with simple slender central prong (Fig. 5I). Hypognathal groove with 9 oligodent rows; anterior hypostomatic seta and palpcoxal seta slightly pilose, others simple; internal malae fan-shaped, fimbriated; corniculi conical (Fig. 5J, K). Palptrochanter with v1 simple, v2 pilose, palpfemur with al1 pectinate and with small rounded protuberance at base of al1 (Fig. 5M). D.m. of chelicera with 4 teeth, d.f. with two denticles antiaxially, one paraxially alongside pilus dentilis (Fig. 5L).

Measurements: tarsus I =127-140μm, tarsus IV =161-179μm. Epigynium: h =173-202μm, b =156-177μm, st5-st5' =103-129μm, h/b =1.13. Sternal shield: st1-st1' =46-55μm; st2-st2' =69-87μm, st3-st3' = 92-127μm.

Specimen collected near Noia (Sp496): tarsus I =110-127μm; tarsus IV =150-159μm.

Epigynium: h =166-170μm, b = 170-179μm, v5-v5' =108-115μm, h/b =0.96.

Male

Idiosomal dorsum. Chaetotaxy with 20 pairs of setae on podonotal region and 23 pairs on opisthonotal region, setae simple, their lengths: j1 =36μm, z1 =12μm, s2-s3 =18μm, s6 =48μm, j3-j4 =54μm, other setae of series z =36-42μm. Opisthonotal setae of series J and S =48μm, setae of series R =42μm. Adenotaxy: gland pores gdj2, gdj4, gdz6, gdZ1 and gdZ4 lacking. Poroidotaxy: podonotum with 5 pairs of poroids, opisthonotal poroids not observable.

Idiosomal venter. Holoventral shield reticulated, with prominent procurved line passing behind sternal setae 2 (Fig. 5A). Anterior margin of sternal shield flanked by two protuberances and concave at location of genital lamina. Genital lamina trapezoidal, anterior margin folded, its angles appearing rounded (Fig. 5C). Subgenital sclerite rectangular, situated between base of tritosternum and genital lamina, with ventral and dorsal side partially denticulated and with a central triangular opening. This structure flanked on each side by two circular platelets supporting and restricting, probably, displacement of rectangular structure and genital lamina when open

(Fig. 5B). Opisthogastric shield with 7 pairs of ventral setae, their length from 24 to 36µm. Gland pore gv1 absent, gv2 double.

Gnathosoma. Hypognathal groove with 9-10 clearly denticulated rows, palp-coxal seta simple (Fig. 5F). Corniculi simple, conical (Fig. 5H). Tectum triangular, with central prong long, slender and with lateral margins rounded (Fig. 5E). Palp-trochanter with v1 simple, v2 pilose, palpfemur with small protuberance near base of spatulate and pectinate anterolateral seta (al) (Fig. 5G).

Chelicera (Fig. 5D). D.f. without denticles, only with a rounded protuberance proximally, d.m. with 5-8 denticles and a larger tooth; apex of both digits slightly hooked. Arthrodial cuticule with small brush-like process paraxially and setiform process antiaxially.

Legs. Armature of leg II with simple triangular spurs only on femur and genu; femur with small axillary process bearing seta and with adjacent distal protuberance (Fig. 6A). Coxa I with 7 small denticles on its paraxial, distal ridge (Fig. 6H). Coxa II with serrated denticulated ridge anterolaterally (Fig. 6I). Leg IV: trochanter with flattened protuberance on posterolateral side; femur with finger-like prominence posterolaterally on distal margin and with pd1 and pd2 setae pilose and short (Fig. 6E); tibia with one stout pilose, posterolateral seta (Fig. 6F); tarsus with pd2 simple and long, reaching base of pd1 (Fig. 6G). Measurments: tarsus I =115-129µm; tarsus IV =161-173µm. Specimens from near Noia (Sp 496) tarsus I =116µ; tarsus IV =159µ.

Etymology

The new species is dedicated to Dr Claire Athias-Henriot who pioneered modern systematics of gamasid mites and stimulated me to carry on with my research on mites.

Remarks

The male of *M. athiasae* subgen., sp. n. is characterized by the following combination of characters:

- Armature of leg II with a reduced axillary process bearing a seta; tibia without spurs.
- Genital lamina trapezoidal; rectangular denticulated sclerite situated between genital lamina and basis of tritosternum; genital orifice flanked by platelets.
- Chelicera with d.f. oligodont and d.m. with 7-8 denticles.

The female is unique among the Pergamasinae by having the combination of a peritrematal shield only anteriorly united to the dorsal shield, as in *Paragamasus,* and the d.m. of chelicera with 4 teeth, as in *Heteroparasitus*. Other peculiar characteristics are the shape of the endogynium and epigynium.

Specimens from near Noia (La Coruna) differ in some characters from specimens collected from other localities: in males the sternogenital cuticule has a different pattern with two parallel sclerotized lines between st2 and st5, the distal apophysis on femur II is absent (Fig. 6B), the distal spur on femur IV is shorter; in females the proportions of the epigynium are different.

The setal shape of the tarsi II (Fig. 6C) and IV (Fig. 6G, L) are different in *M. athiasae* and *H.coronarius*. For the moment I cannot evaluete the taxonomic importance of this observation because of insufficient knowledge of the setal pattern of tarsi II-IV in most Pergamasinae.

DISCUSSION

The genus *Holoparasitus* Oudemans, 1936 was divided by Juvara-Bals (1975) into three genera, *Holoparasitus* Oudemans, 1936, *Heteroparasitus* Juvara-Bals, 1975 and *Ologamasiphis* Holzmann, 1969. This decision was based on the following characters:

- Idiosomal chaetotaxy; idionotal cuticular systems; number of opisthogastric setae in both sexes.
- Females: fusion or separation of ventrianal shield with dorsal and peritrematal shields; number of teeth on d.m. of chelicera.
- Males: structure of the genital orifice and particularities of the leg II.

Holoparasitus comprises only the species whose characters are similar to those of the type species of *Holoparasitus* as defined by Hyatt (1987). *Ologamasiphis* is a valid genus. It differs from *Heteroparasitus* by the patterns of the idionotal systems and by details of the armature of the leg II (♂), the genital orifice (♂) and the epigynium and endogynium (♀).

Heteroparasitus is defined by a combination of features discussed in the present paper. *Medioparasitus* subgen. n. possesses a peculiar combination of characters, mainly in the female. Its peritrematal shield is free as in *Paragamasus* Hull, 1918. The digitus mobilis has 4 teeth as in *Heteroparasitus,* but unlike in other taxa included in Paragamasini sensu Juvara-Bals (1975) which all have only 3 teeth. The ventral gland pore gv1 is absent as in *Paragamasus (Meriadenogamasus)* from Nepal (Athias-Henriot, 1973) or in *Ologamasiphis* Athias-Henriot, 1971. The placement of *Medioparasitus* subgen. n. in the genus *Heteroparasitus* is uncertain at present. It is close to this genus by the number of opisthogastric setae, the structures of the genital orifice and of femur II in the male, and by the characters of the epigynium in the female. As mentioned above, the chaetotaxy and cuticular systems could not be properly studied because the available specimens were folded or crushed under the cover slides. However, the adenotaxy is deficient, lacking the gland pores gdj2, gdj4, gdz6, gdZ4 and gv1.

KEY TO THE GENERA OF PERGAMASINAE JUVARA-BALS, 1972
(Modified after Evans & Till, 1978 and Karg, 1993)

1 Tarsus I without claws and pulvillus; holodorsal shield attenuated posteriorly, its opisthonotal region with less than 12 pairs of setae; idiosoma length 490 µm, male unknown . . . . . ***Pergamasellus*** Evans, 1957
Type species: *P. delicatus* Evans, 1957

\- Tarsus I with claws and pulvillus; holodorsal shield not attenuated posteriorly, opistonotal region with more than 12 pairs of setae; idiosoma length 450-1400µm 2

2 Holodorsal, peritrematal and opisthogastric shields fused posteriorly in females and males, opisthogastric region with 8-9 pairs of ventral setae; movable digit of female chelicera with three teeth; idiosoma globular, well sclerotized, maximum length 950 µm . . . ***Holoparasitus*** Oudemans, 1936
Type species: *Gamasus calcaratus* Koch, 1839

- Female holodorsal and peritremal shield fused or separate, opistogastric shield free; in males all shields fused; movable digit of female chelicera with three or four teeth; idiosoma oval-shaped, rarely globular (in this case weakly sclerotized), maximum length 2060µm 3

3 Female holodorsal and peritrematal shields fused (except in the subg. *Medioparasitus*), opisthogastric shield free; male without transverse suture on dorsal shield; movable digit of female chelicera with four teeth . . . 4

- Female holodorsal shield anteriorly united with peritrematal shield, the latter fused or not fused with opisthogastric shield; male with or without transverse suture on dorsum idiosoma; movable digit of female chelicera with three or four teeth 5

4 Podonotal region with 18-22 pairs of setae, opisthonotal region hypertrichous; opistogastric shield with 11-32 pairs of ventral setae, tectum with 3-5 prongs; female with two big triangular presternal sclerites, epigynium triangular or subpentagonal; femur II of male with triangular or different- shaped apophysis; idiosoma oval–shaped, length 880 to 2060µm. . . . . ***Pergamasus*** Berlese, 1904
Type species: *Acarus crassipes* Linné sensu Berlese, 1906

- Podonotal region with 20 pairs of setae, opisthonotal regions with 21-23 pairs of setae; opisthogastric shield with 7 pairs of ventral setae, tectum trifid or triangular; female with presternal sclerites almost completly fused to sternal shield, with small triangular structures remaining, epigynium heptagonal; femur II of male with triangular apophysis and axillary process bearing seta; idiosoma globular, length less than 700µm . . . . . ***Heteroparasitus*** Juvara-Bals, 1975
Type species: *Pergamasus tirolensis* Sellnick, 1968

a. Setae on dorsal scutum moderately long, not reaching line of the following setal row; female peritrematal shield fused with dorsal shield; gland pore gv1 present on sternal shield; tectum trifid; male leg II with one spur on femur, genu and tibia ; subgenital sclerite oval . . . . . Subgen. ***Heteroparasitus*** s. str.

b. Setae on dorsum scutum long, especially on opisthonotum, reaching mid-length of setae of the following setal row; female peritrematal shield free posteriorly; gv1 absent on sternal shield; tectum triangular; male leg II with spurs only on femur and genu; subgenital sclerite rectangular with denticles . . . . . Subgen. ***Medioparasitus*** subgen. n.
Type species*: M. athiasae* sp. n.

5 Female dorsal and peritrematal shields united anteriorly, peritrematal shield fused with opisthogaster; extension of peritrematal shield behind stigmata discernible in male; male without transverse suture on idiosoma . . . 6

- Female dorsal and peritrematal shields united anteriorly, peritrematal shield free posteriorly; extension of peritrematal shield behind stigmata not recognizable in male; male with or without transverse suture on dorsum of idiosoma 9

6 Podonotal region with 19-20 pairs of setae, opisthonotal region polytrichous; palpgenual setae al1 and al2 bifid or fringed or foliaceous; presternal sclerites of female large, triangular, contiguous; movable digit of male chelicera with two teeth, subgenital sclerite present, idiosoma length 800-1200µm 7

- Podonotal region with 13-20 pairs of setae, opisthonotal region holotrichous (23-24 pairs of setae) or oligotrichous; palpgenual setae al1 and al2 truncate, presternal sclerites of female triangular, small, distant from each other or contigous; movable digit of male chelicera with one tooth, subgenital sclerite absent, idiosoma length 350-800µm 8

7 Palpgenual seta al1 bifid and al2 foliaceous; opisthogastric shield with 23-29 pairs of ventral setae, sclerocuticle wrinkled; movable digit of female chelicera with four teeth; idiosoma large, length 1000-1200µm . . . . . ***Mixogamasus*** Juvara-Bals, 1972

Type species: *M. intermedius* Juvara-Bals, 1972

- Palpgenual setae al1and al2 fringed, opisthogastric shield with 11-16 pairs of ventral setae; sclerocuticle smooth; movable digit of female chelicera with three teeth and adjacent denticles between them; idiosoma length of male 787-896µm, of female 1028-1300µm . . . . . ***Phytiogamasus*** Juvara-Bals & Athias-Henriot, 1972

Type species: *Parasitus primitivus* Oudemans, 1904

8 Podonotal region with 19-20 pairs of setae, opisthonotal region with 23-24 pairs; opisthogastric shield with 9-10 pairs of ventral setae; movable digit of male chelicera with one tooth, movable digit of female chelicera with four teeth; idiosoma length of male 350-800µm, of female 440-900µm . . . . . ***Leptogamasus*** Trägardh, 1936

Type species: *L. suecicus* Trägardh, 1936

- Podonotal region with 13 pairs of setae, opisthonotal region with 12 pairs; opisthogastric shield with 7 pairs of ventral setae; movable digit of female chelicera with three teeth; idiosoma length of female 450µm, male unknown . . . . . ***Zelogamasus*** Hennessy & Farrier, 1989

Type species: *Z. oligochaetus* Hennessy & Farrier, 1989

9 Podonotal region with 22-23 or 31-45 pairs of setae, opisthonotal region hypertrichous, with about 60 pairs of setae; opisthogastric shield with 11-30 pairs of ventral setae; palpgenual setae al1and al2 fringed; movable digit of male chelicera with two teeth; female genital pores iv5 near posterior margin of epigynium; presternal sclerites of female triangular, contiguous; idiosoma length of male 700-885µm, of female 1170-1300µm . . . . . ***Amblygamasus*** Berlese, 1906

Type species: *Gamasus dentipes* Koch, 1839

- Podonotal region with 16-18 or 20-21 pairs of setae, opistonotal region oligotrichous or holotrichous; opisthogastric shield with 8-11 pairs of ventral setae; palpgenual setae al1 and al2 always entire, spatulate; male movable digit of chelicera with one or two teeth; female genital pores iv5 on soft cuticle between epigynium and opisthogaster; presternal sclerites of female triangular or ribbon-like, or in the shape of small triangular sclerites with intermediate sclerotizations, or fused with sternal shield; idiosoma length of male 420-1100µm, of female 450-1200µm 10

10 Podonatal region with 16-18 pairs of setae, opisthonotal region with 14-21 pairs of setae, opisthogaster shield with 7-8 pairs of setae; male movable digit of chelicera with 2 teeth, femur II without axillary process, genital opening without subgenital sclerite but with a sclerified tape (ribbon) linked with the anterior margin of sternal shield; female with presternal sclerites fused to sternal shield, idiosoma globular ..... ***Ologamasiphis*** Athias-Henriot, 1971
Type species: *Pergamasus epigynialis* Willmann, 1940

- Podonotal region with 20-21 pairs of setae, opisthonotal region with 23-24 pairs of setae, opisthogastric shield with 11pairs of ventral setae; male movable chelicera with one or two teeth, femur with axillary process, genital opening with subgenital sclerites; presternal sclerites of female triangular or ribbon like or in the shape of small sclerites with intermediate sclerotizations; idiosoma oval ..... ***Paragamasus*** Hull, 1918
Type species: *Parasitus robustus* Oudemans, 1902

Comments on the key

During the last twenty years a large number of taxa have been described and a great variety of characters used in the descriptions of species and supraspecific taxa of Pergamasinae. Unfortunately, the descriptions were often inconsistent, resulting in divergent taxonomic concepts.

The aim of the present key is to give a practical tool for identification of the genera in Pergamasinae. No attempt was made to analyse the phylogenetic relationships, because important characters of some taxa remain unknown. This is particularly true for the characters common to both sexes, such as the idionotal pore-like systems (glands, poroids) and the leg chaetotaxy, especially that of the legs II and IV, as well as of the sensory field of the leg I. Characteristics of the idionotal systems are very important for the classification of the supraspecific taxa (Johnston & Moraza, 1991; Klompen *et al.*, 1996). These characteristics have been studied for only some of the genera presently placed in the Pergamasinae (Athias-Henriot, 1971 b, 1973; Juvara-Bals, 1972, 1975, 1981). A revision of the genera and subgenera is required for a better understanding of the supraspecific concepts in the subfamily.

Only the genus *Heteroparasitus* is keyed to subgeneric level in order to accommodate *Medioparasitus* in the system. Nevertheless, some clarifications concerning the subgenera *Leptogamasus* Trägardh, 1936 and *Paragamasus* Hull, 1918, and the genus *Ologamasiphis* Athias-Henriot, 1971 are given here.

The genus *Leptogamasus* includes three subgenera, i.e.: *Leptogamasus* Trägardh, 1936 (type species: *L. suecicus* Trägardh, 1936), *Ernogamasus* Athias-Henriot, 1971 (type species: *Pergamasus leruthi* Cooreman, 1951), *Tomeogamasus* Athias-Henriot, 1971 (type species: *Pergamasus falculiger* Berlese, 1906).

Valigamasus Karg, 1993 is a junior objective synonym of *Ernogamasus,* which is based on the same type species (syn. nov.). Diagnoses of the subgenera were given by Athias-Henriot (1971a, 1972) and by Juvara-Bals (1981) who raised the subgenera to genus rank. It is beyond the scope of this paper to further discuss the generic or subgeneric level of these insufficiently known taxa. I consider, however, for the moment, *Leptogamasus* as a genus with three subgenera.

Within *Paragamasus* Hull, 1918 nine subgenera were recognized (Athias-Henriot, 1971a, 1973) corresponding mainly to her " types d'organisation " (Athias-Henriot, 1967). Karg (1971) distinguished two subgenera within *Paragamasus* i.e.: *Paragamasus* Hull, 1918 and *Lysigamasus* Karg, 1971, which he later raised to generic level (Karg, 1993). The only given character separating the latter taxa is the shape of the presternal sclerites. *Paragamasus* Hull sensu Karg (1993) includes the subgenera *Paragamasus* s.str. and *Aclerogamasus* Athias-Henriot, 1971. *Lysigamasus* is a mixture of the subgenera *Anidogamasus*, *Anchigamasus*, *Dyogamasus* and *Tanygamasus* as proposed by Athias-Henriot (1971a). Karg's short diagnosis of this genus it is in need of some more accuracy and details. *Lysigamasus* is commonly used as valid but according to the International Code of Zoological Nomenclature (ICZN, 1999, art. 21.3) it is a junior subjective synonym of *Anidogamasus* Athias-Henriot, 1971. Both subgenera were described in 1971, with Athias-Henriot's paper issued on 17.05. 1971, but an exact date for Karg's description is unknown. A study of the groupings in *Paragamasus* is beyond the scope of this paper. The *Paragamasus* group needs a revision, which takes into account the characters of the idiosoma (chaetotaxy, adenotaxy, poroidotaxy) and of the leg chaetotaxy, and which finally rearranges the genus into taxa that correspond to natural groups. In the following key *Paragamasus* is considered as a genus with several subgenera.

The genus *Ologamasiphis* presents many problems and requires a thorough revision. Holzmann (1969) established *Ologamasiphis* as a subgenus in *Holoparasitus* for two species, *O. minimus* Holzmann, 1969 and *O. rotulifer* Willmann, 1940, but she did not designate a type species. Karg (1971) considered *O. rotulifer* sensu Holzmann 1969 as a new species that he named *Holoparasitus coronarius* and he supported *Ologamasiphis* as a subgenus of *Holoparasitus,* with three species, *H. (O.) coronarius*, *H. (O.) tirolensis* and *H. (O.) minimus* but he also did not designate a type species. According to the International Code of Zoological Nomenclature (ICZN, 1999, art. 13.3) the name *Ologamasiphis* Holzmann, 1969 is thus unvailable. Athias-Henriot (1971a) considered *Ologamasiphis* as a separate genus in which she included four species belonging to her "type d'organisation epigynalis". She designated *Pergamasus epigynalis* Willmann, 1940 as the type species and considered *O. minimus* Holzmann, 1969 synonymous with *O. disfistulatus* (Athias-Henriot, 1967). This synonymy has to be verified because the respective descriptions differ in some characters. It is impossible, for the moment, to compare *O. disfistulatus* with *O. minimus*

because the latter species was deposited in the Holzmann collection, which was unfortunately mislaid. More research has to be carried out when this material becomes available again.

The species included by Athias-Henriot (1967,1971a) in *Ologamasiphis* belong to two groups, to which I attribute subgeneric status:

1 - *Ologamasiphis* sensu str., type species *P. epigynalis* (Willmann, 1940).

The following species are included: *O. parnethortus* (Athias-Henriot, 1967), *O. bulgatulus* (Athias-Henriot,1967), *O. turdetanus* (Athias-Henriot,1967), *O. judaeortus* (Athias-Henriot,1967).

Diagnosis: Podonotal region with18-20 pairs of setae, opisthonotum with 21-22 pairs of setae, adenotaxy with 4 pairs of podonatal and 3 pairs of opisthonotal gland-pores; on ventral idiosoma gv1 absent; in females peritrematal shield anteriorly fused with the margin of dorsal shield and posteriorly free, d.m. of chelicera with 3 teeth; in males a ribbon-like structure, instead of a subgenital sclerite, linked with anterior margin of sternal shield.

2 - *Ologamasiphis (Holzmannia)* **subgen. n.**, type species *Pergamasus disfistulatus* (Athias-Henriot, 1967), syn. *O. mininus* Holzmann, 1969.

Diagnosis: Podonotal region with 16 pairs of setae, opisthonotum with 20; adenotaxy with 4 pairs of podonotal and 2 pairs of opisthonotal gland-pores; on ventral idiosoma gv1 present; in females peritrematal shield fused with dorsal shield, d.m.of chelicera wih 3-4 teeth; in males subgenital sclerite absent.

I also assign to this new subgenus one unidentified specimen found in the Athias collection (slide H3/G 260) and the specimens which Juvara-Bals (1975) identified as *O. disfistulatus* which probably belong to a new species.

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A taxonomic revision of the family Oncopodidae III. Further new species of *Gnomulus* Thorell (Opiliones, Laniatores)

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A taxonomic revision of the family Oncopodidae III. Further new species of *Gnomulus* Thorell (Opiliones, Laniatores). - Twenty-one new *Gnomulus* species are described and placed in nine species groups. The new taxa are: *G. carinatus* (Kalimantan), *G. claviger* (Philippines), *G. crassipes* (Philippines), *G. exsudans* (Sarawak, Sabah), *G. hamatus* (Philippines), *G. hutan* (Sarawak), *G. javanicus* (Java), *G. latoperculum* (Sulawesi), *G. leofeae* (Myanmar), *G. lomani* (Borneo), *G. marginatus* (Thailand), *G. matabesar* (Halmahera), *G. monticola* (peninsular Malaysia), *G. obscurus* (Sarawak), *G. pilosus* (peninsular Malaysia), *G. rostratoideus* (peninsular Malaysia), *G. ryssie* (Thailand), *G. sinensis* (southern China), *G. spiniceps* (Vietnam), *G. tuberculatus* (Sumatra) and *G. tumidifrons* (Halmahera). Additional specimens of *G. armillatus* (Thorell) and *G. laruticus* Martens & Schwendinger are reported and illustrated, respectively. Relationships and zoogeography are discussed.

Key-words: Opiliones - Oncopodidae - *Gnomulus* - new species - taxonomy - zoogeography - Asia.

INTRODUCTION

In our preceding paper on the Oncopodidae (Schwendinger & Martens, 1999b) we have re-examined the 27 known species of *Gnomulus* without taking new taxa into account. Here we add 21 new species to this genus. Most of them were collected fairly recently by means of leaf litter sifting and soil extraction; a few others were found in old collections, where they had been misidentified by previous taxonomists who did not examine the genitalia of these specimens. The present number of 48 nominal *Gnomulus* species is remarkable when considering that oncopodids were long regarded as being extremely rare. Prior to a partial revision by Schwendinger in 1992, merely 21 species (including *G. thorelli* Sørensen, which was then overlooked) were known for the whole family.

In an attempt to keep some degree of order within this species-rich and presumably further expanding genus, 11 preliminary species groups are distinguished.

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This grouping has no nomenclatural relevance; it is done for purely practical reasons and does not represent the results of a thorough phylogenetic analysis. Some (hopefully the majority) of our species groups may actually correspond with monophyletic lineages, others may not. A few species, which stand isolated and do not fit in well with any group of related species, are placed in monotypical species groups. It is hoped that additional new species will be found, which will either link these outsiders to other groups or will prove that they belong to distinct lineages (as in the case of the *sumatranus*-group in here).

Four of the six groups distinguished by Schwendinger & Martens (1999b: 979) are re-evaluated and five additional groups are added. The *aborensis*-group (with three species from central Nepal, northeastern India and northern Thailand) is excluded, because no new material has become available. The *rostratus*-group (with two described species from peninsular Malaysia) is not treated here either. Several new species have meanwhile been discovered in peninsular Malaysia and Thailand, which also belong to this very distinct species group. They will be treated separately.

MATERIALS AND METHODS

External structures were studied and drawn with a ZEISS SV11 stereomicroscope, the penes with a NIKON Optiphot compound microscope (each with a drawing tube). The penes were expanded by placing them in hot lactic acid and then in destilled water. Expansion is reversed when the penes are transferred to 70% alcohol.

Body measurements refer to the dorsal scutum. Leg articles were measured on their dorsal side, from joint to joint. All measurements are given in mm. Terminology of penis morphology follows that of Martens & Schwendinger (1998: fig. 1).

Abbreviations used in the text: AMNH American Museum of Natural History, New York; BMH Bishop Museum, Honolulu; MAR collection of J. Martens, Mainz; MSNG Museo Civico di Storia Naturale, Genova; NHML Natural History Museum, London [formerly British Museum (Natural History)]; MHNG Muséum d'histoire naturelle, Genève; NSMT National Science Museum, Tokyo; SMF Naturmuseum und Forschungsinstitut Senckenberg, Frankfurt; ZMB Museum für Naturkunde der Humboldt-Universität, Berlin; ZMC Zoologisk Museum, København; ZMH Zoologisches Institut und Museum, Universität Hamburg.

TAXONOMY

Gnomulus Thorell, 1890

Synonymy and diagnosis: See Martens & Schwendinger (1998: 526) and Schwendinger & Martens (1999b: 946).

Type species: *Gnomulus sumatranus* Thorell, 1891. Designated by ruling of the International Commission on Zoological Nomenclature (2001), following an application by Schwendinger & Martens (1999a). See also Schwendinger & Martens (1999b: 946).

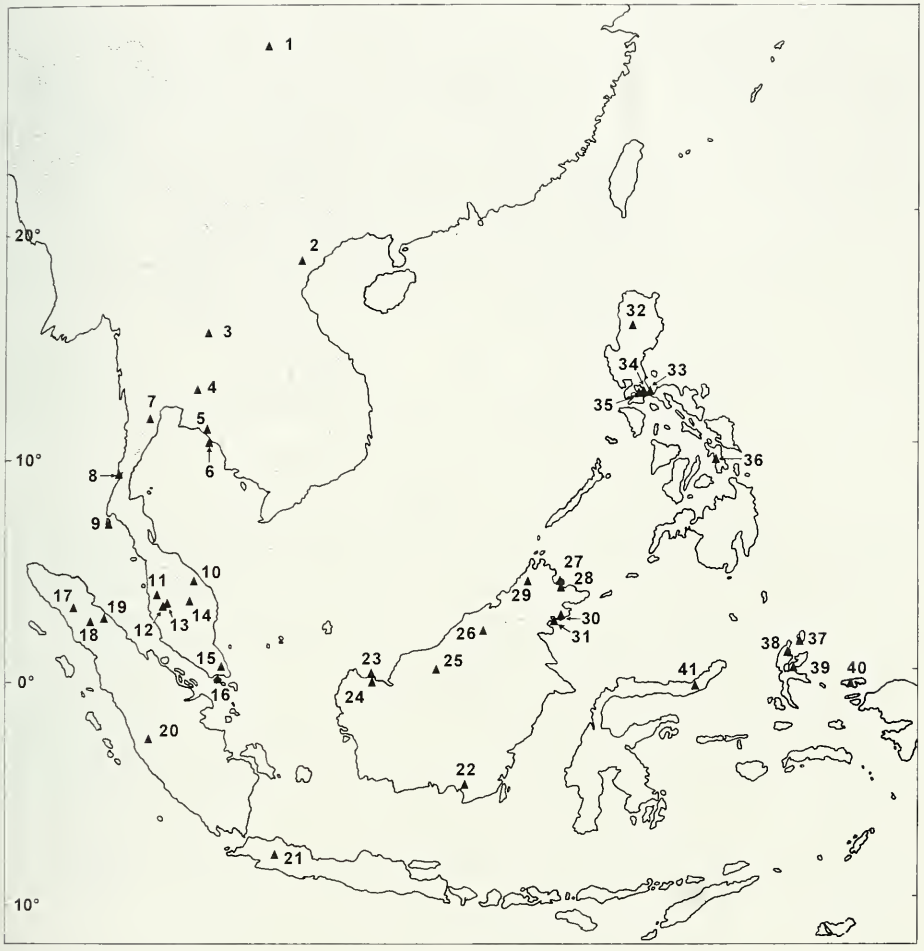


FIG. 1

Records of *Gnomulus* species treated in this paper. - 1 Omei Shan (*G. sinensis* sp. n.), 2 Cuc Phuong (*G. spiniceps* sp. n.), 3 Tham Pu Lub (*Gnomulus* sp.), 4 Khao Yai N. P. (*Gnomulus* sp.), 5 Nam Tok Phliu N. P. (*G. marginatus* sp. n.), 6 Ko Chang N. P. (*G. marginatus* sp. n.), 7 Kaeng Krachan N. P. (*G. ryssie* sp. n.), 8 Malewoon (*G. leofeae* sp. n.), 9 Ko Siray (*Gnomulus* sp.), 10 Jeram Pasu (*Gnomulus* sp.), 11 Maxwell Hill (*G. laruticus* Martens & Schwendinger; *Gnomulus* sp.), 12 Chenderiang (*Gnomulus* sp.), 13 Cameron Highlands (*G. monticola* sp. n.), 14 Taman Negara (*G. pilosus* sp. n.), 15 Kota Tinggi (*G. rostratoideus* sp. n.), 16 Bukit Timah (*G. rostratoideus* sp. n.), 17 Ketambe (*G. tuberculatus* sp. n.), 18 Bukit Lawang (*Gnomulus* sp.), 19 Deli (*Gnomulus* sp.), 20 Gunung Kerinci (*G. armillatus* (Thorell)), 21 Mt. Gede (*G. javanicus* sp. n.), 22 Bandjermasin (*G. carinatus* sp. n.), 23 Santubong (*Gnomulus* sp.), 24 Kuching (*G. obscurus* sp. n.), 25 Kapit (*G. hutan* sp. n.), 26 Gunung Mulu N. P. (*G. exsudans* sp. n.), 27 Sepilok (*G. exsudans* sp. n.), 28 Sapagaya (*G. exsudans* sp. n.), 29 Mt. Kinabalu (*Gnomulus* sp.), 30 Tiger Hill (*Gnomulus* sp.), 31 Nunukan Island (*Gnomulus* sp.), 32 Sagada (*Gnomulus* sp.), 33 Quezon N. P. (*Gnomulus* sp.), 34 Mt. Banahaw (*G. hamatus* sp. n., *G. claviger* sp. n., *G. crassipes* sp. n.), 35 Mt. Makiling (*G. hamatus* sp. n., *G. claviger* sp. n.), 36 Baybay (*Gnomulus* sp.), 37 Morotai (*Gnomulus* sp.), 38 Tobelo (*G. matabesar* sp. n.), 39 Buli (*G. tumidifrons* sp. n.), 40 Waigeo (*Gnomulus* sp.), 41 Dumoga - Bone N. P. and Gunung Tongara (*G. latoperculum* sp. n.).

THE *SINENSIS*-GROUP (new)

Diagnosis: Medium-sized (4.3-5.5 mm) species with robust chelicerae; no ventrobasal process on palpal femur; stigmatic pit without tubercle on posterior margin; dorsal scutal areas only indistinctly elevated, not medially divided by a pronounced longitudinal furrow as in the *aborensis*-group. Glans penis with distally hook-shaped, outwards-bent lateral sclerites and a pair of subterminal ventral teeth on the stylus; stylus base bulbous. This species group is very close to the *aborensis*-group (Schwendinger & Martens, 1999b: 948); it comprises two species, *G. sinensis* sp. n. and *G. spiniceps* sp. n., from the northeast of the known distribution area of *Gnomulus*.

Gnomulus sinensis sp. n. Figs 2-9

Material: CHINA, Sichuan Province, Omei Shan, Wannian, 1050 m, 1 ♂ holotype (MHNG), leg. W. Schawaller, 19.III.1999.

Etymology: Latin: *sinensis* (adjective of *sina*) = chinese.

Diagnosis: Close to *G. aborensis* (Roewer) but distinguished by: Body smaller; lateral tubercles on posterior carapace region wider; dorsal scutal areas less elevated; chelicerae less robust, with only a low ventral mound on proximal article; proximal palpal femur without dorsal boss or ventral process; palpal trochanter with strong ventral process; truncus penis fairly stout, distally truncate; glans penis short, wide; lateral sclerites strongly convex, distally narrow, basally elevated; median plate short, completely covering membraneous tubes.

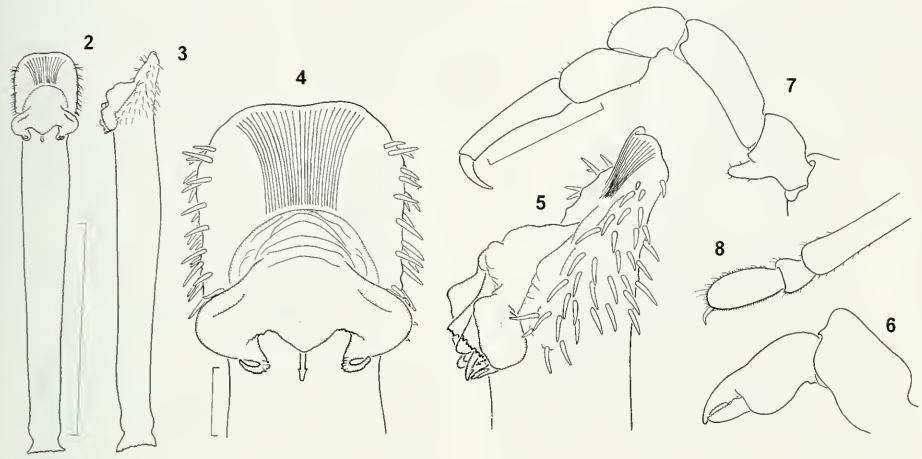
Description: ♂ (holotype). Coloration: Body light amber, with dark brown reticulation on carapace and on proximal articles of pedipalps and chelicerae. Legs mostly brown, interspersed with dark areas; leg tarsi III, IV, palpal tarsi and cheliceral hand light amber, leg tarsi I, II cream. Dorsal scutum with dark patches on lateral margin; dorsal and ventral scutal areas with dark margin around amber central portion; anterior dorsal scutal areas medially divided by a shallow amber furrow, ventral areas undivided. Genital operculum dark. Fig. 9a-c.

Carapace short, with indistinct low, widely rounded eye tubercle and a pair of broadly rounded lateral tubercles below wide, undivided carapace-abdomen bridge (Fig. 9a, c). Dorsal scutum with anterior areas only slightly elevated, posterior ones more distinctly so; ventral scutal areas only moderately swollen (Fig. 9c), bearing "encrusted" hairs (see Schwendinger & Martens, 1999b: fig. 69a, b). Palpal coxa with large ventral process; ventral side of leg coxa I without anterolateral process; ventral side of leg coxa II with small anteroproximal process (no posteroproximal one), coxa III without process. Genital operculum quite large, somewhat triangular in shape, slightly wider than long; posterior margin of stigmatic pit without tubercle (Fig. 9b).

Chelicerae (Fig. 6) fairly robust; proximal article with distinct dorsodistal to dorsomedian boss; ventral side with low, wide mound.

Palps (Fig. 7): Ventral side of femur without proximal process; trochanter with strong, slightly distad-inclined ventral process.

Legs 1324, tarsal formula 2-2-3-3. Distitarsus of leg II 2.2 times longer than wide (Fig. 8).



FIGS 2-8

Gnomulus sinensis sp. n., ♂ holotype. - Penis, dorsal (2) and lateral view (3); apex of penis, dorsal (4) and lateral view (5). Left chelicera, retrolateral view (6); left palp, retrolateral view (7); distal part of left leg II, retrolateral view (8). - Scale lines 0.1 mm (4, 5), 1.0 mm (others).

Penis (Figs 2-5): Truncus penis fairly stout, its distal margin widely rounded and slightly invaginated. Glans penis short, wider than truncus at that point; lateral sclerites strongly convex, in proximal portion elevated above median plate, with wrinkles on lower side and with narrow, outward-bent, strongly hook-like tips; membraneous tubes completely covered by a short, broadly triangular median plate; stylus slender, base bulbous, apex with a small pair of subterminal ventral teeth.

♀. Unknown.

Measurements: (♂): Body 4.32 long, 3.29 wide; carapace region 1.06 long, 2.00 wide. - Palp and legs:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.67	0.96	0.62	0.44	-	0.91	3.60
Leg I	0.52	1.58	0.77	0.82	1.43	0.74	5.86
Leg II	0.59	2.03	1.01	1.26	2.03	1.11	8.03
Leg III	0.52	1.48	0.79	0.86	1.63	0.59	5.87
Leg IV	0.64	1.93	1.03	1.31	2.42	0.74	8.07

Relationships: *Gnomulus sinensis* sp. n. is closest to *G. spiniceps* sp. n.

Distribution and bionomics: Known only from Mount Omei (3079 m) in southern China. The specimen was sifted from the forest floor of a subtropical broad-leaf-forest. This is so far the northernmost record for the family Oncopodidae [Fig. 1 (1)].

Gnomulus spiniceps sp. n. Figs 10-19

Material: VIETNAM, Ninh Binh Province, Cuc Phuong National Park, 450 m, about 40 km NW of Ninh Binh, ♂ holotype (NSMT-Ad 174), leg. S. Nomura, 15.X.1995.

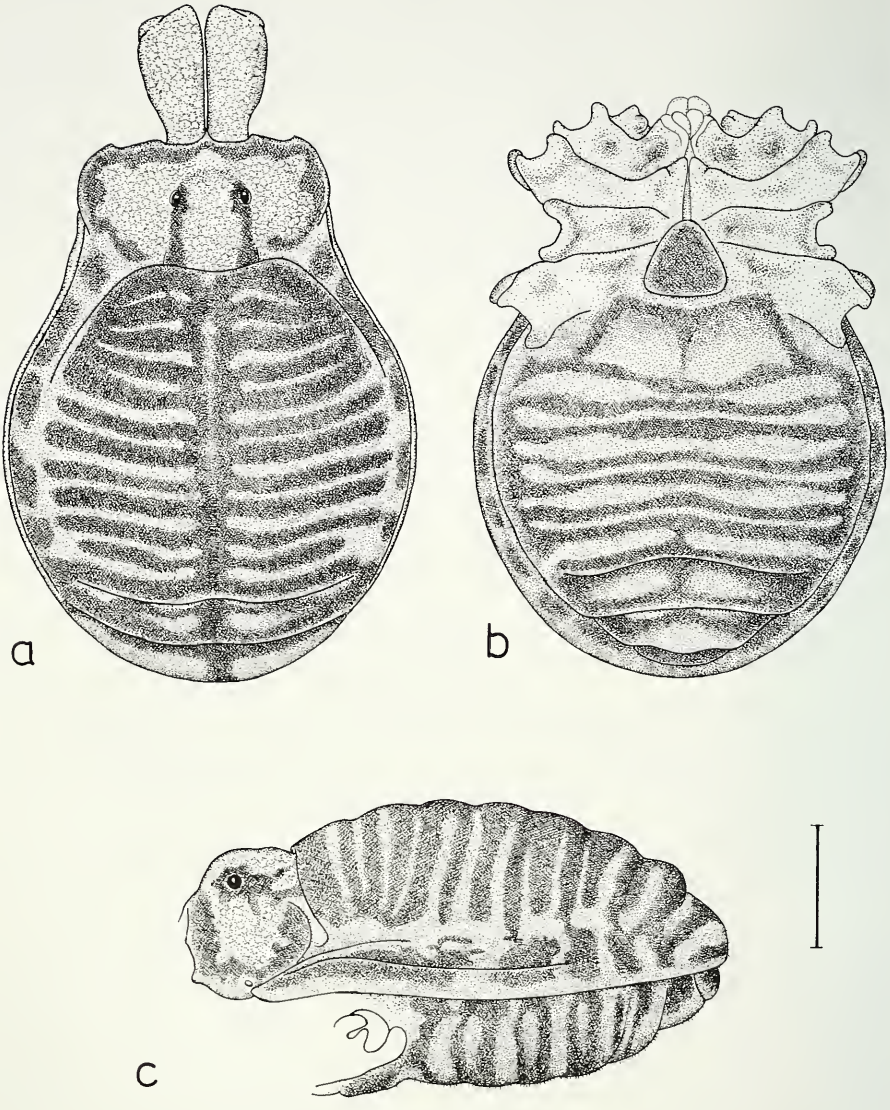
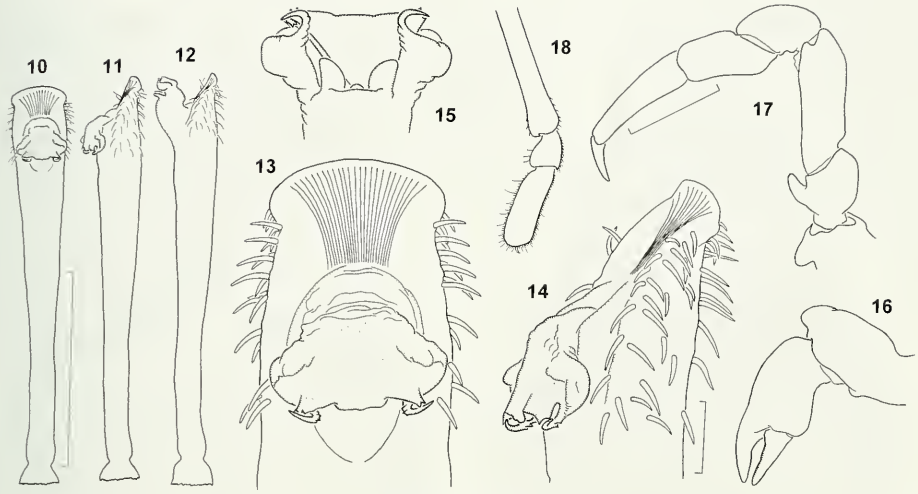


FIG. 9

Gnomulus sinensis sp. n., ♂ holotype. - Body, dorsal (a), ventral (b) and lateral view (c). - Scale line 1.0 mm.

Etymology: Latin: *spina* = thorn, spine, *ceps* (from *caput*) = head; noun in apposition. The specific epithet refers to the long and pointed eye tubercle of the holotype.

Diagnosis: Closest to *G. sinensis* sp. n., distinguished by: Eye tubercle pronounced, pointed; posterior scutal areas less elevated; distitarsus II longer; penis more slender, with a narrower glans and a widely truncate median plate.



FIGS 10-18

Gnomulus spiniceps sp. n., ♂ holotype. - Penis, dorsal (10) and lateral view (11); penis with expanded glands, lateral view (12); apex of penis, dorsal (13) and lateral view (14); expanded glans, dorsal view (15). Left chelicera, retrolateral view (16); left palp, retrolateral view (17); distal part of left leg II, retrolateral view (18). - Scale lines 0.1 mm (13-15), 1.0 mm (others).

Description: ♂ (holotype). Coloration: Body light amber, with dark brown reticulation on carapace and on proximal articles of pedipalps and chelicerae. Dorsal scutum with dark pattern on scutal elevations and with dark patches on light lateral and posterior margin (Fig. 19a, c). Ventral side of body light amber, ventral scutal elevations pale, with dark fringes; genital operculum darkened in its centre (Fig. 19b). Trochanters and femora of palps and trochanters to metatarsi of legs darkened (on posterior legs most distinctly so in proximal portion), palpal tarsi and cheliceral hand light amber, leg tarsalia II cream.

Carapace with distinct, acutely pointed eye tubercle; carapace-abdomen bridge wide, undivided, with very wide, low tubercles below. Dorsal scutal areas slightly elevated, medially indistinctly broken by a shallow longitudinal furrow; ventral scutal areas moderately swollen, without modified hairs (Fig. 19a, c). Palpal coxa with large ventral process; leg coxa I with small anterolateral process; leg coxa II with distinct anteroproximal and indistinct posteroproximal processes; coxa III without process. Genital operculum anteriorly rounded, slightly wider than long; posterior margin of stigmatic pits without tubercle (Fig. 19b).

Chelicerae (Fig. 16) fairly robust; proximal article with distinct, forward-inclined dorsodistal to dorsomedian boss and knob-shaped proventral subdistal process.

Palps (Fig. 17): Ventral side of femur without proximal process; trochanter with long, slightly distad-inclined ventral process.

Legs 1342, tarsal formula 2-2-3-3. Distitarsus II about 2.9 times longer than wide (Fig. 18).

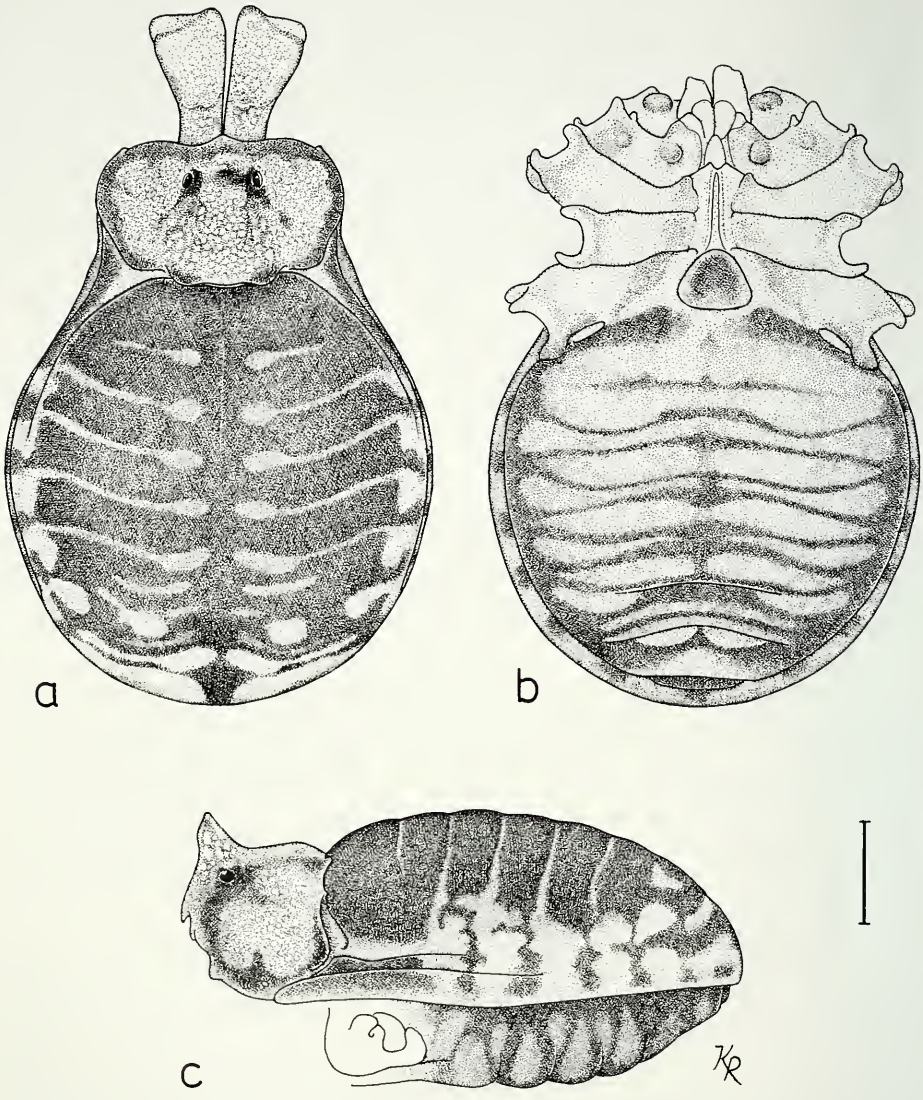


FIG. 19

Gnomulus spiniceps sp. n., ♂ holotype. - Body, dorsal (a), ventral (b) and lateral view (c). - Scale line 1.0 mm.

Penis (Figs 10-15): Truncus penis relatively slender, its anterior margin widely arched. Glans short, narrower than truncus at that point; lateral sclerites strongly convex, elevated at proximolateral margins, with strongly outward-bent hook-like tips carrying transversal wrinkles on lower side; membraneous tubes completely covered by short, very wide median plate with almost straight distal margin and distinctly

dentate lateral corners; stylus slender, base bulbous, apex with a small pair of subterminal ventral teeth.

♀. Unknown.

Measurements: (♂): Body 5.46 long, 4.06 wide; carapace region 1.48 long, 2.31 wide. - Palp and legs:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.84	1.23	0.84	0.62	-	1.28	4.81
Leg I	0.64	2.02	0.96	1.03	1.77	0.76	7.18
Leg II	0.79	2.66	1.33	1.67	2.53	1.16	10.14
Leg III	0.59	2.02	0.96	1.08	1.94	0.69	7.28
Leg IV	0.79	2.61	1.28	1.67	2.95	0.81	10.11

Relationships: *Gnomulus spiniceps* sp. n. is most closely related to *G. sinensis* sp. n. External morphology of both new species shows a clear relationship with the *aborensis*-group, but their penis morphology is distinct.

Distribution: Known only from the type locality in northern Vietnam [Fig. 1 (2)].

THE *ASLI*-GROUP (see Schwendinger & Martens, 1999b: 956)

Diagnosis: These small (2.3-4.2 mm) species can be further characterized by: Palpal trochanter with a distinctly distad-directed ventral process; tubercle on posterior margin of stigmatic pit distinct (*G. laruticus*, *G. monticola* sp. n., *G. pilosus* sp. n.), indistinct or absent (other species); stylus penis with a ventral pair of subterminal teeth and a bulbous base.

Species account and distribution: Five species are known from the western and central parts of peninsular Malaysia, i.e. *G. asli* Martens & Schwendinger, *G. hirsutus* Martens & Schwendinger, *G. laruticus* Martens & Schwendinger, *G. monticola* sp. n. *and G. pilosus* sp. n.

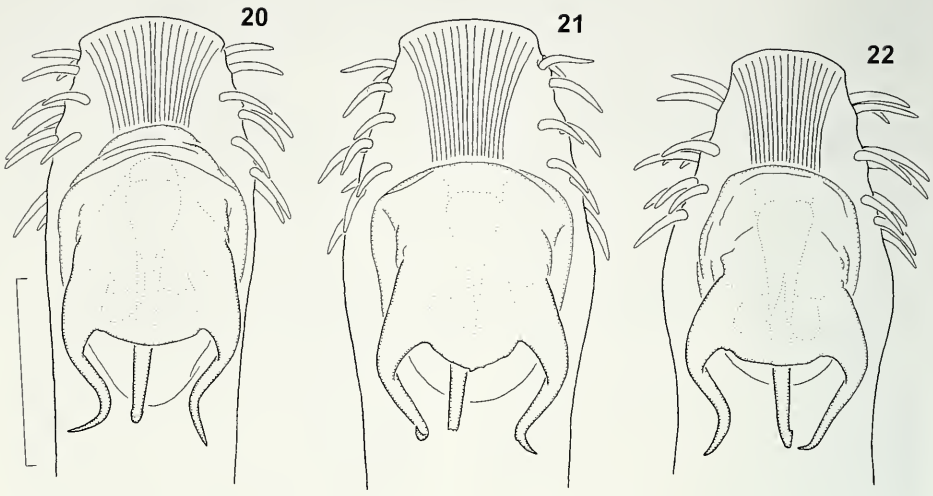
Gnomulus laruticus Martens & Schwendinger, 1998 Figs 20-22

Gnomulus laruticus Martens & Schwendinger (1998: 539-542, figs 105-113).

New material: MALAYSIA (peninsula), Perak, Maxwell Hill near Taiping (type locality) [Fig. 1 (11)], at 1150 m, 2 ♂, 7 ♀, 24.- 25.XI.1999, at 1250 m, 1 ♂, 23.XI.1999; all specimens leg. G. Cuccodoro & I. Löbl (1 ♂, 1 ♀ in MAR, others in MHNG).

Remarks: All newly collected specimens possess the unusual tarsal formula (2-2-2-2), which confirmes that this is a diagnostic character for *G. laruticus*. The amber coloration and dark markings of the new specimens are more pronounced than in the holotype and they all possess a genital operculum with a dark central zone. Their penes largely correspond with that of the holotype, but one ♂ has a distinctly narrower apex and a lateral glans sclerite with an inwards pointing apex (only on one side, probably deformed; Fig. 22).

The ♀ from the same locality (at 1200 m) mentioned in Martens & Schwendinger (1998: 549) clearly belongs to a different, presumably undescribed species.



FIGS 20-22

Gnomulus laruticus Martens & Schwendinger. - Apex of penis of three males, dorsal view. - Scale line 1.0 mm.

Gnomulus monticola sp. n. Figs 23-35

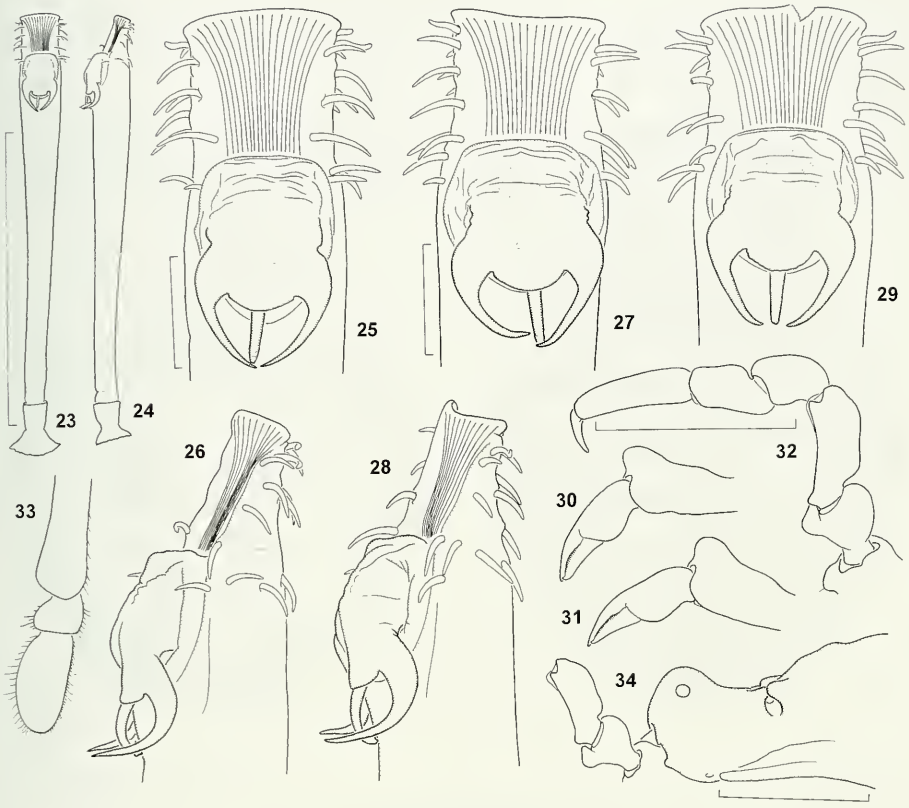
Material: MALAYSIA (peninsula), Pahang, Cameron Highlands, near Tanah Rata: Gunung Jasar, 1550 m, trail 11, ♂ holotype (MHNG), 1 ♂, 1 ♀ paratypes, 3 juv., 24.III.1993; G. Jasar, 1720 m, 1 ♂, 2 ♀ paratypes, 25.III.1993; trails 4 and 13 (E of Tanah Rata), 1500 m, 1 ♂ paratype, 23.III.1993; trail 9 (between Tanah Rata and Robinson Fall), 1400 m, 2 ♀ paratypes, 27.III.1993, all leg. I. Löbl & F. Calame. - Ringlet, 960 m, 1 juv., leg. T. Jaccoud. 1 ♂, 1 ♀ paratypes in MAR, others in MHNG.

Etymology: Latin: *monticola* = mountain dweller; noun (male gender) in apposition.

Diagnosis: Close to *G. asli*, distinguished by: Body larger; colour pattern different; anterior dorsal scutal margin less rounded; teeth of carapace-abdomen bridge longer, more widely separated; glans penis with more rounded median plate; tips of lateral glans sclerites very close to each other.

Description: ♂ (holotype). Coloration: Body light amber, ventral scutum more reddish; characteristic dark pattern on dorsal and ventral scuta. Genital operculum reddish amber with dark central zone (Fig. 35a-c). Leg segments (except tarsi) darkened, with light circular distal band on all tibiae and light median bands on metatarsi III and IV and (less distinct) on all femora. Palps and chelicerae light amber, with a dark reticulation (faint on tarsus and cheliceral hand, respectively).

Carapace with low rounded eye tubercle; no lateral tubercles present. Carapace-abdomen bridge distinctly divided, composed of two widely separated opposing pairs of fairly long conical processes. Dorsal and ventral scutal areas only slightly elevated (Fig. 35a, c). Ventral scutum covered with fine short hairs (much denser than on dorsal scutum). Palpal coxa with distinct ventral process; leg coxa I with low, wide anterolateral one; ventral side of leg coxae II and III with small anteroproximal



FIGS 23-34

Gnomulus monticola sp. n., ♂ holotype (27, 28, 30, 32, 33), ♂ paratypes (23-26, 29), ♀ paratype (31, 34). - Penis, dorsal (23) and lateral view (24); apex of penis, dorsal (25, 27, 29) and lateral view (26, 28). Left chelicera, retrolateral view (30, 31); left palp, retrolateral view (32); distal part of left leg II, retrolateral view (33); anterior body and proximal palp (34). - Scale lines 0.1 mm (25-29), 1.0 mm (others).

processes, coxa II also with small posteroproximal one. Genital operculum slightly wider than long; a small but distinct tubercle on posterior margin of stigmatic pit (Fig. 35b).

Chelicerae (Fig. 30): Hand weak, proximal article with distinct dorsodistal and indistinct dorsomedian boss, no ventral tubercle.

Palps (Fig. 32): Ventral side of femur with small proximal process; trochanter with basally wide, distad-inclined ventral process.

Legs 1324, tarsal formula 2-2-3-3. Distitarsus II about 2 times longer than wide (Fig. 33).

Penis (Figs 23-28; holotype: 27, 28): Truncus fairly slender, continually widening towards apex, with almost straight distal margin. Glans distinctly remote from tip of truncus, with quadrangular membraneous socket; short, widely rounded

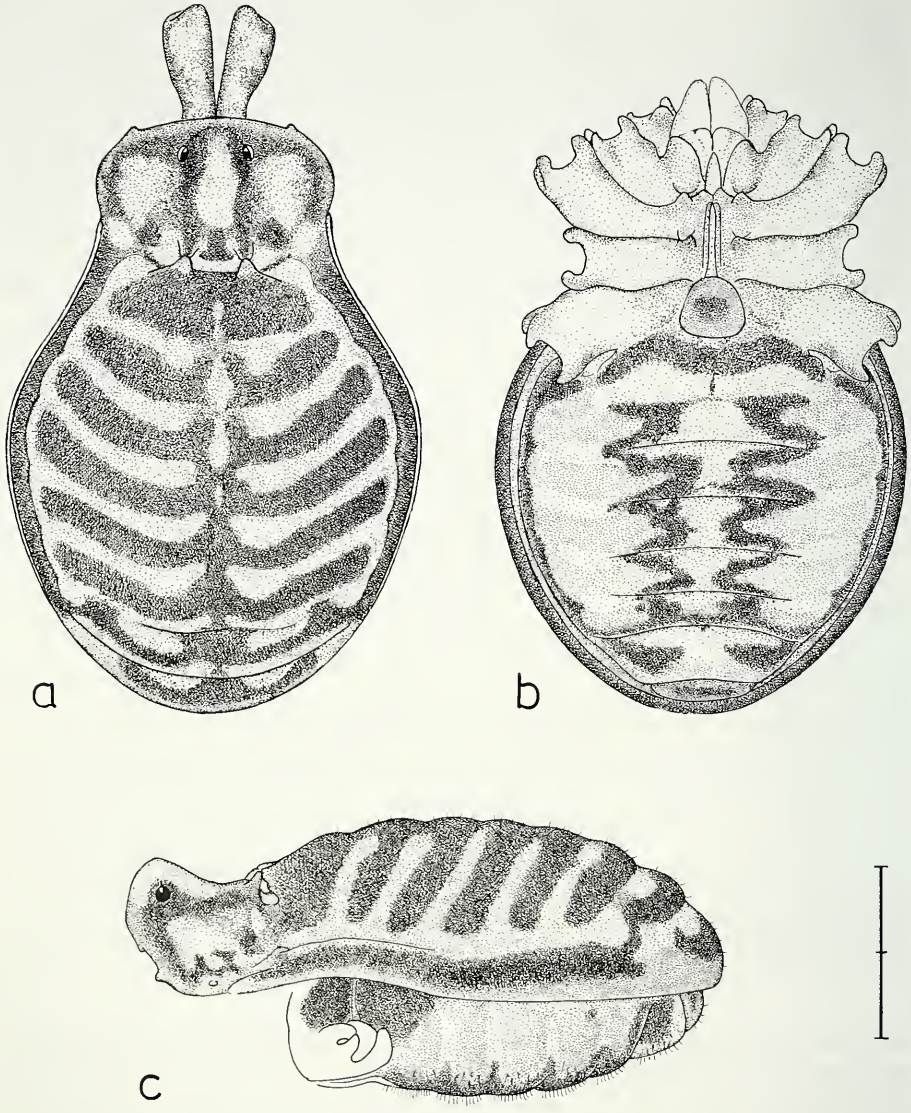


FIG. 35
Gnomulus monticola sp. n., ♂ holotype. - Body, dorsal (a), ventral (b) and lateral view (c). - Scale line 1.0 mm.

median plate covering membraneous tubes; lateral sclerites sickle-shaped, bent away from the truncus, their tips almost touching each other; stylus slender, base bulbous, apex with a small pair of subterminal ventral teeth.

♀. As the male, no external sexual dimorphism discernible.

Measurements: ♂ holotype (♀ in parentheses): Body 3.38 (3.60) long, 2.32 (2.54) wide; carapace region 0.79 (0.75) long, 1.29 (1.32) wide. - Palp and legs:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.41 (0.41)	0.47 (0.47)	0.38 (0.39)	0.27 (0.27)	- -	0.56 (0.56)	2.09 (2.10)
Leg I	0.38 (0.38)	0.86 (0.89)	0.50 (0.53)	0.52 (0.53)	0.75 (0.75)	0.58 (0.58)	3.59 (3.66)
Leg II	0.47 (0.47)	1.16 (1.21)	0.69 (0.71)	0.79 (0.82)	1.16 (1.16)	0.69 (0.69)	4.96 (5.06)
Leg III	0.38 (0.38)	0.86 (0.91)	0.53 (0.57)	0.58 (0.60)	0.97 (0.97)	0.44 (0.44)	3.76 (3.87)
Leg IV	0.44 (0.47)	1.22 (1.27)	0.69 (0.72)	0.88 (0.89)	1.44 (1.44)	0.50 (0.50)	5.17 (5.29)

Variation: Range of measurements in ♂♂ (n=4) and ♀♀ (n=5; in parentheses): Body 3.31-3.38 (3.39-3.75) long, 2.32-2.36 (2.32-2.59) wide, carapace region 0.72-0.79 (0.72-0.79) long, 1.27-1.29 (1.29-1.37) wide. There is only very little variation in the shape of the eye tubercle and of the ventral processes on palpal trochanter and femur. The penes possess a slightly arched or slightly invaginated distal margin (Figs 25, 27, 29). The holotype has a circular constriction above the base of its truncus penis. This is absent in one ♂ and developed into a small circular fold [as otherwise only observed in the lectotype of *G. sumatranus* (Schwendinger & Martens, 1999b: figs 70, 71)] in the other ♂ (Figs 23, 24).

Relationships: External and genital morphology show that *G. monticola* sp. n. is most closely related to *G. asli*, which occurs in the lowlands at the foot of the Cameron Highlands.

Distribution and bionomics: Known only from the Cameron Highlands in the western part of peninsular Malaysia [Fig. 1 (13)]. The specimens were sifted from leaf litter of a montane rain forest.

Gnomulus pilosus sp. n. Figs 36-45

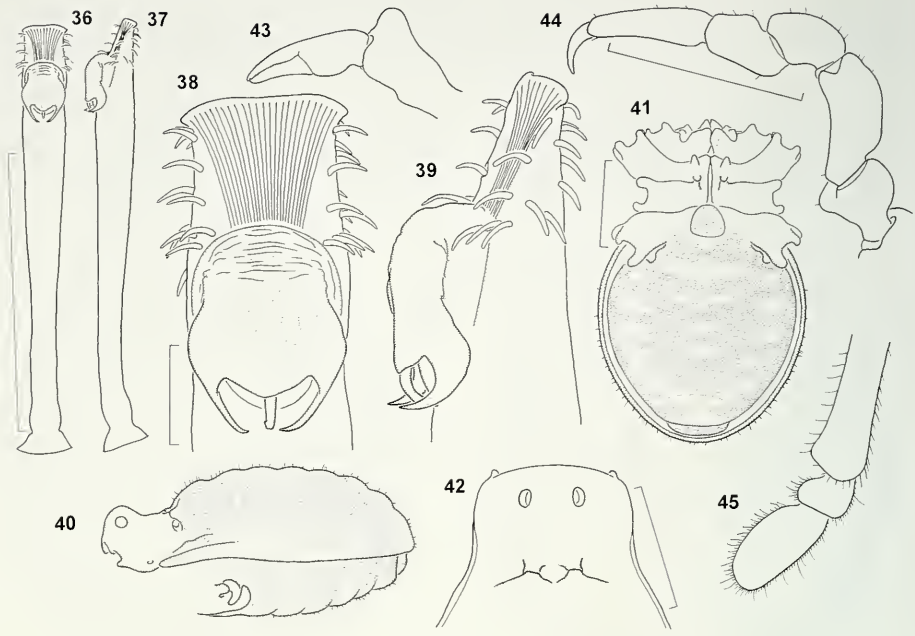
Material: MALAYSIA (peninsula), Pahang, Taman Negara (= National Park), Tembeling Trail, 90-120 m, ♂ holotype, 10./13.III.1993, leg. I. Löbl & F. Calame (MHNG).

Etymology: Latin: *pilosus* = hairy.

Diagnosis: Similar to *G. hirsutus*, distinguished by: Hair cover less dense; colour pattern on ventral scutum different; anterior dorsal scutal margin less rounded; teeth of carapace-abdomen bridge more widely separated; ventral process on palpal femur smaller; glans penis with a shorter, more V-shaped median plate and more strongly converging lateral sclerites with a wider base.

Description: ♂ (holotype). Coloration: Body amber, with dark reticulation in carapax region and with dark pattern on dorsal (shaped as in *G. hirsutus*) and ventral scuta. Genital operculum dark. Palps and chelicerae light amber, with a dark reticulation (except on palpal tarsus). Legs mostly dark brown, with a light circular median band on metatarsi III and IV and (less distinct) on femur IV; tarsi light amber, with distitarsus I dorsally darkened.

Carapace with rounded eye tubercle, no lateral tubercles. Left and right processes of carapace-abdomen bridge distinctly separated from each other (Fig. 42). Dorsal and ventral scutal areas moderately elevated (Fig. 40). Palpal coxa with distinct ventral process; leg coxa I with widely triangular anterolateral process; ventral side of leg coxae II and III with conical anteroproximal processes, the latter



FIGS 36-45

Gnomulus pilosus sp. n., ♂ holotype. - Penis, dorsal (36) and lateral view (37); apex of penis, dorsal (38) and lateral view (39). Body, lateral (40) and ventral view (41); anterior body, dorsal view (42); left chelicera, retrolateral view (43); left palp, retrolateral view (44); distal part of left leg II, retrolateral view (45). - Scale lines 0.1 mm (38, 39), 1.0 mm (others).

overlapped by rounded posteroproximal process on coxa II. Genital operculum slightly wider than long; a distinct tubercle present on posterior margin of stigmatic pit (Fig. 41). Whole body, except for carapace region, covered by fine hairs (Fig. 40).

Chelicerae (Fig. 43): Hand weak, proximal article with distinct dorsodistal and indistinct dorsomedian boss and with indistinct retroventral tubercle.

Palps (Fig. 44): Ventral side of femur with small rounded proximal process; trochanter with distad-inclined ventral process.

Legs 1324, tarsal formula 2-2-3-3. Distitarsus II 2.1 times longer than wide (Fig. 45).

Penis (Figs 36-39): Truncus continually widening towards apex, with widely arched, indistinctly invaginated distal margin. Glans quite remote from tip of truncus, with rounded membraneous socket and short, widely V-shaped median plate covering membraneous tubes; lateral sclerites sickle-shaped, their bases wide (as seen in lateral view; Fig. 39), distal parts bent away from the truncus and towards each other; stylus slender, base bulbous, apex with a small pair of subterminal ventral teeth.

♀. Unknown.

Measurements: ♂: Body 3.45 long, 2.32 wide; carapace region 0.74 long, 1.28 wide. - Palp and legs:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.38	0.50	0.39	0.27	-	0.57	2.11
Leg I	0.38	0.98	0.55	0.57	0.82	0.66	3.96
Leg II	0.49	1.32	0.71	0.88	1.34	0.71	5.45
Leg III	0.39	0.98	0.58	0.61	1.07	0.46	4.09
Leg IV	0.49	1.39	0.77	0.96	1.61	0.53	5.75

Relationships: Externally the new species is very similar to *G. hirsutus* (especially in hair cover and dorsal colour pattern), but penis morphology indicates a closer relationship with *G. monticola* sp. n.

Distribution and bionomics: Known only from the type locality in the southern part of Taman Negara, in the centre of peninsular Malaysia [Fig. 1 (14)]. The type specimen was sifted from leaf litter of a lowland rain forest.

THE *ROSTRATOIDEUS*-GROUP (new)

Diagnosis: Medium-sized (about 5.5 mm) species with strongly forward-inclined, beak-like eye tubercle and distinct carapace-abdomen bridge; ventral process on palpal trochanter distad-directed; dark margin around dorsal scutum unbroken; posterior margin of stigmatic pit without tubercle; stylus penis with invaginated base and without subterminal ventral teeth.

Species account and distribution: This species group is represented only by *G. rostratoideus* sp. n. from the southern end of the Malay Peninsula.

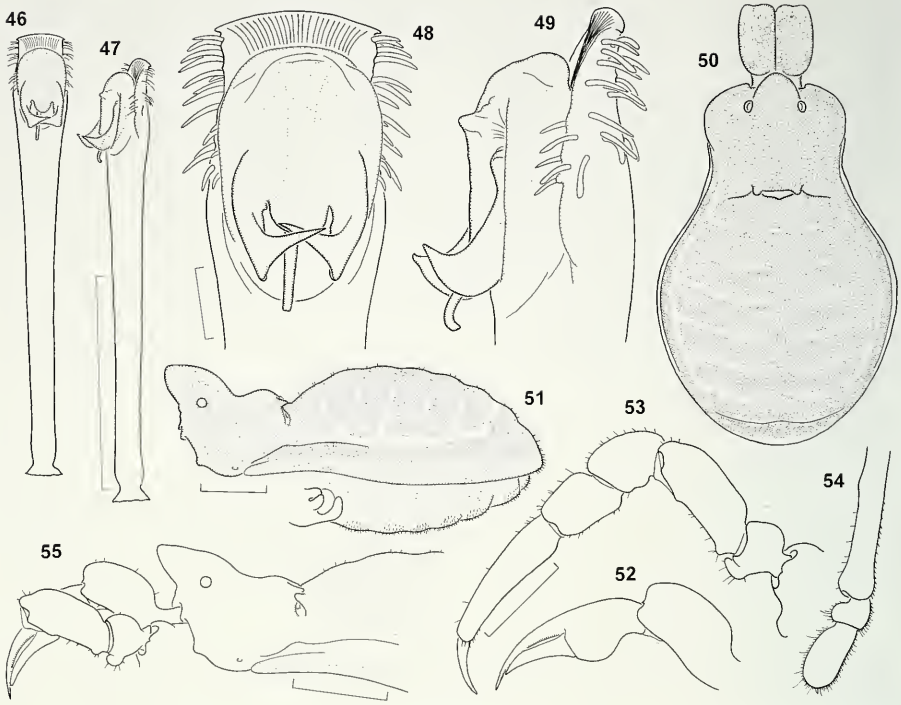
Gnomulus rostratoideus sp. n. Figs 46-55

Material: MALAYSIA (peninsula), Kota Tinggi Waterfalls, 170 m, at the foot of Gunung Muntahak, ca. 15 km NW of Kota Tinggi, Johor, ♂ holotype, 5.II.2000, leg. P. J. Schwendinger. - SINGAPORE, Bukit Timah Nature Reserve, 1 ♀ (not a type), 4.VII.1969, leg. D. H. Murphy; same locality, Jungle Fall Valley, 100 m, 1 ♀ (not a type), 9.VI.2001, leg. P. Schwendinger. All specimens in MHNG.

Etymology: The latinized Greek suffix *-oideus* refers to similarities with *G. rostratus* Thorell.

Diagnosis: Externally similar to *G. rostratus* Thorell, distinguished by a narrower eye tubercle (in dorsal view), by a more arched dorsal and ventral scutum and by an unbroken dark margin around the dorsal scutum. Penis very different in shape: Truncus more slender, distal margin widely rounded; glans with convex pincer-like lateral sclerites ending in undivided apices, with a rounded median plate covering short membraneous tubes, and with a thin, tubular stylus without subterminal ventral teeth.

Description: ♂ (holotype). Coloration: Body amber, with dark brown reticulation on carapace, chelicerae, pedipalps and ventral side of prosoma. Abdominal part of dorsal scutum framed by an unbroken dark margin; dark transversal bands on scutal elevations, medially interconnected in areas III-V (Figs 50, 51). Legs mostly dark brown; tarsi light brown, with reddish grey on proximal part of dorsal distitarsi I and II. Ventral scutal areas with faint dark transversal bands; genital operculum dark reddish brown.



FIGS 46-55

Gnomulus rostratoideus sp. n., ♂ holotype (46-54), ♀ (55). - Penis, dorsal (46) and lateral view (47); apex of penis, dorsal (48) and lateral view (49). Body, dorsal (50) and lateral view (51); left chelicera, retrolateral view (52); left palp, retrolateral view (53); distal part of left leg II, retrolateral view (54). Anterior body, chelicera and proximal palp, lateral view (55). - Scale lines 0.1 mm (48, 49), 1.0 mm (others).

Carapace with large pointed, anteriad-inclined eye tubercle and with a rounded hump behind it; no lateral tubercles present; carapace-abdomen bridge composed of two opposing pairs of widely separated teeth (Figs 50, 51). Abdominal part of dorsal scutum moderately arched; ventral and dorsal scutal areas only slightly elevated, the ventral ones bearing "encrusted" hairs (Fig. 51). Palpal coxa with large ventral process; ventral side of leg coxa I with distinct anterolateral process; ventral side of leg coxa II with pronounced anteroproximal and posteroproximal processes, coxa III with distinct anteroproximal one. Genital operculum as long as wide, anteriorly rounded; posterior margin of stigmatic pit without tubercle but with distinct ledge.

Chelicerae (Fig. 52) weak; proximal article with dorsodistal to dorsomedian boss (distally low) and without ventral tubercle. Cheliceral fingers very long and slender.

Palps (Fig. 53): Ventral side of femur with small proximal process and bulging distal margin; trochanter with distad-directed ventral process.

Legs 1324, tarsal formula 2-2-3-3. Distitarsus of leg II 2.2 times longer than wide (Fig. 54).

Penis (Figs 46-49): Truncus penis fairly slender, continually widening from base to the height of glans, narrower between middle of glans and widely rounded distal margin. Glans penis with large membraneous socket, about as wide as truncus at that point; lateral sclerites convex, sickle-shaped, with acutely pointed tips crossing each other; membraneous tubes short, completely covered by a rounded, U-shaped median plate; stylus long and slender, its base slightly invaginated, its apex without subterminal ventral teeth.

♀ (Identification uncertain). As the male, but eye tubercle less elevated and more pointed in dorsal view, region behind eye tubercle less elevated, abdominal part of dorsal scutum less arched, ventral process on palpal trochanter shorter, more knob-shaped (Fig. 55).

Measurements: ♂ holotype (♀ in parentheses): Body 5.48 (5.43) long, 3.48 (3.33) wide; carapace region 1.70 (1.50) long, 2.06 (1.90) wide. - Palp and legs:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.63 (0.51)	1.15 (0.91)	0.79 (0.65)	0.61 (0.53)	- -	1.47 (1.31)	4.65 (3.91)
Leg I	0.63 (0.53)	1.74 (1.43)	0.83 (0.75)	1.03 (0.87)	1.50 (1.27)	0.83 (0.69)	6.56 (5.54)
Leg II	0.75 (0.71)	2.30 (1.96)	1.19 (1.17)	1.66 (1.39)	2.30 (1.90)	1.03 (0.87)	9.23 (8.00)
Leg III	0.55 (0.55)	1.72 (1.39)	0.91 (0.75)	1.07 (0.87)	1.72 (1.50)	0.61 (0.55)	6.58 (5.61)
Leg IV	0.77 (0.67)	2.38 (1.98)	1.21 (1.07)	1.62 (1.39)	2.65 (2.28)	0.75 (0.63)	9.38 (8.02)

Variation: The second ♀ measures: Body length 5.26, width 3.22, carapace length 1.49, width 1.78. Both ♀ from Singapore are smaller than the ♂ from Malaysia and differ in some details of external morphology. These specimens may therefore not be conspecific, but the common presence of an unbroken dark dorsal scutal margin, a fairly distinct hair cover and geographical proximity clearly show that they are more closely related with each other than with any of the species of the *rostratus*-group. Until this uncertainty is solved by the discovery of a ♂ from Singapore, we tentatively place the ♀♀ examined in *G. rostratoideus* sp. n., but we do not designate them as paratypes.

Relationships: *Gnomulus rostratoideus* sp. n. appears to be the sister taxon of the *rostratus*-group. Congruence in penis morphology with the species of the *goodnighti*-group is considered to be due to convergence (see discussion).

Distribution and bionomics: Known from rainforests in the south of peninsular Malaysia [Fig. 1 (15)] and on nearby Singapore Island [Fig. 1 (16)].

THE *SUMATRANUS*-GROUP (see Schwendinger & Martens, 1999b: 957)

Diagnosis: The new species possesses a distinctly elevated eye tubercle and posteroproximal processes on coxae II, but no transversal keels on its dorsal scutum. Therefore the diagnosis of this group has to be modified. The *sumatranus*-group is essentially characterized by: Body large (6.8-9.0 mm); chelicerae robust (at least in the ♂), with a distad-inclined proventral tooth (pointed process) on proximal article; a subdistal process present on ventral side of palpal femur (indistinct in some females); proximal process on ventral side of palpal femur slightly to distinctly distad-directed; distodorsal tubercle present on palpal trochanter; posterior margin of stigmatic pit with tubercle; lateral sclerites on glans penis cylindrical, acutely pointed, only slightly bent; stylus penis with ventral pair of subterminal teeth and bulbous base.

Species account and distribution: This group comprises two species from Sumatra, i.e. *G. sumatranus* Thorell and *G. tuberculatus* sp. n.

Gnomulus tuberculatus sp. n. Figs 56-73

Material: INDONESIA, Sumatra, Aceh Province, Gunung Leuser National Park, Ketambe Research Station, 300-500 m, ♂ holotype (MHNG), 1 ♂, 3 ♀ paratypes, 3 juv., 23.-30.XI.1989, leg. I. Löbl, D. Agosti & D. Burckhardt (1 ♀ paratype in MAR, others in MHNG).

Etymology: Latin: *tuberculatus* = tuberculate. The specific epithet refers to the presence of two tubercles on the dorsal side of leg coxa IV and of one tubercle on the anterolateral side of trochanter III.

Diagnosis: Close to *G. sumatranus*, distinguished by: Body smaller; carapace shorter in the ♂, with a distinct eye tubercle in both sexes; ventral side of leg coxa II with an anteroproximal process, process on coxa III larger; trochanter III with a small prolateral tubercle; proximal process on ventral side of palpal femur smaller, not distad-inclined, subdistal process indistinct; distitarsus II shorter; penis without circular fold around subbasal truncus; distal margin of truncus less arched; two setae present on each side of glans penis; tips of lateral sclerites slightly inclined towards each other.

Description: ♂ (holotype). Coloration: Body amber, with dark reticulation on carapace, chelicerae and pedipalps; dorsal scutal elevations dark brown, separated by a light median, longitudinal, partly broken stripe in areas I-IV and by pairs of light transversal stripes ending in light paramedian patches (Fig. 73a, c). Legs dark brown; tarsi I, II cream (slightly darkened on dorsal side of distitarsus I), tarsi III, IV light brown.

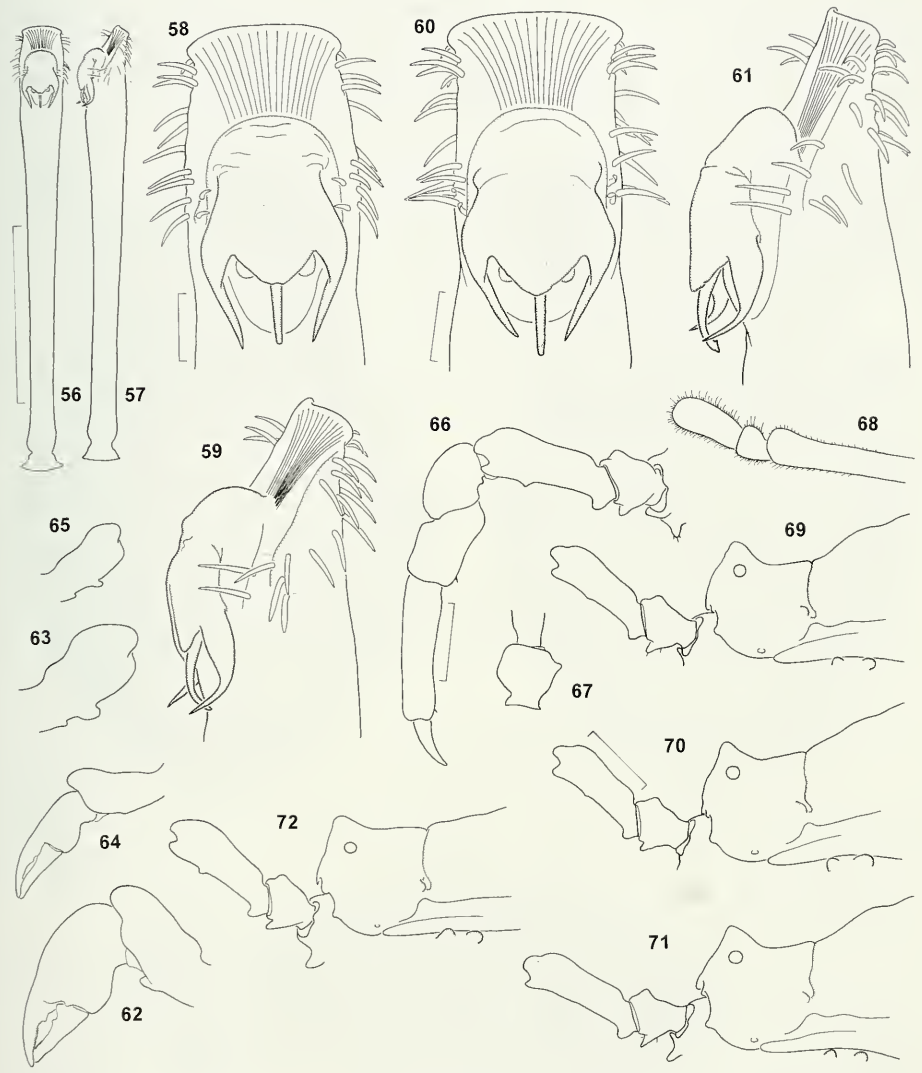
Carapace with conical, distally rounded eye tubercle and an indistinct pair of lateral tubercles below wide undivided carapace-abdomen bridge. Dorsal scutal areas only slightly elevated; ventral scutal areas distinctly swollen, without hairs (Figs 73a, c). Palpal coxa with distinct ventral process; leg coxa I with long, outwards-inclined anterolateral one; ventral leg coxae II and III with distinct anteroproximal processes, coxa II additionally with low posteroproximal one (Fig. 73b); dorsal side of leg coxa IV with two knob-shaped tubercles (Figs 69-72, 73c). Genital operculum about as long as wide; rounded tubercle on posterior margin of stigmatic pit (Fig. 73b).

Chelicerae (Figs 62, 63): Hand strong, cutting edges of fingers each with a strong subbasal tooth; proximal article with forward-inclined dorsodistal to dorsomedian boss and with two distad-inclined proventral teeth (the subbasal one smaller than the subterminal one; Fig. 63).

Palps (Fig. 66): Ventral side of femur with indistinct subdistal and distinct proximal process; trochanter with low dorsal tubercle and with small, slightly distad-inclined ventral process.

Legs 1324, tarsal formula 2-2-3-3. Trochanter of leg III with prolateral tubercle (Fig. 67); distitarsus II about 2.2 times longer than wide (Fig. 68).

Penis (Figs 56-61; holotype: 60, 61): Truncus fairly slender, with very widely arched distal margin; membraneous socket of glans penis laterally bordered by two pairs of setae. Glans with subtriangular median plate partly covering membraneous tubes; distal portion of lateral sclerites cylindrical, acutely pointed, not sigmoid and only moderately bent away from the truncus, tips slightly inclined towards each other; stylus slender, base bulbous, apex with a small pair of subterminal ventral teeth.



FIGS 56-72

Gnomulus tuberculatus sp. n., ♂ holotype (60, 61, 62, 63, 66-68), ♂ paratype (56-59, 72), ♀ paratypes (64, 65, 69-71). - Penis, dorsal (56) and lateral view (57); apex of penis, dorsal (58, 60) and lateral view (59, 61). Left chelicera, retrolateral view (62, 64); proximal article of left chelicera, prolateral view (63, 65); left palp, retrolateral view (66); trochanter of left leg III, dorsal view (67); distal part of left leg II, retrolateral view (68); anterior body and proximal palp, lateral view (69-72). - Scale lines 0.1 mm (58-61), 1.0 mm (others).

♀. As the male but coloration generally more reddish; carapace region slightly smaller; chelicerae weaker, subbasal tooth on cutting edge of both cheliceral fingers indistinct, no dorsomedian boss on proximal article (Figs 64, 65); subdistal process on

ventral side of palpal femur reduced, hardly discernible (Figs 69-71); ventral scutal areas not swollen.

Measurements: ♂ holotype (♀ in parentheses): Body 6.83 (6.90) long, 4.80 (4.70) wide; carapace region 1.83 (1.39) long, 2.77 (2.43) wide. - Palp and legs:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.99 (0.79)	1.63 (1.29)	1.04 (0.84)	0.77 (0.59)	- -	1.88 (1.53)	6.31 (5.04)
Leg I	0.79 (0.69)	2.57 (2.40)	1.14 (1.04)	1.29 (1.19)	2.28 (2.05)	1.06 (0.99)	9.13 (8.36)
Leg II	0.94 (0.84)	3.32 (3.17)	1.56 (1.41)	2.18 (2.03)	3.42 (3.22)	1.29 (1.29)	12.71 (11.96)
Leg III	0.74 (0.69)	2.52 (2.38)	1.19 (1.14)	1.44 (1.34)	2.70 (2.57)	0.69 (0.79)	9.28 (8.91)
Leg IV	1.01 (0.99)	3.27 (3.17)	1.58 (1.48)	2.23 (2.13)	4.11 (3.98)	0.94 (0.89)	13.14 (12.64)

Variation: Range of measurements in ♂♂ (n=2) and ♀♀ (n=3; in parentheses): Body 6.83-7.05 (6.90-7.18) long, 4.80-4.93 (4.60-4.95) wide, carapace region 1.73-1.83 (1.39-1.46) long, 2.77-2.82 (2.43-2.52) wide. Most specimens have a narrowly rounded eye tubercle (Figs 69, 70, 72, 73c), in one ♀ it is almost pointed (Fig. 71).

Relationships: Genital morphology and certain characteristics of chelicerae, palps and leg coxae I indicate that *Gnomulus tuberculatus* sp. n. is most closely related to *G. sumatranus*.

Remark: The eye tubercles of the juvenile specimens and of a female were illustrated in Schwendinger & Martens (1999b: figs 135-137).

Distribution: Known only from the type locality in northern Sumatra [Fig. 1 (17)].

THE *ARMILLATUS*-GROUP (see Schwendinger & Martens, 1999b: 958)

Diagnosis: The following characteristics are added to the diagnosis of this group of medium-sized to large (5.3-8.6 mm) species: Ventral side of palpal trochanter with ventrad- or slightly distad-directed process; posterior margin of stigmatic pit with distinct (often pronounced) tubercle; stylus with a ventral pair of subterminal teeth and with a bulbous base.

Species account and distribution: 20 species are known at present: One from Myanmar (*G. leofeae* sp. n.), two from Thailand (*G. marginatus* sp. n., *G. ryssie* sp. n.), two from peninsular Malaysia [*G. piliger* (Pocock), *G. pulvillatus* (Pocock)], two from Sumatra [*G. armillatus* (Thorell), *G. drescoi* (Šilhavý)], two from Java [*G. javanicus* sp. n., *G. thorelli* (Sørensen) (male unknown, uncertain assignment)] and 10 from Borneo [*G. annulipes* (Pocock), *G. baharu* Schwendinger, *G. carinatus* sp. n., *G. conigerus* (Schwendinger), *G. exsudans* sp. n., *G. hutan* sp. n., *G. laevis* (Roewer), *G. lonuni* sp. n., *G. obscurus* sp. n., *G. sundaicus* (Schwendinger)] and one from Palawan, the Philippines [*G. palawanensis* (Suzuki), male unknown, uncertain assignment].

Gnomulus marginatus sp. n. Figs 74-91

Material: THAILAND, Chanthaburi Province and District, Nam Tok Phliu - Khao Sabap National Park, near Phliu Waterfall, 50 m, ♂ holotype, 2 ♂, 1 ♀ paratypes, 12.XI.1998. - Trat Province, Laem Ngop District, Ko Chang (= Elephant Island) National Park, forest above White Sand Beach, 20-50 m, 3 ♂ paratypes, 6.-8.IX.1993, 1 juv., 24.VIII.1992 (all specimens

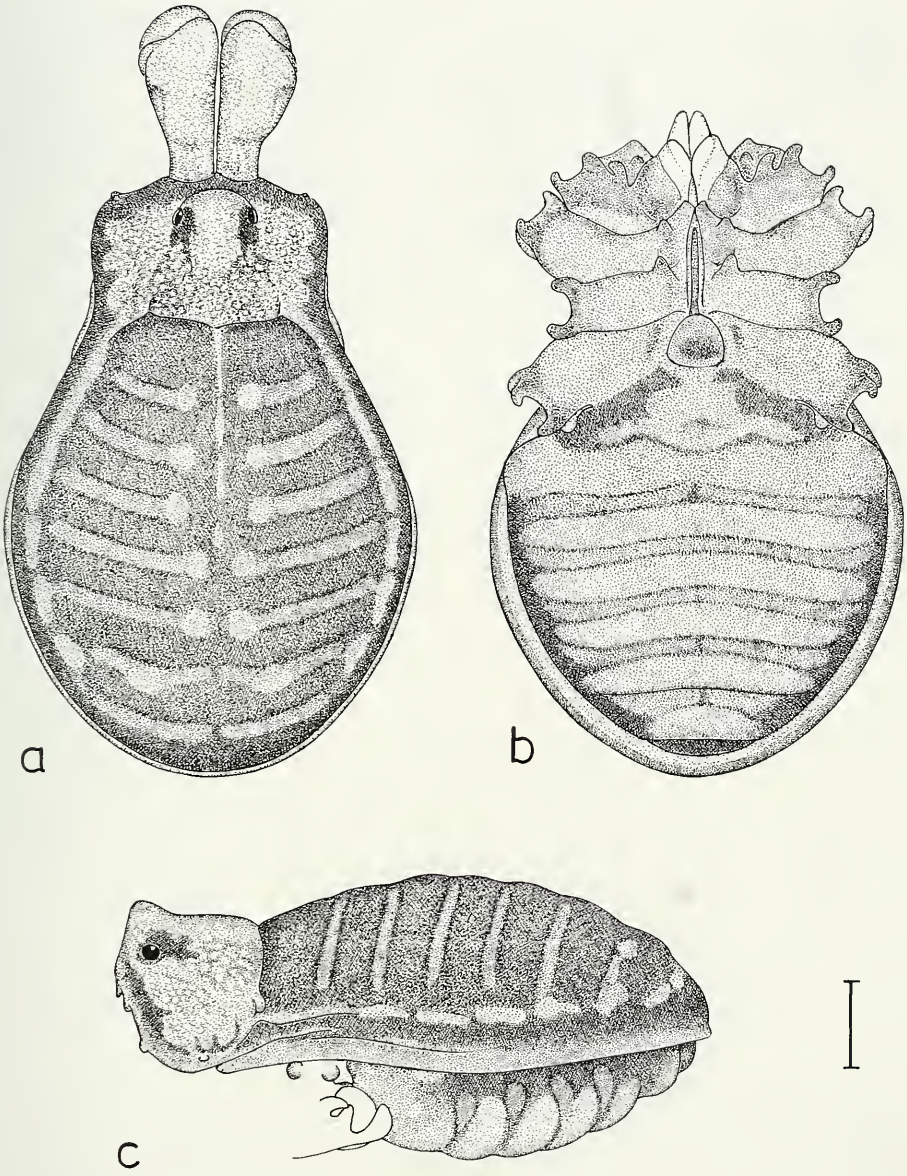
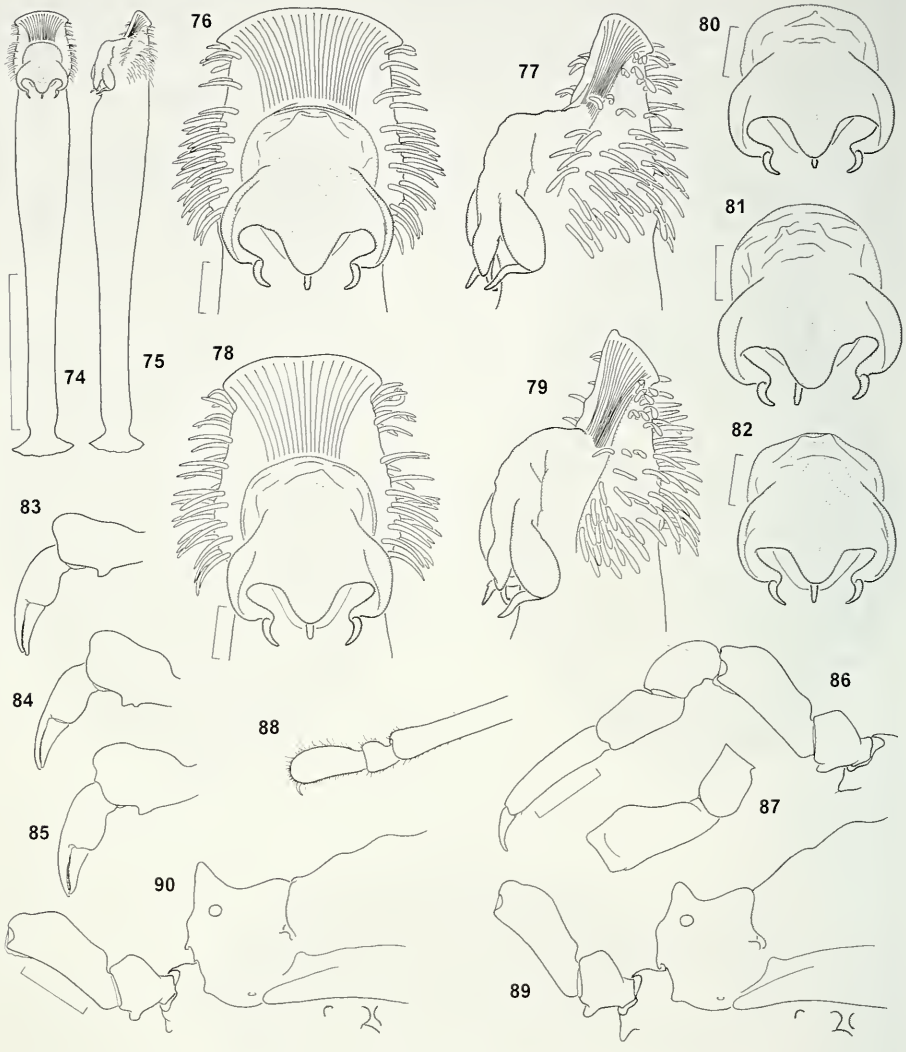


FIG. 73

Gnomulus tuberculatus sp. n., ♂ holotype. - Body, dorsal (a), ventral (b) and lateral view (c). - Scale line 1.0 mm.

leg. P.J. Schwendinger); same island, west side, 12°03'N, 102°18'E, 50-200 m, 1 ♂ paratype, 3.-23.XII.1999 (leg. A. Schulz). 1♂ paratype in MAR, others in MHNG.

Etymology: Latin: *marginatus* (adjective of *margo*) = framed. The specific epithet refers to the conspicuous dark marginal and light submarginal band around the abdominal part of the dorsal scutum.



FIGS 74-90

Gnomulus marginatus sp. n., ♂ holotype (74-77, 85-88), ♂ paratype (78-82, 84, 90), ♀ paratypes (83, 89). - Penis, dorsal (74) and lateral view (75); apex of penis, dorsal (76, 78) and lateral view (77, 79); glans penis, dorsal view (80-82). Left chelicera, retrolateral view (83-85); left palp, retrolateral view (86); trochanter and femur of left palp, dorsal view (87); distal part of left leg II, retrolateral view (88); anterior body and proximal palp, lateral view (89, 90). - Scale lines 0.1 mm (76-82), 1.0 mm (others).

Diagnosis: Similar to *G. armillatus*, distinguished by: Light submarginal band on abdominal part of dorsal scutum; retroventral tooth on proximal cheliceral article more distinct and pointed; ventral processes on palpal femur and trochanter smaller; two tubercles on dorsal side of leg coxa IV and one on lateral side of abdominal

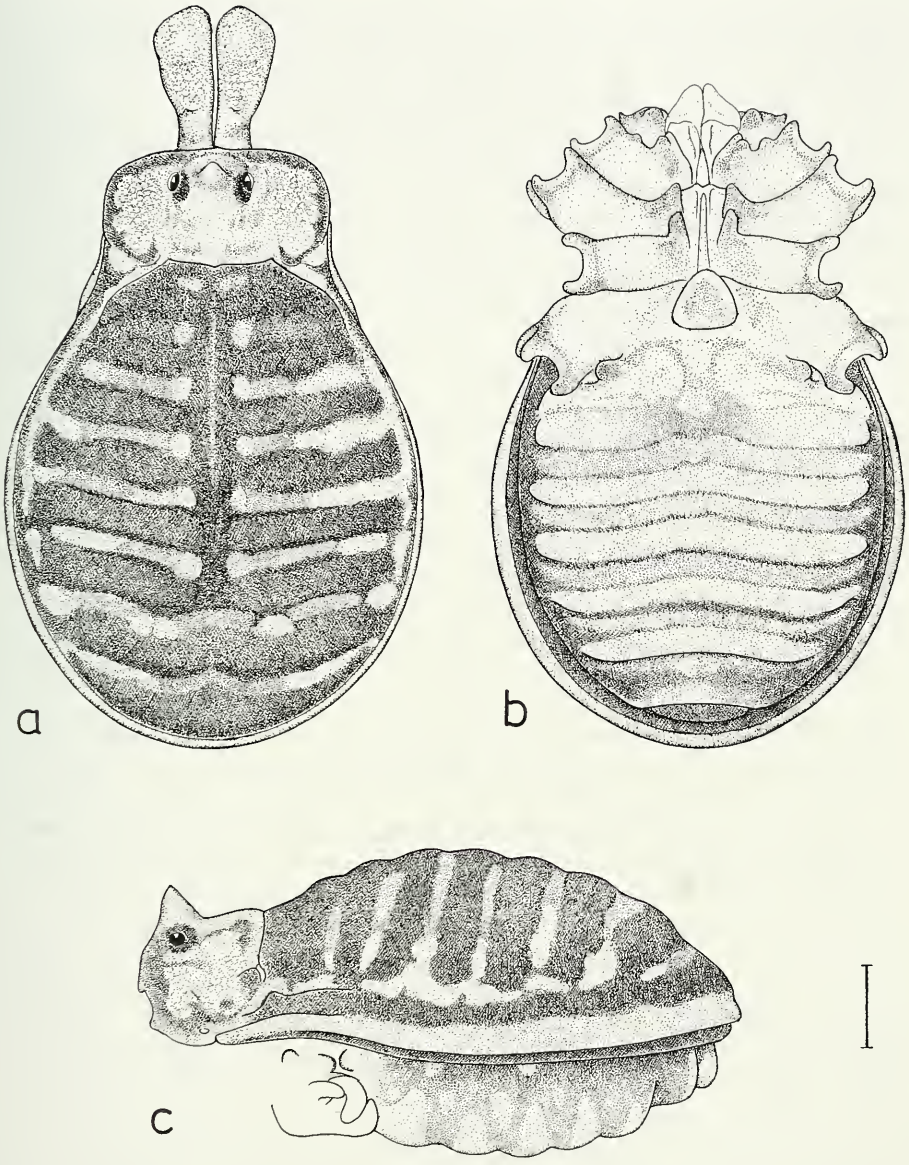


FIG. 91

Gnomulus marginatus sp. n., ♂ holotype. - Body, dorsal (a), ventral (b) and lateral view (c). - Scale line 1.0 mm.

segment II; penis more stout, glans wider, its lateral sclerites more convex and basally more elevated, its median plate longer, tongue-shaped.

Description: ♂ (holotype). Coloration: Body brown, dorsal scutum with dark brown pattern and clearly outlined red-brown margin below light brown submarginal

band (Fig. 91a, c); ventral scutal elevations pallid (Fig. 91b); legs dark brown, except for light yellow-brown tarsi (tarsus I dorsodistally darkened); dark reticulation on brown carapace and palps and on light brown chelicerae.

Carapace with conical, pointed eye tubercle and with a pair of lateral tubercles posteriorly below wide, indistinctly divided carapace-abdomen bridge. Dorsal scutal areas only slightly elevated, divided by a shallow median furrow in areas I-IV; ventral scutal areas distinctly swollen, no hairs present (Fig. 91a, c). Palpal coxa with large ventral process; leg coxa I with distinct anterolateral process; ventral side of leg coxae II and III with distinct anteroproximal processes, coxa II also with indistinct posteroproximal one (Fig. 91b); dorsal side of leg coxa IV with two knob-shaped tubercles; one more such tubercle posterior to them, on the lateral side of abdominal segment II (Fig. 91c). Genital operculum somewhat triangular, wider than long; posterior margin of stigmatic pit with a distinct rounded tubercle (Fig. 91b).

Chelicerae (Fig. 85): Hand weak, proximal article fairly strong, with dorsodistal to dorsomedian boss and distinct retroventral tooth.

Palps (Figs 86, 87): Femur with low prodorsal median boss (Fig. 87) and indistinct ventroproximal process; trochanter with low ventral process.

Legs1324, tarsal formula 2-2-3-3. Distitarsus of leg II about 2.3 times longer than wide (Fig. 88).

Penis (Figs 74-82; holotype: 74-77): Truncus fairly stout, slightly constricted below glans, with widely arched distal margin and plenty of subapical setae. Glans with tongue-shaped median plate covering membraneous tubes; lateral sclerites with moderately elevated dorsal ledge in proximal part, distal part slender, sigmoid, cylindrical, pointing away from the truncus, tapering tips widely apart; stylus slender, base bulbous, apex with a small pair of subterminal ventral teeth.

♀. As the male but dark pattern on dorsal scutum less pronounced, ventral scutal elevations not pallid; eye tubercle slightly smaller and less pointed (possibly an individual variation; Fig. 89); proximal article of chelicerae more slender (Fig. 83).

Measurements: ♂ holotype (♀ in parentheses): Body 6.74 (7.08) long, 4.82 (4.97) wide; carapace region 1.48 (1.38) long, 2.61 (2.58) wide. - Palp and legs:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.89 (0.89)	1.48 (1.40)	1.08 (1.08)	0.81 (0.79)	- -	1.55 (1.53)	5.81 (5.69)
Leg I	0.69 (0.64)	2.46 (2.41)	1.16 (1.11)	1.25 (1.28)	2.16 (2.12)	0.98 (0.93)	8.70 (8.49)
Leg II	0.89 (0.86)	3.17 (3.15)	1.48 (1.48)	2.21 (2.12)	3.25 (3.20)	1.33 (1.28)	12.33 (12.09)
Leg III	0.79 (0.74)	2.51 (2.41)	1.21 (1.21)	1.43 (1.38)	2.56 (2.48)	0.79 (0.74)	9.29 (8.96)
Leg IV	0.93 (0.93)	3.20 (3.15)	1.53 (1.48)	2.19 (2.09)	3.89 (3.81)	0.93 (0.93)	12.67 (12.39)

Variation: Range of measurements in ♂♂ (n=6): Body 6.33-6.95 long, 4.65-4.82 wide, carapace region 1.45-1.56 long, 2.54-2.61 wide. One ♂ paratype with a bifid ventral tooth on proximal cheliceral article (Fig. 84) and with a truncate ventral process on palpal trochanter (Fig. 90).

Relationships: *Gnomulus marginatus* sp. n. clearly belongs to the *armillatus*-group; it appears most closely related to *G. piliger*, *G. pulvillatus* from the Malayan Peninsula and to *G. armillatus* from Sumatra. Striking similarities in external and penis morphology are also evident between *G. marginatus* sp. n. and *G. annulipes* from Sarawak. These are regarded as convergences.

Distribution and bionomics: Known from two localities (separated by about 50 km) in southeastern Thailand, one on the mainland [Fig. 1 (5)] and the other on an island ca. 6 km off the coast [Fig. 1 (6)]. The animals were found under decaying wood on the forest floor of a semi-evergreen rain forest (at Nam Tok Phliu) and of a secondary forest adjacent to primary forest (on Ko Chang).

Gnomulus ryssie sp. n. Figs 92-101

Material: THAILAND, Phetchaburi Province, Kaeng Krachan National Park, 300-400 m, 25-30 km W of park headquarters, ♂ holotype, 17.XI.1985, leg. I. Löbl & D. Burckhardt (MHNG).

Etymology: Ryssie is a forest-dwelling hermit in Thai (originally Hindu) mythology. Noun in apposition.

Diagnosis: Closest to *G. marginatus* sp. n., distinguished by: Eye tubercle larger; abdominal region higher; no ventral process on proximal article of chelicerae; no prodorsal boss on palpal femur; ventral process on palpal trochanter smaller; no posterior tubercle on dorsal side of coxa IV; lateral tubercles on abdominal segment II indistinct; penis more slender, with fewer subapical setae; glans with longer, subtriangular median plate; lateral sclerites less distinctly elevated above median plate.

Description: ♂ (holotype). Coloration: Body light amber, with dark reticulation in carapace region, on proximal article of chelicerae and on femur to tarsus of pedipalps; dorsal scutal elevations dark (Fig. 96), ventral ones pallid; legs and palps dark amber, all tarsi and distal portion of leg tibiae III and IV light brown; dorsal side of distitarsus I darkened.

Carapace with strong conical eye tubercle and a small pair of lateral tubercles below wide, medially divided carapace-abdomen bridge. Abdominal part of dorsal scutum high; scutal areas slightly elevated, medially separated by a shallow longitudinal furrow in anterior part of abdominal region (Figs 96, 97); ventral scutal areas distinctly swollen, without pubescence. Palpal coxa with conical ventral process; leg coxa I with anterolateral one; ventral side of leg coxae II and III with distinct anteroproximal processes, coxa II with small posteroproximal one; dorsal side of leg coxa IV with distinct anterior tubercle, posterior one absent; pair of lateral tubercle on abdominal segment II indistinct. Genital operculum wider than long; stigmatic pit with a rounded tubercle on posterior margin.

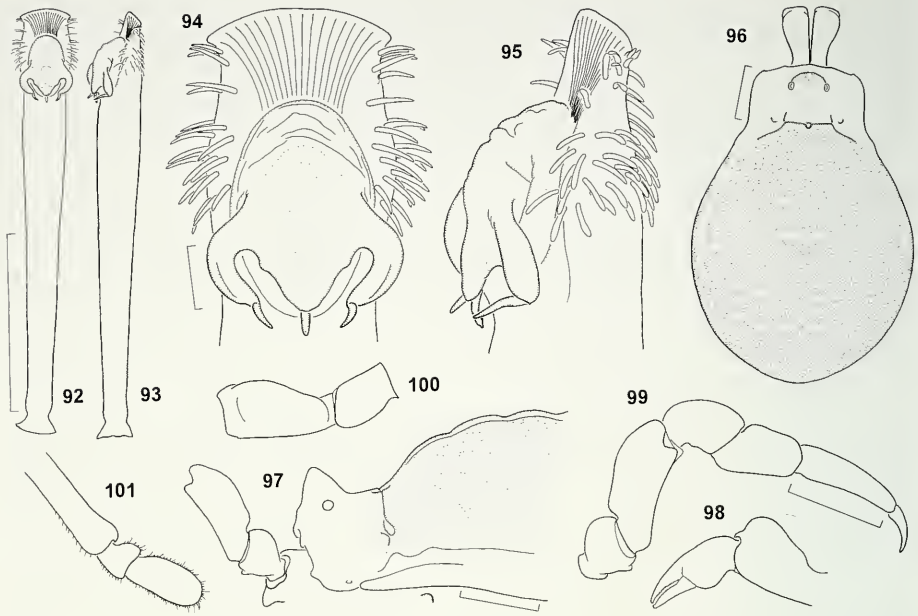
Chelicerae (Fig. 98): Proximal article with distinct dorsodistal and indistinct dorsomedian boss; no ventral process.

Palps (Figs 99, 100): Femur with indistinct ventroproximal process, no prodorsal boss (Fig. 100); trochanter with very small ventral process.

Legs 1324, tarsal formula 2-2-3-3. Distitarsus II about 2.2 times longer than wide (Fig. 101).

Penis (Figs 92-95): Truncus slightly constricted below glans, with widely arched distal margin; glans with large subtriangular median plate covering membraneous tubes; lateral sclerites convex, with slightly elevated ledge in proximal part; distal part slender, sigmoid, tapering, pointing away from the truncus, tips widely apart; stylus slender, base bulbous, apex with a small pair of subterminal ventral teeth.

♀. Unknown.



FIGS 92-101

Gnomulus ryssie sp. n., ♂ holotype. - Penis, dorsal (92) and lateral view (93); apex of penis, dorsal (94) and lateral view (95). Body, dorsal view (96); anterior body and proximal palp, lateral view (97). Left chelicera, retrolateral view (98); right palp, retrolateral view (99); trochanter and femur of left palp, dorsal view (100); distal part of left leg II, retrolateral view (101). - Scale lines 0.1 mm (94, 95), 1.0 mm (others).

Measurements: (♂): Body 6.22 long, 4.38 wide; carapace region 1.13 long, 2.21 wide. - Palp and legs:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.69	1.03	0.83	0.59	-	1.15	4.29
Leg I	0.54	1.92	0.89	0.98	1.62	0.79	6.74
Leg II	0.64	2.51	1.13	1.77	2.51	0.98	9.54
Leg III	0.57	1.92	0.98	1.18	2.02	0.59	7.26
Leg IV	0.74	2.56	1.21	1.80	3.10	0.69	10.1

Relationships: *Gnomulus ryssie* sp. n. is closest to *G. marginatus* sp. n.

Distribution: Known only from the type locality in the southwestern part of central Thailand [Fig. 1 (7)].

Gnomulus leofeae sp. n. Figs 102-111

Pelitnus segnipes Loman: Roewer (1935: 13).

Material: MYANMAR, Tenasserim, Malewoon (= Maliwun), ♂ holotype (MSNG, Nr. 10203), leg. L. Fea, VIII-IX 1887.

Etymology: This species is dedicated to the Italian naturalist Leonardo Fea, who travelled and collected in Myanmar in the years 1885-1888. The genitive ending "-ae" is linguistically correct (and accepted by the International Code of Zoological Nomenclature) for names with a terminal "-a", also when referring to a man.

Diagnosis: Closest to *G. pulvillatus*, distinguished by: Eye tubercle lower; lateral tubercles in posterior carapace region present; median dorsal scutal elevations keeled; palpal femur more slender, its ventroproximal process more distad-inclined; leg coxa II without posteroproximal process; penis not constricted at position of glans; glans narrower and less convex in dorsal view, its lateral sclerites longer and more slender; isolated pair of lateral setae on each side of membraneous socket situated more proximally.

Description: ♂ (holotype). Coloration: Body and limbs light amber throughout (bleached), except for slightly darker leg tarsi.

Carapace with widely conical, pointed eye tubercle and a pair of small lateral tubercles (Fig. 106) below wide, medially divided carapace-abdomen bridge (Fig. 108). Dorsal scutal areas slightly elevated, the median ones keeled (Fig. 106). Ventral scutum heart-shaped (probably deformed due to preservation), areas swollen, without pubescence (Fig. 107). Palpal coxa with digitiform ventral process; leg coxa I with pronounced anterolateral one; ventral side of leg coxae II and III with distinct anteroproximal processes, no posteroproximal one coxa II; no tubercles on dorsal side of leg coxa IV. Genital operculum somewhat triangular, slightly wider than long; posterior margin of stigmatic pit with pronounced tubercle (Fig. 107).

Chelicerae (Fig. 109): Proximal article with distinct dorsodistal and indistinct dorsomedian boss, ventral side with low, wide hump.

Palps (Fig. 110): Strong, slightly distad-inclined ventral processes on proximal femur and on trochanter.

Legs 1324, tarsal formula 2-2-3-3. Distitarsus II about 2.8 times longer than wide (Fig. 111).

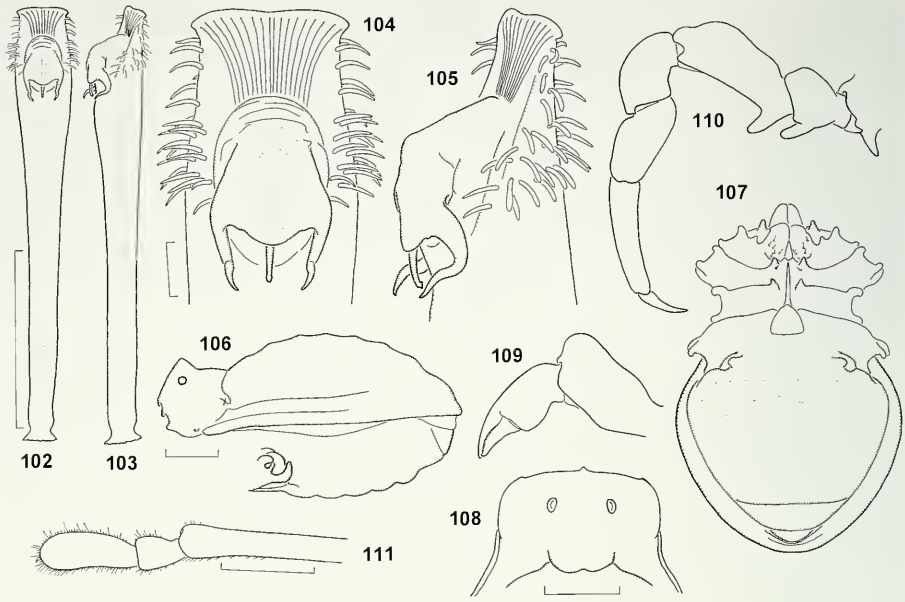
Penis (Figs 102-105): Truncus widest at position of glans, distal margin indistinctly invaginated. Glans with short, widely rounded median plate covering membraneous tubes; lateral sclerites cylindrical, fairly long and slender, their distal parts sigmoid, tapering, pointing away from the truncus; stylus slender, base bulbous, apex with a small pair of subterminal ventral teeth.

♀. Unknown.

Measurements: (♂): Body 5.74 long, 4.21 wide; carapace region 1.44 long, 2.13 wide. - Palp and legs:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.87	1.24	0.99	0.64	-	1.29	5.03
Leg I	0.69	2.45	1.16	1.34	2.08	1.06	8.78
Leg II	0.82	3.37	1.58	2.33	3.22	1.34	12.66
Leg III	0.72	2.50	1.29	1.56	2.57	1.14	9.78
Leg IV	0.89	3.32	1.56	2.28	3.86	1.29	13.20

Relationships: *Gnomulus leofeae* sp. n. is closely related to *G. pulvillatus* from central peninsular Malaysia and to *G. piliger* from southern Thailand.



FIGS 102-111

Gnomulus leofeae sp. n., ♂ holotype. - Penis, dorsal (102) and lateral view (103); apex of penis, dorsal (104) and lateral view (105). Body, lateral view (106); body, ventral view (107); anterior body, dorsal view (108). Left chelicera, retrolateral view (109); left palp, retrolateral view (110); distal part of left leg II, retrolateral view (111). - Scale lines 0.1 mm (104, 105), 1.0 mm (others).

Remarks: *Gnomulus leofeae* sp. n., *G. piliger* and *G. pulvillatus* are quite similar to each other in external and genital characters, and each species is known only from a single specimen. Additional conspecific material from the Malay Peninsula may show whether these are really three distinct species or just individual or population-dependent variations of a widely distributed and unusually variable species.

Distribution: Known only from the type locality at the southernmost tip of Myanmar [Fig. 1 (8)].

Gnomulus armillatus (Thorell, 1891)

Synonyms: See Schwendinger & Martens (1999: 963).

Remark: A new ♂ specimen was collected on Gunung (= Mount) Kerinci (2160 m, 17.-18.II.2000, leg. P. J. Schwendinger, MHNG), Jambi Province, Sumatra [Fig. 1 (20)], which largely accords with the ♂ from the same locality mentioned by Schwendinger & Martens (1999b: 963, 965, figs 114, 122). The new ♂ also possesses a fairly low, rounded eye tubercle, but its ventral processes on palpal femur and trochanter are larger (more typical for males of this species) and the ventral tubercle on the proximal cheliceral article is indiscernible. The median plate of the glans penis

is more distinctly V-shaped, with clearly discernible lateral teeth, well-according with conspecific males from close to the type locality (see Schwendinger & Martens, 1999b: figs 110, 112).

Gnomulus javanicus sp. n. Figs 112-124

Pelitnus segnipes Loman. - Loman (1902: 182, partim). - Roewer (1923: 63, partim).

Material: INDONESIA, Java, Mt. Gede, SE of Bogor, ♂ holotype (ZMH, with labels: "*Pelitnus segnipes*, Loman det. 1901/02, H. Fruhstorfer vend. 18.II.1897" and "*Pelitnus segnipes*, Roewer det. 1914, No. 1258"). - Java, without exact locality, 2 ♀ paratypes (SMF 1602, with label: "*Pelitnus javanus* n. sp. Roewer, typus, 1 ♂, 1 ♀, Roewer det. 1929").

Diagnosis: Similar to *G. laevis*, distinguished by: Body smaller; palp without prolateral boss and with distinct ventrobasal process on femur; ventral process on palpal trochanter longer; distitarsus II shorter; penis with narrower apex and less strongly arched distal margin; glans narrower, its lateral sclerites less convex, with more distinctly pointed apices; median plate shorter.

Description: ♂ (holotype). Coloration mostly dark reddish brown; transversal bands on dorsal scutal elevations slightly darker, medially disconnected in areas I-III; chelicerae and proximal article of pedipalps slightly lighter.

Carapace with low, rounded eye tubercle, without lateral tubercles posteriorly below wide, indistinctly divided carapace-abdomen bridge (Figs 116, 124). Dorsal scutal areas distinctly elevated, anterior ones rounded, posteriors keeled; ventral scutal areas swollen, without modified hairs. Palpal coxa with distinct ventral process; leg coxa I with small anterolateral one; ventral side of leg coxae II and III with distinct anteroproximal processes, coxa II with indistinct posteroproximal one; dorsal side of coxa IV without tubercle. Genital operculum narrow, slightly longer than wide (Fig. 117); posterior margin of stigmatic pit with tubercle.

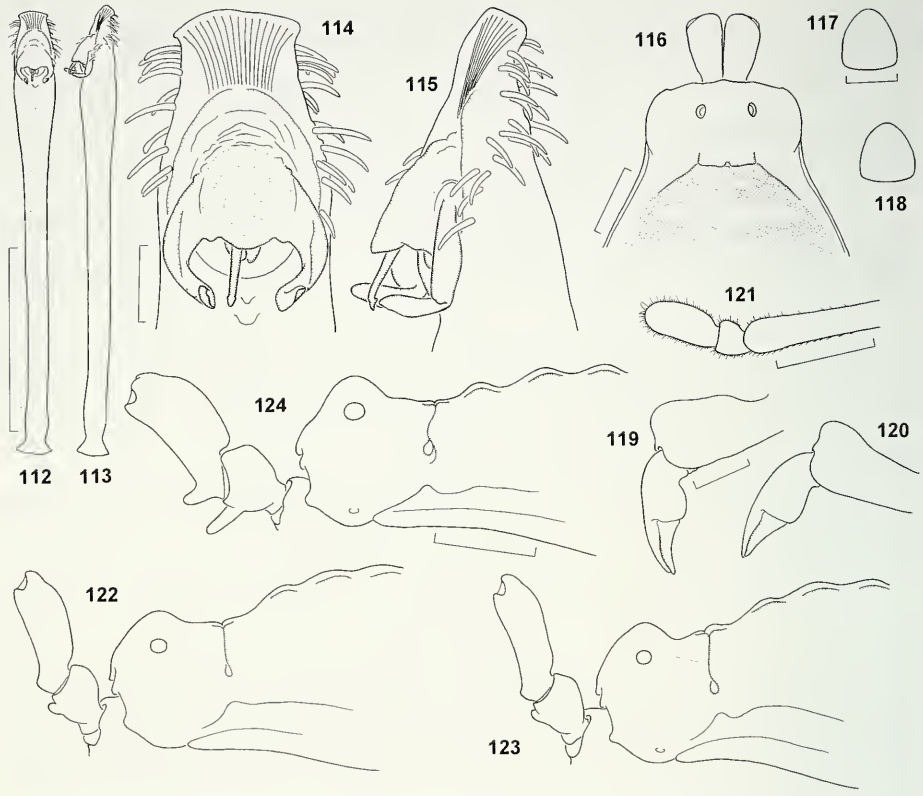
Chelicerae (Fig. 119) weak, proximal article with distinct dorsodistal and less distinct dorsomedian boss; no ventral tubercle.

Palps (Fig. 124): Femur stout, with strong ventroproximal process and long dorsodistal to dorsoproximal boss; trochanter with long, digitiform, slightly distad-inclined ventral process.

Legs 13(24?), tarsal formula 2-2-3-3. Distitarsi of legs II missing.

Penis (Figs 112-115): Truncus slender, widest below glans, with narrow, slightly arched apex. Glans slightly narrower than truncus at that point; lateral sclerites convex and with a moderately elevated dorsal ledge in proximal half, distal half narrowly paddle-shaped, pointing away from the truncus, both sides parallel to each other; knee between proximal and distal part of lateral sclerites bent at right angles, not bulged towards truncus (Fig. 115); median plate very short, widely rounded, with a pair of rounded lateral teeth; membraneous tubes distally not covered by median plate; stylus slender, base bulbous, apex with a small pair of subterminal ventral teeth.

♀. As the male but with much shorter ventral processes on palpal femur and trochanter; palpal femur without dorsal boss (Figs 122, 123); proximal article of chelicera without dorsomedian boss (Fig. 120); dorsal scutal areas less elevated and



FIGS 112-124

Gnomulus javanicus sp. n., ♂ holotype (112-117, 119, 124), ♀ paratypes (118, 120-123). - Penis, dorsal (112) and lateral view (113); apex of penis, dorsal (114) and lateral view (115). Anterior body and chelicerae, dorsal view (116); genital operculum (117, 118); left chelicera, retrolateral view (119, 120); distal part of left leg II, retrolateral view (121); anterior body and proximal palp, lateral view (122-124). - Scale lines 0.1 mm (114, 115), 1.0 mm (others).

ventral scutal areas not swollen. Legs 1324; distitarsus II about 2.1 times longer than wide (Fig. 121).

Measurements: ♂ holotype (♀ in parentheses): Body 5.86 (5.92) long, 4.05 (4.02) wide; carapace region 1.25 (1.08) long, 2.23 (2.10) wide. - Palp and legs:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.81 (0.69)	1.12 (1.04)	0.94 (0.74)	0.69 (0.54)	- -	1.18 (1.08)	4.74 (4.09)
Leg I	0.56 (0.54)	2.24 (1.68)	1.06 (0.89)	1.31 (1.04)	1.93 (1.63)	0.94 (0.84)	8.04 (6.62)
Leg II	0.69 (0.64)	3.24 (2.32)	1.53 (1.16)	2.37 (1.63)	3.24 (2.32)	? (1.13)	? (9.20)
Leg III	0.69 (0.59)	2.43 (1.75)	1.18 (0.99)	1.62 (1.16)	2.37 (1.92)	1.00 (0.84)	9.29 (7.25)
Leg IV	1.03 (0.89)	3.18 (2.42)	1.50 (1.21)	2.24 (1.77)	3.58 (2.91)	1.18 (0.94)	12.71 (10.14)

Variation: Range of measurements in ♀♀ (n=2): Body 5.67-5.92 long, 3.86-4.02 wide, carapace region 1.08-1.18 long, 1.99-2.10 wide. One ♀ has a very low eye tubercle (Fig. 122).

Relationships: *Gnomulus javanicus* sp. n. is closest to *G. lomani* sp. n.

Remarks: The specimens examined are clearly distinct from *G. thorelli*, which also occurs on Java. However, males and females of *G. javanicus* sp. n. (both from the same island) differ from each other in a number of characters (see above), which either reflect a pronounced sexual dimorphism or indicate that they belong to different species. Until further evidence for the contrary becomes available, these specimens are regarded as conspecific.

As far as we know "*Pelitnus javanus* Roewer" has never been described and was never mentioned in the literature. It thus is an unpublished name without nomenclatural relevance.

Distribution: Known only from one or two localities on Java [Fig. 1 (21)]. The exact locality of the presumably conspecific female paratypes is unknown. *Gnomulus thorelli* was found at Cibodas (Schwendinger & Martens, 1999b: 969) and possibly occurs syntopically with *G. javanicus* sp. n.

Gnomulus lomani sp. n. Figs 125-140

Pelitnus segnipes Loman. - Loman (1902: 182, partim). - Roewer (1923: 63, partim).

Material: BORNEO, Telang (locality not identified), ♂ holotype, ♂ paratype (ZMB 4247), with one label saying "*Pelitnus segnipes* Loman, 1892, Fundort (= find locality): Telang, Broneo (Burma)" and another in Gothic handwriting (probably by Roewer) "*Pelitnus segnipes* Loman, von Loman falsch bestimmt (= misidentified by Loman)"; both specimens leg. F. Grabonsky. - SUMATRA, BORNEO, without exact locality, 2 ♂, 1 ♀, "leg. ?, leg. Schwaner?" (ZMA; no types).

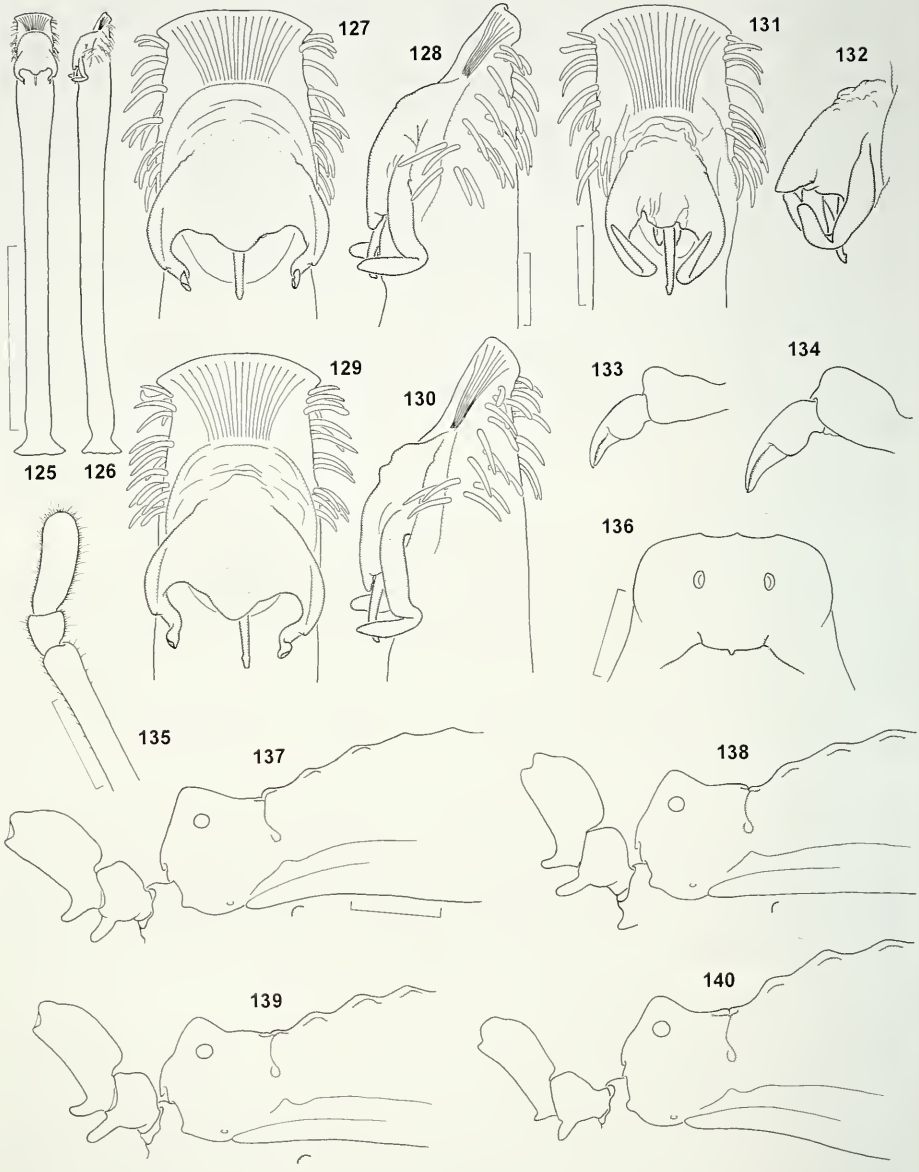
Etymology: The species is dedicated to Jan Cornelis Christiaan Loman, a Dutch zoologist of outstanding merit, who published on opilionids from 1879 to 1910.

Diagnosis: Very similar to *G. javanicus* sp. n., distinguished by the presence of small tubercles on the dorsal side of leg coxa IV and by details of penis morphology, i.e. apex of truncus wider; glans wider than truncus at that point; knee between proximal and distal part of lateral sclerites more bulged towards the truncus (as seen in lateral view); apices of lateral sclerites more widely apart; membraneous tubes entirely covered by longer, more V-shaped median plate with less distinct pair of lateral teeth.

Description: ♂ (holotype). Coloration: Body dark amber, limbs light amber, with tarsi and distal portions of leg articles slightly lighter; pattern on dorsal and ventral scutum faded.

Carapace with quite low, conical eye tubercle and without lateral tubercles posteriorly below wide, indistinctly divided carapace-abdomen bridge (Figs 136, 137). Dorsal scutal areas distinctly elevated, anterior ones rounded, posteriors keeled; ventral scutal areas swollen, without modified hairs. Palpal coxa with strong ventral process; leg coxa I with small anterolateral one; ventral side of leg coxae II and III with distinct anteroproximal processes, no posteroproximal one on coxa II; dorsal side of coxa IV with a small anterior tubercle. Genital operculum about as long as wide; posterior margin of stigmatic pit with low tubercle.

Chelicerae (Fig. 134) weak, proximal article with distinct dorsodistal to dorsomedian boss; no ventral process.



FIGS 125-140

Gnomulus lomani sp. n., ♂ holotype (125-128, 134, 136, 137), ♀ paratypes (129-130, 139), presumably conspecific ♂ (138) and ♀ (133, 140). - Penis, dorsal (125) and lateral view (126); apex of penis, dorsal (127, 129, 131) and lateral view (128, 130); glans penis, lateral view (132). Left chelicera, retrolateral view (133, 134); distal part of left leg II, retrolateral view (135); anterior body, dorsal view (136); anterior body and proximal palp, lateral view (137-140). - Scale lines 0.1 mm (127-132), 1.0 mm (others).

Palps (Fig. 137): Femur with strong ventroproximal process and extended dorsodistal to dorsoproximal boss; trochanter with long, digitiform ventral process.

Legs 1324, tarsal formula 2-2-3-3. Distitarsus II 2.9 times longer than wide (Fig. 135).

Penis (Figs 125-132; holotype: 125-128): Truncus slender, continuously widening towards apex; distal margin broadly arched. Glans wider than truncus at that point; lateral sclerites convex and with a slightly elevated dorsal ledge in proximal half, distal part narrowly paddle-shaped, pointing away from the truncus (Fig. 128), both sides parallel to each other; knee between proximal and distal half distinctly bulged towards the truncus; apices of lateral sclerites widely apart; median plate quite short, more or less distinctly V-shaped, distally rounded, with lateral teeth reduced to low bulges; membraneous tubes completely covered by median plate; stylus slender, base bulbous, apex with a small pair of subterminal ventral teeth.

♀ (uncertain identification). As the male but with a more slender palpal femur, distinctly smaller ventral processes on palpal trochanter and femur and with a smaller dorsomedian boss on the proximal cheliceral article.

Measurements: ♂ holotype (♂ paratype in parentheses; no measuremets of available ♀ given because of uncertain identification): Body 5.70 (5.67) long, 4.05 (3.99) wide; carapace region 1.19 (1.19) long, 2.22 (2.20) wide. - Palp and legs:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.78	1.06	0.90	0.65	-	1.12	4.51
Leg I	0.56	2.06	1.06	1.25	1.87	0.94	7.74
Leg II	0.72	2.99	1.56	2.28	2.99	1.31	11.85
Leg III	0.69	2.24	1.22	1.50	2.31	1.00	8.96
Leg IV	0.97	2.81	1.50	2.12	3.40	1.18	11.98

Variation: The ♂ paratype has indistinct posteroproximal processes on coxa II, more strongly elevated dorsal scutal areas (Fig. 139) and a longer median plate on glans penis (Fig. 129).

Relationships: *Gnomulus lomani* sp. n. is closest to *G. javanicus* sp. n.; both are in the same phyletic lineage with *G. exsudans* sp. n., *G. hutan* sp. n., *G. laevis*, *G. obscurus* sp. n. and *G. sundaicus*.

Remarks: The indication of the type locality ["Telang, Broneo (Burma)"], as given on the label with the types, is misleading. According to information from Jason Dunlop, the ZMB houses extensive material collected by Fritz Grabonsky in Borneo, but none from Burma. Broneo was obviously misspelled for Borneo, but it is unclear why Burma was added in parentheses.

2 ♂ and 1 ♀ (dried and pinned specimens transferred to alcohol) with label reading "Sumatra, leg. ?, Borneo, leg. Schwaner (?)", lodged in the ZMA and recorded by Loman (1902: 182), are very similar to the types of *G. lomani* sp. n. but cannot be assigned to this species with certainty. In one ♂ the distal part of the penis is missing, in the other the penis is bent and its glans partly collapsed (caused by the pin which passed beside the tip of the penis; Figs 131, 132).

The weaker palpal femur, smaller ventral processes on palpal trochanter and femur (Fig. 140) and smaller dorsomedian boss on the proximal cheliceral article (Fig. 133) of the female (conspecific?) are probably due to sexual dimorphism. The same is seen in *G. armillatus* (see Schwendinger & Martens 1999b, figs 116-123) and - less distinctly so - also in *G. exsudans* sp. n. (Figs 181-184); it presumably also holds true for *G. javanicus* sp. n. (Figs 122-124).

Distribution: The type locality cannot be identified, but there are three localities which may correspond: 1) Pulau Talang (1°55'N, 109°46'E), an island off the coast at the western end of Sarawak, 2) Telang (2°07'S, 115°00'E) in southern Kalimantan and 3) Pulau Telang (0°43'N, 104°37'E), an island in the Riau Archipelago, south of Singapore.

Gnomulus obscurus sp. n. Figs 141-149

Material: MALAYSIA (east), Sarawak, Kuching, ♂ holotype (SMF 7373/12, with label: "*Pelitnus segnipes*, Roewer det. 1939").

Etymology: Latin: *obscurus* = hidden, unknown. The specific epithet refers to the previous misidentification of the type specimen.

Diagnosis: Similar to *G. annulipes*, distinguished by: Body smaller; eye tubercle lower, more rounded; penis more slender, with basally narrower, distally wider lateral sclerites and with a W-shaped median plate.

Description: ♂ (holotype). Coloration (bleached): Body and cheliceral fingers light amber, no colour pattern on scuta discernible; limbs mostly light orange.

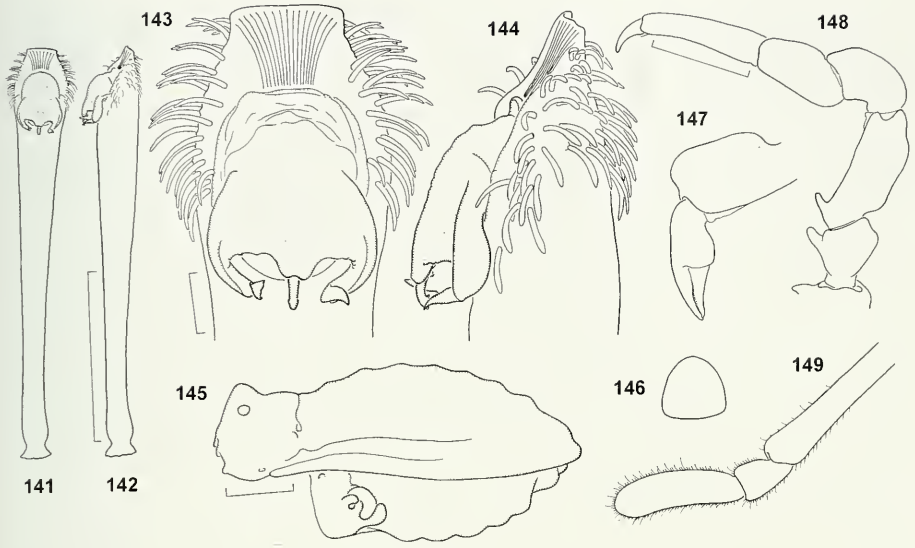
Carapace with widely conical, distally rounded eye tubercle and with a pair of small lateral tubercles below wide, indistinctly divided carapace-abdomen bridge. Anterior dorsal scutal areas little elevated, indistinctly keeled, posterior ones rounded (Fig. 145); a low longitudinal furrow separating anterior areas medially. Ventral scutal areas swollen, without modified hairs. Palpal coxa with large ventral process; leg coxa I with distinct anterolateral one; coxa II with strong, coxa III with small anteroproximal process, coxa II with posteroproximal one. Genital operculum almost semicircular (Fig. 146); posterior margin of stigmatic pit with small tubercle.

Chelicerae (Fig. 147) weak, proximal article with distinct dorsodistal to dorsomedian boss; no ventral process.

Palps (Fig. 148): Ventral side of femur with narrow, slightly anteriad-inclined proximal process and moderately developed dorsodistal to dorsoproximal boss; trochanter with slightly distad-inclined ventral process.

Legs 1324, tarsal formula 2-2-3-3. Distitarsus II about 3.5 times longer than wide (Fig. 149).

Penis (Figs 141-144) slender, widest at height of membraneous socket of glans; apex narrow, carrying plenty of setae; distal margin of truncus almost straight. Glans narrower than truncus at that point; lateral sclerites convex and with a moderately elevated dorsal ledge in basal half, in distal half laterally compressed, tapering and pointing away from the truncus; median plate short, with a narrow, protruding, somewhat W-shaped median portion; membraneous tubes completely covered by



FIGS 141-149

Gnomulus obscurus sp. n., ♂ holotype. - Penis, dorsal (141) and lateral view (142); apex of penis, dorsal (143) and lateral view (144). Body, lateral view (145); genital operculum, ventral view (146); left chelicera, retrolateral view (147); left palp, retrolateral view (148); distal part of left leg II, retrolateral view (149). - Scale lines 0.1 mm (143, 144), 1.0 mm (others).

median plate; stylus slender, base bulbous, apex with a small pair of subterminal ventral teeth.

♀. Unknown.

Measurements: (♂): Body 5.64 long, 3.99 wide; carapace region 1.33 long, 2.12 wide. - Palp and legs:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.84	1.11	0.89	0.62	-	1.23	4.69
Leg I	0.64	2.42	1.11	1.36	2.12	1.13	8.78
Leg II	0.74	3.30	1.53	2.51	3.30	1.58	12.96
Leg III	0.67	2.47	1.23	1.63	2.56	1.18	9.74
Leg IV	0.94	3.30	1.48	2.34	3.77	1.33	13.16

Relationships: Penis morphology shows that *G. obscurus* sp. n. is close to *G. exsudans* sp. n., *G. javanicus* sp. n., *G. hutan* sp. n., *G. laevis, G. lomani* sp. n. and *G. sundaicus*.

Distribution: Known only from Kuching in Sarawak, northern Borneo, where *G. obscurus* sp. n. apparently occurs sympatrically with *G. sundaicus* [Fig. 1 (24)].

Gnomulus hutan sp. n. Figs 150-163

Material: MALAYSIA (east), Sarawak, confluent of Sun Oyan and Mujong rivers, E of Kapit, 50 m, ♂ holotype, ♂ paratype, 18.V.1994, leg. I. Löbl & D. Burckhardt (MHNG).

Etymology: Malay and Indonesian: *hutan* = forest; noun in apposition.

Diagnosis: Similar to *G. lomani* sp. n., distinguished by: Body larger; dorsal scutal areas less elevated; tubercles behind coxa IV present; ventral processes on palpal femur and trochanter smaller; penis stouter, with a narrower apex, a smaller membraneous base of the glans and a longer median plate.

Description ♂ (holotype). Coloration mostly dark amber, with dark reticulation on carapace region, chelicerae and pedipalps; pattern on abdominal part of dorsal scutum indistinct; leg tarsi light amber, distitarsus I dorsally darkened.

Carapace with conical, terminally rounded eye tubercle; no lateral tubercles below wide, indistinctly divided carapace-abdomen bridge (Fig. 157). Dorsal scutal areas indistinctly elevated. Ventral scutum with a pair of anterolateral tubercles behind coxa IV; ventral scutal areas swollen, pallid, covered with very small short hairs (Fig. 156). Palpal coxa with pronounced ventral process; leg coxa I with short, wide anterolateral one; coxae II and III with distinct anteroproximal processes, coxa II with small posteroproximal one; dorsal side of coxa IV with distinct anterior tubercle (Fig. 156). Genital operculum rounded, as long as wide (Fig. 158); posterior margin of stigmatic pit with quite large tubercle.

Chelicerae (Fig. 159) weak, proximal article with distinct dorsodistal to dorsomedian boss; no ventral process.

Palps (Figs 160, 161): Femur with small ventroproximal process, with distinct dorsodistal to dorsoproximal boss and with wide, low prodorsal boss (Fig. 161); trochanter with digitiform, slightly distad-inclined ventral process.

Legs 1324, tarsal formula 2-2-3-3. Distitarsus II about 2.8 times longer than wide (Fig. 162).

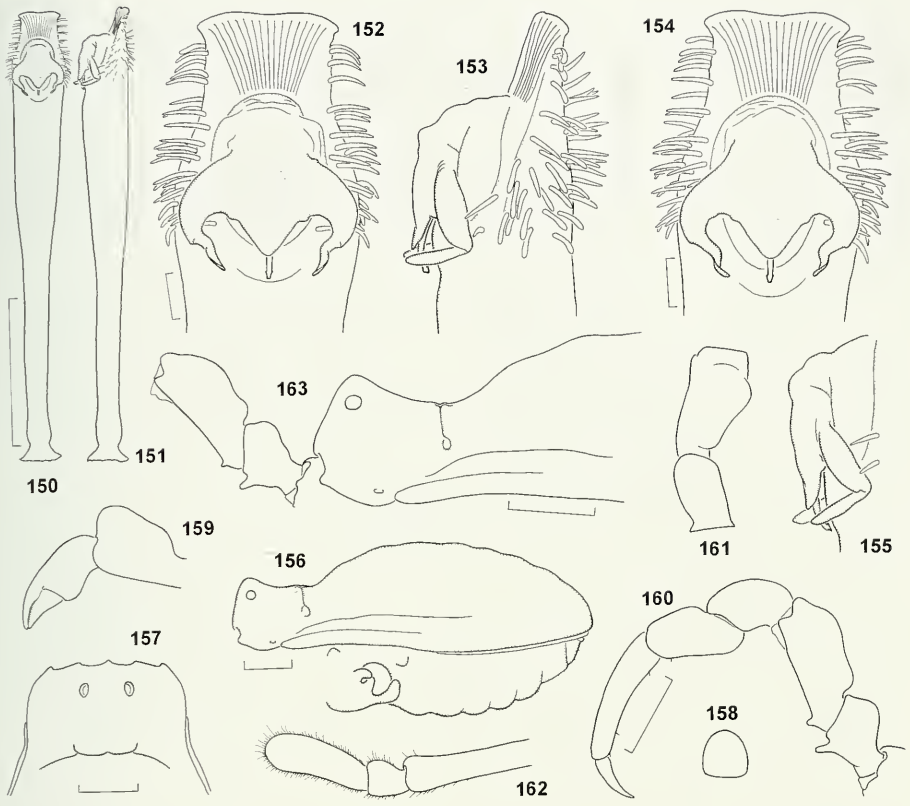
Penis (Figs 150-155; holotype: 152, 153) fairly stout, widening in distal half, distal margin slightly invaginated; apex narrow, carrying plenty of setae. Glans slightly narrower than truncus at that point; lateral sclerites strongly convex, basal half with moderately elevated dorsal ledge, distal half narrowly paddle-shaped, pointing away from the truncus; median plate long, V-shaped, with a small pair of lateral teeth; membraneous tubes completely covered by median plate; stylus slender, base bulbous, apex with a small pair of ventral subterminal teeth.

♀. Unknown.

Measurements: ♂ holotype (♂ paratype in parentheses): Body 7.44 (7.47) long, 4.96 (5.08) wide; carapace region 1.49 (1.46) long, 2.70 (2.67) wide. - Palp and legs:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.96	1.30	0.99	0.81	-	1.55	5.61
Leg I	0.81	2.42	1.21	1.43	2.23	1.24	9.34
Leg II	0.99	3.32	1.55	2.39	3.47	1.64	13.36
Leg III	0.87	2.45	1.30	1.61	2.79	1.12	10.14
Leg IV	1.24	3.41	1.67	2.42	4.43	1.30	14.47

Variation: The paratype has smaller ventral processes on its palpal femur and trochanter (Fig. 163) than the holotype (Fig. 160).



FIGS 150-163

Gnomulus hutan sp. n., ♂ holotype (152, 153, 156-162), ♂ paratype (150, 151, 154, 155, 163). - Penis, dorsal (150) and lateral view (151); apex of penis, dorsal (152, 154) and lateral view (153); glans penis, lateral view (155). Body, lateral view (156); anterior body, dorsal view (157); genital operculum, ventral view (158); left chelicera, retrolateral view (159); left palp, retrolateral view (160); trochanter and femur of left palp, dorsal view (161); distal part of left leg II, retrolateral view (162); anterior body and proximal palp, lateral view (163). - Scale lines 0.1 mm (152-155), 1.0 mm (others).

Relationships: This species appears most closely related to *G. lomani* sp. n., followed by *G. javanicus* sp. n. and *G. exsudans* sp. n.

Distribution: Known only from the environs of Kapit, in the central part of Sarawak [Fig. 1 (25)].

Gnomulus exsudans sp. n. Figs 164-185

Material: MALAYSIA (east), Sarawak, Gunung Mulu National Park, Base Camp (= Paku Camp, 150 m?), ♂ holotype, 1 ♂, 1 ♀ paratypes, 1 juv., VI.1978, leg. F. Wanless (NHML). - Sabah, Sandakan Bay (southwest), Sapagaya Lumber Camp, 2-20 m, 1 ♂ paratype (BMH; penis dissected and retained by W. A. Shear), 7 ♀ paratypes, 2 juv., 4.-7.XI.1957, leg. J. L. Gressitt (BMH); Sandakan Bay (northwest), Sepilok Forest Reserve, 1-10 m, 7 ♂, 5 ♀

paratypes, 1 juv., 30.X.1957, leg. J. L. Gressitt (1 ♂, 1 ♀ paratypes in MAR, 1 ♂, 1 ♀ paratypes in MHNG, others in BMH).

Etymology: Latin: *exsudans* (present participle of *exsudare*) = sweating out. The specific epithet refers to the paired spots of secretion found on the dorsal and ventral scutum of this species.

Diagnosis: Similar to *G. hutan* sp. n., distinguished by: Body smaller; dorsal scutal areas more elevated; no tubercle on dorsal side of coxa IV; ventral process on palpal femur stronger; penis with wider apex; glans wider than truncus at that point, lateral sclerites distally wider and proximally more strongly elevated above the median plate.

Description: ♂ (holotype). Coloration: Dorsal scutum amber, with dark reticulation in carapace region, dark margin and dark scutal elevations (broken by light median longitudinal stripe in areas I-IV); ventral scutal elevations swollen and pallid (Figs 185a-c). Legs grey-brown, lighter near the joints; chelicerae, pedipalps and trochanters and tarsi of legs light brown, with dark reticulations on proximal article of chelicerae and on palpal trochanter and femur; tarsalia of leg I ventrally cream.

Carapace with pronounced, distally rounded eye tubercle slightly set back from front margin of scutum and with indistinct lateral tubercles posteriorly below wide, divided carapace-abdomen bridge. Dorsal scutal areas distinctly elevated and narrowly rounded (Fig. 185a, c); ventral scutal areas swollen, without modified hairs. Palpal coxa with pronounced ventral process; leg coxa I with indistinct anterolateral one; ventral side of leg coxae II and III with distinct anteroproximal processes, a small posteroproximal one on coxa II. Genital operculum about as long as wide; strongly pronounced tubercle on posterior margin of stigmatic pit (Fig. 185b).

Chelicerae (Fig. 177) weak, proximal article with dorsodistal to dorsomedian boss; no ventral process.

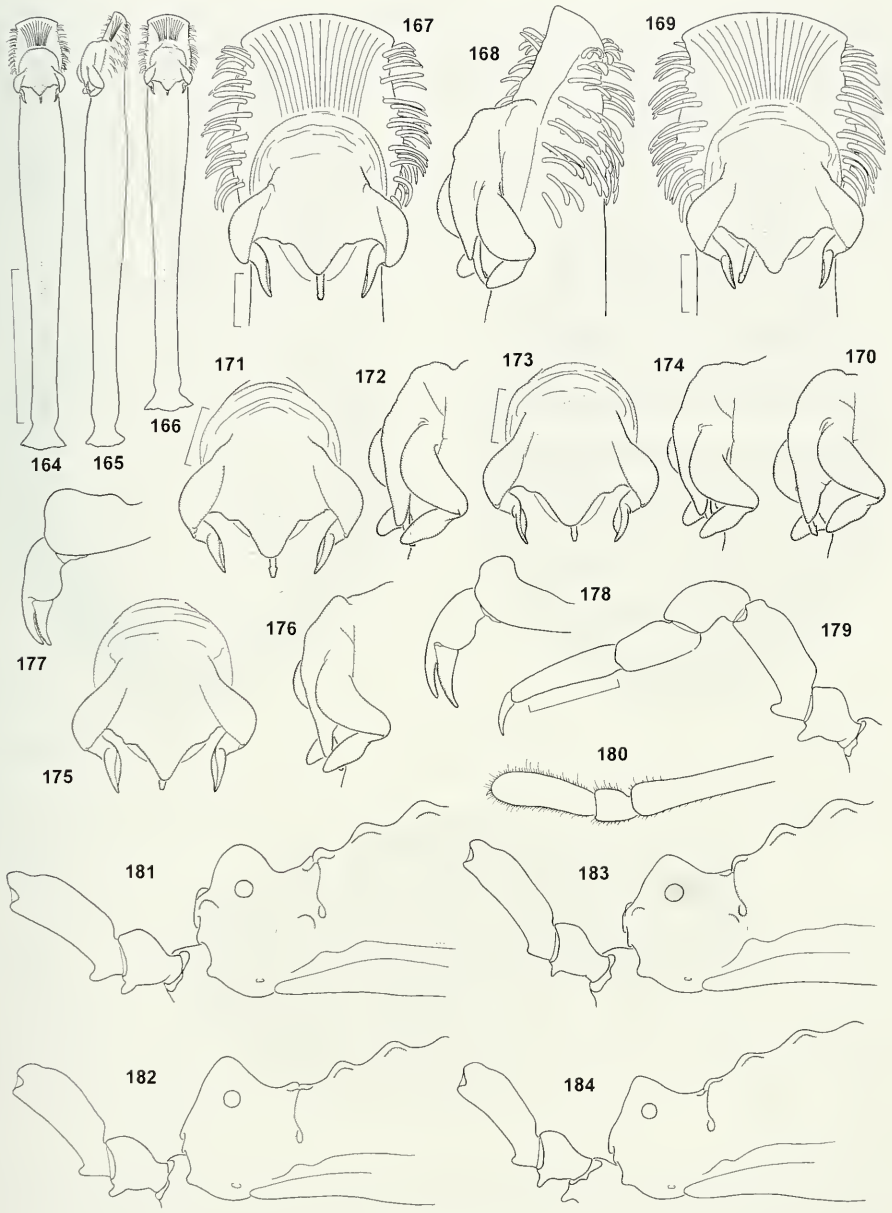
Palps (Fig. 179): Ventral side of femur with slightly distad-inclined proximal process, about as long as ventrad-directed process on ventral side of trochanter.

Legs 1324, tarsal formula 2-2-3-3. Distitarsus of leg II 3.2 times longer than wide (Fig. 180).

Penis (Figs 164-176; holotype: 164, 165, 167, 168): Truncus slightly constricted at height of glans, distal margin broadly arched. Glans wider than truncus at that point; lateral sclerites convex, proximal half with dorsal ledge strongly elevated above median plate, distal half widely paddle-shaped, pointing away from the truncus; knee between proximal and distal half of lateral sclerites rounded, somewhat bulged towards the truncus; median plate V-shaped, with an indistinct pair of lateral teeth; membraneous tubes completely covered by median plate; stylus slender, base bulbous, apex with a small pair of subterminal ventral teeth.

♀. As the male but: Carapace region relatively smaller; ventral processes on palpal femur and trochanter slightly weaker (Figs 183, 184); proximal article of chelicera without dorsomedian boss (Fig. 178); ventral scutal areas not swollen; distitarsus II only 3.0 times longer than wide.

Measurements: ♂ holotype (♀ from type locality in parentheses): Body 5.95 (6.12) long, 4.18 (4.38) wide; carapace region 1.33 (1.16) long, 2.21 (2.12) wide. - Palp and legs:



FIGS 164-184

Gnomulus exsudans sp. n., ♂ holotype (164, 165, 167, 168, 177, 179, 180), paratypes: ♂ from the type locality (181), ♂♂ from Sabah (166, 169-176, 182), ♀ from the type locality (178, 183), ♀ from Sabah (184). - Penis, dorsal (164, 166) and lateral view (165); apex of penis, dorsal (167, 169) and lateral view (168); glans penis, dorsal (171, 173, 175) and lateral view (170, 172, 174, 176). Left chelicera, retrolateral view (177, 178); left palp, retrolateral view (179); distal part of left leg II, retrolateral view (180); anterior body and proximal palp, lateral view (181-184). - Scale lines 0.1 mm (167-176), 1.0 mm (others).

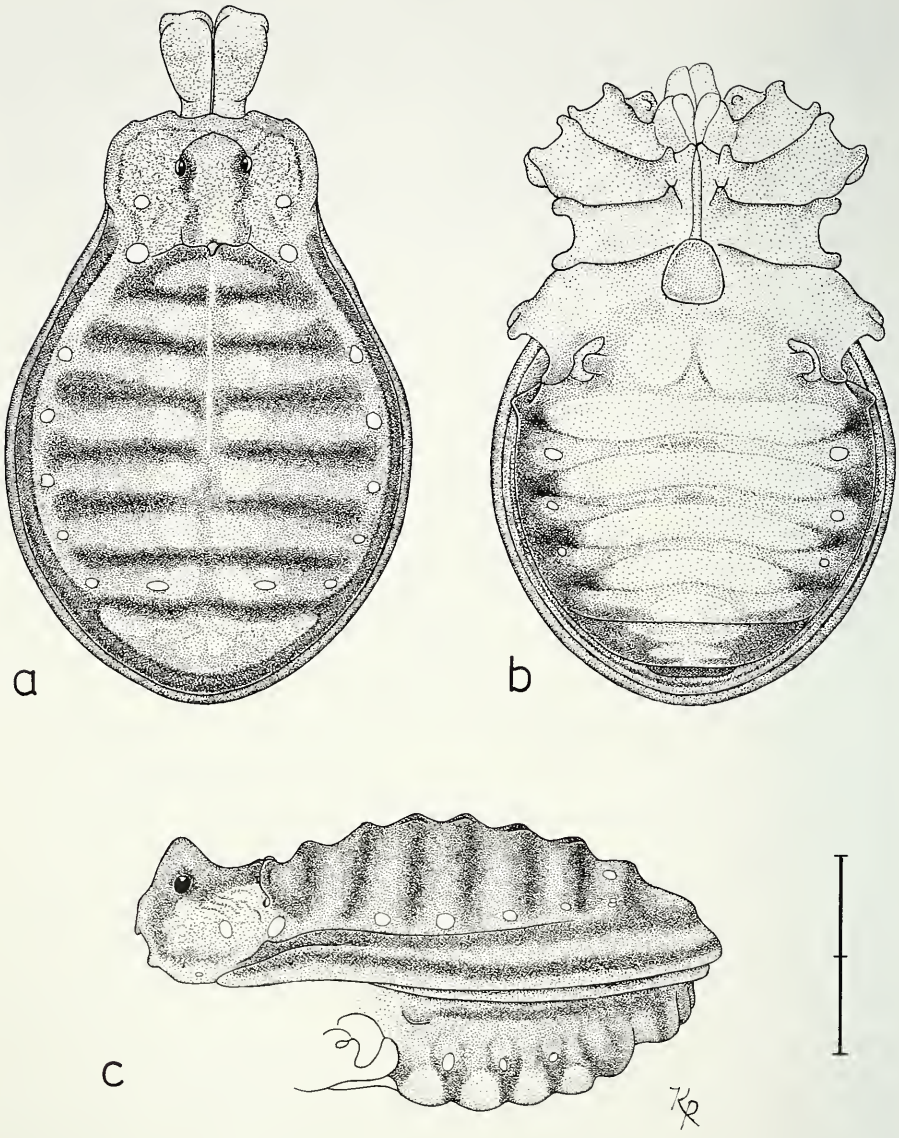


FIG. 185

Gnomulus exsudans sp. n., ♂ holotype. - Body, dorsal (a), ventral (b) and lateral view (c). - Scale line 1.0 mm.

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.79 (0.79)	1.18 (1.18)	0.93 (0.89)	0.64 (0.59)	- -	1.18 (1.23)	4.72 (4.68)
Leg I	0.79 (0.64)	2.51 (2.31)	1.08 (1.03)	1.40 (1.28)	2.16 (2.07)	1.16 (1.13)	9.10 (8.46)
Leg II	0.84 (0.84)	3.64 (3.35)	1.57 (1.50)	2.68 (2.56)	3.39 (3.25)	1.50 (1.40)	13.62 (12.90)
Leg III	0.69 (0.69)	2.66 (2.46)	1.28 (1.21)	1.67 (1.67)	2.68 (2.56)	1.38 (1.35)	10.36 (9.94)
Leg IV	1.03 (0.93)	3.44 (3.35)	1.53 (1.48)	2.41 (2.39)	3.91 (3.76)	1.43 (1.40)	13.75 (13.31)

Variation: Range of measurements in ♂♂ (n= 10) [♀♀ (n= 13) in parentheses]: Body 5.26-5.95 (5.53-6.18) long, 3.68-4.45 (3.89-4.45) wide, carapace region 1.11-1.33 (1.02-1.17) long, 1.95-2.21 (1.88-2.12) wide. Specimens of the Sarawak and Sabah populations show the same penis morphology but differ in a few external characters. The animals from the type locality in eastern Sarawak have a more bulged anterior carapace margin, an eye tubercle slightly set back from the scutal front margin (Figs 181, 183, 185c) and a distincly less elevated anterolateral process on leg coxa I than specimens from Sabah. Eye tubercles vary from pointed to rounded (Figs 181-184, 185c). The tubercles behind coxa IV are more or less pronounced in different specimens and on either side of the body. The ♂ paratype from Sarawak has distinct tubercles below its carapace-abdomen bridge (Fig. 181); these are indistinct or absent in other specimens (Figs 182-184, 185c). All specimens from Sabah are clearly darker in colour, which was probably caused by humid acids (from soil particles) in the preservative.

Remarks: Paired spots of denaturated secretion, arranged in a regular pattern near the lateral margins of the dorsal and ventral scutum, occur in all specimens examined (Figs 181-185). These spots are very distinct in the specimens from Sarawak, less so (missing on ventral scutum) in those from Sabah. Such peculiar secretions have never been found in other oncopodid species and are probably specific. However, as these secretions are quite loosely attached to the cuticle and are easily brushed off, we don't use them as a diagnostic character. They deserve further examination.

Relationships: According to penis morphology, *Gnomulus exsudans* sp. n. is closest to *G. hutan* sp. n.; both are closely related to *G. laevis, G. javanicus* sp. n., *G. lomani* sp. n., *G. obscurus* sp. n. and *G. sundaicus*. *Gnomulus conigerus*, which also occurs in the Sepilok Forest Reserve, is clearly more distant and belongs to a different phyletic lineage within the *armillatus*-group (cf. Schwendinger, 1992: 183, 184, figs 27-41).

Distribution and bionomics: *Gnomulus exsudans* sp. n. is known from three localities, one in eastern Sarawak, the other two in eastern Sabah. The Sarawak [Fig. 1 (26)] and Sabah [Fig. 1 (27, 28)] populations are separated by about 400 km. According to a note on the label, the specimens from the type locality were swept from shrubs. In the Oncopodidae occurrence off the forest floor is most unusual and has otherwise only been observed in *G. sundaicus* from western Sarawak (Schwendinger 1992: 187).

Gnomulus carinatus sp. n. Figs 186-190

Pelitnus segnipes Loman. - Loman (1902: 182, partim). - Roewer (1923: 63, partim, fig. 66). - Schwendinger (1992: 187, figs 57-61).

Material: INDONESIA, South Kalimantan, Bandjermasin (= Banjarmasin), ♂ holotype, leg. Suck (SMF 1259).

Etymology: Latin: *carinatus* = keeled. The specific epithet refers to the keeled dorsal scutal elevations of this species.

Diagnosis: Externally similar to *G. thorelli* (male unknown), distinguished by keeled elevations on posterior part of dorsal scutum and by a longer subbasal process

on ventral side of palpal femur. Penis similar to that of *G. armillatus* but: Truncus with wider apex; glans shorter, wider; lateral sclerites more convex; median plate more rounded and carrying distinct lateral teeth.

Description: ♂ (holotype). Coloration: Body reddish brown, colour pattern faded; legs yellow-brown, tarsi I, II cream.

Carapace with conical, pointed eye tubercle and with a pair of small lateral tubercles posteriorly below wide, indistinctly divided carapace-abdomen bridge. Dorsal scutal elevations rounded in areas I-II, distinctly keeled in posterior areas; ventral scutal areas swollen, covered by few very small hairs without incrustations (Fig. 187). Palpal coxa with large ventral process; leg coxa I with distinct antero-lateral one; ventral side of leg coxae II and III with small anteroproximal processes, coxa II without posteroproximal one. Genital operculum somewhat triangular, slightly wider than long; posterior margin of stigmatic pit with tubercle.

Chelicerae (Fig. 188) weak, proximal article with distinct dorsodistal and indistinct dorsomedian boss; no ventral process.

Palps (Fig. 189): Ventral side of femur with strong subbasal, slightly distad-directed process; trochanter with short, ventrad-directed process.

Legs 1324, tarsal formula 2-2-3-3. Distitarsus of leg II about 2.5 times longer than wide (Fig. 190).

Penis (Fig. 186; Schwendinger, 1992: figs 58-61): Truncus in its distal half wider than in proximal half; distal margin broadly arched, median part almost straight. Glans slightly wider than truncus at that point; lateral sclerites strongly convex in proximal portion, with dorsal ledge moderately elevated above median plate, distal half cylindrical, weakly sigmoid, tapering and pointing away from the truncus; median plate short, widely rounded, with a distinct pair of lateral teeth; stylus slender, base bulbous, apex with a small pair of subterminal ventral teeth.

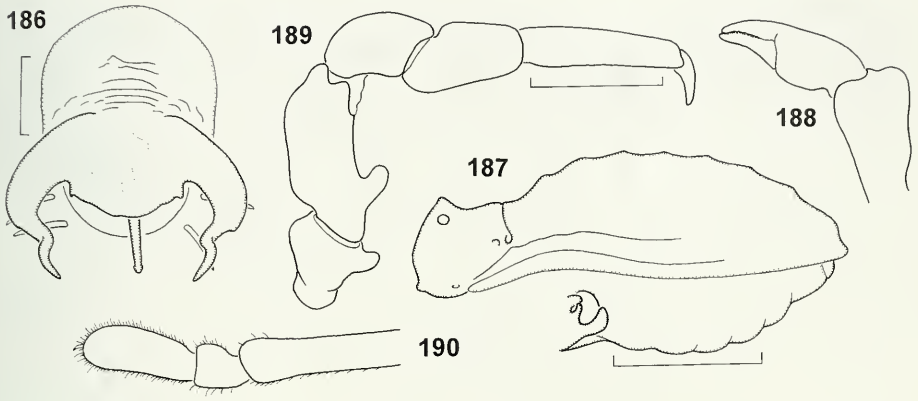
♀. Unknown.

Measurements: (♂): Body 6.00 long, 3.98 wide; carapace region 1.23 long, 2.16 wide. - Palp and legs:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.79	1.13	0.89	0.59	-	1.13	4.53
Leg I	0.64	2.02	1.08	1.18	1.82	0.84	7.58
Leg II	0.74	2.66	1.38	1.82	2.61	1.28	10.49
Leg III	0.69	2.02	1.08	1.28	2.21	0.84	8.12
Leg IV	0.79	2.56	1.38	1.87	3.35	0.93	10.88

Relationships: *Gnomulus carinatus* sp. n. appears most closely related to *G. thorelli* (♂ unknown). These are the only two *Gnomulus* species known at present, which possess a ventral process distinctly remote from the base of the palpal femur. Regarding penis morphology, most congruence is seen between *G. carinatus* sp. n. and *G. armillatus*.

Remark: *Gnomulus carinatus* sp. n. could be the conspecific male to the female syntypes of *G. thorelli*, since most differences between them correspond with sexual dimorphism found in other *Gnomulus* species. However, a wide geographic



FIGS 186-190

Gnomulus carinatus sp. n., ♂ holotype. - Glans penis, dorsal view (186). Body, lateral view (187); left chelicera, retrolateral view (188); right palp, retrolateral view (189); distal part of left leg II, retrolateral view (190). - Scale lines 0.1 mm (186), 1.0 mm (others).

separation and the presence of keeled dorsal scutal elevations in *G. carinatus* sp. n. (rarely seen in *Gnomulus*) indicate distinctiveness.

Distribution: Known only from the type locality in southern Borneo [Fig. 1 (22)].

THE *HAMATUS*-GROUP (new)

Diagnosis: Medium-sized (5.1-5.3 mm) species with rounded eye tubercle and without carapace-abdomen bridge; posterior margin of stigmatic pit without tubercle; ventral side of palpal trochanter with slightly distad-directed, spatulate process. Penis subdistally widened; glans with an extensive membraneous socket; lateral sclerites distally truncate; median plate long, very narrow, turned upwards; stylus with a bulbous base and with a pair of subterminal teeth.

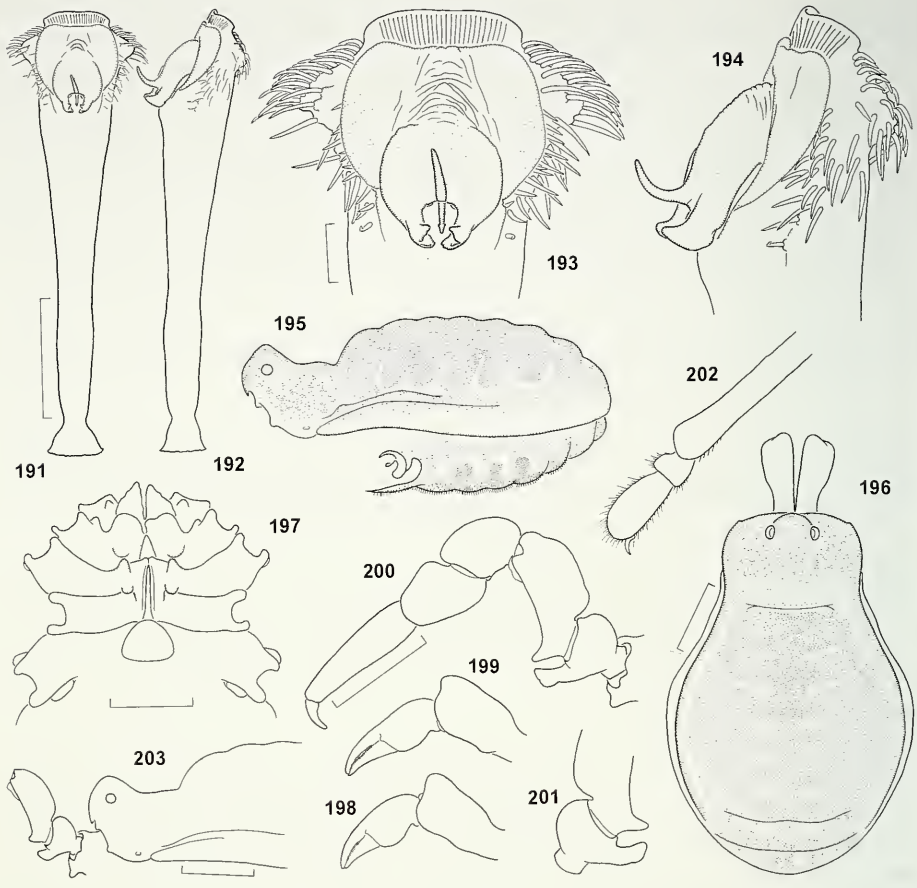
Species account and distribution: Only a single species, *G. hamatus* sp. n., from Luzon, the Philippines.

Gnomulus hamatus sp. n. Figs 191-203

Material: PHILIPPINES, Luzon, Lagunas, Mt. Banahaw, above Kinabuhayan, trail to Crystalino, 600-700 m, ♂ holotype, 24.XI.1995. - Mt. Makiling, south of Los Baños, near Mad Springs, 400-450 m, ♀ paratype, 19.XI.1995; leg. I. Löbl (both in MHNG).

Etymology: Latin: *hamatus* = furnished with a hook. The specific epithet refers to the upturned, hook-like median plate of the glans penis.

Diagnosis: Externally similar to *G. minor* (♂ unknown), distinguished by: Body larger; interocular area elevated; dorsal and ventral scutal areas higher; ventral processes on palpal femur and trochanter longer. Distinguished from all other *Gnomulus* species by a stout, subdistally very wide penis; its glans with a large membraneous base and an upturned, hook-like median plate.



Figs 191-203

Gnomulus hamatus sp. n., ♂ holotype (191-197, 199-202), ♀ paratype (198, 203). - Penis, dorsal (191) and lateral view (192); apex of penis, dorsal (193) and lateral view (194). Body, lateral (195) and dorsal view (196); anterior body, ventral view (197); left chelicera, retrolateral view (198, 199); left palp, retrolateral view (200); proximal part of right palp, retrolateral view (201); distal part of left leg II, retrolateral view (202); anterior body and proximal palp, lateral view (203). - Scale lines 0.1 mm (193, 194), 0.5 mm (191, 192), 1.0 mm (others).

Description: ♂ (holotype). Coloration: Dorsal scutum amber, with dark reticulation in carapace region, dark margin and dark, medially interconnected, transversal bands (Figs 195, 196); central portion of each ventral scutal elevation somewhat pallid. Legs dark amber, except for light amber tarsalia (with darkened dorsal sides on tarsi I, III and IV).

Carapace with widely conical, distally rounded eye tubercle; no lateral tubercles in posterior portion; carapace-abdomen bridge absent. Dorsal scutal areas moderately elevated, the first one rising steeply behind the carapace region; ventral

scutal areas indistinctly elevated, densely covered with short white truncate hairs (Fig. 195). Palpal coxa with small ventral process; leg coxa I with distinct anterolateral process; ventral side of leg coxa II with distinct anteroproximal and posteroproximal processes, the latter overlapping anteroproximal one on coxa II. Genital operculum wider than long; no tubercle on posterior margin of stigmatic pit (Fig. 197).

Chelicerae (Fig. 199) weak, proximal article with low, slightly forward-inclined dorsodistal to dorsomedian boss and indistinct retroventral tubercle.

Palps (Figs 200, 201): Femur with pronounced ventral process and dorsoproximal boss; ventral side of trochanter with long, spade-shaped, slightly distad-inclined process.

Legs 1324, tarsal formula 2-2-3-3. Distitarsus of leg II 2.1 times longer than wide (Fig. 202).

Penis (Figs 191-194): Truncus stout; apex with wide subterminal lateral lobes carrying plenty of setae; distal margin broadly arched. Glans narrower than truncus at that point; membraneous socket very large, shaped like a plate; lateral sclerites short, with broadly truncate tips close to each other; median plate narrow, hook-like, pointing away from the truncus and slightly distad; membraneous tubes mostly covered by basal part of median plate; stylus slender, base bulbous, apex with a small pair of subterminal ventral teeth.

♀. As the male but palp with shorter ventral processes on femur and trochanter, proximodorsal boss on palpal femur less distinct (Fig. 203); ventral scutal areas darker and less elevated, covered with fewer hairs.

Measurements: ♂ (♀ in parentheses): Body 5.09 (5.29) long, 3.46 (3.66) wide; carapace region 1.28 (1.24) long, 1.95 (1.90) wide. - Palp and legs:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.67 (0.59)	0.94 (0.89)	0.74 (0.69)	0.54 (0.49)	- -	1.24 (1.24)	4.13 (3.90)
Leg I	0.52 (0.49)	1.48 (1.53)	0.79 (0.74)	0.86 (0.84)	1.38 (1.33)	0.84 (0.77)	5.87 (5.70)
Leg II	0.67 (0.69)	1.95 (1.98)	1.03 (1.01)	1.33 (1.33)	2.07 (2.07)	0.99 (0.94)	8.04 (8.02)
Leg III	0.59 (0.54)	1.46 (1.46)	0.84 (0.79)	0.91 (0.89)	1.70 (1.68)	0.62 (0.62)	6.12 (5.98)
Leg IV	0.74 (0.74)	2.15 (2.10)	1.09 (1.09)	1.48 (1.46)	2.67 (2.52)	0.74 (0.74)	8.87 (8.65)

Relationships: In the shape of the stylus, in the slightly distad-inclined ventral process on palpal trochanter and in medium body size, *G. hamatus* sp. n. corresponds with species of the *armillatus*-group. The lack of a carapace-abdomen bridge and the presence of aberrant modifications of the penis, however, indicate that this species is closer to the *goodnighti*-group.

Distribution: Known from two mountains near San Pablo City in central Luzon [Fig. 1 (34, 35)].

The *tumidifrons*-group (new)

Diagnosis: Small (3.4-4.0 mm) species with relatively large eyes, without a carapace-abdomen bridge and with a distad-directed proximal process on ventral side of palpal trochanter; dorsal scutal elevations lighter in colour than areas in between them; posterior margin of stigmatic pit without tubercle. Truncus penis with circular

wrinkles in basal portion; glans with long, golfclub-shaped membraneous tubes protruding from under a narrow, pointed median plate; stylus strong, with a seemingly bulbous base and without subterminal ventral teeth.

Species account and distribution: This group is close to the *goodnighti*-group and it comprises two species, *G. tumidifrons* sp. n. and *G. matabesar* sp. n., from the Moluccas.

Gnomulus tumidifrons sp. n. Figs 204-216

Material: INDONESIA, Moluccas, Halmahera, Buli, Maba, 20 m, ♂ holotype, 3 ♀ paratypes, 6.-7.XI.1999; leg. A. Riedel (1 ♀ paratype in MAR, others in MHNG).

Etymology: Latin: *tumidus* = swollen, *frons* = forehead; noun in apposition. The specific epithet refers to the characteristic frontal hump on the eye tubercle of this species.

Diagnosis: Similar to *G. coniceps*, distinguished by: Eyes larger; interocular tubercle smaller, with a distinct hump on frontal side; carapace-abdomen bridge absent; dorsal scutal areas light, less elevated; penis with narrower apex; lateral sclerites of glans wider in distal portion, not covering long, golfclub-shaped membraneous tubes.

Description: ♂ (holotype). Coloration: Body light amber, with dark reticulation in carapace region and dark pattern on dorsal and ventral scuta; dorsal scutal elevations light, separated by dark transversal bands and by a dark longitudinal median stripe; ventral scutal elevations I-V pallid (Fig. 216a-c). Chelicerae, pedipalps and leg coxae and trochanters light yellow-brown; other leg segments mostly darkened, except for light amber tarsi and distal portions of tibiae and metatarsi; distitarsus I ventrally cream.

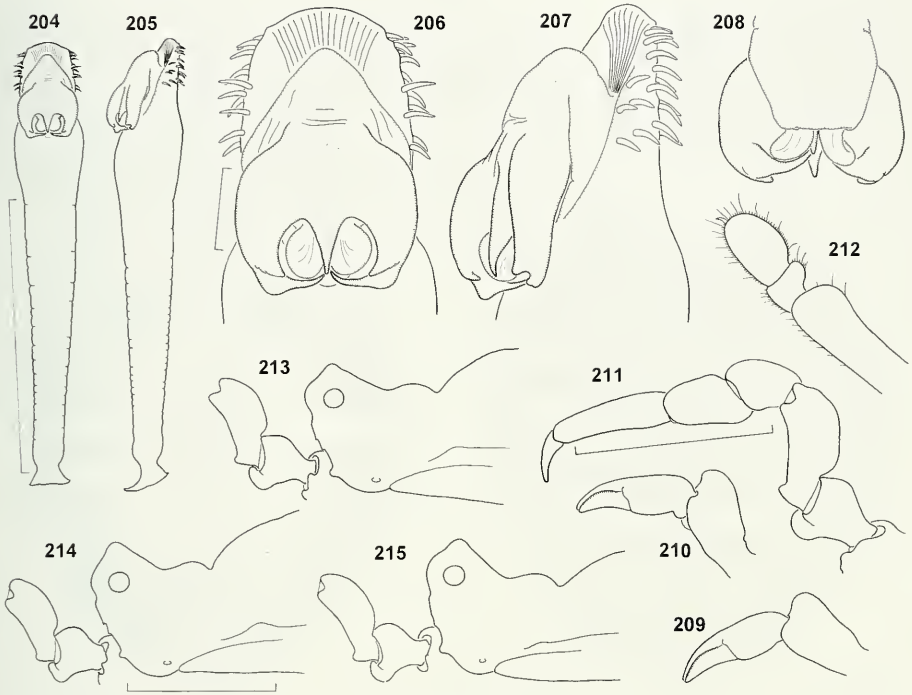
Carapace with small conical eye tubercle bearing a hump on its front side; eyes large; no lateral tubercles on posterior carapace; carapace-abdomen bridge absent. Dorsal scutal areas moderately elevated, VI and VII most strongly so; ventral scutal areas indistinctly swollen (Fig. 216a, c) and covered with short hairs. Palpal coxa with strong ventral process; leg coxa I with indistinct anterolateral one; ventral side of leg coxae II and III with small anteroproximal processes, indistinct posteroproximal one on coxa II. Genital operculum about as long as wide; no tubercle on posterior margin of stigmatic pit (Fig. 216b).

Chelicerae (Fig. 210) weak, proximal article with distinct dorsodistal and indistinct dorsomedian boss; no ventral process.

Palps (Fig. 211): Femur stout, ventral side with small proximal process; trochanter with distad-directed ventral process.

Legs 1324, tarsal formula 2-2-3-3. Distitarsus of leg II 1.6 times longer than wide (Fig. 212).

Penis (Figs 204-208): Truncus fairly stout, widest below glans, slightly constricted at height of glans, with circular wrinkles in proximal part; distal margin broadly arched. Glans slightly wider than truncus at that point; membraneous socket distally pointed; lateral sclerites massiv and convex, proximal portion wide, with a strong dorsal tooth on each side; tips of lateral sclerites fang-like, pointing towards each other; median plate long, narrowly triangular; membraneous tubes long, golf-



FIGS 204-215

Gnomulus tumidifrons sp. n., ♂ holotype (204-208, 210-212), ♀ paratypes (209, 213-215). - Penis, dorsal (204) and lateral view (205); apex of penis, dorsal (206) and lateral view (207); glans penis, ventral view (208). Left chelicera, retrolateral view (209, 210); left palp, retrolateral view (211); distal part of left leg II, retrolateral view (212); anterior body and proximal palp, lateral view (213-215). - Scale lines 0.1 mm (206, 207), 1.0 mm (others).

club-shaped, clearly visible in between median plate and lateral sclerites; stylus strong, fairly wide at bulbous base, tip pointed, without subterminal ventral teeth, completely covered by the median plate.

♀. As the male, apart from very slightly less pallid ventral scutal elevations.

Measurements: ♂ (♀ in parentheses): Body 3.42 (3.34) long, 2.28 (2.25) wide; carapace region 0.90 (0.83) long, 1.20 (1.18) wide. - Palp and legs:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.45 (0.40)	0.49 (0.47)	0.41 (0.38)	0.28 (0.27)	- -	0.57 (0.57)	2.20 (2.09)
Leg I	0.35 (0.32)	0.82 (0.81)	0.47 (0.45)	0.47 (0.45)	0.69 (0.68)	0.46 (0.47)	3.26 (3.18)
Leg II	0.41 (0.40)	1.04 (1.04)	0.63 (0.60)	0.72 (0.69)	1.07 (1.07)	0.54 (0.56)	4.41 (4.36)
Leg III	0.35 (0.33)	0.72 (0.72)	0.50 (0.50)	0.49 (0.48)	0.87 (0.84)	0.39 (0.40)	3.32 (3.27)
Leg IV	0.47 (0.45)	1.01 (0.99)	0.66 (0.66)	0.79 (0.77)	1.28 (1.26)	0.44 (0.42)	4.65 (4.55)

Variation: Range of measurements in ♀♀ (n= 3): Body 3.34-3.70 long, 2.25-2.33 wide, carapace region 0.83-0.90 long, 1.18-1.23 wide.

Relationships: This species is most closely related to *G. matabesar* sp. n.

Distribution and bionomics: Known only from the type locality in the eastern region of Halmahera Island [Fig. 1 (39)]. The animals were collected by sifting leaf litter in a disturbed primary rain forest.

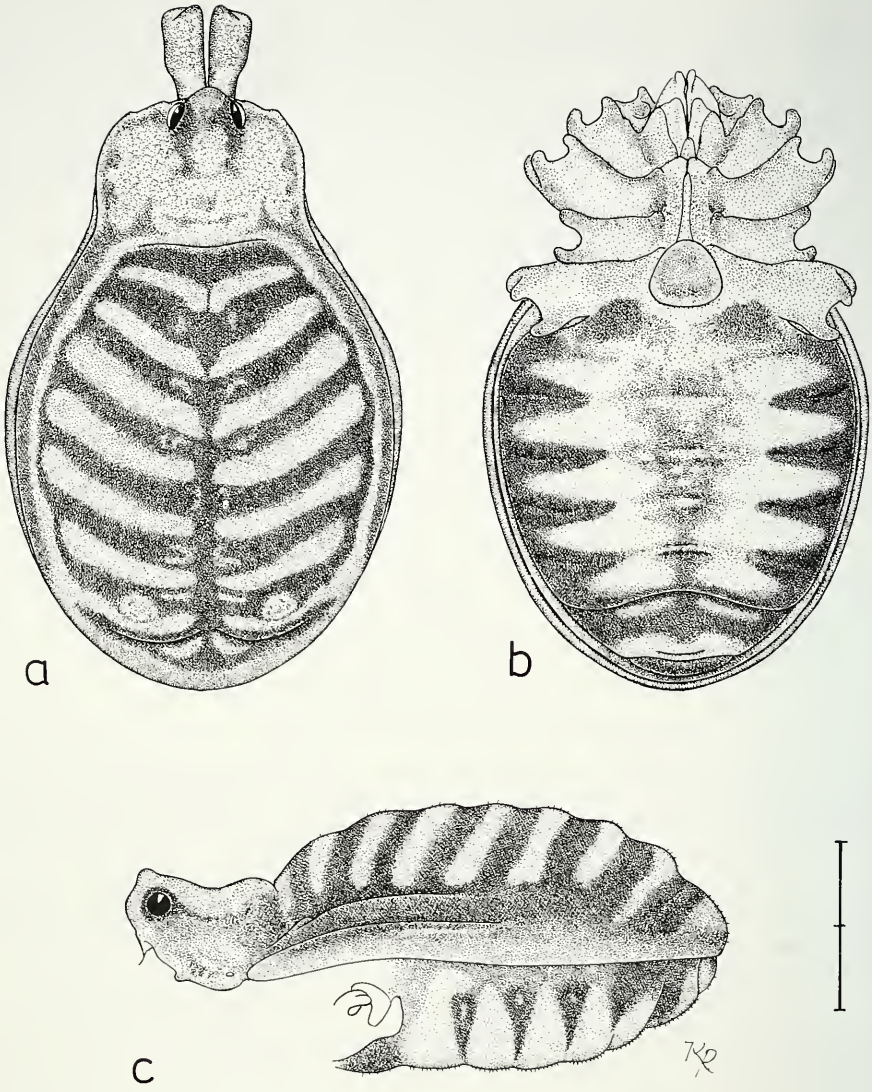


FIG. 216

Gnomulus tumidifrons sp. n., ♂ holotype. - Body, dorsal (a), ventral (b) and lateral view (c). - Scale line 1.0 mm.

Gnomulus matabesar sp. n. Figs 217-224

Material: INDONESIA, Moluccas, Halmahera, mountains SW of Tobelo, 850 m, ♂ holotype, 2 juv., 1.XI.1999; leg. A. Riedel (MHNG).

Etymology: Malay and Indonesian: *mata* = eye, *besar* = big; noun in apposition. The specific epithet refers to the unusually large eyes of this species.

Diagnosis: Closely related to *G. tumidifrons* sp. n., distinguished by: Eye tubercle without frontal hump; colour pattern on dorsal scutum less marked; antero-

proximal processes on ventral side of leg coxae II larger; distitarsus II relatively longer; truncus penis more slender; membraneous socket of glans with broadly rounded distal margin; lateral sclerites basally narrower, without dorsal teeth and with truncate tips; median plate shorter, wider at base, with lateral teeth.

Description: ♂ (holotype). Coloration as in *G. tumidifrons* sp. n., but dark markings generally less pronounced (bleached?).

Carapace with stout, conical, slightly foreward-inclined eye tubercle; eyes large; no lateral tubercles in posterior part; carapace-abdomen bridge absent. Dorsal scutal areas moderately elevated, VI and VII highest (Fig. 221); ventral scutal areas covered with short hairs. Palpal coxa with pronounced ventral process; leg coxa I with indistinct anterolateral one; ventral side of leg coxa II with quite large, III with small and narrow anteroproximal processes, a short, rounded posteroproximal one on coxa II. Genital operculum about as long as wide; no tubercle on posterior margin of stigmatic pit.

Chelicerae (Fig. 222) weak, proximal article with dorsodistal boss; no ventral process.

Palps (Fig. 223): Femur stout, with small ventroproximal process; trochanter with distad-directed ventral process.

Legs 1324, tarsal formula 2-2-3-3. Distitarsus of leg II 2 times longer than wide (Fig. 224).

Penis (Figs 217-220): Truncus constricted at height of glans, with circular wrinkles in proximal half; apex with broadly arched distal margin. Glans about as wide as truncus at that point, its membraneous socket widely rounded distally; lateral sclerites short, their broadly rounded tips covering lateral parts of long, golfclub-shaped membraneous tubes; median plate short, its distal part narrowly triangular, its base wide, with distinct lateral teeth; stylus fairly strong, base seemingly bulbous, tip pointed, without subterminal teeth, completely covered by the median plate.

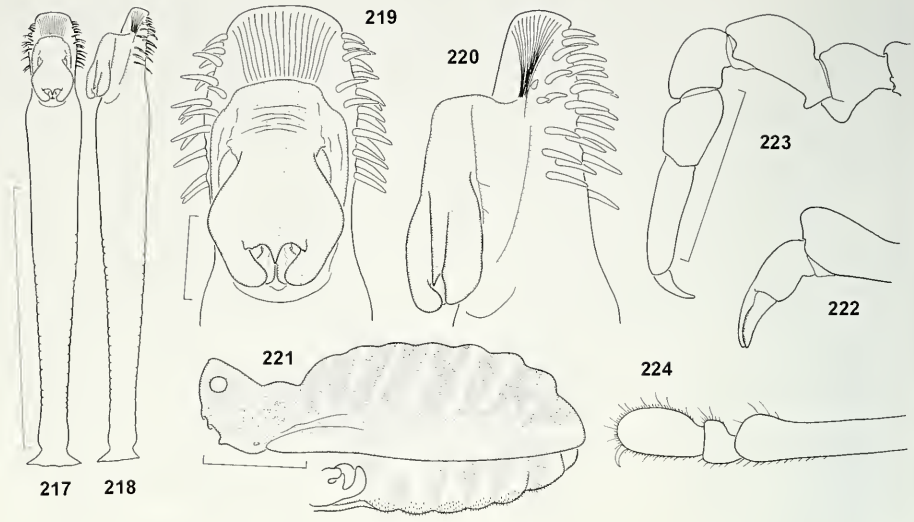
♀. Unknown.

Measurements: ♂: Body 3.59 long, 2.35 wide; carapace region 0.93 long, 1.29 wide. - Palp and legs:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.55	0.58	0.46	0.32	-	0.64	2.55
Leg I	0.37	0.97	0.55	0.55	0.86	0.55	3.85
Leg II	0.47	1.24	0.72	0.89	1.39	0.67	5.38
Leg III	0.42	0.84	0.56	0.58	1.08	0.47	3.95
Leg IV	0.52	1.19	0.72	0.95	1.55	0.52	5.45

Remarks: The juveniles examined possess a high, conical, but not forward-inclined eye tubercle.

Relationships: *Gnomulus matabesar* sp. n. and G. *tumidifrons* sp. n. are closest relatives. Small body size, a distad-directed ventral process on palpal trochanter and modifications of membraneous tubes and stylus indicate phylogenetic proximity to the *goodnighti*-group from the Philippines. The shape of the membraneous tubes also points to a fairly close relationship with *G. latoperculum* sp. n. from Sulawesi.



FIGS 217-224

Gnomulus matabesar sp. n., ♂ holotype. - Penis, dorsal (217) and lateral view (218); apex of penis, dorsal (219) and lateral view (220). Body, lateral view (221); left chelicera, retrolateral view (222); left palp, retrolateral view (223); distal part of left leg II, retrolateral view (224). - Scale lines 0.1 mm (219, 220), 1.0 mm (others).

Distribution: Known only from the type locality in the northern part of Halmahera Island [Fig. 1 (38)].

THE *LATOPERCULUM*-GROUP (new)

Diagnosis: Large (5.7-6.7 mm) species with a wide, undivided carapace-abdomen bridge and with a slightly distad-inclined process on ventral side of palpal trochanter; posterior margin of stigmatic pit with tubercle; genital operculum very wide; penis scoop-shaped, carrying an enlarged pointed stylus with an invaginated base and without subterminal ventral teeth.

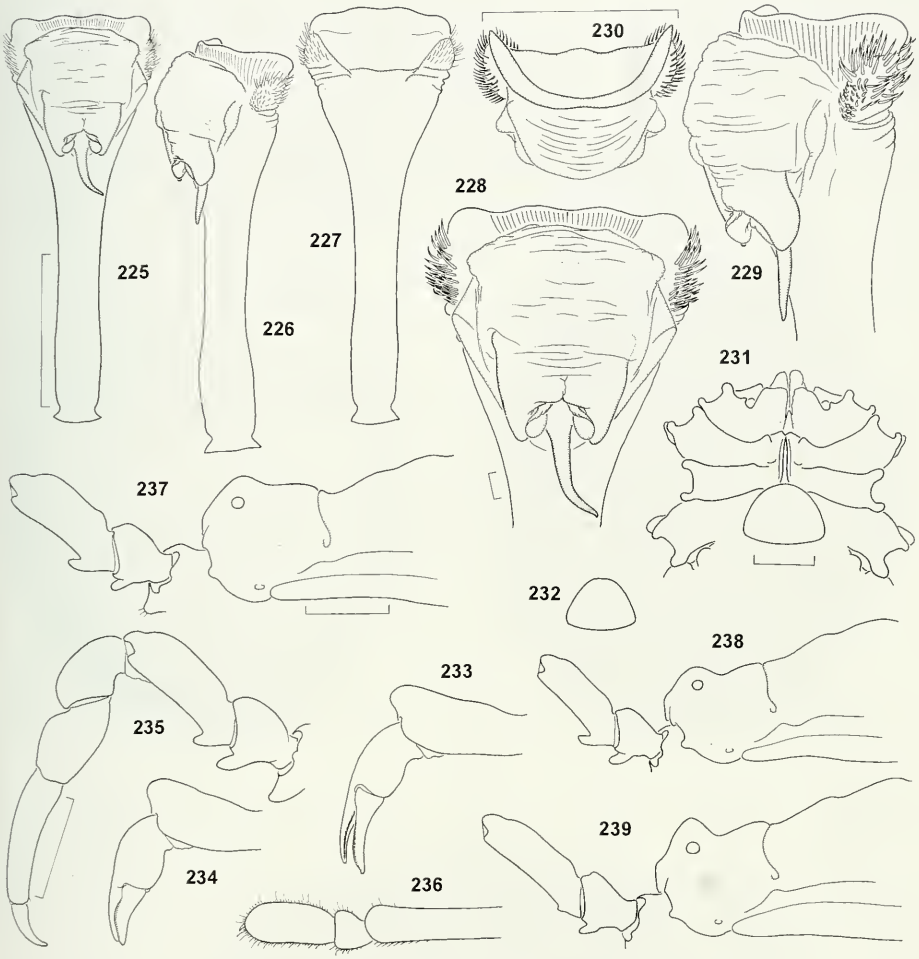
Species account and distribution: At present, this group is represented only by *G. latoperculum* sp. n. from northern Sulawesi.

Gnomulus latoperculum sp. n. Figs 225-240

Material: INDONESIA, Sulawesi, Northern Sulawesi Province, Dumoga - Bone National Park, ♂ holotype, ♂ paratype (penis not examined), 2 juv., XI.1985, leg. P. D. Hillyard (Project Wallace Expedition; NHML). - Same province, Kotamobagu, Matalibaru, Gunung Tongara, 800-900 m, 2 ♀ paratypes, 5.-9.XII.1999, leg. A. Riedel (MHNG).

Etymology: Latin: *latus* = wide, extensive, *operculum* = cover, lid; noun in apposition. The specific epithet refers to the unusually wide genital operculum (especially in males) of this species.

Diagnosis: Similar to *G. claviger* sp. n., distinguished by: Body much larger; eye tubercle lower; carapace-abdomen bridge wider, undivided; genital operculum



FIGS 225-239

Gnomulus latoperculum sp. n.. ♂ holotype (225-230, 237), ♂ paratype (234-236), ♀ paratypes (231-233, 238, 239). - Penis, dorsal (225), lateral (226) and ventral view (227); apex of penis, dorsal (228). lateral (229) and distal view (230). Anterior body, ventral view (231); genital operculum, ventral view (232). Left chelicera, retrolateral view (233, 234); left palp, retrolateral view (235); distal part of left leg II, retrolateral view (236); anterior body and proximal palp, lateral view (237-239). - Scale lines 0.1 mm (228, 229), 1.0 mm (others).

wider; truncus penis scoop-shaped; glans carrying lobate lateral sclerites and a basally thick, distally tapering stylus; median plate absent.

Description: ♂ (paratype). Coloration quite pale, light yellow-brown (newly moulted specimen). Dark reticulation in carapace region and dark pattern on dorsal and ventral scuta; dark transversal bands on dorsal scutal elevations broken by light, narrow, longitudinal stripe in areas I-VI; dorsal and ventral scutal elevations each with a pallid transversal band in its centre (Fig. 240a-c). Chelicerae and pedipalps

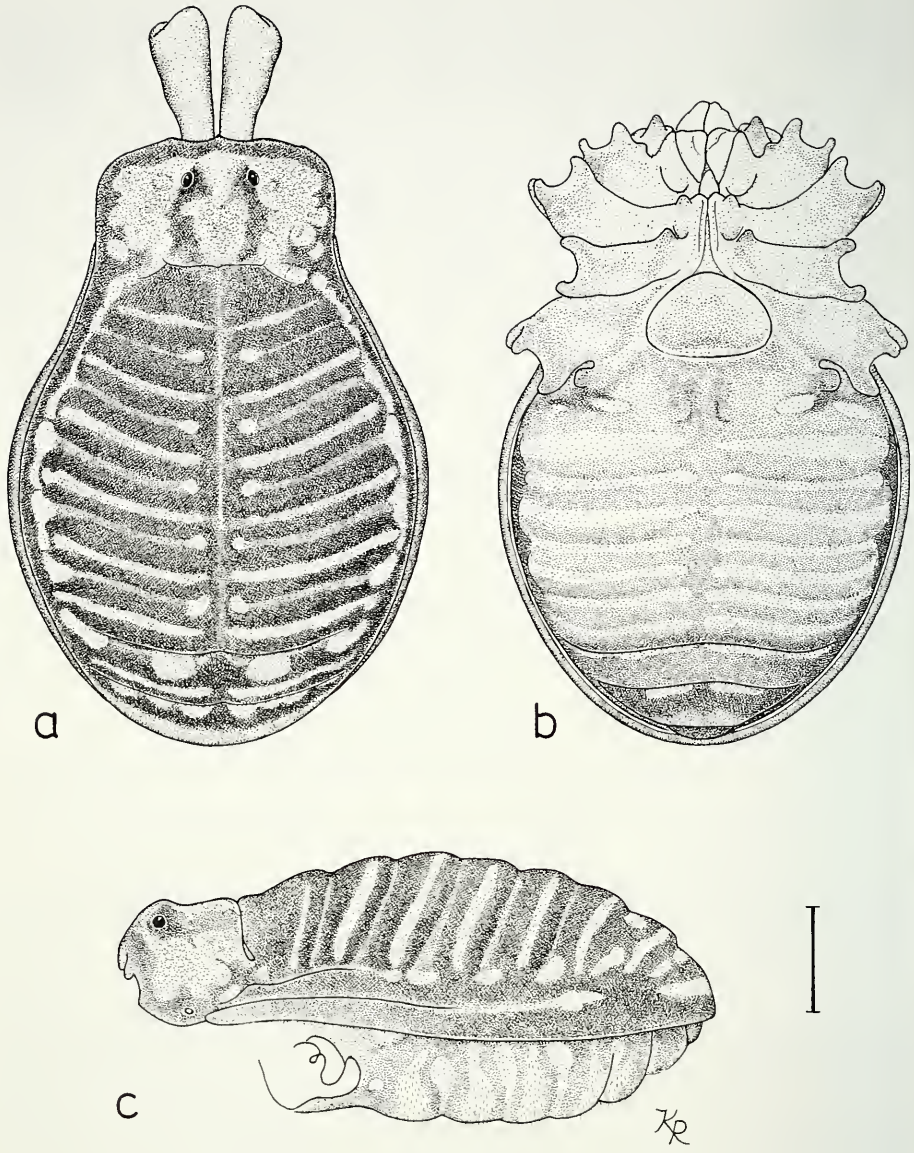


FIG. 240

Gnomulus latoperculum sp. n., ♂ paratype. - Body, dorsal (a), ventral (b) and lateral view (c). - Scale line 1.0 mm.

with dark reticulation. Legs mostly dark, except for light distal portion on tibiae and light median zone on metatarsi of posterior legs and light tarsi on all legs.

Carapace with small, low, rounded eye tubercle; no lateral tubercles below wide, undivided carapace-abdomen bridge. Dorsal scutal areas moderately elevated;

ventral scutal areas slightly swollen (Fig. 240a, c), covered with short hairs. Palpal coxa with pronounced ventral process; leg coxa I with small anterolateral one; ventral side of leg coxae II and III with small conical anteroproximal processes, an indistinct rounded posteroproximal one on coxa II. Genital operculum very large, much wider than long; posterior margin of stigmatic pit with pronounced tubercle (Fig. 240b).

Chelicerae (Fig. 234) weak, proximal article with dorsodistal boss; no ventral process.

Palps (Fig. 235): Femur and trochanter each with a slightly distad-inclined ventral process.

Legs 1324, tarsal formula 2-2-3-3. Distitarsus of leg II 2.3 times longer than wide (Fig. 236).

Penis (Figs 225-230): Truncus stout, apex very wide, scoop-shaped (see Fig. 230 for distal view), with almost straight distal margin; setae restricted to two pallid, cushion-shaped oval areas in a lateral subterminal position. Glans large, about as wide as truncus at that point, situated close to anterior margin of truncus; membraneous socket large, distally widely rounded; lateral sclerites lobate, pointing down the truncus; median plate absent; membraneous tubes long, distally flat, wide and rounded, clearly visible in between lateral sclerites and stylus; stylus strongly enlarged, very wide at invaginated base, distally tapering, without ventral subterminal teeth.

♀. As the male, apart from less elevated, entirely dark ventral scutal elevations and a more or less distinctly narrower genital operculum (Figs 231, 232).

Measurements: ♂ holotype (♀ in parentheses): Body 6.21 (6.36) long, 4.12 (4.09) wide; carapace region 1.38 (1.23) long, 2.44 (2.29) wide. - Palp and legs:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.89 (0.71)	1.26 (1.13)	0.99 (0.84)	0.67 (0.59)	- -	1.33 (1.31)	5.14 (4.58)
Leg I	0.67 (0.62)	2.02 (1.92)	1.04 (0.94)	1.13 (1.11)	1.75 (1.73)	0.99 (0.91)	7.60 (7.23)
Leg II	0.79 (0.74)	2.61 (2.54)	1.33 (1.23)	1.70 (1.75)	2.56 (2.47)	1.16 (1.11)	10.15 (9.84)
Leg III	0.69 (0.59)	1.87 (1.85)	1.06 (0.99)	1.26 (1.23)	2.12 (2.17)	0.79 (0.79)	7.79 (7.62)
Leg IV	0.94 (0.84)	2.51 (2.54)	1.33 (1.26)	1.85 (1.87)	3.20 (3.20)	0.89 (0.89)	10.72 (10.60)

Variation: Range of measurements in ♂♂ (n= 2) and ♀♀ (n=2; in parentheses): Body 5.74-6.21 (6.36-6.68) long; 3.99-4.12 (4.09-4.51) wide, carapace region 1.26-1.38 (1.23-1.48) long, 2.29-2.44 (2.29-2.56) wide. The ♂ paratype has distinct pale transversal bands in the central zones of its dark dorsal scutal elevations (Fig. 240a). This is not observable in the holotype, where the underlying pigmentation is partly detached from the cuticle (due to preservation?). One ♀ has a distinctly higher eye tubercle and smaller ventral processes on palpal femur and trochanter (Fig. 239). Variation in the size of the genital operculum, see Figs 231, 232, 240b.

Relationships: The relationships of *G. latoperculum* sp. n. are unclear. Judging from penis morphology it appears most closely related to the *goodnighti*-species group.

Distribution: Known only from two localities (close to each other) in northern Sulawesi [Fig. 1 (41)]. The ♀ paratypes were collected by sifting leaf litter in a selectively logged primary rain forest.

THE *GOODNIGHTI*-GROUP (see Schwendinger & Martens, 1999b: 974)

Diagnosis: Small (1.9-3.8 mm) species, additionally characterized by: Ventral process on palpal trochanter distinctly distad-directed; posterior margin of stigmatic pit without tubercle; carapace-abdomen bridge absent (*G. crucifer, G. minor, G. crassipes* sp. n.) or present (all others); glans penis usually with quite long membraneous tubes; stylus enlarged (often strongly modified), if slender, then without ventral pair of subterminal teeth (*G. coniceps, G. imadatei*?); base of stylus bulbous (*G. coniceps, G. goodnighti* and *G. crassipes* sp. n.) or invaginated (all others).

Species account and distribution: Nine species: One from Brunei [*G. imadatei* (Suzuki)] and eight from the Philippines [*G. claviger* sp. n., *G. coniceps* Martens & Schwendinger, *G. crassipes* sp. n., *G. crucifer* Martens & Schwendinger, *G. goodnighti* (Suzuki), *G. leyteensis* Martens & Schwendinger, *G. maculatus* Martens & Schwendinger, *G. minor* Tsurusaki (male unknown - assignment uncertain)].

Gnomulus claviger sp. n. Figs 241-255

Material: PHILIPPINES, Luzon, Mt. Banahaw, above Kinabuhayan, trail to Cristalino, 600-700 m, ♂ holotype, 24.XI.1995, leg. I. Löbl (MHNG). - Los Baños, Mt. Makiling (= Mt. Maquiling), 2 ♂ paratypes, XI.1968 and 5.V.1968, leg. R. A. Morse (AMNH).

Etymology: Latin: *clava* = club, cudgel; *ger* (suffix derived from *gerere*) = furnished with. The specific epithet refers to the club-shaped penis of this species.

Diagnosis: Close to *G. maculatus*, distinguished by: Colour pattern different; ventroproximal process on palpal femur larger; penis stouter, distally wider, with membraneous socket extending beyond apex of truncus; sclerites of glans, especially stylus, different in shape.

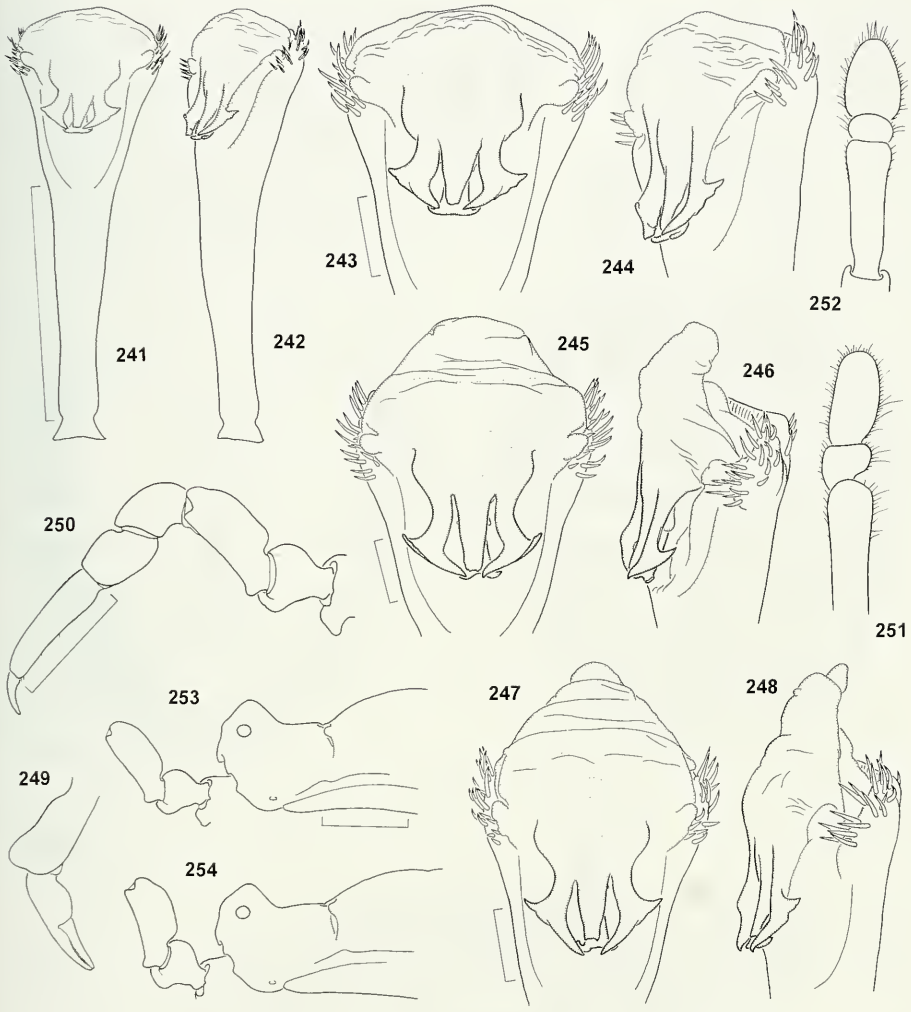
Description: ♂ (paratype). Coloration: Body amber, with dark reticulation in carapace region and dark margin and transversal bands on dorsal scutum (cf. Fig. 255a, c); dark transversal bands on ventral scutum less distinct (median portion most clearly pronounced). Genital operculum light throughout (cf. Fig. 255b). Chelicerae and pedipalps with dark reticulation, except for light yellow-brown hand and tarsus, respectively. Legs mostly darkened, except for light tarsi and light distal portion on tibiae and metatarsi.

Carapace with low, widely conical, terminally rounded eye tubercle bearing a small hump on its front side; no lateral tubercles in posterior part; carapace-abdomen bridge formed by two opposing pairs of tubercles. Dorsal scutal areas only indistinctly elevated; ventral scutal areas with few fine hairs, not recognizably modified (cf. Fig. 255a, c). Palpal coxa with strong ventral process; leg coxa I with indistinct anterolateral one; ventral side of leg coxae II and III with small conical anteroproximal processes, a knob-shaped posteroproximal one on coxa II. Genital operculum clearly wider than long; posterior margin of stigmatic pit without tubercle (Fig. 255b).

Chelicerae (Fig. 249) weak, proximal article with distinct dorsodistal and indistinct dorsomedian boss; no ventral process.

Palps (Fig. 250): Femur short, ventral side with small, ventrad-directed proximal process; trochanter with distad-directed ventral process.

Legs 1324, tarsal formula 2-2-3-3. Distitarsus II 2.1 times longer than wide



FIGS 241-254

Gnomulus claviger sp. n., ♂ holotype (245, 246, 254), ♂ paratypes (141-244, 247-253). - Penis, dorsal (241) and lateral view (242); apex of penis, dorsal (243, 245, 247) and lateral view (244, 246, 248). Left chelicera, retrolateral view (249); left palp, retrolateral view (250); distal part of left leg II, retrolateral view (251); distal part of left leg I, dorsal view (252). Anterior body and proximal palp, lateral view (253, 254). - Scale lines 0.1 mm (243-248), 0.5 mm (others).

(Fig. 251); distitarsus I somewhat egg-shaped, clearly wider than preceding leg segments (Fig. 252).

Penis (Figs 241-248; holotype: 245, 246): Truncus stout, strongly widening in distal half; apex very wide, with broadly arched distal margin. Glans very close to tip of truncus, slightly narrower than truncus at that point; membraneous socket distally

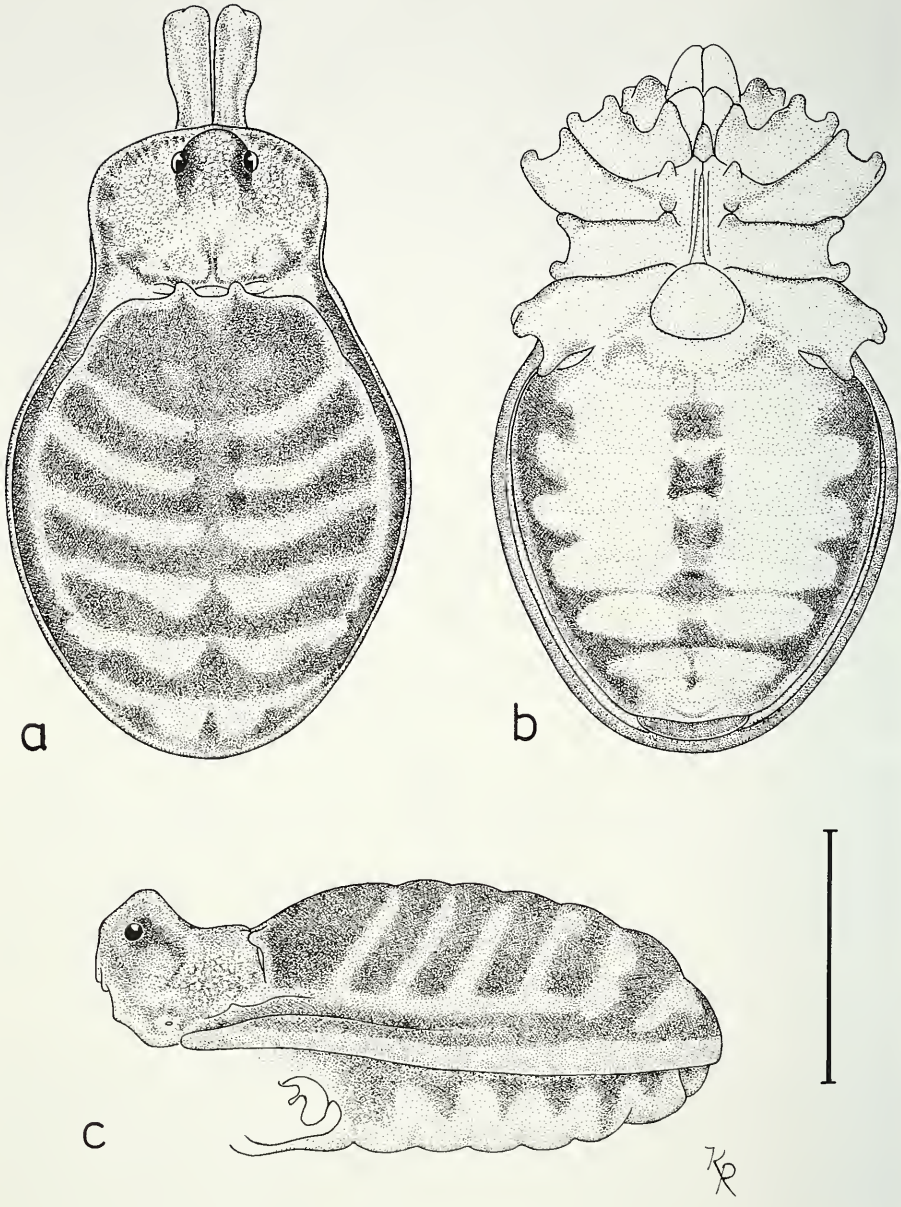


FIG. 255

Gnomulus claviger sp. n., ♂ paratype. - Body, dorsal (a), ventral (b) and lateral view (c). - Scale line 1.0 mm.

inflatable; lateral sclerites each with a lateral spur at about mid-length, tips tapering, inclined towards each other, pointing down the truncus; median plate long, narrowing towards the truncate tip; membraneous tubes short, mostly covered by median plate; stylus distinctly enlarged, base invaginated, tip broadly truncate, with distolateral edges drawn into recurved hooks.

♀. Unknown.

Measurements: ♂ paratype: Body 2.45 long, 1.56 wide; carapace region 0.62 long, 0.94 wide. - Palp and legs:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.31	0.40	0.33	0.20	-	0.50	1.74
Leg I	0.27	0.68	0.40	0.40	0.57	0.42	2.74
Leg II	0.35	0.93	0.51	0.60	0.88	0.51	3.78
Leg III	0.29	0.64	0.41	0.40	0.73	0.33	2.80
Leg IV	0.35	0.93	0.56	0.68	1.01	0.37	3.90

Variation: Measurements, external and genital characters of all three ♂ differ only to a minor extent: Body 2.43-2.56 long, 1.56-1.72 wide, carapace region 0.62-0.64 long, 0.93-0.98 wide; eye tubercles, see Figs 253, 254, 255c.

Remarks: In two males the membraneous socket of the glans penis is distally extended into a flat cap (Figs 245-248); in the third male the socket appears to be deflated and its distal portion retracted (Figs 241-244). An inflatable socket has not been observed in other oncopodids and it is not clear whether it has any function during copulation and whether inflation also occurs on the expanded penis (when the glans is folded upwards).

Relationships: The strongly modified stylus of *G. claviger* sp. n. clearly places this species in the *goodnighti*-group, closest to *G. maculatus*. Strong resemblance in the shape of the truncus penis between *G. claviger* sp. n. and *G. latoperculum* sp. n. is considered to be due to convergence.

Distribution: Known only from two mountains on Luzon Island [Fig. 1 (34, 35)]. where this species occurs together with *G. hamatus* sp. n. On one of these mountains, Mt. Makiling, a third congeneric species, *G. minor* (generic placement has yet to be confirmed by males), was found.

Gnomulus crassipes sp. n. Figs 256-273

Material: PHILIPPINES, Luzon, Mt. Banahaw, near school, 500 m, about 1 km from Kinabuhayan, ♂ holotype, 2 ♂, 1 ♀ paratypes, 1 juv., 26.XI.1995; summit trail, 800 m, 1 ♂ paratype, 25.XI.1995: above Kinabuhayan, trail to Cristalino, 600-700 m, 3 ♀ paratypes, 24.XI.1995. All specimens leg. I. Löbl (1 ♂, 1 ♀ paratypes in MAR, others in MHNG).

Etymology: Latin: *crassus* = thick, stout, *pes* = leg; noun in apposition. The specific epithet refers to the incrassate metatarsus III of males in this species.

Diagnosis: Close to *G. crucifer* (also possessing the unusual tarsal formula 2-2-2-2), distinguished by: Body smaller; colour pattern different; ventroproximal process on palpal femur larger; truncus penis subdistally constricted; glans with longer lateral sclerites; stylus different in shape.

Description: ♂ (holotype). Coloration: Body light brown, with dark reticulation on carapace region, chelicerae and pedipalps; abdominal region of dorsal scutum amber, with dark margin and dark transversal bands (laterally more or less distinctly touching each other) on all areas (Fig. 273a, c); transversal bands on ventral scutum weakly pronounced (Fig. 273). Femora to metatarsi of legs darkened, tarsi light brown.

Carapace with very low, widely rounded eye tubercle; posterior portion of carapace elevated, slightly higher than eye tubercle; no lateral tubercles in posterior part; carapace-abdomen bridge absent. Dorsal scutal areas only indistinctly elevated, ventral scutal areas slightly more so, without hairs (Fig. 273a, c). Palpal coxa with pronounced ventral process; leg coxa I with indistinct anterolateral one; ventral side of leg coxae II and III with conical anteroproximal processes, a knob-shaped posteroproximal one on coxa II. Genital operculum wider than long; no tubercle on posterior margin of stigmatic pit (Fig. 273b).

Chelicerae (Fig. 266) weak, proximal article with slightly forward-inclined dorsodistal and indistinct dorsomedian boss; no ventral process.

Palps (Fig. 267): Femur short, with widely rounded ventroproximal process; trochanter with distad-directed ventral process.

Legs 3142, tarsal formula 2-2-2-2. Distitarsus II 1.2 times longer than wide (Fig. 268); metatarsus III recognizably inflated (Figs 269, 270).

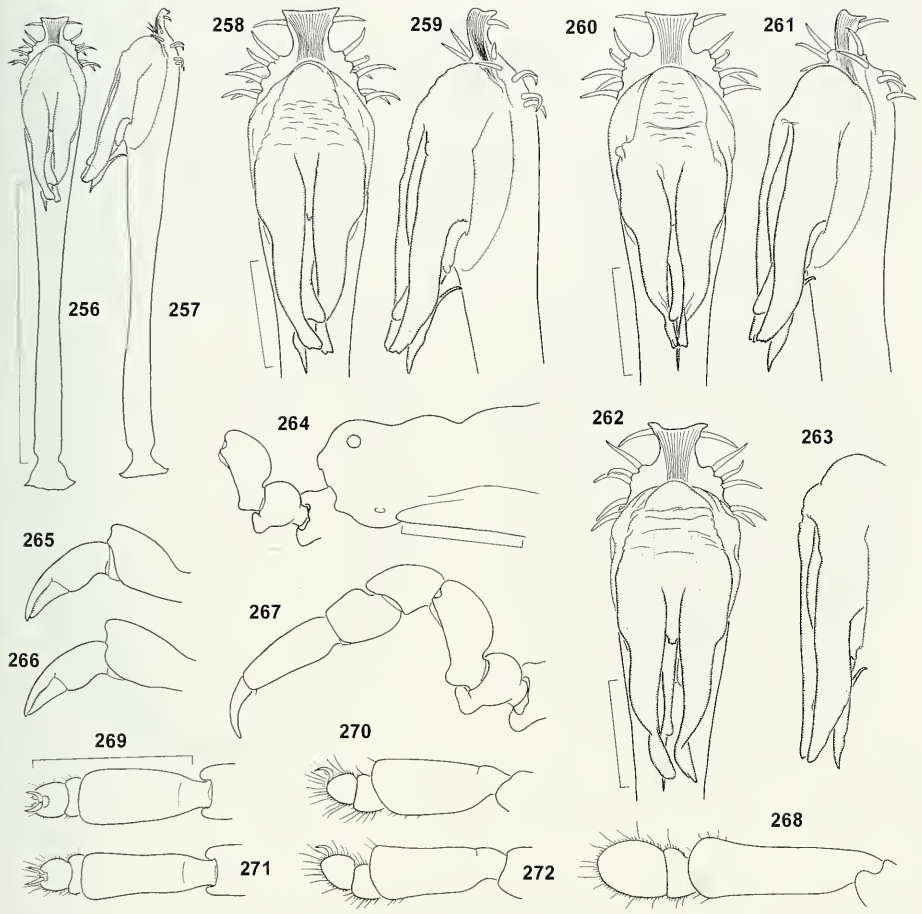
Penis (Figs 256-263; holotype: 260, 261): Truncus slender, strongly constricted below axe-shaped (in dorsal view) apex; distal margin almost straight; a pair of lateral setae situated above constriction, few other setae below it. Glans slightly wider than truncus at that point; membraneous socket distally wide, rounded; lateral sclerites long, pointing down the truncus, their tips unevenly rounded; median plate short, pointed, mostly covered by lateral sclerites; membraneous tubes long, covered by lateral sclerites; stylus enlarged, base bulbous, distal portion compressed at the sides, with a dorsal boss at some distance from the blade-shaped tip, sperm duct opening on the tip of a narrow medioventral spine pointing towards the truncus.

♀. As the male but metatarsus III not incrassate (Figs 271, 272).

Measurements: ♂ holotype (♀ in parentheses): Body 1.94 (2.09) long, 1.17 (1.26) wide; carapace region 0.56 (0.60) long, 0.70 (0.72) wide. - Palp and legs:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.20 (0.21)	0.25 (0.25)	0.24 (0.24)	0.16 (0.16)	- -	0.32 (0.33)	1.17 (1.19)
Leg I	0.21 (0.21)	0.42 (0.44)	0.29 (0.30)	0.21 (0.22)	0.25 (0.36)	0.22 (0.23)	1.70 (1.76)
Leg II	0.24 (0.27)	0.54 (0.57)	0.36 (0.38)	0.31 (0.32)	0.54 (0.55)	0.27 (0.28)	2.26 (2.37)
Leg III	0.21 (0.21)	0.33 (0.35)	0.28 (0.29)	0.23 (0.23)	0.41 (0.41)	0.15 (0.15)	1.61 (1.64)
Leg IV	0.25 (0.27)	0.50 (0.52)	0.37 (0.39)	0.37 (0.39)	0.56 (0.58)	0.17 (0.17)	2.22 (2.31)

Variation: Range of measurements in ♂♂ (n = 4) and ♀♀ (n= 4; in parentheses): Body 1.90-1.98 (1.99-2.09) long, 1.13-1.20 (1.22-1.26) wide, carapace region 0.55-0.56 (0.56-0.60) long, 0.68-0.70 (0.72) wide. In some specimens the dark transversal bands on the dorsal scutum are broken by light, narrow longitudinal stripes in areas II and III; the ventral scutal bands are partly broken in some specimens. In one male the median plate of the glans penis is narrowly truncate instead of pointed (Fig. 262).



FIGS 256-272

Gnomulus crassipes sp. n., ♂ holotype (260, 261, 266, 267-270), ♂ paratypes (256-259, 262, 263), ♀ paratype (264, 271, 272). - Penis, dorsal (256) and lateral view (257); apex of penis, dorsal (258, 260, 262) and lateral view (259, 261); glans penis, lateral view (263). Left chelicera, retrolateral view (265, 266); left palp, retrolateral view (267); distal part of left leg II, retrolateral view (268); distal part of left leg III, dorsal (269, 271) and lateral view (270, 272). - Scale lines 0.1 mm (258-263), 0.5 mm (others).

Relationships: Modifications of the glans (especially of its stylus) and a distad-directed ventral process on the palpal trochanter place *G. crassipes* sp. n. in the *goodnighti*-group. Congruence in external morphology (tarsal formula 2-2-2-2, no carapace-abdomen bridge) and penis morphology (especially the reduction of the median plate) suggest closest relationship with *G. crucifer*.

Distribution: Known only from a mountain on Luzon Island [Fig. 1 (34)], where the new species occurs together with *G. claviger* sp. n. and *G. hamatus* sp. n.

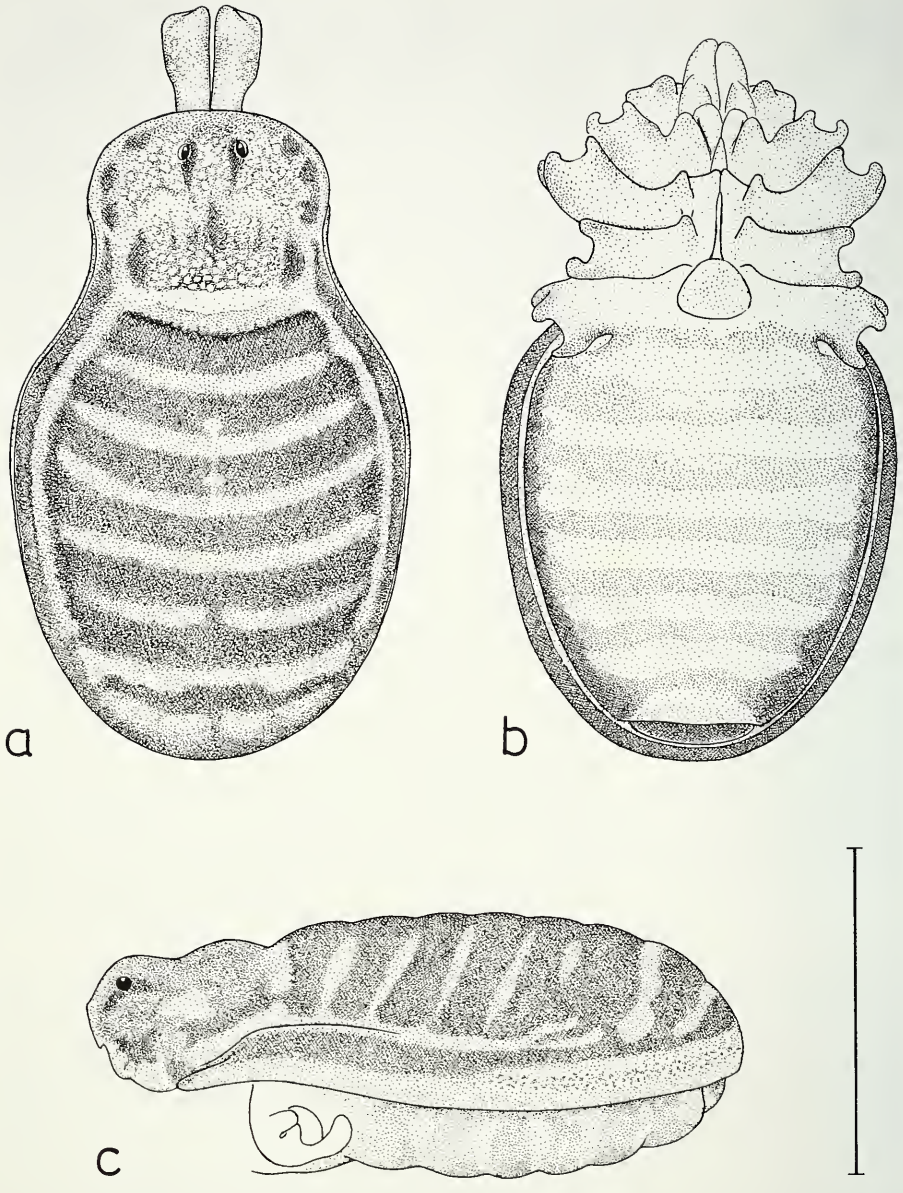


FIG. 273

Gnomulus crassipes sp. n., ♂ paratype. - Body, dorsal (a), ventral (b) and lateral view (c). - Scale line 1.0 mm.

UNIDENTIFIED MATERIAL

THAILAND: 1 juv. (leg. L. Deharveng; MHNG) was collected in front of Tham (= Cave) Pu Lub, ca. 300 m, near Phu Kradung village, Khon Kaen Province, northeastern Thailand [Fig. 1 (3)].

2 ♀ (leg. I. Löbl & D. Burckhardt and P. J. Schwendinger; MHNG), similar to *G. ryssie* sp. n. and *G. marginatus* sp. n., were found on Khao (= Mount) Khieo, 1150 m, in the Khao Yai National Park, Nakhon Ratchasima Province, northeastern Thailand [Fig. 1 (4)].

4 ♀ (leg. M. Andersen & A. R. Rasmussen; ZMC) from Ko (= Island) Siray off Phuket Island [Fig. 1 (9)] appear to be close to *G. marginatus* sp. n. and *G. ryssie* sp. n.

1 ♀ (leg. A. Schulz; MHNG), very similar to the 4 ♀ from Ko Siray, was found in the Khao Sok National Park (Phang Nga Province; not indicated on Fig. 1).

MALAYSIA (peninsula): 1 ♀ (leg. P. J. Schwendinger; MHNG), belonging to the *asli*-group, was sifted from leaf litter near Jeram Pasu Waterfall, ca. 30 km south of Kota Baharu, Kelantan [Fig. 1 (10)].

1 ♀ (leg. A. Riedel; MAR) from Maxwell Hill, 1200 m, Taiping, Perak (see Martens & Schwendinger, 1998: 549) [Fig. 1 (11)] occurs syntopically with *G. laruticus* but clearly does not belong to any of the known *asli*-group species. It possesses an unusually large genital operculum.

1 juvenile (leg. P. J. Schwendinger; MHNG) from a forest near Chenderiang [Fig. 1 (12)] possibly belongs to *G. pulvillatus* (see Schwendinger & Martens, 1999b: 957).

MALAYSIA (Sarawak): 2 ♀ (leg. I. Löbl & D. Burckardt; MHNG) from Santubong Peninsula (0-100 m), N of Kuching [Fig. 1 (23)], appear to be close to *G. laevis*, but are distinguished by the lack of ventral processes on palpal femur and trochanter.

1 ♀ (leg. I. Löbl & D. Burckhardt; MHNG) from near Kapit (the type locality of *G. hutan* sp. n.) [Fig. 1 (25)] is distinct by the lack of a ventral process on palpal trochanter and by the rare tarsal formula 2-2-2-2.

MALAYSIA (Sabah): 1 ♀ (leg. R. Leakey?; NHML) from Mount Kinabalu National Park, 1540 m [Fig. 1 (29)] and a large juvenile (leg. W. Schawaller; MAR) from the same mountain at 1500-1600 m externally largely correspond with *G. exsudans* sp. n., but presumably belong to a different species.

The same also applies to 4 juveniles (leg. P. Lehtinen; Zoological Museum Turku) from Tiger Hill near Tawau, southeastern Sabah [Fig. 1 (30)].

INDONESIA (Sumatra): 1 ♀ (collector unknown; MHNG) from Deli near Medan, Northern Sumatra Province [Fig. 1 (19)] seemingly belongs to the *sumatranus*-group. A juvenile (leg. A. Riedel; MHNG) from Bukit Lawang (west of Medan) [Fig. 1 (18)] may also be conspecific.

INDONESIA (Kalimantan): 1 ♀ (leg. P. Beron & T. Ivanova; National Museum of Natural History, Sofia) from Nunukan Island (near the border to Sabah) [Fig. 1 (31)] is externally similar to *G. exsudans* sp. n. but possesses a distinctly larger body and a lower eye tubercle.

INDONESIA (Moluccas): 1 juv. (leg. A. Riedel; MHNG) from Morotai Island (north of Halmahara) [Fig. 1 (37)] is similar to the species of the *tumidifrons*-group but has a different colour pattern than the juveniles from Halmahera.

INDONESIA (Irian Jaya): 1 ♀, 1 juv. (leg. A. Riedel; MHNG) from Gunung Susu on Waigeo Island is externally similar to *G. tumidifrons*.

PHILIPPINES (Luzon): 1 ♀ (leg. L. Deharveng; MAR) from near Sagada [Fig. 1 (32)] resembles *G. crucifer* but differs by larger size and the common tarsal formula 2-2-3-3.

1 juv. (leg. L. Deharveng; MAR) from the Quezon National Park [Fig. 1 (33)] clearly differs from the species found at the nearby mountains, Mt. Makiling and Mt. Banahaw.

PHILIPPINES (Leyte): 1 ♀ (fairly large; mentioned in Martens & Schwendinger 1998: 549) and 1 juv. (leg. J. Martens & W. Schawaller; MAR) from north of Baybay [Fig. 1 (36)] differ from *G. leyteensis*, which occurs at the same locality.

DISCUSSION

The species groups

At present 48 *Guonulus* species are known, which we arrange in 11 preliminary species groups. Two of them (*aboreusis*-group, *rostratus*-group) were treated earlier (Schwendinger & Martens, 1999b) and are not further considered here.

1. *Guonulus sineusis* sp. n. and *G. spiniceps* sp. n., here placed in the *sineusis*-group, are both close to the *aboreusis*-group. Discoveries of further new species in the northern part of the distribution area of *Guonulus* will most likely close the narrow gap between these two groups.

2. In the most species-rich assembly, the *aruillatus*-group with 20 spp., details of penis morphology indicate four different phyletic lineages:

A) *Guonulus piliger* from southern Thailand, *G. leofeae* sp. n. from southern Myanmar, *G. pulvillatus* from peninsular Malaysia, *G. aruillatus* from Sumatra and *G. cariuatus* sp. n. from southern Kalimantan all possess narrow, cylindrical, pointed, slightly sigmoid lateral glans sclerites pointing away from the truncus, in addition to a short, broadly rounded median plate.

B) *Guonulus ryssie* sp. n. and *G. uarginatus* sp. n. from central and southeastern Thailand are similar but have a long, more or less pointed median plate.

C) *Guonulus baharu* from Brunei and *G. conigerus* from Sabah also have cylindrical, pointed lateral sclerites, but they are U-shaped instead of sigmoid and their median plate is quite long and pointed. Genitalic characters of all these species appear to be plesiomorphic, as cylindrical, pointed lateral sclerites are also present in the primitive *Palaeoucopus*. Therefore these three subgroups are possibly not monophyletic.

D) *Guonulus javanicus* sp. n. (from Java), *G. exsudans* sp. n., *G. hutan* sp. n., *G. laevis*, *G. lonani* sp. n., *G. obscurus* sp. n. and *G. sundaicus* (from northern Borneo), on the other hand, all possess paddle-shaped or blade-shaped lateral sclerites with laterally compressed apices, which are probably apomorphic. These 7 *Guonulus*

species, presumably together with *G. annulipes* (the apices of its small and hook-like lateral sclerites are not clearly compressed), seem to form a distinctly monophyletic group.

In *G. thorelli* from Java and *G. drescoi* from Sumatra the males are still unknown and therefore their relationships remain unclear. We assume that the former species is close to *G. carinatus* sp. n. and the latter close to (or even identical with) *G. armillatus*.

3. The *asli*-group is a distinct, seemingly quite primitive lineage, restricted in its distribution to peninsular Malaysia. The fortunate find of further *G. laruticus* specimens confirms that the unusual tarsal formula 2-2-2-2 is in fact a specific character and not just a deformity of the holotype. The same is presumably also the case in the unrelated *G. crucifer* (with the same tarsal formula) from the Philippines.

4. *Gnomulus tuberculatus* sp. n., the second species of the *sumatranus*-group, makes an external distinction from the *armillatus*-group and from the *aborensis*-group less clear-cut than before. With regard to penis morphology, however, the two species of the *sumatranus*-group show more congruence with the externally much different *asli*-group species. The synapomorphic presence of a subdistal process on the ventral side of their palpal femur, in addition to their large size, show that *G. sumatranus* and *G. tuberculatus* sp. n. belong to a distinct lineage and do not just present links between the *armillatus*- (or *aborensis*-) group and the *asli*-group.

5. *Gnomulus rostratoideus* sp. n. is externally almost indistinguishable (except for an unbroken dark margin around the dorsal scutum) from the species of the *rostratus*-group, which are characterised by a strong, beak-like, forward-inclined eye tubercle. The penis of the new species, however, does not show the same derived morphology (i.e. stylus shaped like a flattened bell). Instead it resembles the penes of the *gooduighti*-group species in that its cylindrical stylus lacks ventral subterminal teeth. This congruence is considered to be due to convergent reduction. Therefore *G. rostratoideus* sp. n. is probably a primitive relative of the species in the *rostratus*-group. We place it here in a species group of its own, the *rostratoideus*-group, and regard it as sister to the distinct and clearly monophyletic *rostratus*-group.

6. *Gnomulus hamatus* sp. n., the only representative of the *hamatus*-group, possesses several characters which appear to be primitive for the genus *Gnomulus* (i.e. medium body size, an only slightly distad-inclined ventral process on palpal trochanter and stylus penis slender, with bulbous base and with a pair of subterminal ventral teeth). The absence of a carapace-abdomen bridge and the presence of pronounced modifications on the truncus penis and certain parts of the glans (i.e. subdistally wide truncus, enlarged membraneous socket, truncate lateral sclerites, hook-shaped median plate), however, show that this species is much closer to the *goodnighti*-group than to the *armillatus*-group. Therefore we place *G. hamatus* sp. n. in a species group of its own and regard it as the sister of the *goodnighti*-group.

7. With 11 species known at present, the *gooduighti*-group is second to the *armillatus*-group in species-richness but it is more diverse with regard to penis morphology. Moreover, the group has a fairly restricted distribution in the Philippines and northern Borneo, which indicates that this is a relatively young phylogenetic lineage undergoing rapid speciation. This group is probably paraphyletic.

Gnomulus goodnighti and *G. leyteensis* show the primitive situation of retaining a ventral pair of subdistal teeth on their stylus penis. Otherwise both species perfectly correspond with others from this group, mostly because their styli are distinctly enlarged. *Gnomulus coniceps* and seemingly also *G. imadatei* (not examined; see Suzuki, 1969: fig. 4d, e), on the other hand, lack subdistal teeth on their styli (and are otherwise quite typical for this group), but these styli appear to be slender, not enlarged. Hence, the presence of an enlarged stylus or the absence of subterminal teeth on the stylus alone are not exclusive characteristics of the *goodnighti*-group (see also the *rostratoideus*-, *tumidifrons*- and *latoperculum*-group).

Gnomulus crassipes sp. n. and *G. crucifer* are related by the unusual tarsal formula 2-2-2-2, by the reduction of their carapace-abdomen bridge and by similar modifications of the glans penis. The lack of a carapace-abdomen bridge appears to link them with *G. minor* (male unknown) and with the *tumidifrons*-group, but this is not reflected in a similar penis morphology. The carapace-abdomen bridge probably has been reduced parallel in different lineages, i.e. in the *goodnighti*-group, in the *tumidifrons*-group and in the *hamatus*-group.

8. *Gnomulus tumidifrons* sp. n. and *G. matabesar* sp. n. from the Moluccas, here placed in the *tumidifrons*-group, clearly represent a distinct phyletic lineage close to the *goodnighti*-group. Small body size, a distad-directed ventral process on palpal trochanter, fairly long membraneous tubes in the glans and an enlarged stylus are shared by both groups. The two species of the *tumidifrons*-group are characterized by large eyes, a glans penis with fairly large, golfclub-shaped membraneous tubes, which are not covered by the narrow, spike-like median plate. Similar membraneous tubes are also found in *G. latoperculum* sp. n. The *tumidifrons*-group is possibly an offshoot of the *goodnighti*-group, which in this case would be paraphyletic.

9. *Gnomulus latoperculum* sp. n. (*latoperculum*-group) appears intermediate between three species groups. In external morphology it resembles species of the *armillatus*-group (by its fairly large size, its wide, undivided carapace-abdomen bridge and by a slightly distad-inclined ventral process on palpal trochanter), but its penis shows modifications otherwise mostly found in the *goodnighti*-group (i.e. enlarged cylindrical stylus with invaginated base and without subdistal pair of teeth, long membraneous tubes, reduced median plate, lobate lateral sclerites). As in the case of the *tumidifrons*-group, G. *latoperculum* sp. n. is presumably also a highly derived descendant of the (then paraphyletic) *goodnighti*-group. Most similarities in penis morphology are found between *G. latoperculum* sp. n. and *G. claviger* sp. n., but we consider these as convergent. A close relationship possibly also exists between *Gnomulus latoperculum* sp. n. and both species of the *tumidifrons*-group from the Moluccas, as indicated by geographical proximity and by the long, distally flattened and widened (golfclub-shaped) membraneous tubes of the glans penis. The latter may, however, be yet another case of convergence.

Zoogeography

Gnomulus has clearly the largest distribution of all oncopodid genera, covering the entire range of the family (Fig. 1 and Schwendinger & Martens, 1999b: fig. 1). The newly discovered species considerably expand the previously known distribution

of the Oncopodidae towards the northeast and the southeast. *Gnomulus sinensis* sp. n. marks the northeasternmost occurrence in this family and *G. spiniceps* sp. n. stands at the eastern periphery of the known distribution on mainland Asia. Looking at the sparse and widely separated oncopodid records in this region (with the exception of a relatively well-investigated peninsular Malaysia), one can see how little we still known about the diversity of these enigmatic opilionids, let alone about their biology. These patchy records are not least due to restricted accessability of certain areas, either because of the political situation in Myanmar and northeastern India, or because of dangers from land mines and unexploded bombshells in Indochina. Unfortunately this restricts zoological investigations in situ, but not large-scale habitat destruction in these areas.

The most surprising discovery from the new material is the occurrence of oncopodids beyond Wallace's line, i.e. *Gnomulus latoperculum* sp. n. in northern Sulawesi, *G. matabesar* sp. n. and *G. tumidifrons* sp. n. in the northern Moluccas and an unidentified species (only ♀ and juvenile available) on an island off the northwestern tip of New Guinea. Considering that oncopodids require constantly high humidity and looking at the relationships between these three nominal species and at their taxonomic distinctiveness from congeners west of Wallace's line, we can exclude that they have been introduced by man. The closest relatives of these three species are found in the Philippines and not on the Greater Sunda Islands. Therefore it appears that the ancestors of these autochthonous taxa have arrived from the north, probably in fairly recent geological times. It will be exciting to learn from further collections on the Lesser Sunda Islands and on New Guinea, how far the Oncopodidae have advanced into the Australian region.

The different species groups occupy quite distinctly outlined geographical ranges with only few disjunctions. The *aborensis*-group species occur in and around the Himalayas and its foothills extending into northern Thailand, whereas the *sinensis*-group occupies the northeastern part of the generic range on mainland Asia, i. e. southern China and northern Vietnam. The *asli*-group and the *rostratus*-group are known only from peninsular Malaysia (new finds for the latter also in Thailand), the *sumatranus*-group only from Sumatra and the *tumidifrons*-group so far only from the Moluccas (probably also from Waigeo Island off New Guinea). The monotypic *rostratoideus*-group, *latoperculum*-group and *hamatus*-group occur in southern peninsular Malaysia, on Sulawesi and on Luzon Island (Philippines), respectively. The *goodnighti*-group is found on the Philippine islands and one of its species also on Borneo. Only the *armillatus*-group has a wide distribution, ranging from northeastern Thailand to Sumatra, Java and probably the whole of Borneo. Most species appear to have small distribution areas, only two members of the *armillatus*-group are noteworthy exceptions: The known range of *G. armillatus* stretches over 170 km, that of G. *exsudans* sp. n. over about 400 km.

Remarkable is the seemingly syntopical occurrence of three congeneric species (*G. hamatus* sp. n., *G. claviger* sp. n. and *G. crassipes* sp. n.) on Mt. Banahaw, Luzon Island. The latter two species even belong to the same derived species-group. From the nearby Mt. Makiling also three species are known, i.e. *G. hamatus* sp. n., *G. claviger* sp. n. and *G. minor*. In this case, however, it is not clear whether the latter

species (male unknown) is really congeneric with the other two. At the same mountain there is additionally an undescribed *Biantoncopus* and an oncopodid species, which at present we cannot attribute to any genus. The presence of presumably yet another *Gnomulus* species (1 juvenile available) in the nearby Quezon National Park shows that the Oncopodidae have experienced an exceptionally vivid process of speciation in the Philippines and on Luzon Island in particular.

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INDEX [Names of *Gnomulus* species treated in this paper]

Added in proof: We have only recently received further *Gnomulus* specimens from the Philippines, Malaysia and Singapore (all in MHNG; leg. L. Deharveng, S. Huber, L. Monod, A. Schulz, P. J. Schwendinger), which will be treated in a later paper.

Revue suisse de Zoologie 109 (1): 115-125; mars 2002

Taxonomic consideration of the genus *Odontobuthus* Vachon (Scorpiones, Buthidae), with description of a new species [1]

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Taxonomic consideration of the genus *Odontobuthus* Vachon (Scorpiones, Buthidae), with description of a new species. - The two species of the genus *Odontobuthus* Vachon known at present are reassessed and considered to be valid. A new species, *Odontobuthus bidentatus* sp. n. is described from Iraq and from the region of Borazdjan, southern Iran. Some comments on the geographical distribution of the genus are added and a key to its species is provided.

Key-words: Scorpions - *Odontobuthus* - Iraq - new species - geographical distribution.

INTRODUCTION

The genus *Odontobuthus* was introduced by Vachon in 1950. Its type species, *Buthus doriae* Thorell, 1876, was originally described from Teheran. Since its establishment, *Odontobuthus* has been thought to consist of only two species, *O. doriae*, distributed in Iran and Iraq, and *Odontobuthus odonturus* (Pocock, 1897) from Kelat Frontier, Sind (before in India, now in Pakistan). The genus is presumably distributed throughout India, Pakistan, Iran and Oman (Fet & Lowe, 2000).

For some time, the validity of these two species has been questioned. After describing *O. odonturus* (under *Buthus odonturus*) in 1897, Pocock changed his mind and, in his Fauna of India (Pocock, 1900), considered it to be only a sub-species of *B. doriae*, *B. doriae odonturus* (=*Odontobuthus doriae odonturus*). This opinion was retained by others authors, including Takashima (1945). More recently, in their new version of the Fauna of India, Tikader and Bastawade (1983) redescribed Pocock's holotype under *O. doriae odonturus* and suggested that the genus might be monotypic. Finally Kovarik (1997) listed both species and justified their validity on the basis of the different number of lateral lobes on the metasomal segment V.

Because of various imprecisions in the diagnosis both of the genus and of the species, and also doubts about their precise geographical distribution (see Fet & Lowe, 2000), we decided to investigate the large collection of *Odontobuthus* available in the Paris Museum, together with several specimens now deposited in the Geneva

[1] The study was supported by the Department of cultural affairs, City of Geneva, Switzerland.
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Museum. We concluded that the two species in this genus are valid and can be justified by more than the single character given by Kovarik (1997). Furthermore, some specimens from Iraq and from the south of Iran were found to represent a new congeneric species, which is described below. The geographical distribution of *O. doriae* is probably limited to Iran, whereas the presence of *O. odonturus* in Iran still requires confirmation. The records by Vachon (1966), Habibi (1971), and Farzanpay (1988) are most certainly based on misidentifications. Revised diagnoses are given for the genus and for the two known species, followed by a description of the new species. A key is also provided for the three species.

Abbreviations: MHNG. Muséum d'histoire naturelle, Genève. MNHN. Muséum National d'Histoire Naturelle, Paris. NHMW. Naturhistorisches Museum, Wien.

TAXONOMIC TREATMENT

Odontobuthus Vachon, 1950

Type species by original designation: *Buthus doriae* Thorell.

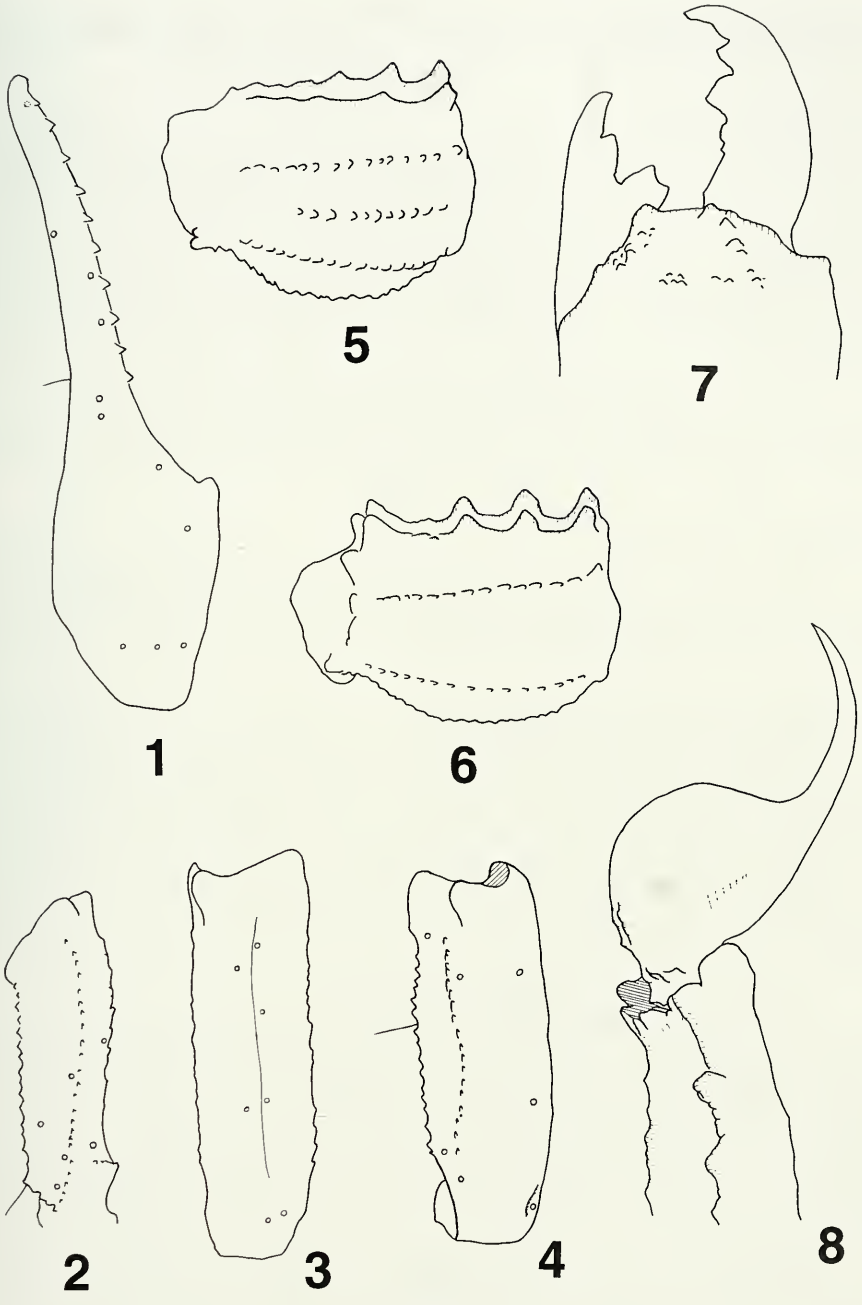
Diagnosis: Scorpions of small to medium size, ranging from 40 to 70 mm in total length. General coloration yellow to pale yellow. Dentate margins of fixed and movable fingers with 10 to 14 oblique rows of granules separated by stronger accessory granules. Carapace carinae strong, showing a lyre-shaped configuration. Tergites tricarinated. Ventral carinae of metasomal segments II-III and ventral transverse carina of segment IV armed with very strong teeth. Ventrolateral carinae of metasomal segment V with several strong lobated granules. Anal arch composed of strong lateral lobes and more reduced ventral lobes. Trichobothriotaxy type A-β.

Odontobuthus doriae (Thorell) Figs 1-8

Diagnosis: Scorpions of medium size, ranging from 65 to 70 mm in total length. General coloration yellow to pale yellow. Dentate margins of fixed and movable fingers with 13-14 oblique rows of granules. Ventral carinae of metasomal segments II-III armed with 3 pairs of very strong conical teeth. Ventrolateral carinae of metasomal segment V with 4-5 strong lobated granules. Anal arch composed of 2 strong lateral lobes and 6 more reduced ventral lobes.

Variation in pectinal teeth counts. Males: 27-35. Females: 18-24.

Material examined: IRAN, Borudjerd,1 male (T. Habibi) MNHN RS 4667; Cazvin, 1 male, 1 female, 1971 (T. Habibi) MHNG; Karady, 1 male, 1 female, 1971 (T. Habibi) MHNG; Kashan, 1 female (T. Habibi) MNHN RS 4669, 2 males, 4 females, MNHN RS 1824, 1 female, MNHN RS 1823, 4 males, 13 females (A. Chabaud) MNHN RS 1828, 2 males, 22 females (A. Chabaud) MNHN RS 1827, 3 males, 2 females (A. Chabaud) MNHN RS 1826, 5 males, 12 females (A. Chabaud) MNHN RS 4645, 6 males, 16 females (A. Chabaud) MNHN RS 4646; Region of Teheran, 4 males, 5 females, 1974 (Farzanpay) MHNG; Rezayeh, 1 female (T. Fatemi) MNHN RS 4341; Teheran, 2 males, 2 females (T. Habibi) MNHG; 1 female (T. Fatemi) MNHN RS 4403; 20 km NW of Kashan toward Quom, 1 female, 1974 (J. Delacour) MNHN RS 7884; 132 km NW of Rafssanjam, 114 km SE of Yazd, 1 female (J. Garzoni, A. de Chambrier); 100 km SE of Esfahan, after Shiraz, 1 male, 1974 (J. Delacour) MNHN RS 7883; 70 km W of Sirjan toward Chiraz, 1 female, 1974 (J. Delacour) MNHN RS 7881; 100 km NW of Sirjan toward Kerman, 1 male, 3 females, 1974 (J. Delacour) RS 7880; 130 km W of Sirjan



FIGS 1-8

Odontobuthus doriae (female). 1-4. Trichobothrial pattern. 1. Chela, external aspect. 2. Femur, dorsal aspect. 3-4. Tibia, external and dorsal aspects. 5-6. Metasomal segments II and III, lateral aspect. 7. Chelicera, dorsal aspect. 8. Metasomal segment V and telson, lateral aspect, showing anal arch.

toward Chiraz, 1 female, 1974 (J. Delacour) RS 7882; 1 male (Loeffler) NHMW; 1 male MNHN RS 1821; 3 males, 3 females MNHN RS 1819; 1 female MNHN RS 1818; 1 male, 1 female (Doria) MNHN RS 1825.

Odontobuthus odonturus (Pocock) Figs 9-12

Diagnosis: Scorpions of small to medium size, ranging from 40 to 50 mm in total length. General coloration yellow; carapace carinae covered with dark pigment. Dentate margins of fixed and movable fingers with 10-11 oblique rows of granules. Ventral carinae of metasomal segments II-III armed with 3 pairs of very strong flattened spinoid teeth. Ventrolateral carinae of metasomal segment V with 3 strong lobated granules. Anal arch composed of 3 moderate lateral lobes and 4 more reduced ventral lobes.

Variation in pectinal teeth counts. Males: 26-29. Females: 16-21.

Material examined: PAKISTAN, Indus Delta, 2 males, 7 females, MHNG; Karachi 1 male, 1 female, MNHN RS 1822; Karachi Rehri village, 7 females, 1965 (J. A. Anderson), MHNG; Korangi-Colony, 1 male MHNG.

Odontobuthus bidentatus sp. n. Figs 13-26

Type material. Holotype (male): IRAQ, 180 km north of Bagdad, Khanagin-Dyala, II/1964 (G. Pringle). Paratypes (1 female): IRAQ, 40 km SW of Mossoul, 10/XI/1981 (B. Moutis). (1 male, 1 female): IRAN, region of Borazdjan, III/1971 (T. Habibi). All specimens deposited in the Natural History Museum, Geneva.

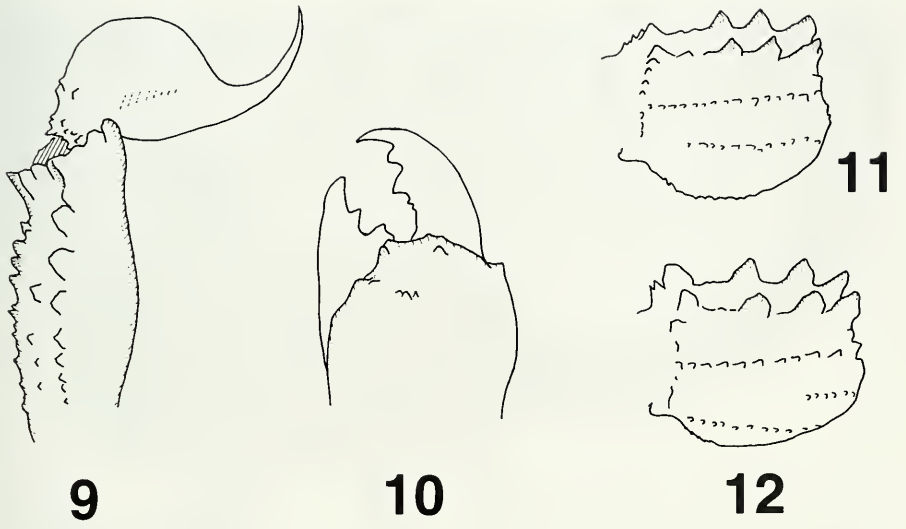
Etymology: The specific name refers to the presence of 2 pairs of teeth on the ventral carinae of metasomal segments II-III.

Diagnosis: Scorpions of medium size, ranging from 60 to 65 mm in total length. General coloration yellow; carapace with a dark triangular spot on the anterior edge. Dentate margins of fixed and movable fingers with 13-14 oblique rows of granules. Ventral carinae of metasomal segments II-III armed with 2 pairs of very strong conical teeth. Ventrolateral carinae of metasomal segment V with 2-3 strong lobated granules. Anal arch composed of 3 strong lateral lobes and 4 reduced ventral lobes.

Description (based on holotype and paratypes):

Coloration. Generally yellow with only a few dark spots or pigmented zones on the body. Prosoma: carapace with a triangular dark spot in the anterior region; zone between anterior median carinae not pigmented; eyes surrounded by black pigment. Mesosoma: tergites I-VII with slightly pigmented confluent zones. Metasoma: all segments including vesicle yellowish; aculeus yellowish at the base and reddish at its extremity. Venter; pectines pale-yellow. Chelicerae yellowish; teeth dark reddish. Pedipalps: some carinae and rows of granules on the dentate margins of the fingers reddish.

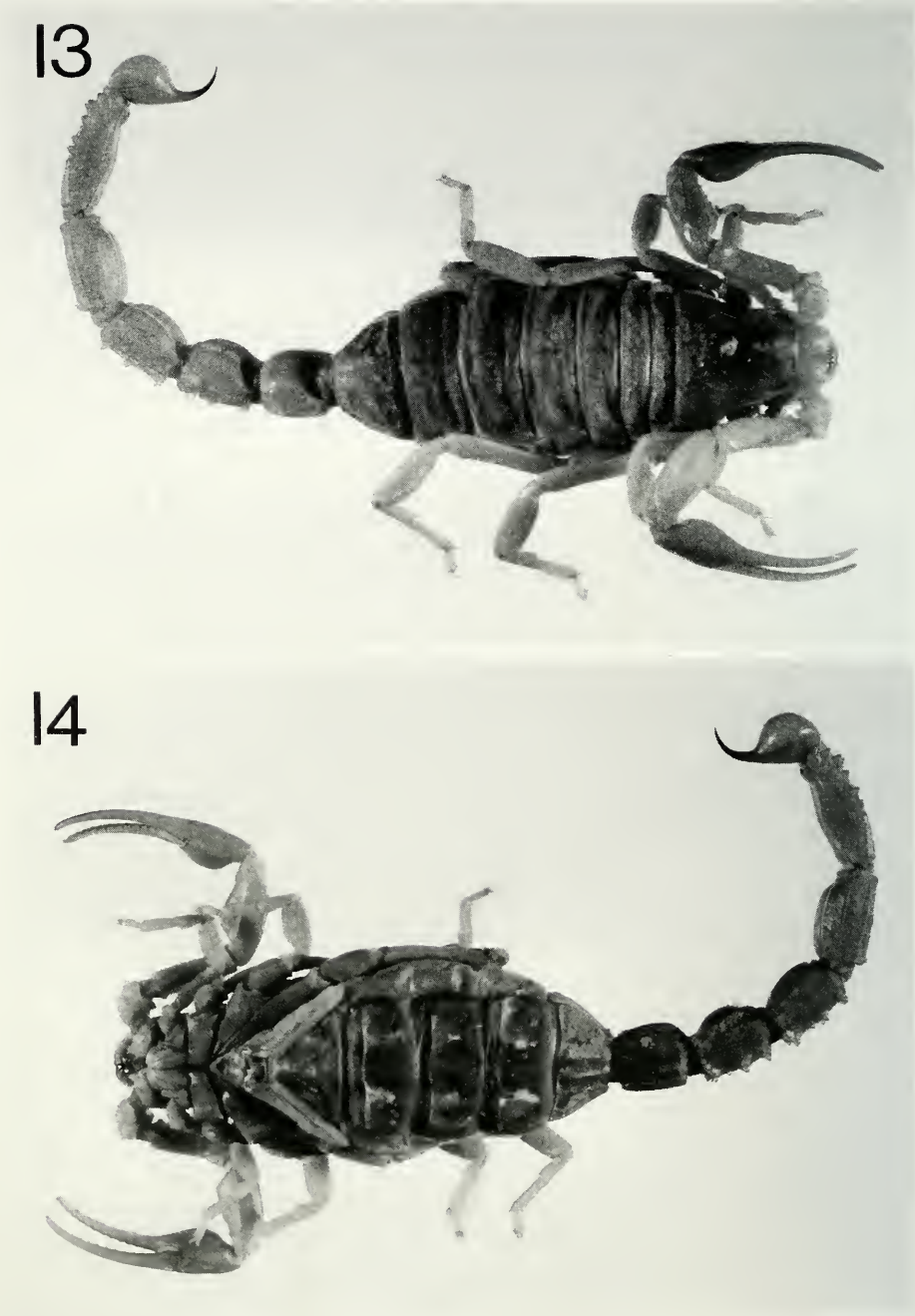
Morphology. Prosoma: Anterior margin of carapace only slightly emarginate. Carapace carinae moderately to strongly developed; anterior median carinae strong; central lateral and posterior median carinae showing lyre configuration; central median carinae moderately developed. All furrows moderately developed to strong. Intercarinal spaces moderately to weakly granular. Median ocular tubercle anterior to



FIGS 9-12

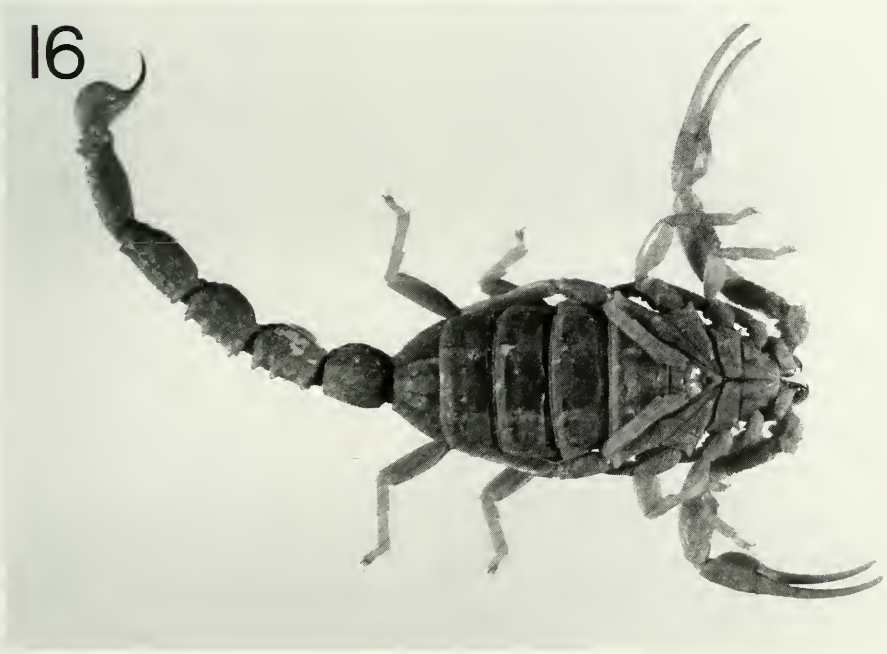
Odontobuthus odonturus (male). 9. Metasomal segment V and telson, lateral aspect, showing anal arch. 10. Chelicera, dorsal aspect. 11-12. Metasomal segments II and III, lateral aspect.

the center of the carapace; median eyes separated by almost one and half ocular diameters. Five pairs of lateral eyes; the first four arranged in one line, the fifth pair situated anteriorly, just next to the second. Mesosoma: Tergites I-VI tricarinate; all carinae strong. Tergite VII pentacarinate, with all carinae strong. Intercarinal spaces moderately granular. Sternites: two carinae present on sternites III-VI, moderately developed to weak; VII with four carinae, strong. Pectines long; pectinal teeth count 32-31 (32-32 in male paratype; 25-26, 27-27 in female paratypes). Metasoma: Segments I-II with 10 carinae; ventral carinae of segment I with a few stronger granules; on segment II, two pairs of very strong conical granules. Segments III-IV with 8 carinae; ventral carinae of segment III with 2 pairs of very strong conical granules. Segment V with 7 carinae; the ventrolateral one armed with 2-3 strong lobated granules. Dorsal furrows of all segments weakly developed, smooth; intercarinal spaces very weakly granular, almost smooth. Telson smooth. Aculeus moderately long; subaculear tubercle absent. Chelicerae with 2 very much reduced basal denticles on the movable finger (see Vachon, 1963). Pedipalps: Trichobothrial pattern orthobothriotaxic, type A (according to Vachon, 1974); dorsal trichobothria of femur in beta configuration (see Vachon, 1975). Femur pentacarinate; all carinae moderately crenulate. Tibia with 7 carinae, moderately crenulate; anterior margin with 4 spinoid granules. Chelae with vestigial carinae only. Dentate margins on fixed and movable fingers composed of 13-14 oblique rows of granules, separated by stronger accessory granules. Legs: Ventral aspect of tarsi with numerous thin long setae. Strong tibial spurs present on legs III-IV. Pedal spurs present, moderately developed to strong on all legs.



FIGS 13-14

Odontobuthus bidentatus sp. n., male paratype, dorsal and ventral aspects (photos by Cl. Ratton, MHNG).



FIGS 15-16

Odontobuthus bidentatus sp. n., female paratype, dorsal and ventral aspects (photos by Cl. Ratton, MHNG).

Morphometric values (in mm): male holotype (in parentheses female paratype). Total length 65.7 (61.2); carapace length 9.0 (8.0), anterior width 5.8 (5.2), posterior width, 10.4 (9.4); metasomal segment I length 5.2 (4.6), width 6.0 (5.2); metasomal segment V length 8.6 (7.1), width 4.2 (3.7), depth 3.6 (3.0); vesicle width 4.0 (3.6), depth 4.1 (3.6); pedipalp: femur length 7.8 (6.2), femur width 2.2 (2.0), tibia length 8.8 (7.2), tibia width 3.2 (2.7), chela length 16.4 (13.2), chela width 4.3 (2.5), chela depth 4.8 (3.2), movable finger length 12.0 (9.6).

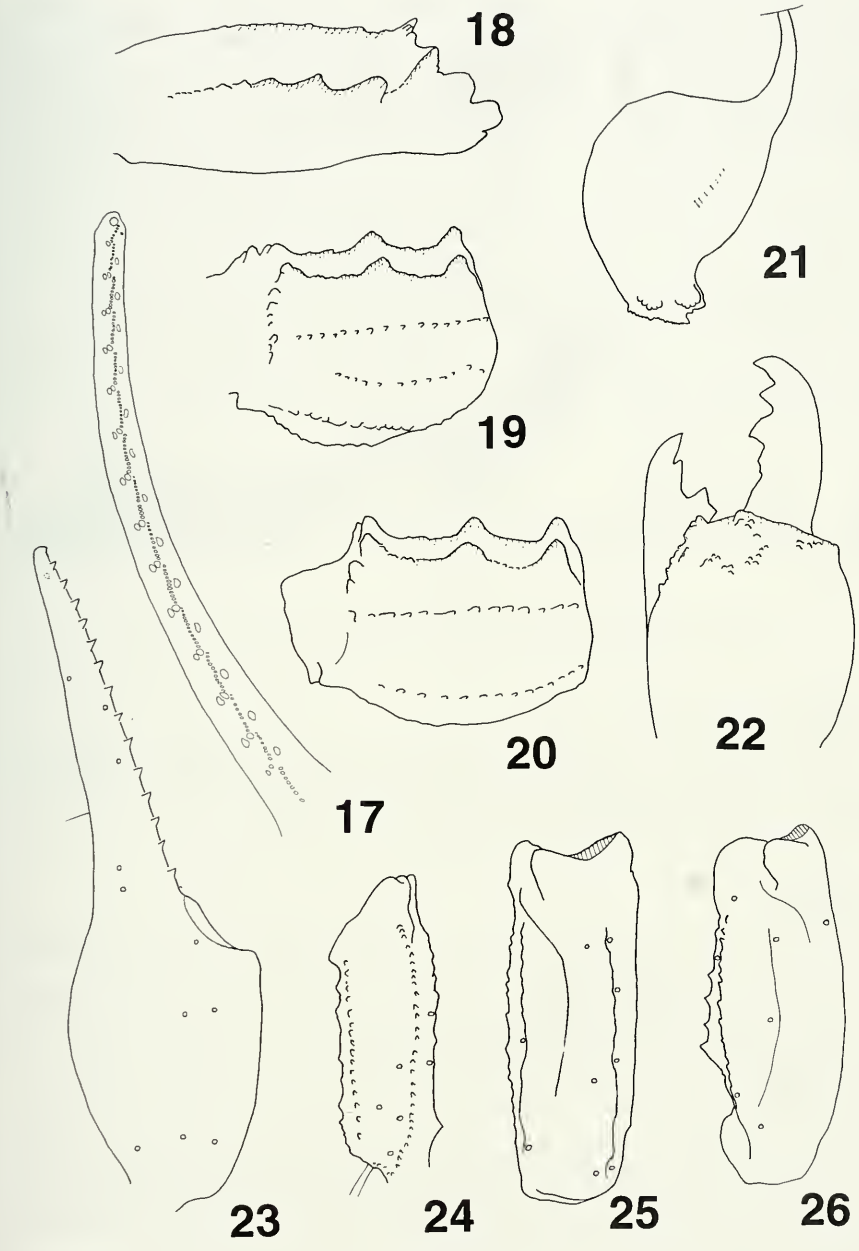
Key to the species of *Odontobuthus*

1 Anal arch with 2 strong lateral lobes and 6 reduced ventral lobes . . . *O. doriae*
(1) Anal arch with 3 strong or moderately developed lateral lobes and 4 reduced ventral lobes 2
2 Dentate margins of fixed and movable fingers with 10-11 rows of granules; ventral carinae of metasomal segments II-III with 3 pairs of spinoid teeth . . . . . *O. odonturus*
(2) Dentate margins of fixed and movable fingers with 13-14 rows of granules; ventral carinae of metasomal segments II-III with 2 pairs of spinoid teeth . . . . . *O. bidentatus* sp. n.

Some comments on the geographical distribution of the species

From our study we have concluded that *Odontobuthus doriae* has most probably only a limited distribution in the central and northwestern regions of Iran (Fig. 27). Its presence in Iraq still requires confirmation. It may be that the records of *O. doriae* from Iraq is due to misidentification of specimens which actually belong to the new species described in here. The distribution of *Odontobuthus odonturus* has only been confirmed for Pakistan and India. Its presence in the southern regions of Iran also requires confirmation. We assume that the records by Habibi (1971) and Farzanpay (1988) also result from misidentification of the new species, which is present in the southwest of Iran. This apparently disrupted distribution pattern of the new species does not stand alone. The localities recorded for *O. bidentatus* sp. n., show a similar pattern of distribution as observed for the buthid *Compsobuthus matthiesseni* Birula by Sissom and Fet (1998). This species is widely distributed within the drainage systems of the Tigris and Euphrates Rivers. Such a pattern of distribution applies to sites where the altitude ranges from 150 to 200 m. In contrast, at the sites where *O. doriae* was collected the altitude is much greater, ranging from 1000 to 3000 m.

The record of *O. odonturus* for Oman (Fet & Lowe, 2000) requires further investigation. We have examined a few poorly preserved specimens, labeled *O. doriae*, from the MNHN collections, which are presumably collected in Oman by M. Maindron. These specimens originate from outside the known distribution of either *O. doriae* or *O. odonturus*. We therefore prefer to postpone a decision until more material from Oman becomes available.



FIGS 17-26

Odontobuthus bidentatus sp. n. (male holotype). 17. Movable finger, cutting edge. 18. Metasomal segment V, lateral aspect, showing anal arch. 19-20. Metasomal segments II and III, lateral aspect. 21. Telson, lateral aspect. 22. Chelicera, dorsal aspect. 23-26. Trichobothrial pattern. 23. Chela, external aspect. 24. Femur, dorsal aspect. 25-26. Tibia, external and dorsal aspects.

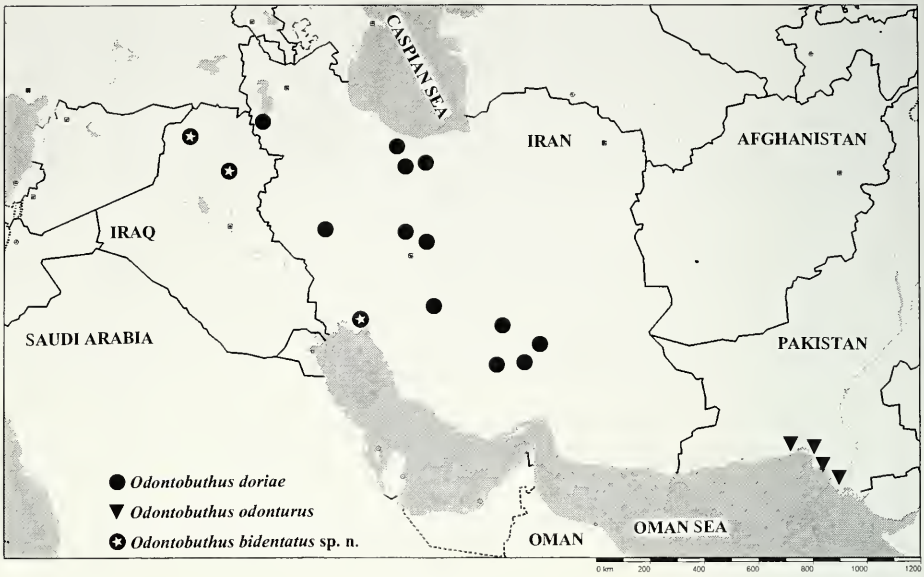


FIG. 27
Map showing the localities of the *Odontobuthus* material examined.

ACKNOWLEDGEMENTS

We are grateful to Didier Geffard (Laboratoire de Zoologie, Arthropodes, MNHN) for technical assistance and to Prof. John L. Cloudsley-Thompson (London) and Peter Schwendinger (MHNG) for reviewing the manuscript.

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Revue suisse de Zoologie 109 (1): 127-141; mars 2002

Nouvelles additions à la faune de scorpions néotropicaux (Arachnida)[1]

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New records of scorpions for the Neotropics (Arachnida). - In this paper are presented the results of the study of an interesting collection of neotropical scorpions now deposited in the Geneva Museum. The collection is composed of 7 families, 14 genera and 34 species. Two new species, *Tityus apiacas* sp. n. and *Tityus vaissadei* sp. n. (Buthidae) are described.

Key-words: Scorpion - Neotropics - new species - *Tityus*.

INTRODUCTION

Dans une publication récente (Lourenço, 1997a), j'ai pu apporter une première contribution concernant des scorpions de la région néotropicale déposés au Muséum d'histoire naturelle de Genève.

La faune des Scorpions de la région néotropicale peut être considérée comme une des plus étudiées au monde, avec de nombreuses contributions depuis le début du 19ème siècle, jusqu'à la synthèse globale de Mello-Leitão (1945).

Dans une perspective plus moderne, plusieurs travaux d'ensemble concernant la systématique et la biogéographie ont été réalisés depuis une vingtaine d'années. Parmi les plus importants peuvent être cités, Maury (1979), Lourenço (1982a,b, 1983, 1988; 1991, 1994a, 1995, 1997a,b), Francke & Stockwell (1987). Cependant, compte-tenu de la très grande diversité de la faune scorpionique de la région néotropicale (Lourenço, 1994b), la découverte de nouvelles espèces, mais aussi la confirmation de nouvelles stations pour des espèces déjà connues est chose courante.

Le présent travail est le résultat de l'étude d'une collection hétérogène de Scorpions néotropicaux déposés désormais au Muséum d'histoire naturelle de Genève. En plus de la description de deux espèces nouvelles, quelques considérations sont faites sur des espèces rares. Pour le restant des espèces, seule une liste est proposée.

La présentation du matériel étudié est faite dans l'ordre alphabétique des familles. Les pays concernés sont: Grandes Antilles: Hispaniola, Haiti, République Dominicaine; Petites Antilles: Martinique, Montserrat, Sainte Lucie, Saint Martin;

[1] Etude subventionnée par le Département municipal des affaires culturelles de la Ville de Genève.

Manuscrit accepté le 21.06.2001

Amérique du Sud: Argentine, Bolivie, Brésil, Colombie, Equateur, Guyane française, Mexique, Pérou, Trinidad, Vénézuela.

A l'exception de quelques spécimens de *Tityus apiacas,* le matériel cité dans le présent travail est déposé au Muséum d'histoire naturelle de Genève (MHNG).

BOTHRIURIDAE Simon, 1880

Bothriurus Peters, 1861

Bothriurus patagonicus Maury, 1968

Matériel: Argentine, Prov. Mendoza, Los Lenas (litière), 2/III/1985 (N. Fernandez), 1 femelle. Répartition: sud de l'Argentine.

Urophonius Pocock, 1893

Urophonius iheringii Pocock, 1893

Matériel: Brésil, Porto Alegre, 22/IX/1986 (E.K. Bastos), 1 mâle. Répartition: sud du Brésil et Uruguay.

BUTHIDAE C.L. Koch, 1837

Ananteris Thorell, 1891

Ananteris balzani Thorell, 1891

Matériel: Brésil, District Fédéral, Brasilia, 10/III/1976 (leg. W. Lourenço), 1 femelle ; Taguatinga, 2/IX/1976 (W. Lourenço), 1 mâle, 1 femelle. Répartition: nord de l'Argentine, Paraguay, centre et nord du Brésil; régions savanicoles.

Ananteris cussinii Borelli, 1910

Matériel: Vénézuela, Estado Aragua, Caguá, Ansia Miranda, II/1975 (M. Gonzalez-Sponga), 1 mâle, 1 femelle (topotypes). Répartition: nord du Vénézuela.

Ananteris venezuelensis Gonzalez-Sponga, 1972

Matériel: Vénézuela, Estado Bolivar, entre El Dorado y Santa Elena de Uairén, 12/I/1978 (M. Gonzalez-Sponga), 1 mâle, 1 femelle (topotypes). Répartition: centre du Vénézuela.

Caribetityus Lourenço, 1999

Caribetityus elii (Armas & Marcano Fondeur, 1992)

Matériel: République Dominicaine, Prov. La Vega, Loma de Casabito (1410-1440 m), tropical moist forest, 12/V/1998 (D. Huber), 9 mâles, 7 femelles, 16 immatures. Obs: Immatures nés en laboratoire. Répartition: île d'Hispaniola.

Isometrus Ehrenberg, 1828

Isometrus maculatus (DeGeer, 1778)

Matériel: Antilles, Île de San Martin, Pic du Paradis humide (350 m), 28/VII/1996 (M. Breuil), 1 mâle. Obs: Nouvelle station pour l'espèce. Répartition: cosmopolite sur des régions tropicales et sub-tropicales.

Microtityus Kjellesvig-Waering, 1966

Microtityus consuelo Armas & Marcano Fondeur, 1987

Matériel: République Dominicaine, Prov. Borahona, 1,2 km d'Ojeda (rocky trail, bush), 7/V/1998 (D. Huber), 3 mâles, 6 femelles. Répartition : île d'Hispaniola.

Rhopalurus Thorell, 1876

Rhopalurus abudi Armas & Marcano Fondeur, 1987

Matériel: République Dominicaine, Prov. Pedernales, 3,9 km N de Manuel Goja (sand bush), 8/V/1998 (D. Huber), 1 mâle, & femelle; Solar en ciudad Santo Domingo, 18/VII/1988 (J.A. Ottenwalder), 1 femelle. Répartition: île d'Hispaniola.

Rhopalurus princeps (Karsch, 1879)

Matériel: Haiti, Côte ouest, 22/IV/1984 (D. Rigolage), 2 mâles, 1 femelle, 1 juvénile. Répartition: île d'Hispaniola.

Tityus C.L. Koch, 1836

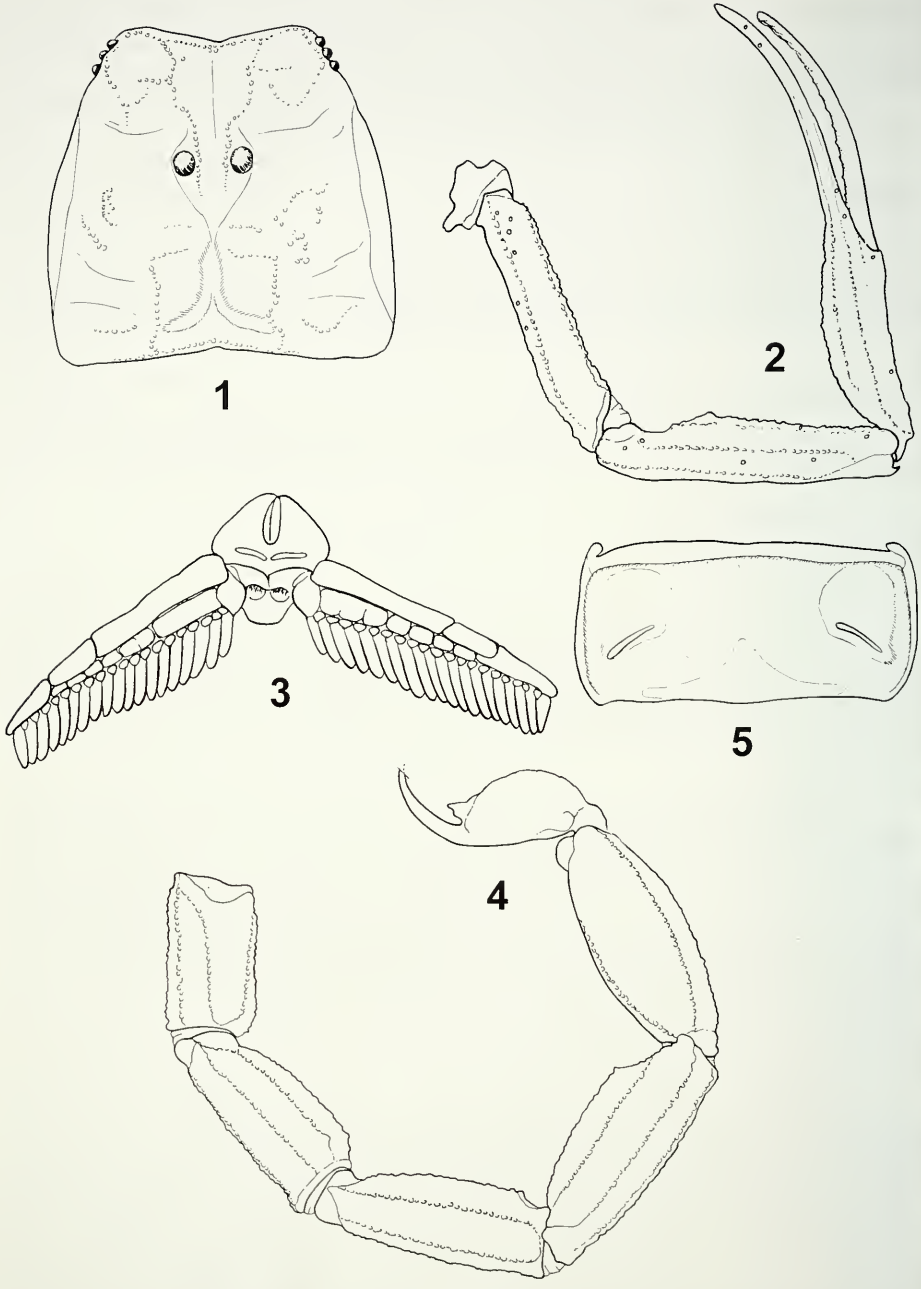
Tityus apiacas sp. n. Figs 1-10

Holotype mâle: Brésil, Etat du Mato Grosso, Apiácas (9° 34' S - 57° 23' W), 10-15/II/1997 (G. Skuk & V. Xavier). Deposé au Musée de Zoologie, Université de São Paulo (MZUSP). Paratypes: Même localité que pour l'holotype, 2 mâles, 2 femelles (MZUSP). Brésil, Etat de Mato Grosso, Aripuanã, Chapada Dardanelos (10° 10' S - 59° 27' W), 2-13/XI/1996 (G. Skuk), 2 mâles, 1 femelle (MHNG).

Etymologie. Le nom de la localité typique (Apiácas) est placé en apposition au nom générique.

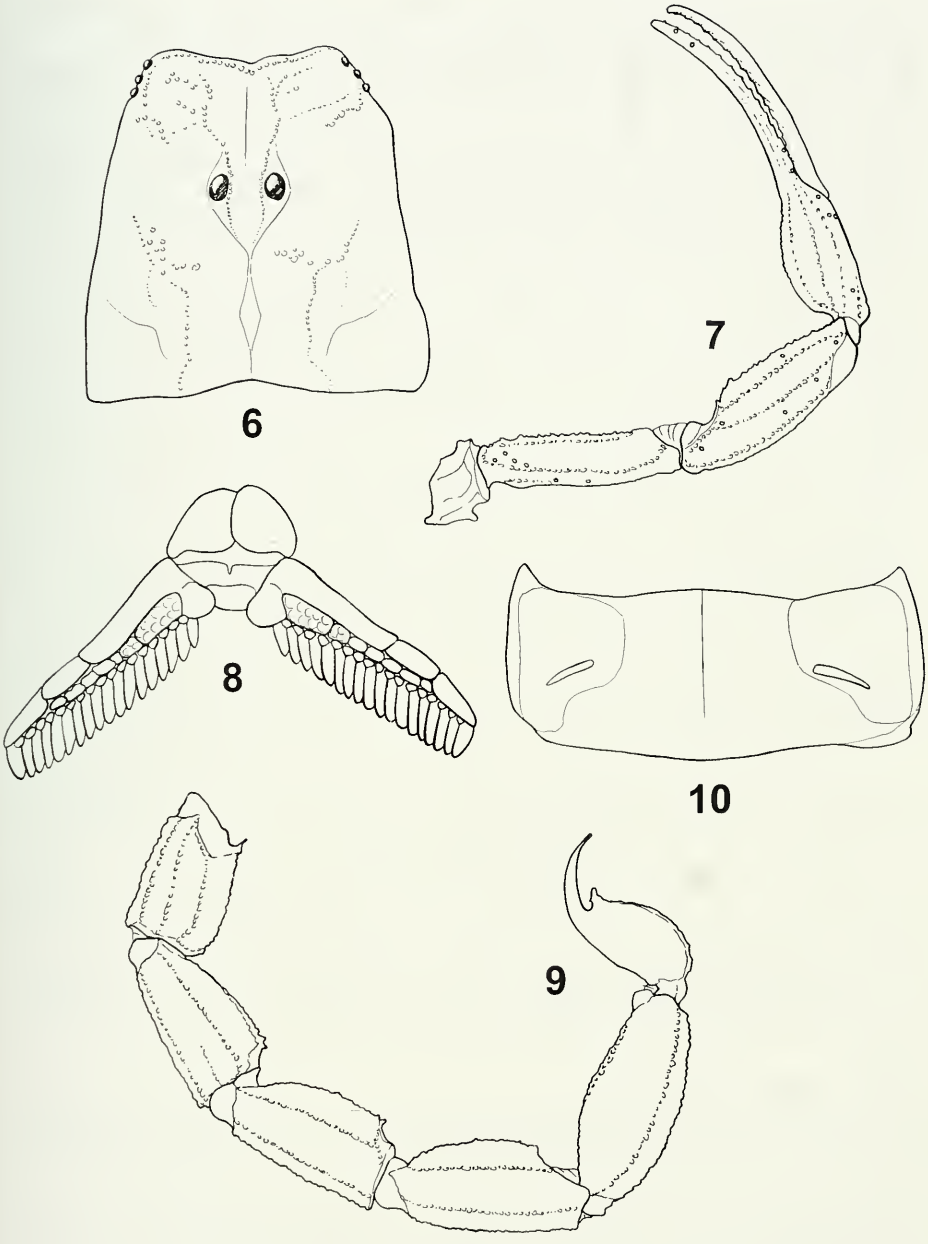
Diagnose. Espèce de grande taille (cf. Tableau I), de couleur sombre appartenant au groupe de "*Tityus asthenes*". La nouvelle espèce est voisine de *Tityus cambridgei* Pocock et de *Tityus dinizi* Lourenço, mais peut être distinguée de ces dernières espèces par: (i) absence des carènes ventrales au quatrième anneau du metasoma chez les mâles, (ii) présence de plusieurs papilles arrondies sur la lamelle médiane proximale des peignes chez les femelles. *Tityus apiacas* sp. n., peut être également distinguée de *T. dinizi* par l'absence de dilatation de la lame basilaire intermédiaire des peignes chez les mâles. Finalement la répartition géographique des trois espèces est nettement distincte (Fig. 19).

Description fondée sur l'holotype mâle. Coloration générale brun noirâtre. Prosoma: Plaque prosomienne brun noirâtre; tubercule oculaire et yeux latéraux noirâtres, plus foncés que la carapace. Mesosoma: Tergites I à VII de même coloration que celle de la plaque prosomienne, avec quelques zones jaunâtres estompées. Sternites brunâtres avec quelques zones jaunâtres estompées; le Vème avec un triangle jaunâtre. Metasoma: Anneaux caudaux I à V brun noirâtre avec des zones jaunâtres diffuses; le Vème plus foncé. Telson plus clair que l'anneau V; aiguillon à base jaune-rougeâtre et à extrémité rougeâtre. Peignes jaune-clair; opercule génital, sternum, hanches et processus maxillaires d'un brun clair avec quelques zones jaunâtres. Pédipalpes brun noirâtre; doigts de la main noirâtres. Pattes brun noirâtre



FIGS 1-5

Tityus apiacas sp. n. (Holotype mâle). 1. Carapace, 2. Pédipalpe, vue dorsale avec trichobothries. 3. Peignes et opercule génital. 4. Metasoma et telson, vue latérale. 5. Sternite V.



FIGS 6-10

Tityus apiacas sp. n. (Paratype femelle). 6. Carapace. 7. Pédipalpe, vue dorsale avec trichobothries. 8. Peignes et opercule génital. 9. Metasoma et telson, vue latérale. 10. Sternite V.

avec des taches jaunâtres diffuses. Chélicères jaunâtre foncé avec une trame de taches noires sur son ensemble; base des doigts très foncée.

Morphologie. Prosoma: Front de la plaque prosomienne avec une échancrure frontale moyennement marquée. Tubercule oculaire antérieur par rapport au centre de la plaque prosomienne; yeux médians séparés par un diamètre oculaire; trois paires d'yeux latéraux. Plaque prosomienne moyennement granulée; carènes médianes oculaires allant du bord antérieur jusqu'en arrière du tubercule oculaire, bien marquées; carènes médianes postérieures bien marquées; sillon médian postérieur profond; d'autres sillons moyennement profonds. Mesosoma: Tergites I-VII moyennement granulés; carène axiale présente sur tous les tergites, et plus marquée dans les derniers; dans le VIème couvrant la moitié du tergite; tergite VII avec cinq carènes, l'axiale limitée au tiers antérieur; les deux médianes et les deux latérales fusionnées dans la région proximale. Sternum triangulaire; peignes avec 20-19 dents; lame basilaire intermédiaire non dilatée. Sternites faiblement granulés; stigmates linéaires. Metasoma: Anneau I avec 10 carènes; anneaux II et III avec 8 carènes; anneau IV avec 6 carènes, les ventrales absentes; anneau V avec 5 carènes; espaces intercarénaux faiblement granulés dans tous les anneaux; anneau V avec la face dorsale lisse; vésicule avec quelques granules très réduits; aiguillon long; épine sous-aiguillonaire développée et aiguë avec deux granules ventraux. Pédipalpes: Fémur à 5 carènes, tibia à 7 carènes, la carène interne-dorsale à granules spiniformes. Pince allongée avec 8 carènes. Tranchant des doigts mobiles avec 16-16 séries obliques de granules. Chélicères avec la dentition caractéristique des Buthidae (Vachon, 1963); les dents ventrales du doigt mobile réduites. Trichobothriotaxie du type A-α, orthobothriotaxique (Vachon, 1974, 1975). Pattes: tarses armés de nombreuses soies ventrales.

Femelle paratype. Coloration générale plus claire que chez le mâle; pattes et pédipalpes brun-rougeâtre; triangle jaunâtre sur le sternite V petit et estompé. Corps plus trapu que chez le mâle; anneaux du metasoma plus courts avec 10-8-8-8-5 carènes. Peignes avec la lame intermédiaire basilaire fortement dilatée; lamelle médiane proximale avec des nombreuses papilles arrondies. Pédipalpes plus courts et plus robustes que chez le mâle; tranchant des doigts mobiles avec 16-16 séries obliques de granules.

Variation du nombre de dents des peignes. Mâles : 18-19, 19-19, 19-20(x2). Femelles : 19-19(x3).

Tityus asthenes Pocock, 1893

Matériel: Equateur, Napo, Sacha, 10/VI/1994 (W. Lourenço), 1 mâle. Répartition: Equateur et côte pacifiques de Colombie et Panama.

Tityus bahiensis (Perty, 1834)

Matériel: Brésil, Minas Gerais, Uberlandia, 30/VI/1986 (W. Lourenço), 2 mâles. Répartiton: centre et sud-est du Brésil.

Tityus bastosi Lourenço, 1984

Matériel: Equateur, Napo, Sacha, 11/VI/1994 (W. Lourenço), 1 femelle + exuvia. Répartition: Amazonie occidentale, Brésil, Equateur, Pérou, Colombie.

Tityus cambridgei Pocock, 1897

Matériel: Brésil, Pará, Belém, 15/III/1970 (A. Correa), 6 mâles; Belém/Abaetetuba (in Palmae – *Raphia taedigera*), 27/V/1996 (G. Couturier), 1 mâle. Répartition: Amazonie orientale, Brésil et Guyane française.

Tityus columbianus (Thorell, 1876)

Matériel: Colombie, Iza, 11/III/1993 (W Lourenço), 1 femelle, 8 juvéniles (forme sexuée); Mosquera, 26/II/1988 (W. Lourenço), 5 femelles; 8/III/1993 (W. Lourenço), 3 femelles, 30 juvéniles (forme parthenogénétique), + exuvia. Répartition: cordillère orientale de Colombie.

Tityus fasciolatus Pessôa, 1935

Matériel: Brésil, D.F., Braslândia, 7/VI/1976 (W. Lourenço), 9 mâles, 21 femelles, 7 immatures. Répartition: région centrale du Brésil.

Tityus forcipula (Gervais, 1843)

Matériel: Colombie, Penas Blancas (rainforest, 2100 m), 15/II/1988 (W. Lourenço), 1 femelle. Répartition: côte pacifique de Colombie et Equateur.

Tityus fuehrmanni Kraepelin, 1914 Fig. 11

Matériel: Colombie, Angelopolis, II/1998 (W. Lourenço), 1 mâle, 1 femelle, 3 juvéniles (topotypes). Répartition: cordillère centrale de Colombie.

Tityus insignis (Pocock, 1889)

Matériel: Antilles, Sainte Lucie, 2/IX/1997 (W. Lourenço), 1 mâle + Exuvie (topotype). Répartition: endémique de Sainte Lucie.

Tityus melanostictus Pocock, 1893

Matériel: Trinidad, Majuba Road, Petit Valley, Diego Martin, 1/VII/1970 (F.H. Aitken), 1 femelle. Répartition: Trinidad, nord du Vénézuela.

Tityus metuendus Pocock, 1897

Matériel: Brésil, Amazonas, Manaus, Reserva Ducke, V/1972 (A. Correa), 1 femelle; Acre, Cruzeiro do Sul (primary rainforest), 7/IV/1981 (W. Lourenço), 1 femelle; Pérou, Iquitos, Loreto, Jenaro Herrera, V/1996 (G. Couturier), 1 femelle (parthenogénétique), 20 juvéniles (mâles). Répartition: Amazonie centrale et occidentale, Brésil et Pérou.

Tityus pictus Pocock, 1893

Matériel: Antilles, St. Vincent (W.I.), Union, I/1995 (J. Dandin), 1 femelle. Répartition: sud des Petites Antilles.

Tityus serrulatus Lutz & Mello, 1922

Matériel: Brésil, Minas Gerais, Belo Horizonte, 25/X/1987 (W. Lourenço), 1 femelle. Répartition: régions centre et sud-est du Brésil.

Tityus silvestris Pocock, 1897

Matériel: Brésil, Pará, Belém, 15/III/1970 (A. Correa), 1 mâle, 3 femelles. Répartition: bassin amazonien, Brésil, Pérou, Equateur.

FIG. 11
Tityus fuehrmanni, Femelle d'Angelopolis, Colombie, localité typique.

Tityus vaissadei sp. n. Figs 12-18

Tityus nematochirus: Lourenço, 1997b : 75

Holotype mâle; 8 mâles et 15 femelles paratypes (MHNG). Colombie, Dept. Boyaca, Otanche, 100 km à W. de Tunja, région de Muzo, VI/1986 (Indiens de la Mine de Muzo).

Etymologie. Le nom spécifique est attribué en hommage à M. Alain Vaissade, Maire de la Ville de Genève.

Diagnose. Espèce de grande taille (cf. Tableau I), de couleur sombre appartenant au groupe de "*Tityus asthenes*". La nouvelle espèce peut être distinguée de *Tityus nematochirus*, par la forme des doigts de la pince des pédipalpes bien plus encourbés vers l'antérieur, par la présence de granules spiniformes plus fortement marqués sur les carènes dorsales des anneaux II-III du metasoma et par quelques différences dans la dentition des chélicères.

La nouvelle espèce peut également être distinguée de *Tityus oteroi* Lourenço et de *Tityus antioquensis* Lourenço & Otero Patiño par les caractères suivants :

TABLEAU I. Mensurations (en mm) des espèces décrites (M = mâle, F = femelle)

	Tityus apiacas		*Tityus vaissadei*	
	M	F	M	F
Longueur totale	97,0	76,0	81,0	73,0
Prosoma				
- Longueur	8,8	8,2	8,8	7,9
- Largeur antérieure	6,8	6,0	7,1	5,9
- Largeur postérieure	10,1	9,6	10,2	9,5
Anneau caudal I				
- Longueur	7,2	6,2	6,8	5,2
- Largeur	4,4	4,2	4,4	4,6
Anneau caudal V				
- Longueur	11,7	9,2	11,3	8,9
- Largeur	5,1	4,2	4,7	4,0
- Hauteur	4,9	4,1	4,4	4,0
Vésicule				
- Largeur	3,8	3,0	3,7	3,2
- Hauteur	3,5	2,9	3,6	3,0
Pédipalpe				
- Fémur longueur	13,6	9,3	18,3	9,8
- Fémur largeur	2,8	2,4	2,2	2,4
- Tibia longueur	13,8	9,7	18,5	10,4
- Tibia largeur	3,0	3,4	2,4	3,3
- Pince longueur	21,8	16,6	29,5	17,1
- Pince largeur	2,8	2,8	2,0	2,9
- Pince hauteur	2,5	2,7	2,0	2,8
Doigt mobile				
- Longueur	13,9	11,0	18,0	11,6

De *T. oteroi* par des pédipalpes bien plus longs et affilés; en outre, les carènes dorsales des anneaux I-IV du metasoma chez *T. oteroi* présentent des épines postérieures très développées.

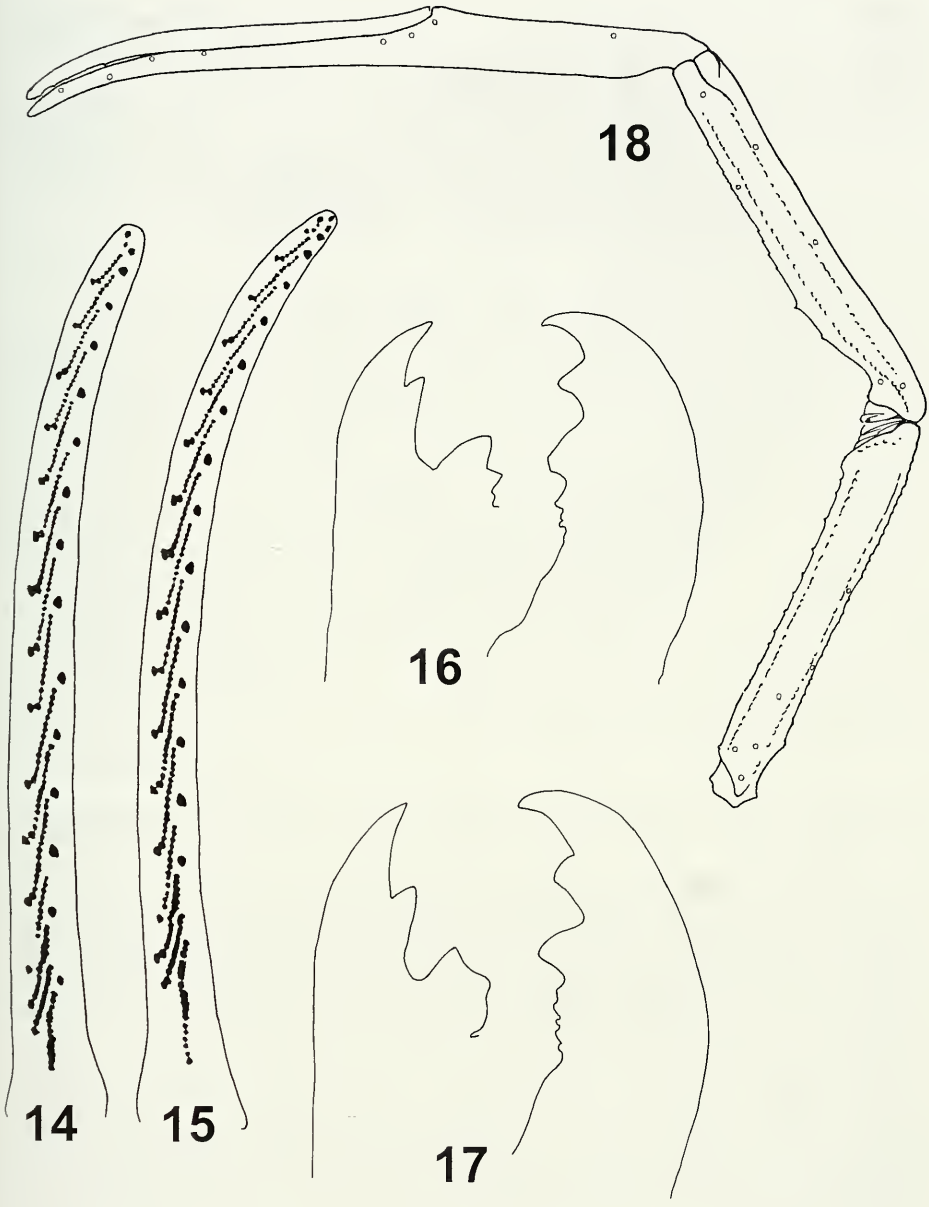
De *T. antioquensis* par la coloration, noirâtre chez la nouvelle espèce est rougeâtre chez *T. antioquensis*; en outre, la lame basilaire intermédiaire chez *T. antioquensis* n'est pratiquement pas dilatée, les carènes dorsales du metasoma ne présentent pas des granules spiniformes et les nombres de dents aux peignes sont plus faibles allant de 14 à 16.

Description fondée sur l'holotype mâle. Coloration générale brun-noirâtre. Prosoma: Plaque prosomienne brun-noirâtre sans taches; tubercule oculaire et yeux latéraux noirâtres. Mesosoma: Tergites I à VII avec la même coloration que celle de la plaque prosomienne, mais légèrement plus foncés. Sternites brun-rougeâtre avec une grande tache plus claire dans la région postérieure du Vème. Metasoma: Anneaux caudaux I à V brun-noirâtre. Telson brun-rougeâtre; aiguillon à base jaune foncé et à extrémité rougeâtre. Peignes jaune-clair; opercule génital, sternum, hanches et processus maxillaires d'un brunâtre tacheté. Pattes et pédipalpes brun-rougeâtre; tarses

12

13

FIGS 12-13
Tityus vaissadei sp. n. Holotype-mâle (12) et paratype femelle (13), vue dorsale.



FIGS 14-18

FIGS 14-15. Tranchant des doigts mobiles des pédipalpes avec la courbure caractéristique vers l'antérieur. 14. *Tityus nematochirus* (holotype-mâle). 15. *Tityus vaissadei* (holotype-mâle). FIGS 16-17. Doigts fixe et mobile des chélicères. 16. *Tityus nematochirus* (holotype-mâle). 17. *Tityus vaissadei* (holotype-mâle). 18. Pédipalpe de *Tityus vaissadei* (holotype-mâle), vue dorsale avec trichobothries.

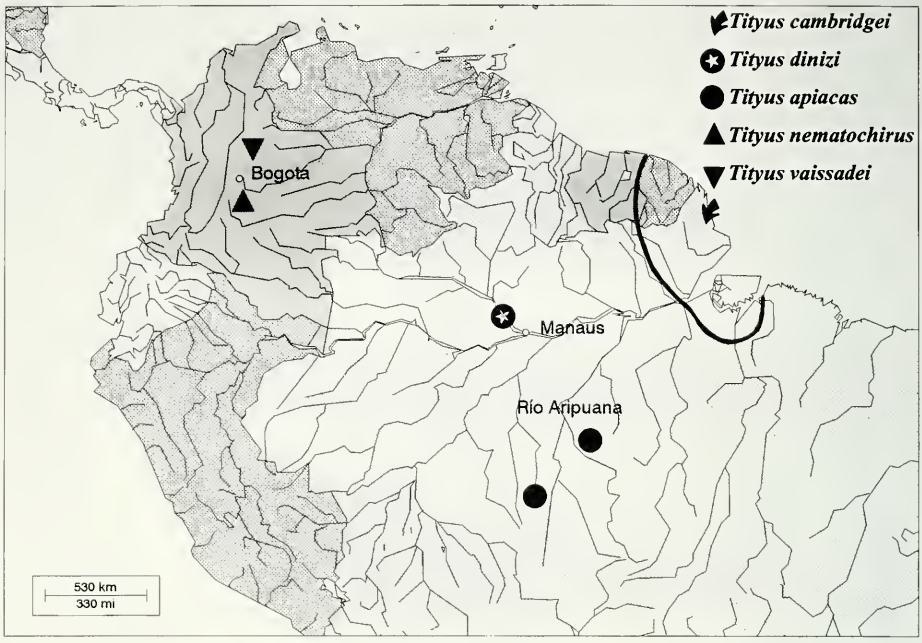


FIG. 19

Carte avec les localités typiques de *Tityus apiacas* sp. n. et *Tityus vaissadei* sp. n. et espèces associées.

des pattes jaunâtres. Chélicères brun-rougeâtre foncé avec une trame de taches noires sur son ensemble.

Morphologie. Prosoma: Front de la plaque prosomienne avec une échancrure frontale moyennement marquée. Tubercule oculaire antérieur par rapport au centre de la plaque prosomienne; yeux médians séparés par un peu plus d'un diamètre oculaire; trois paires d'yeux latéraux. Plaque prosomienne faiblement granulée; carènes médianes oculaires allant du bord antérieur jusqu'au début du tubercule oculaire; carènes médianes postérieures faiblement marquées; sillon interoculaire bien marqué. Mesosoma: Tergites moyennement granulés; carène axiale présente sur tous les tergites; tergite VII avec cinq carènes, l'axiale limitée au tiers antérieur; les deux médianes et les deux latérales fusionnées dans la région proximale. Sternites faiblement granulés, presque lisses; stigmates longs et linéaires. Peignes avec 21-21 dents; lame basilaire intermédiaire avec une faible dilatation, arrondie. Metasoma: Anneaux I avec 10 carènes; anneaux II à IV avec 8 carènes; anneau V avec 5 carènes; espaces intercarénaux faiblement granulés; vésicule peu granulée; épine sous-aiguillonaire courte et spinoide avec deux granules dorsaux. Pédipalpes: Fémur à 5 carènes, tibia à 7 carènes, la carène interne-dorsale sans granules spiniformes. Pince avec 9 carènes très estompées. Tranchant des doigts mobiles avec 16-16 séries de granules. Chélicères avec la dentition caractéristique des Buthidae; le doigt mobile avec 2x2 petites dents

en position basale (Vachon, 1963). Trichobothriotaxie du type A-α, orthobothriotaxique (Vachon, 1974, 1975).

Femelle. Coloration plus claire que chez le mâle, brun-rougeâtre; pattes et pédipalpes rougeâtre. Corps plus trapu; pédipalpes beaucoup plus courts que chez le mâle. Granulation et carènes plus marquées. Lame basilaire intermédiaire dilatée et ronde.

Variation dans le nombre de dents des peignes. Mâles: 19-19, 19-20(x3), 20-19, 20-20(x2), 21-21. Femelles: 17-17, 18-18(x2), 19-18, 19-19(x5), 20-18, 20-19, 20-20(x4).

Remarque. Dans une note précédente sur les scorpions de Colombie (Lourenço, 1997b), le présent matériel a été identifié comme étant *Tityus nematochirus* Mello-Leitão, 1940, espèce décrite de Villavicencio. A ce moment les types étaient considérés comme perdus. Récemment, j'ai pu localiser au Musée National de Rio de Janeiro, Brésil, un exemplaire mâle, appartenant à la série typique. Malgré le très mauvais état de conservation de cet exemplaire (conservé à sec puis mis en alcool), j'ai pu constater que le matériel collecté à Muzo appartenait à une espèce distincte. Déjà dans deux cas précédents, deux autres espèces assez proches de *T. nematochirus* ont été décrites (Lourenço, 1998; Lourenço & Otero Patiño, 1998).

Tityus zulianus Gonzalez-Sponga, 1981

Matériel: Vénézuela, Estado Zulia, Cupure, 7/III/2000 (A. Borges), 1 mâle. Répartition: région nord-ouest du Vénézuela.

CHACTIDAE Pocock, 1893

Broteochactas Pocock, 1893

Broteochactas brejo Lourenço, 1988

Matériel: Brésil, Ceará, Maranguape (Mts.), II/1948 (Stanford expedition), 1 femelle (holotype). Remarque: Depuis sa description, ce spécimen est resté dans les mains de l'auteur, sans affectation d'un musée précis, en raison des doutes sur son appartenance. Arrivant à la conclusion que cet exemplaire est libre, je le dépose désormais dans la collection du Muséum d'histoire naturelle de Genève. Répartition: seule connue de la localité typique.

Chactopsis Kraepelin, 1912

Chactopsis anduzei Gonzalez-Sponga, 1982

Matériel: Vénézuela, Terr. Federal Amazonas, Cano Pava, X/1982 (P. Anduze), 1 femelle (topotype). Répartition: sud du Vénézuela.

Taurepania Gonzalez-Sponga, 1978

Taurepania vestigialis Gonzalez-Sponga, 1978

Matériel: Vénézuela, Estado Bolivar, Riberas del curso médio del Rio Yuruani, 12/VI/1975 (A. Lancini), 2 femelles (topotypes). Répartition: sud du Vénézuela.

DIPLOCENTRIDAE Peters, 1861

Oieclus Simon, 1880

Oieclus purvesii (Becker, 1880)

Matériel: Petites Antilles, Montserrat, Parishof St. Peterw woodlands, 16°45'605-62°12'956, secondary forest under stone, 27/II/2001 (M. Stevens), 1 immature. Répartition: Petites Antilles.

EUSCORPIIDAE Laurie, 1896

Euscorpius Thorell, 1876

Euscorpius flavicaudis (DeGeer, 1778)

Matériel: Uruguay, Port de Montevideo, X/1997 (C.A. Toscano-Gadea), 1 mâle, 1 femelle. Obs: Cette espèce typiquement européenne a pu s'introduire et s'acclimater dans la zone portuaire de Montevideo (voir Toscano-Gadea, 1998). Répartition: Afrique du Nord, Europe du Sud.

IURIDAE Thorell, 1876

Hadruroides Pocock, 1893

Hadruroides maculatus (Thorell, 1876)

Matériel: Pérou, Gran Tumbez, IV/1951 (R. Bauer), 2 mâles, 1 femelle, 1 juvénile. Répartition: Equateur, Peru.

VAEJOVIDAE Thorell, 1876

Syntropis Kraepelin, 1900

Syntropis macrura Kraepelin, 1900

Matériel: Mexique, Baja California Sur, N. Los Aripes, 25/VI/1985 (W. Lourenço & G. Polis), 2 mâles, 2 femelles (topotypes). Répartition: Mexique, Baja California.

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A revision of *Oreophoetes* Rehn, 1904, and description of a new genus (Insecta: Phasmatodea: Anareolatae: Diapheromeridae: Diapheromerinae: Oreophoetini)

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A revision of *Oreophoetes* Rehn, 1904, and description of a new genus (Insecta: Phasmatodea: Anareolatae: Diapheromeridae: Diapheromerinae: Oreophoetini). - The genus *Oreophoetes* Rehn, 1904, is revised. Diagnoses are given for all species included and synonyms are listed. *Bacteria nigripes* Scudder, 1875, is reduced to a subspecies of *O. peruana* (Saussure, 1868). A lectotype is designated for *Bacteria peruana* Saussure, 1868. The egg of *Oreophoetes mima* (Giglio-Tos, 1898) is described for the first time. A new genus and species of this tribe from Northern Peru, *Oreophoetophasma hennemanni* gen. n., sp. n., is described.

Key-words: Phasmatodea - *Oreophoetes* Rehn, 1904 - *Oreophoetophasma hennemanni* gen. n., sp. n. - synonymy - eggs.

INTRODUCTION

Because of several distinguishing characters the genus *Oreophoetes* Rehn, 1904, formerly treated as member of the Heteronemiini auct. (see Zompro, 2001c), had to be transferred to Diapheromeridae: Diapheromerinae: Oreophoetini by Zompro (2001a: 53). This tribe includes some of the most colourful phasmids which are distributed in the Andes of NW South America. The species are specialized fern-eaters.

The Oreophoetini are closer related to the Ocnophilini than to the Diapheromerini. As in Ocnophilini, their abdomen is strikingly short, the third antennomere is strongly elongated and the meso- and metafemora are rectangular and not trapezoidal in cross-section. The Diapheromerini have a comparably longer abdomen, much shorter third antennal segment, and meso- and metafemora which are trapezoidal in cross-section.

MATERIAL AND METHODS

Material was examined in several public and private collections. Livestock was obtained from The Phasmid Study Group, England, and reared in cages described by Zompro (1996). Preservations were executed as described by Zompro (1996).

Manuscript accepted 26.09.2001

Measurements were taken using an ocular micrometer of Russian make, drawings were made using a Zeiss-Citoval 2 binocular with trawing tube.

Material was examined from the following collections: Academy of Natural Sciences, Philadelphia, USA [ANSP]; Deutsches Entomologisches Institut, Eberswalde, Germany [DEIC]; Museum d'histoire naturelle, Geneva, Switzerland [MHNG]; Universita di Torino, Torino, Italy [MIZT]; Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Lima, Peru [MUSM]; Naturhistorisches Museum, Vienna, Austria [NHMW]; Staatliches Museum für Naturkunde, Stuttgart, Germany [SMNS]; Staatliches Museum für Tierkunde, Dresden, Germany [SMTD]; Zoologisches Museum der Humboldt-Universität, Berlin, Germany [ZMHB]; Zoologisches Museum der Universität Hamburg, Germany [ZMUH]; Zoologische Staatssammlung, München, Germany [ZSMC]; Frank H. Hennemann, Freinsheim, Germany [FHH] and the author's collection [OZ], affiliated with Zoologisches Museum der Christian-Albrechts-Universität, Kiel, Germany [ZMUK].

OREOPHOETINI

Diagnosis. Small, colourful, Anareolatae. Profemora, at least in male, straight. Abdominal segments II to X combined shorter than thorax with median segment. Third antennal segment more than two times as long as scapus and pedicellus combined. Egg rounded rhombic in transverse cross-section.

The Oreophoetini includes only two genera, *Oreophoetes* Rehn, 1904 and *Oreophoetophasma* gen. n.

Key to the males of Oreophoetini

1 Head globose, as wide as long . . . . . *Oreophoetophasma hennemanni*
- Head rounded rectangular, distinctly longer than wide . . . . . *Oreophoetes* 2
2 Head uniformly yellow or orange 3
- Head with four black spots . . . . . *Oreophoetes peruana peruana*
3 Head and pronotum uniformly yellow . . . . . *Oreophoetes peruana nigripes*
- Head orange, pronotum black . . . . . *Oreophoetes mima*

Key to the known females of Oreophoetini

1 Head subglobose, vertex distinctly raised . . . . *Oreophoetophasma hennemanni*
- Head rounded rectangular, vertex flat . . . . . *Oreophoetes* 2
2 Head with four black spots . . . . . *Oreophoetes peruana*
- Head with at best two small black spots between the eyes . *Oreophoetes mima*

Key to the known eggs of Oreophoetini

1 Capsule brownish red with irregular, darker spots . . . . . *Oreophoetes* 2
- Capsule uniformly black . . . . . *Oreophoetophasma hennemanni*
2 Micropylar plate reaching operculum . . . . . *Oreophoetes peruana*
- Micropylar plate not reaching operculum . . . . . *Oreophoetes mima*

Oreophoetes Rehn, 1904

Oreophoetes Rehn, 1904: 56; Kirby, 1904: 350; Giglio-Tos, 1910: 31; Hebard, 1924: 145; Bradley & Galil, 1977: 180; Sellick, 1997: 102; 1998: 213; Zompro, 2001a: 53.
Type-species: *Bacteria peruana* Saussure, 1868, by original designation.
Allophyllus Brunner von Wattenwyl, 1907: 317.
Type-species: *Bacteria peruana* Saussure, 1868, by subsequent designation of Hebard, 1924: 145.

Complementary description. Small to medium sized, colourful phasmids. Head rounded rectangular, vertex flat, not raised. Eyes small, projecting hemispherically. Antennae in both sexes considerably longer than body. Scapus flattened, rounded rectangular, pedicellus half as long and two thirds as wide, subcylindrical. Pronotum rectangular with curved lateral margins, shorter and narrower than head. Mesonotum twice as long as metanotum, of similar width as pronotum.

Profemora straight. Protibiae longer than profemora, probasitarsus at least as long as combined length of remaining segments. Meso- and metafemora rectangular in cross-section.

Median segment shorter than one third of metanotum. Abdominal segments II to X combined shorter than thorax and median segment combined. Abdominal segment II twice as long as median segment. II to VII of similar width, VII slightly shorter or of equal length. VIII of male as long as X, IX longer. Segment VIII slightly widened posteriorly, IX with dorsomedian carina, X with a notch posteriorly, IX with dorsomedian carina, X with a notch posteriorly. Subgenital plate swollen, with prominent margin posteriorly. Vomer simple, triangular. Cerci simple, slightly curved. VIII of female indistinctly wider than VII, longer than IX or X. X as long as IX. Cerci strong, straight. Subgenital plate boat-like, pointed posteriorly, with ventromedian carina.

Comments concerning *Oreophoetes* Rehn, 1904. The strongly elongated third antennomere is a striking feature which only occurs in the genus *Neophasma* Redtenbacher, 1906, a member of the suborder Areolatae, further it is one of the main distinguishing characters of the recently described fossil Archipseudophasmatidae from Baltic amber (Zompro, 2001b), which are also members of Areolatae.

The species of this genus are able to spray from their prothoracal glands; this spray burns on the skin and is possibly harmful for the eyes.

Oreophoetes mima (Giglio-Tos, 1898)

Bacunculus mimus Giglio-Tos, 1898: 25; Hebard, 1924: 145.
Oreophoetes mimus: Giglio-Tos, 1910: 32.
Heteronemia mimus: Kirby, 1904: 348.

Material examined. 30 ♂, 16 ♀, 1 ♀n5, 1 ♀n4, 12 eggs.

Lectotype (designated by Brock, 1998: 302): ♂, Gualaquiza [MIZT]. - Paralectotypes: 2 ♀, Gualaguiza; 4 ♂, Ecuador. 28.IX.1905 Dr. Fr. Ohaus leg 1905. id. vend. 30.I.1907. cfr. Reisebericht 1907; 18 ♂, 7 ♀, 1 ♀n5, Ecuador. Sabanilla b. Zamora, Prov. Loja 16. / 23. / 27. / 29.IX. / 1. / 2.X.1905 Dr. Fr. Ohaus leg. id. vend. 30.I.1907. cfr. Reisebericht 1907; 2 ♂, 1 ♀, Ecuador. Sabanilla b. Zamora, Prov. Loja 29.IX. / 2.X.1905 Dr. Fr. Ohaus leg. id. vend. 30.I.1907. cfr. Reisebericht 1907 [OZ no. 66-1 -3]; 6 ♂, 5 ♀, 4 eggs, Ecuador, Prov. Zamora,

Chinchipe, Rio Sabanilla, 27.XI.1998, leg. D. Berger [OZ no. 66-4 -8, 10-15]; 3 ♀, 1 ♀n4, 8 eggs, Ecuador, Prov. Zamora, Chinchipe, Estacion Cientifica San Francisco, I.1999, leg. D. Berger [OZ no. 66-9, 16-18].

Diagnosis. This species is extremely variable in size, but usually smaller than *O. peruana*. Body shiny. In males vertex uniformly orange, genae sometimes black; abdomen dark, thorax red with irregular black spots. Head of females with two small black spots between eyes, vertex uniformly yellow. Body yellow with irregular black spots or stripes. Femora irregularly annulated, not only with a long dark area in the apical half as in some females of *O. peruana*.

Measurements (mm), males. Body: 38.4-52.1; head: 2.7-3.3; pronotum: 2.4-3.0; mesonotum: 9.4-12.3; metanotum: 4.7-6.0; mediansegment: 1.3-1.7; profemora: 13.0-17.8; protibiae: 16.5-22.3; mesofemora: 10.1-13.5; mesotibiae: 11.8-15.9; metafemora: 13.0-18.1; metatibiae: 17.2-23.2.

Measurements (mm), females. Body: 41.1-55.0; head: 3.3-4.8; pronotum: 2.4-3.2; mesonotum: 9.8-13.8; metanotum: 4.7-5.6; mediansegment: 1.7-2.2; profemora: 12.0-16.8; protibiae: 13.7-19.2; mesofemora: 9.0-13.0; mesotibiae: 10.0-15.4; metafemora: 12.6-18.8; metatibiae: 14.5-22.6.

Egg. General colour brownish red with irregular darker spots. Capsule slightly punctured, rounded rhombic in transverse cross-section, lateral edges flattened. Micropylar plate reaching close to the operculum anteriorly, short median line present, with broad, laterally parallel margin. Polar area with deep transversal impression. Operculum oval, with a group of short, light bristles in its center. Measurements (mm). Length: 2.55; width: 1.15; height: 2.35.

Oreophoetes peruana peruana (Saussure, 1868)

Bacteria peruana Saussure, 1868: 65; 1870: 160, pl. 3 fig. 12a, b.
Oreophoetes peruana: Rehn, 1904: 56; Kirby, 1904: 350; Giglio-Tos, 1910: 31; Hebard, 1924: 145; Mottaz & Tudor, 1989: 15; Potvin, 1998: 28; Sellick, 1998: 213 fig. 22g, h; Zompro, 2001a: 53 fig. 68-69, 122-123.
Allophyllus peruanus: Brunner von Wattenwyl, 1907: 317, pl. 14: 2a, b.
Bacunculus festae Giglio-Tos, 1898: 22; Hebard, 1924: 145; synonymized by Giglio-Tos, 1910: 31. Lectotype designated by Brock, 1998: 302.
Heteronemia festae: Kirby, 1904: 348.
Bacunculus festuca Giglio-Tos, 1898: 24; Hebard, 1924: 145; synonymized by Giglio-Tos, 1910: 31. Lectotype designated by Brock, 1998: 303.
Allophyllus festuca: Brunner von Wattenwyl, 1907: 318.
Heteronemia festuca: Kirby, 1904: 348.
Bacunculus (?) *gramen* Giglio-Tos 1898: 26; Hebard, 1924: 145; synonymized by Brock, 1998: 303.
Oreophoetes gramen: Giglio-Tos 1910: 32.
Heteronemia gramen: Kirby, 1904: 349.

Material examined. 25 ♂, 16 ♀, 1 ♀n5, several eggs.

Lectotype (by present designation): ♂, Iquitos, Perou, 600/81, Anc. coll. [MHNG]. Paralectotypes: 1 ♂, Perou [MHNG]; 1 ♀n5, lectotype of *Bacunculus festuca* Giglio-Tos, 1898: Valle del Santiago [MIZT]; 1 ♂, holotype of *Bacunculus gramen* Giglio-Tos, 1898: Valle del Santiago [MIZT]; 1 ♂, 1 ♀: Baños, Ecuador [MHNG]; 1 ♀, no data [MHNG]; 1 ♂:

Peru [ZMHB]; 1 ♂, 3 ♀: Santa Inéz, [Ecuad.], R. Haensch S. [ZMHB]; 1 ♂, Ecuador, Bos, 8.X.99, Haensch S. G. [ZMHB]; 1 ♂, Ecuador, A 2500, Haensch S. G. [ZMHB]; 1 ♂, Ecuador, Bos, 22.X.99, Haensch S. G. [ZMHB]; 2 ♂, Ecuador, M. 7.4.99, Haensch S. G. [ZMHB]; 1 ♀, Ecuador, Br. 4.5.99, Haensch S. G. [ZMHB]; 1 ♀, Napo, [Ecuad.], R. Haensch S. G. [ZMHB]; 1 ♂, Peru [DEIC]; 1 ♂, 1 ♀: Jumbatis, a. Huallaga, N. Peru, 350m, leg. C. Kulg 1932, ded. Nagel 1933, November [DEIC]; 1 ♂, 1 ♀, Chaguta, Peru, mittl. Huallaga, leg. G. Kulg 1935, ded. Nagel 1935, März [DEIC]; 5 ♂, 1 ♀, Ecuador, Prov. Napo, Sta. Rosa de Misahualli, 40 m, 21.3.-26.3.1988, leg. Riede *et al.* [SMNS]; 2 ♂, 1 ♀, Santa Inez (Ecuad.), R. Haensch S. [ZMUH]; 1 ♂, Ecuador, Barancas, 16.XII.1905 [ZMUH]; 1 ♀, Ost-Ecuador, Riobamba-Macas und flussabwärts. E. Feyer leg. [ZMUH]; 5 ♂, 5 ♀, several eggs, culture O. Zompro, origin: Peru [OZ no. 42-1-11]; 1 ♂, Ecuador, Puyo Region. Collected by Chris Raper. 10-12-1990 ♂ [Coll. P. E. Bragg. Accession-number PEB-461].

Diagnosis. Large Oreophoetini. Body less shiny than in *O. mima*, head with four black spots. Thorax and abdomen with red (♂), orange or yellow (♀) stripes. ♀ with a broad, black stripe beside yellow median line. Femora of females not annulated, but sometimes with a wide black area in the anterior half. A male in the collection P. E. Bragg (Accession no. PEB-461) features a totally black body.

Measurements (mm), males. Body: 53.2-62.5; head: 2.8-3.7; pronotum: 2.8-3.0; mesonotum: 13.8-17.0; metanotum: 9.0-9.7; mediansegment: 1.3-1.6; profemora: 1.82-22.1; protibiae: 20.0-27.0; mesofemora: 13.5-16.9; mesotibiae: 16.2-22.0; metafemora: 18.5-22.2; metatibiae: 22.9-28.6.

Measurements (mm), females. Body: 54.8-64.0; head: 3.9-5.0; pronotum: 2.7-3.3; mesonotum: 13.7-15.2; metanotum: 7.5-8.8; mediansegment: 1.7-2.0; profemora: 16.5-19.6; protibiae: 20.6-24.0; mesofemora: 13.8-16.1; mesotibiae: 16.0-19.4; metafemora: 17.0-21.1; metatibiae: 22.1-26.7.

Egg. General colour of capsule light brown to reddish brown, with irregular darker spots. Surface slightly punctured, in lower magnification leather-like (x 20). Capsule rounded rhombic in transverse cross-section, subround from lateral view. Micropylar plate projecting, elongated, marginated, reaching operculum anteriorly. Short median line present. Operculum elongated oval, with a group of light, short and thick bristles in its center. Measurements (mm). Length: 3.15; width: 1.65; height: 2.55.

Comments. The type-species of *Oreophoetes* is one of the most famous phasmids. It has been cultured since 1984 in the Phasmid Study Group (no. 84), culture stock was collected in Peru, Tarapoto, Valley of Rio Shilcayo and is easy to rear on various ferns. The temperuture shold not be higher than room-temperature. Because of its striking colours *O. peruana* is one of the favourite species for photographers, and numerous pictures have been published in different kinds of magazines.

Mottaz & Tudor (1989: 39) and Potvin (1998: 28) present brief descriptions, figures and notes on the culture of this species.

Oreophoetes peruana nigripes (Scudder, 1875) stat. n.

Bacteria nigripes Scudder, 1875: 278; 1896: 205, 217.

Material examined. Syntypes: 2 ♂, *Bact. nigripes* Scudd. Type Peruv. Andes [ANSP], examined from a colour print by P. D. Brock; 1 ♂: Chaguta, Peru, mittl. Huallaga, März, leg. G. Klug 1935, ded. Nagel 1935 [SMTD].

Diagnosis. The head, pronotum, anterior and posterior part of meso- and metanotum and the terminal three abdominal segments are yellow, the rest of the body and the extremities are black, the tarsal segments are yellowish-black.

Measurements (mm), taken from a ♂ from SMTD: Body: 52.0; head: 3.0; pronotum: 2.9; mesonotum: 15.8; metanotum: 7.5; mediansegment: 1.1; profemora: 20.5; protibiae: 28.5; mesofemora: 16.2; mesotibiae: 22.1; metafemora: 21.6; metatibiae: 32.0.

Comments. This taxon differs from the variable *O. peruana* (Saussure, 1868) in the colouration and features slight differences in the form of the genitalia. Therefore it is reduced to subspecies level.

The measurements published by Scudder, 1875: 278 (Body: 63; protibiae: 32; mesotibiae: 52; metatibiae: 37) are obviously incorrect, as it is clearly visible in colour print of the holotype, that the metatibiae are longer than the mesotibiae and not considerably shorter. Perhaps Scudder's 52 should read 25. In all other respects the specimen from SMTD agrees perfectly with Scudder's material.

Oreophoetophasma gen. n.

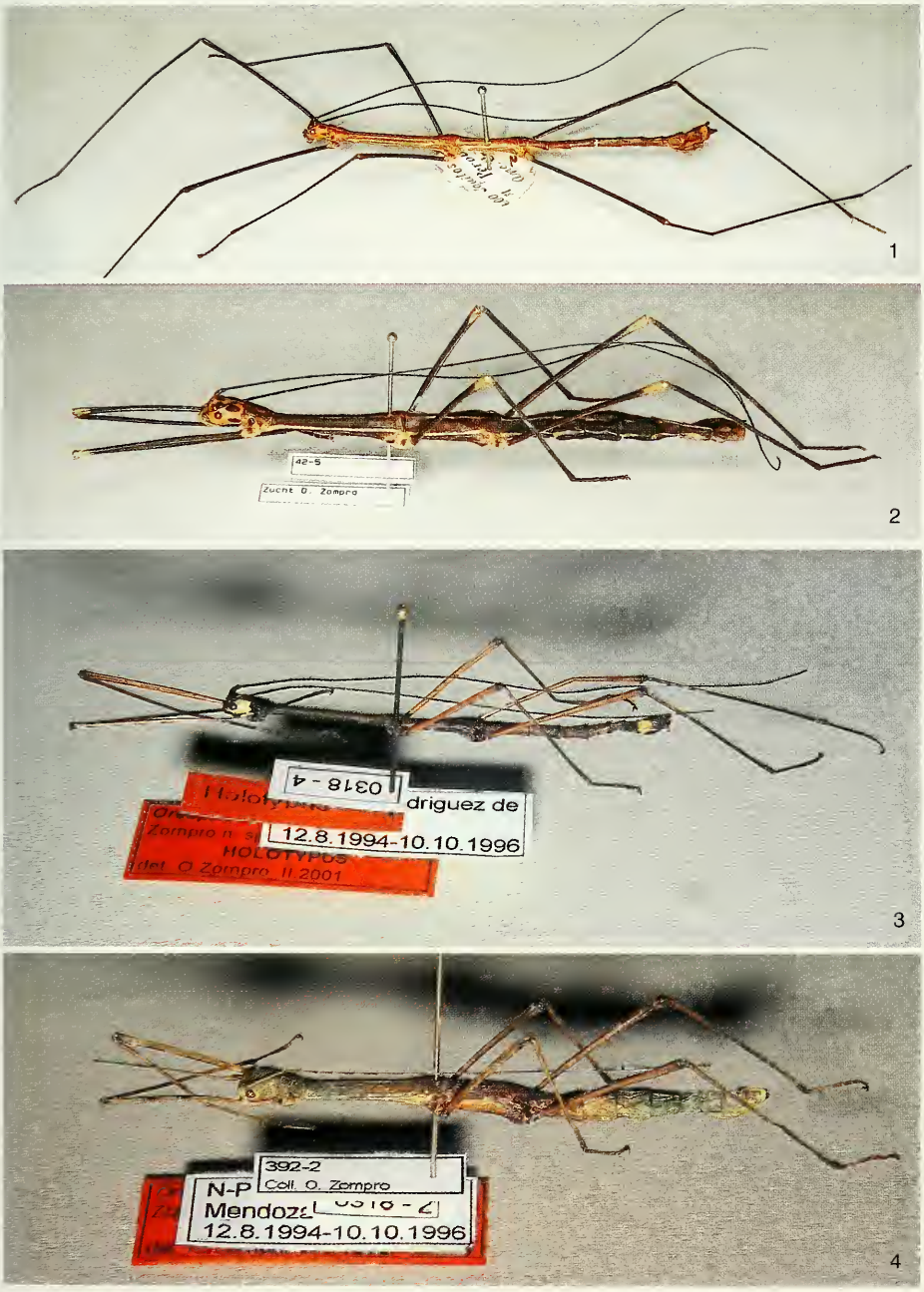
Diagnosis. Small Oreophoetini. Head globose (♂) or subglobose (♀), vertex raised, eyes projecting more than (♂) or hemispherically (♀). Antennae projecting beyond abdomen. Pronotum narrower than head, subrectangular. Mesonotum elongate, five times as long as pronotum, but narrower (♂) or as wide as it (♀). Metanotum half as long as previous segment. Profemora straight (♂) or basally slightly curved and impressed interiorly (♀), subquadrate in cross-section, in ♀ edges distinctly produced. Meso- and metafemora rectangular in cross-section, in ♀ edges also produced. Tibiae quadrate in cross-section, longer than femora, basitarsi as long as following segments combined, these increasingly shorter, terminal tarsite as long as second. Median segment one third as long as metanotum, segments II to V increasingly longer and (♀) wider, V to VII increasingly shorter and (♀) narrower. In ♂ VIII shortest segment, IX longer, X shorter than IX but longer than VIII, vomer simple triangular, poculum bulgy, cerci simple, slightly curved. In ♀ VIII to X increasingly shorter, cerci slightly flattened, subgenital plate swollen, not projecting terminal segment.

Name. "*Oreophoetophasma*" mirrors the close relation to *Oreophoetes* Rehn, 1904. The name is of neutral gender.

Type-species, by present designation: *Oreophoetophasma hennemanni* sp. n.

Oreophoetophasma hennemanni sp. n.

Material. Holotype: ♂, N-Peru, Rodriguez de Mendoza, 12.8.1994-10.10.1996 [MUSM, ex coll. FHH no. 0318-4]. Paratypes: 1 ♂, data as holotype [MHNG, ex coll. FHH no. 5]; 1 ♂, 1 ♀, 2 eggs ex abdomen, data as holotype [FHH no. 1, 6]; 1 ♂, 1 ♀, data as holotype, ex coll. FHH 0318-2, 3 [OZ no. 392-1, 2]; 1 ♀, Oxapampa XII.1931 H. Knipper, Peru, 1800m. ü. M. G. Schreiber [ZMHB, drawer 88/1].



FIGS 1-4

Oreophoetes peruana peruana (Saussure, 1868). 1. ♂, lectotype [MHNG]; 2. ♀ [OZ no. 42-5]; *Oreophoetophasma hennemanni* Zompro sp. n. 3. ♂, holotype [MUSM]; 4. ♀, paratype [OZ no. 392-2]

Description. Male: Head globose, yellow, with a black, quadrate spot on the occiput. Frons, labrum, mandibles and appendices of the head black, clypeus brownish red. Eyes projecting slightly more than hemispherically. Scapus flattened rectangular, pedicellus cylindrical, two thirds as wide and half as long, third antennite twice as long as scapus and pedicellus combined; following segments strongly elongated. Antennae consisting of about 33 segments, projecting beyond the tip of abdomen by the length of the mesonotum.

Pronotum black, longer than wide, narrower but longer than head, with slightly curved lateral margin, deep transverse impression medially and an incomplete median line. Mesonotum reddish brown, strongly elongated, more than five times as long as pronotum, except for the anterior and posterior end distinctly narrower than pronotum. Metanotum less than half as long as mesonotum, as wide as pronotum.

Profemora straight, strongly elongated, rectangular in cross-section, red, base and tip darkened. Protibiae considerably longer, quadrate in cross-section, darker in colour. Probasitarsus as long as remaining segments combined, following ones increasingly shorter, terminal tarsite as long as second tarsite. Meso- and metafemora rectangular in cross-section, knees darkened. Tibiae and tarsi as in foreleg.

Median segment and following abdominal segments coloured as meso- and metanotum, one quarter as long as metanotum and half as long as abdominal segment II. Segment II to V increasingly longer, V to VII increasingly shorter. Segments II to VII of equal width. VIII trapezoidal broadened posteriorly, with distinct median ridge. IX yellow, tectiform, with deep lateral impression which separates the broad lateral margins. X with distinct median ridge, posterior margin divided in two projecting lobes, these with distinct, black teeth interiorly. Abdomen black ventrally. Poculum bulbous, with wrinkled posterior margin.

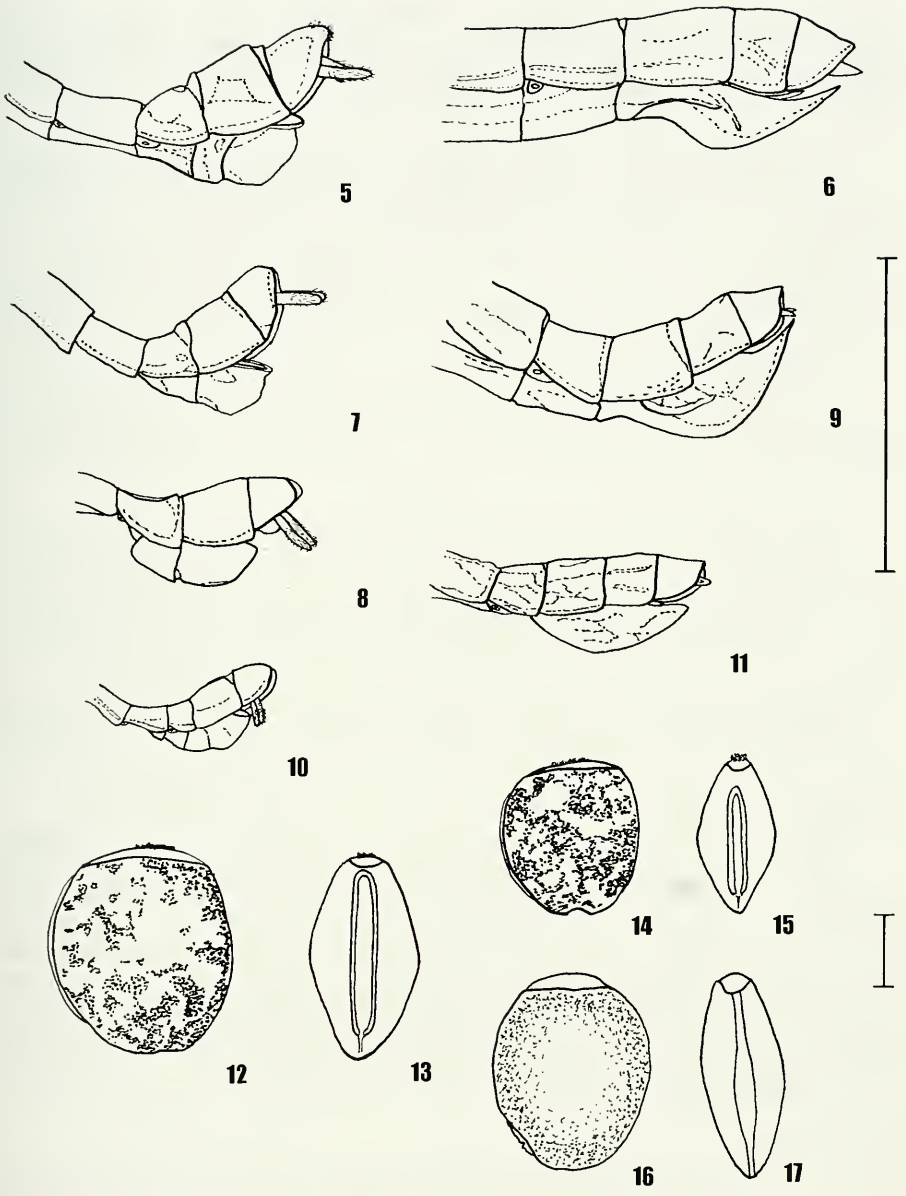
Vomer simple triangularly, yellow. Cerci black, slightly curved, bristled.

Female: General colour green. Head subglobose, slightly longer than wide, vertex distinctly raised. Head and appendices green, clypeus light reddish. Eyes projecting hemispherically. Antennae coloured as head, broken in the specimens examined. Scapus rectangular, flattened, pedicellus two thirds as wide and half as long. Third antennite less than twice as long as previous two segments, following segments elongated.

Pronotum subrectangular, with curved lateral margin and distinct longitudinal and transverse median impressions. Mesonotum five times as long as pronotum. Median ridge distinct, with another, undulated, sometimes interrupted ridge submedianly, and a broad bulge sublaterally. Metanotum half as long as mesonotum, with similar structure.

Legs coloured as body. Profemora subquadrate in cross-section, edges produced. Base slightly curved and distinctly depressed interiorly. Tibiae and tarsi as in male, tarsal segments yellow, claws black. Meso- and metafemora rectangular in cross-section, edges also distinct, tibiae and tarsi as in foreleg.

Median segment one third as long as metanotum, with median keel and a converging carinae submedianly: Segments II to V increasingly longer and broader, V to VII shorter and narrower. III to VIII with two converging carinae submedially. VIII



FIGS 5-17

Oreophoetes peruana peruana (Saussure, 1868). Terminal abdominal segments, 5. ♂, 6. ♀; *Oreophoetes peruana nigripes* (Scudder, 1895). Terminal abdominal segments, 7. ♂; *Oreophoetes mima* (Giglio-Tos, 1898). Terminal abdominal segments, 8. ♂, 9. ♀; *Oreophoetophasma hennemanni* Zompro sp. n. Terminal abdominal segments, 10. ♂, 11, ♀; *Oreophoetes peruana peruana* (Saussure, 1868), egg. 12. Lateral, 13. Dorsal; *Oreophoetes mima* (Giglio-Tos, 1898), egg. 14. Lateral, 15. Dorsal; *Oreophoetophasma hennemanni* Zompro sp. n., egg. 16. Lateral, 17. Dorsal. – Scale 5-11: 10 mm; scale 12-17: 1 mm.

tectiforme, as long as VI, IX shorter than VIII, as long as VII, with one converging carina submedianly. X shorter than IX, with sharp median carina. Subgenital plate yellow, acute posteriorly, anterior part depressed laterally, posterior half with distinct median keel. Cerci simple, slightly flattened, bristled.

Measurements (mm), holotype ♂: Body: 37.0; head: 2.0; pronotum: 1.9; mesonotum: 10.6; metanotum: 4.8; mediansegment: 1.1; profemora: 14.3; protibiae: 17.3; mesofemora: 11.0; mesotibiae: 12.3; metafemora: 14.6; metatibiae: 18.2.

Measurements (mm), ♂♂: Body: 37.0-37.2; head: 1.8-2.0; pronotum: 1.8-2.0; mesonotum: 10.5-10.8; metanotum: 4.8-5.0; mediansegment: 0.9-1.1; profemora: 13.7-14.8; protibiae: 17.0-17.5; mesofemora: 10.6-11.0; mesotibiae: 11.7-12.3; metafemora: 14.3-14.8; metatibiae: 17.8-18.2.

Measurements (mm), ♀♀: Body: 40.1-40.3; head: 2.9-3.1; pronotum: 1.9-2.0; mesonotum: 9.2-10.0; metanotum: 4.8-5.0; mediansegment: 1.6-1.8; profemora: 12.7-12.9; protibiae: 13.0-14.2; mesofemora: 9.2-9.4; mesotibiae: 9.8-10.0; metafemora: 12.0-12.2; metatibiae: 15.2-15.8.

Egg: General colour uniformly black. Capsule strongly depressed laterally, braodest in middle, equally narrowed laterally, with leather-like structure. Micropylar plate strongly elongated, reaching operculum anteriorly. Operculum slightly curved, oval. The description is based on two almost fully developed eggs out of a female's abdomen. Measurements (mm). Length: 2.75; width: 1.15; height: 2.25.

Name: This beautiful species is dedicated to Mr Frank Hennemann, Freinsheim, Germany, to acknowledge several years of good cooperation.

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Bryconamericus uporas sp. n. (Characiformes, Characidae), a new species from the río Uruguay basin, in Argentina

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***Bryconamericus uporas* sp. n. (Characiformes, Characidae), a new species from the río Uruguay basin, in Argentina. -** A new species of the genus *Bryconamericus* is described from río Uruguay basin in Misiones, Argentina. *Bryconamericus uporas* is distinguished by the following combination of characters: low body depth (28.9-32.2 in % of SL); all teeth of upper jaw broadest distally; premaxillary teeth of the inner series with seven cusps; premaxillary teeth of the outer row with five cusps, and maxillary teeth with five or seven cusps. Also, the new species has 18-20 branched anal-fin rays, large subcircular black humeral spot, wide black lateral band, light violet upper half of flank, and lower half silvery. The new species was collected in the headwaters of the arroyos Once Vueltas, Toro, Fortaleza, and Yabotí-Miní. Those streams were born in the sierras, having rocky and sandy bottom, with clear and rapid water.

Key-words: Characiformes - Characidae - *Bryconamericus* - Argentina - Misiones - Uruguay basin.

INTRODUCTION

Seven species of the characiform genus *Bryconamericus* are known from southern South America. This genus includes about 40 species (Malabarba & Kindell, 1995), living in freshwaters from Central America (Eigenmann, 1927; Géry, 1977) to the south of Buenos Aires Province in Argentina (Menni *et al.*, 1988; Casciotta *et al.*, 1999).

Most of these species have been known since the beginning of the last century (Evermann & Kendall, 1906; Eigenmann *et al.*, 1907; Fowler, 1940). However, increasing efforts in studies of characiform fishes have resulted in recent discoveries of new species (Malabarba & Kindell, 1995; Azpelicueta & Almirón, 2001). The purpose of this paper is to describe a new species of the genus from the río Uruguay basin, in Argentina.

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MATERIAL AND METHODS

Measurements are straight line distances taken with calliper. Standard length (SL) was measured from tip of snout to hypural joint, head length includes the opercular flap, caudal peduncle length is taken from last anal-fin ray to hypural joint. Specimens were cleared and stained (C&S) for cartilage and bone following Taylor & Van Dyke (1985).

The specimens examined belong to Academy of Natural Sciences of Philadelphia, USA (ANSP), Fundación Miguel Lillo, Tucumán, Argentina (FML), Muséum d'histoire naturelle, Genève, Switzerland (MHNG), and Facultad de Ciencias Naturales y Museo, La Plata, Argentina (MLP).

Comparative material examined. *Bryconamericus agna* Azpelicueta & Almirón, 2001: FML 3700, holotype, 61.5 mm SL, Argentina, Misiones, arroyo Tabay, Paraná basin. ANSP 177871, 4 ex., 50.4-57.3 mm SL, collecting data as holotype. MHNG 2611.46, 4 ex., 54.3-60.0 mm SL, collecting data as holotype.

Bryconamericus iheringi (Boulenger, 1887): MLP 9073, 110 ex., 39.9-44.3, Argentina, Buenos Aires, Sierra de la Ventana. MLP 9103, 15 ex., 34.8-49.2, Argentina, Buenos Aires, Berisso, Los Talas (man-made ponds connected to Río de la Plata).

Bryconamericus exodon Eigenmann, 1907: MLP 18-IX-80-1, 2 ex., 39.0-43.5 mm SL, Argentina, Buenos Aires, Río de la Plata in Punta Lara.

Bryconamericus thomasi Fowler, 1940: FML 1969, 94 ex. (5 measured, 2 males and 3 females), 40.3-55.4 mm SL, Argentina, Salta, río Piedras.

Bryconamericus uporas sp. n. (non type): MLP uncat, 4 ex., 26.7-49.4 mm SL, Argentina, Misiones, arroyo Toro. MLP uncat, 3 ex., 42.9-45.0 mm SL, Argentina, Misiones, Arroyo Yabotí-Miní.

RESULTS

Bryconamericus uporas sp. n. Figs 1-8, table 1

Holotype. MLP 9568, male, 51.5 mm SL, Argentina, Misiones, Municipio Leandro N. Alem, arroyo Once Vueltas (27° 38' S - 55° 12' W), Uruguay basin. Coll. J. Casciotta, A. Almirón & M. Donato, February-2001.

Paratypes. MLP9583, 14 ex., 43.4-51.0 mm SL, collected with the holotype. MHNG 2619.23, 5 ex., 41.0-47.8 mm SL, Argentina, Misiones, arroyo Fortaleza (26° 45' S – 54° 10' W), coll. J. Casciotta, A. Cione & M. Donato, April-2000.

Diagnosis. *Bryconamericus uporas* is distinguished from other species of the genus by the following combination of characters: low body (28.9-32.2 % of SL); premaxillary and maxillary teeth with distal portion broader than the base; teeth of premaxillary inner row heptacuspid and those of outer row pentacuspid; 18-20 branched anal-fin rays; large subcircular black humeral spot, and wide black lateral band. The new species has the upper half of flank light violet and the lower half silvery.

Description. Morphometrics of holotype and 14 paratypes are presented in table 1. Body moderately elongate (Fig. 1). Greatest body depth approximately at dorsal-fin origin. Dorsal profile of body distinctly convex from upper lip to dorsal-fin origin, almost straight from dorsal-fin base to caudal peduncle. Ventral profile of body sligthly convex from mouth to anal-fin origin, straight from anal-fin origin to caudal peduncle. Dorsal and ventral profiles of caudal peduncle concave. Body laterally compressed between pectoral and anal fins.

TABLE 1

Morphometrics of the holotype and 14 paratypes of *Bryconamericus uporas* sp. n. Standard length is expressed in mm. SD: standard deviation.

	Holotype	Range	mean	SD
Standard length	51.5	43.4-51.5		
Percentage of SL				
Body depth	30.7	28.9-32.2	30.4	0.984
Head length	27.1	24.6-27.1	25.9	0.763
Predorsal length	46.6	46.6-50.5	48.6	1.261
Preventral length	41.3	41.3-46.4	43.9	1.403
Preanal length	57.9	55.0-60.9	59.0	1.513
Dorsal-fin base	13.2	12.7-14.1	13.3	0.488
Anal-fin base	29.9	25.5-29.9	27.4	1.122
Pelvic-fin length	13.0	12.5-15.1	14.1	0.754
Pectoral-fin length	21.9	20.2-22.4	21.4	0.632
Caudal peduncle depth	10.7	10.4-11.7	11.0	0.375
Caudal peduncle length	16.9	14.9-17.7	16.4	0.958
Distance between pectoral and pelvic fin origins	19.4	19.4-22.5	21.3	0.763
Distance between pelvic and anal fin origins	15.9	13.7-18.0	15.9	0.969
Percentage of head length				
Interorbital width	28.6	28.6-34.2	30.9	1.747
Head depth	75.0	75.0-86.3	80.7	2.889
Orbital diameter	35.7	35.7-43.0	39.2	1.818
Snout length	20.0	18.1-21.2	19.6	1.018
Premaxillary+maxillary length	33.5	33.5-41.9	37.4	2.340
Maxillary length	25.0	20.8-27.3	23.9	2.150
Percentage of pectoral-pelvic fin origins				
Pectoral length	113.0	95.3-113.0	100.0	4.242

Dorsal-fin origin nearer snout tip than base of caudal-fin rays, dorsal-fin origin behind vertical through last pelvic-fin ray insertion. Adipose fin present. Tip of pectoral fin reaching or not pelvic-fin origin. Tip of pelvic fin never reaching anal-fin origin.

Dorsal fin with ii,8 rays; posterior margin of dorsal fin straight, second unbranched and first branched dorsal-fin rays of same length. Holotype (largest specimen) with small and few (about 3) hooks on two first branched dorsal-fin rays.

Anal fin with iv,18-20 rays (3 ex.= 18, 7 ex.= 19, 5 ex.= 20), some males with few small hooks on first branched rays. Most of specimens with last unbranched and first six branched rays forming an anterior lobe.

Pectoral fin with i,10-12 rays (2 ex.= 10, 7 ex.= 11, 6 ex.= 12), posterior pectoral-fin margin straight. Scattered hooks on dorsal surface.

Pelvic fin with i,7 rays, with small hooks on ventral surface.

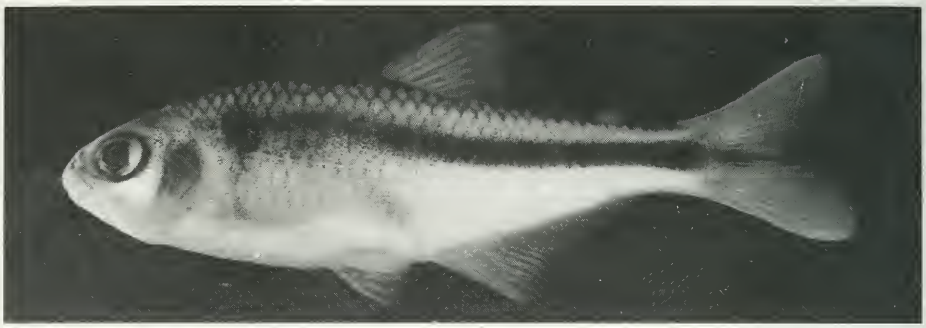


FIG. 1
Bryconamericus uporas sp. n., holotype, MLP 9568, 51.5 mm SL.

Caudal fin with one unbranched and 9 branched rays on upper lobe; one unbranched and 8 branched rays on lower lobe. Lower caudal lobe scarcely longer and more rounded.

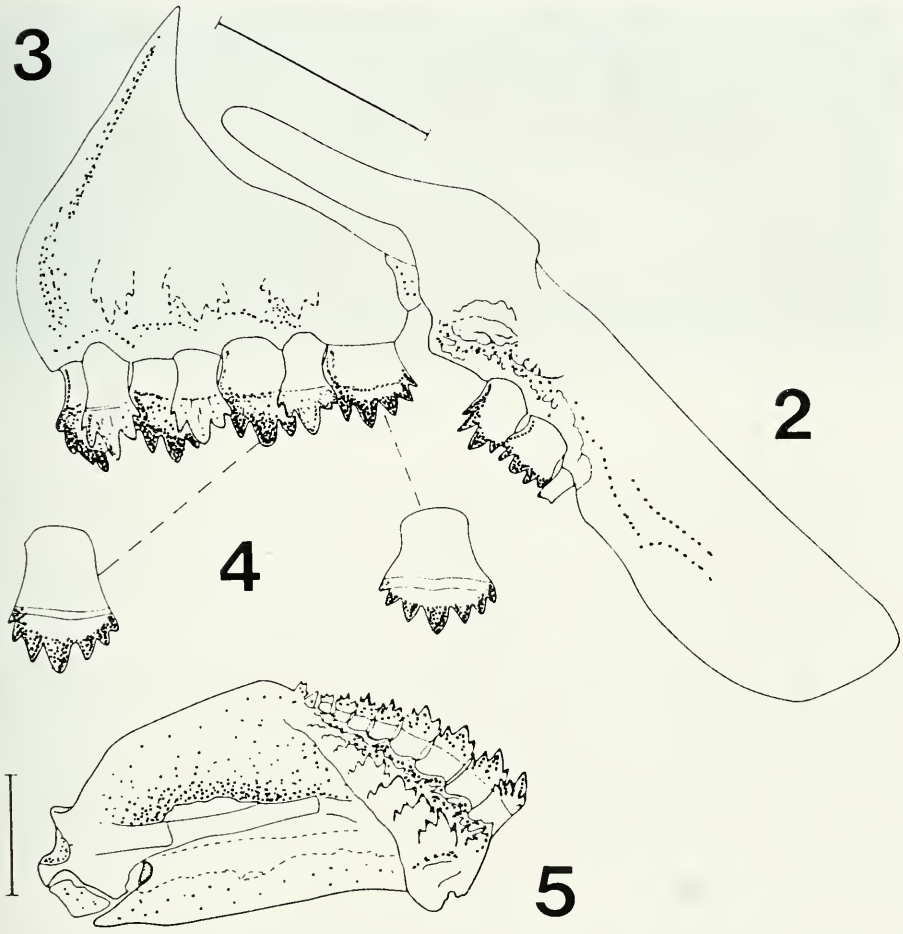
Dorsal profile of head gently convex, concave over supraoccipital. Snout rounded, upper jaw distinctly longer than lower jaw. Mouth placed at level of lower orbital margin. Maxilla surpassing anterior orbital margin. Maxilla with ascending process long, lateral process laminar. Usually 3 teeth, with 5 or 7 cusps; sometimes, a fourth posterior small tooth conic or bicuspid (Fig. 2). Premaxilla bearing two series of teeth, wider distally, compressed anteroposteriorly, with stronger median cusp (Fig. 3). Usually, outer series with 3 aligned teeth, all pentacuspid (1 ex. with 4 teeth, 2 ex. with 2). Inner series of premaxillary teeth consisting of 4 teeth, with 7 cusps. Symphysial tooth narrower; third and fourth teeth broadest (Fig. 4). Dentary bearing 7-10 teeth, first four anterior teeth large; last ones very small. Symphysial tooth broad. Distal area of each tooth compressed anteroposteriorly. Usually 5 cusps in large teeth, remaining teeth with 3 cusps (Fig. 5).

Eyes large. Postero-ventral edge of third infraorbital not in contact, but very close, with sensory tube of preopercle.

Scales cycloid. Lateral series with 37-40 perforated scales (2 ex.= 37, 4 ex., including holotype= 38, 7 ex.= 39, 2 ex.= 40). Five scales between dorsal-fin origin and lateral line, 4-5 scales between lateral line and anal-fin origin. Fourteen scales around caudal peduncle. Eleven to fourteen scales not forming a regular median series between supraoccipital process and dorsal-fin origin in most specimens. Nine to eleven scales in one row, covering proximal portion of eight to ten first anal-fin rays.

Coloration upon capture: Upper half of flank light violet; lower half silvery (Fig. 6).

Coloration in alcohol preserved specimens: Ground color pale yellow, with upper area of flanks darker; margin of scales with dark chromatophores forming a reticular pattern. Lower half of flanks with small isolated chromatophores, some of them concentrated over anal-fin and other ones following myosepta. Dorsum of head and snout with black chromatophores. Scattered chromatophores on opercular area,



FIGS 2-5

Bryconamericus uporas sp. n., 44.5 mm SL. 2, lateral view of left maxilla; 3, lateral view of left premaxilla; 4, detail of third and fourth teeth of inner premaxillary series, lingual view; 5, medial view of left lower jaw. Scale bar: 1 mm.

cheek, and maxilla. Ventral region of head, and vent whitish. A large subcircular black humeral spot, sometimes ventrally elongate, placed behind third or fourth scales of longitudinal series. Next 2 or 3 scales lacking chromatophores. A wide dark lateral band 2 or 3 scales deep extended on middle flank, connected to a caudal spot. Usually, lateral band extending over medial caudal-fin rays. Posterior margin of eye with a silvery half-moon shaped spot. Dorsal fin with chromatophores, especially concentrated on distal half; dorsal-fin rays with chromatophores on their margins. Anal fin with chromatophores, those of distal area very small, larger chromatophores placed on basal region. Adipose with small scattered chromatophores. Caudal fin with

FIG. 6

Bryconamericus uporas sp. n., upon capture, arroyo Once Vueltas, Misiones, Argentina.

chromatophores, specially concentrated on ray margins and close to distal edges. Pectoral and pelvic fins hyaline, with small chromatophores on their surfaces.

Etymology. The specific name *uporas* is a guaraní word meaning an animal-shaped ghost of the water, who care streams, ponds, falls, and swamps.

Distribution. This species is known from headwaters of the arroyos Once Vueltas, Toro, Fortaleza, and Yabotí-Miní, río Uruguay basin, Province of Misiones, Argentina (Fig. 7). The depth of the streams was irregular, about 80 cm (average); the substrate was formed by sand and stones; the course had small falls and pools, and clear water without vegetation (Fig. 8). The temperature of the water was 24-25 °C. Many specimens were observed moving upstream over small falls and falling in pools during the day, in February.

DISCUSSION

The traditional definition of the genus *Bryconamericus* done by Eigenmann (1927) included the species with four teeth in the inner row of the premaxilla, maxilla with few teeth along its anterior border, second suborbital expanded covering lower limb of the preopercle, a single series in the dentary, and absence of scales over the caudal-fin lobes and of a pouch scale on the base of the caudal fin in males. The validity of those characters were subsequently discussed by some authors (Malabarba & Malabarba, 1994) but a phylogenetic definition of the genus is still pendant and Eigenmann's definition is still in use for the generic placement of the new species.

Géry (1977) identified two groups of *Bryconamericus*, *B. diaphanus*-group and *B. peruanus*-group. These groups are artificial, however Géry (1977) is the only available paper presenting an overview of the genus. *Bryconamericus uporas* may be included within the *B. diaphanus*-group because it has 15 to 25 anal-fin rays and 4-6 transverse scales above the lateral line. However, the shape of premaxillary and maxillary teeth of *B. uporas* differs from that present in the species included in that group.

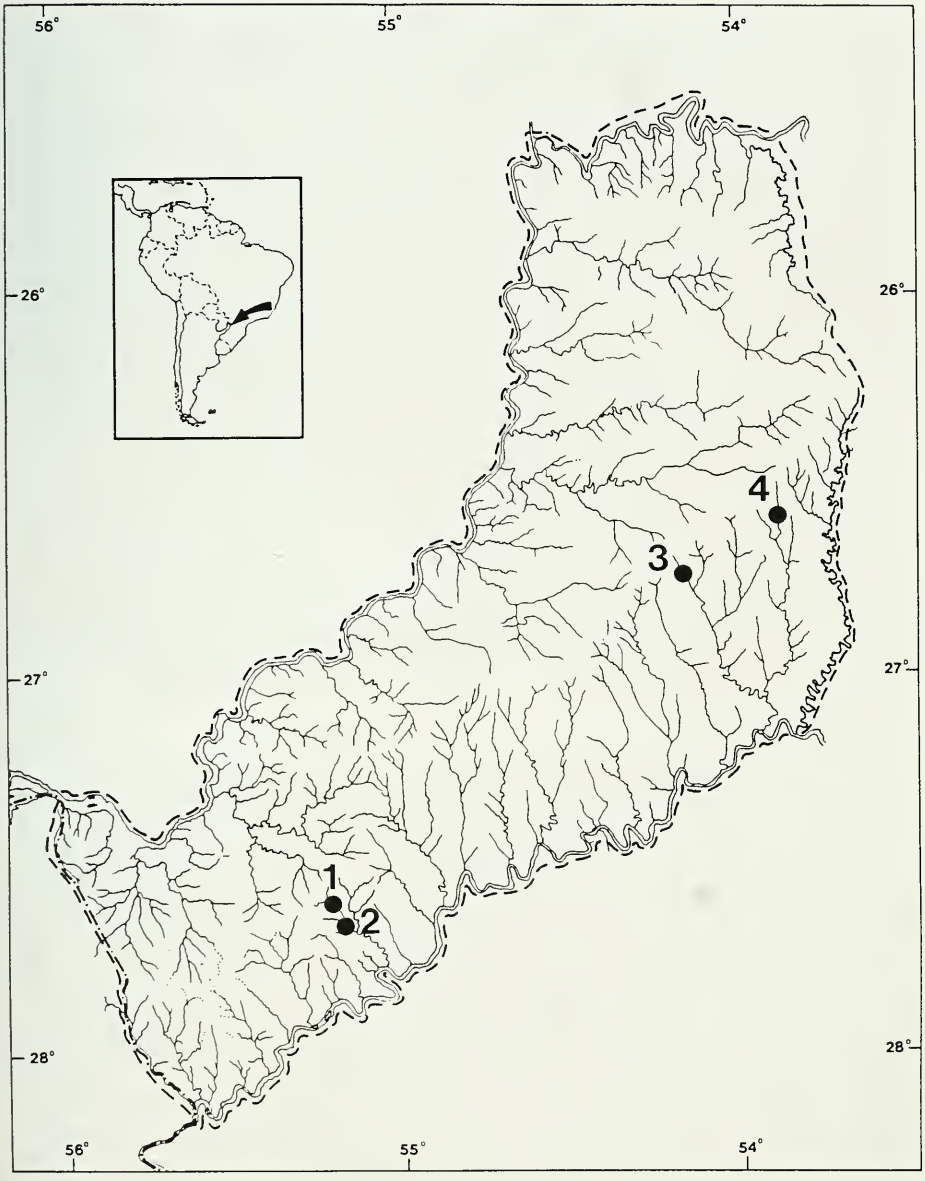


FIG. 7

Map showing the left tributaries of río Paraná and right tributaries of río Uruguay, Misiones, Argentina, with the geographical distribution of *Bryconamericus uporas* sp. n.: 1, arroyo Once Vueltas (type locality); 2, arroyo Toro; 3, arroyo Fortaleza; 4, arroyo Yabotí-Miní.

The following species of *Bryconamericus* were described from southern South America: *B. iheringi*, *B. eigenmanni*, *B. lambari*, *B. thomasi*, *B. exodon*, *B. stramineus* (a junior synonym of *B. exodon*?), *B. sylvicola*, and *B. agna*.

FIG. 8
Habitat of *Bryconamericus uporas* sp. n., arroyo Fortaleza, Misiones, Argentina.

Bryconamericus uporas differs from *B. exodon* in having an aligned outer row of premaxillary teeth and deeper body (28.9-32.2 vs. 22.9-26.8 % in SL). Also a wide black lateral band is present in *B. uporas*, whereas a wide silvery band occurs in *B. exodon*. From *B. eigenmanni*, *B. uporas* is easily distinguished by the higher number of branched anal-fin rays (18-20 vs.15-17), lack of a dot on upper half of dorsal fin, and several morphometric characters such as longer caudal peduncle (14.9-17.7 vs. 18.0-23.0) and shorter distance between origins of pelvic and anal fins (13.7-18.0 vs. 16.0-25.8). *Bryconamericus uporas* differs from *B. iheringi* by lower body depth (28.9-32.2 vs. 33.7-38.1 % in SL), and the shorter predorsal distance (46.6-50.5 vs. 55.5-56.8 % in SL). The wide dark lateral band present in *B. uporas* distinguishes this species from *B. iheringi*, *B. sylvicola*, and *B. lambari*, but a similar band occurs in *B. agna* and *B. thomasi*. The later species has a peculiar deeper caudal peduncle (15.6-17.4 vs. 10.4-11.0 % in SL in *B. uporas*). The lower body and number of branched anal-fin rays differ *B. uporas* from *B. sylvicola* (28.9-32.2 vs. 36.1-40.7 % in SL); (19-22 vs. 22-25). Also *B. uporas* has a wide black lateral band vs. a very narrow band. *Bryconamericus uporas* differs from *B. agna* in having lower body (28.9-32.2 vs. 34.1-39.8 % in SL), longer caudal peduncle length (14.9-17.7 vs. 10.9-11.8 % in SL) and higher number of dentary teeth (7-10 vs. 6-7).

Among the species described from southern South America, it is possible to find some species with a large geographical distribution while others have a very restricted geographical distribution. *Bryconamericus iheringi* and *B. exodon* occur in a wide geographical area, living in different types of environments of the Río de la Plata basin and Laguna dos Patos system. The two species occur in large and small rivers. and the former also inhabits shallow and deep ponds. Besides, *B. iheringi* represents the southernmost record of the genus in the río Sauce Grande drainage (38° 45' S), in the south of Buenos Aires Province (Casciotta *et al.*,1999).

Among the species with restricted distribution, *B. eigenmanni* lives in endorrheic basins of the ríos Primero and Pichanas, Province of Córdoba, Central Argentina (Miquelarena & Aquino, 1999). *Bryconamericus thomasi* occurs in the upper basin of the río Bermejo, río Pasaje-Juramento-Salado, and río Lipeo, Provinces of Salta and Jujuy in Argentina, and Departamento Tarija in Bolivia (Miquelarena & Aquino, 1995). *Bryconamericus lambari* inhabits in tributaries of Laguna dos Patos system, in Brasil (Malabarba & Kindel, 1995). *Bryconamericus sylvicola* (Braga, 1998) lives only in arroyo Urugua-í above the falls. *Bryconamericus agna* is only known from the type locality in the arroyo Tabay, río Paraná basin (Azpelicueta & Almirón, 2001). All those species live in streams and small rivers, with sandy and rocky bottom, shallow (0.5 m) or deep (2 m) pools, and current water. *Bryconamericus uporas* belongs to that group of species with restricted distribution, being present in headwaters of different streams which flow into the río Uruguay in Misiones Province.

IDENTIFICATION KEY FOR SPECIES OF *BRYCONAMERICUS* FROM SOUTHERN SOUTH AMERICA

1 Premaxillary teeth of the outer row not aligned ..... *B. exodon*
- Premaxillary teeth of the outer row aligned 2
2 Wide lateral band 3
- Narrow lateral band 5
3 First four dentary teeth with similar size followed by other ones much smaller 4
- Six or seven dentary teeth decreasing in size anteroposteriorly ..... *B. agna*
4 Premaxillary and maxillary teeth expanded distally ..... *B. uporas* sp.n.
- Premaxillary and maxillary teeth not expanded distally ..... *B. thomasi*
5 Caudal peduncle length 18-23 % of SL, dorsal fin brownish ... *B. eigenmanni*
- Caudal peduncle length 11-18 % of SL, dorsal fin hyaline or with a dark distal area 6
6 Body depth 24.6-29.8 % of SL ..... *B. lambari*
- Body depth 31.5-40.7 % of SL 7
7 Anal-fin base 19.5-25.7 % of SL ..... *B. iheringi*
- Anal fin-base 28.0-33.7 % of SL ..... *B. sylvicola*

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Revue suisse de Zoologie 109 (1): 167-176; mars 2002

A contribution to the study of the genus *Centromerus* Dahl (Araneae: Linyphiidae) in caves of the Balkan Peninsula

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A contribution to the study of the genus *Centromerus* Dahl (Araneae: Linyphiidae) in caves of the Balkan Peninsula. - *Centromerus serbicus* Deltshev sp. n. is described from specimens previously attributed to *C.* pr. *dacicus*. The taxonomic relationships between *C. bulgarianus*, *C. dacicus* and *C. serbicus* sp. n. are discussed and new illustrations are presented. These are closely allied and strictly vicariant species forming a superspecies. *C. acutidentatus* Deltshev, sp. n. is described from caves in Serbia, Bulgaria and Macedonia. This species is closely related to *C. obenbergeri* Kratochvíl & Miller and to *C. gentilis* Dumitrescu & Georgescu. The hitherto unknown female from *C.obenbergeri* is described.

Key-words: Araneae – *Centromerus* – taxonomy – caves – Balkan Peninsula.

INTRODUCTION

Deltshev and Ćurčić (1997) analyzed the taxonomic and phylogenetic interrelationships between the spiders of the *C. europaeus* species group (i.e. *C. bulgarianus* Drensky, *C. subcaecus* Kulczyński, *C. dacicus* Dumitrescu & Georgescu) from caves of the Balkan Peninsula. A troglobitic spider found in the Zlotska Pećina Cave (Serbia) was first identified as *C.* prope *dacicus* and the study of additional material in comparison with material of *C. dacicus* later showed that the species is new to science. It is here discussed as *C. serbicus* sp. n. Another new species *C. acutidentatus* sp. n., which is closely related to *C. obenbergeri* Kratochvíl & Miller and *C. gentilis* Dumitrescu & Georgescu. was collected from the leaf litters and from caves of Serbia, Bulgaria and Macedonia. *Centromerus obenbergeri* is redescribed and the hitherto unknown female of this species is illustrated for the first time.

Abbreviations: Names of collectors are abbreviated as follow: R.N. Dimitrijević - RND; O.S. Karamata - OSK; L.R. Lučić - LRL; S.E. Makarov - SEM; A.M. Petrović - AMP; V.M. Pesić - VMP; S.V. Stancović - SVS; G.S. Stojanović - GSS; E.A. Stojkoska; V.T. Tomić - VTT; B.P.M. Ćurčić - BPMC; S.B. Ćurčić - SBĆ; N.B. Ćurčić - NBĆ; B. Petrov - BP.
All measurements are in mm.

Manuscript accepted 18.08.2001

DESCRIPTIONS (AND REDESCRIPTION)

Centromerus serbicus Deltshev sp. n. Figs 1, 2, 7, 8

Centromerus europaeus (Simon): Fage, 1931 (partim; misidentification):170-171; Drensky, 1936: 94; *C. subcaecus* (Kulczyński): Kratochvíl & Miller, 1938 (partim; misidentification): 109-111; Thaler & Hoefer, 1987: 390-393; *C.* prope *dacicus*: Deltshev & Ćurčić, 1997: 49-55, figs 2, 5, 8, 10: Deltshev *et al.*, 1997: 37P.

Material examined: YUGOSLAVIA: Zlotska Pećina Cave (Lazareva Pećina Cave), vill. Zlot, near Bor, Serbia, 1 ♂ holotype, 3 ♂, 30 ♀ paratypes, 21-23 November 1995, collected by R.N.D, S.E.M., L.R.L.; 2 ♂, 5 ♀ paratypes, 16-17 June 1996, coll. RND, OSK, SEM, VTT; 1 ♂, 16 ♀ paratypes, 26 October 1996, coll. RND, OSK, SEM, LRL; Vernjikica Cave, vill. Zlot near Bor, 1 ♀ paratype, 17 June 1996, 4 ♂, 16 ♀ paratypes, October 1996, coll. RND, OSK, SEM, VTT; Resavska Pećina Cave, near Despotovac, East Serbia, 2 ♂, 3 ♀, paratypes, 14 June 1996, coll. RND, OSK, SEM, VTT.

Depository: The collection of the Institute of Zoology, Faculty of Biology, University of Belgrade, Yugoslavia; 1 ♂ and 3 ♀ paratypes are deposited in the collection of the Muséum d'historie naturelle in Geneva, Switzerland.

Comparative material: *C. bulgarianus* (lectotype, deposited in the collection of Zoology, Sofia): Fig. 5 ; *C. dacicus*, Figs 3, 4, 6 (specimens from Pestua "E.A. Martel", 8 March 1960, deposited in the collection of Institut de Spéologie "E. Racovitza").

Etymology: The species name is derived from Serbia.

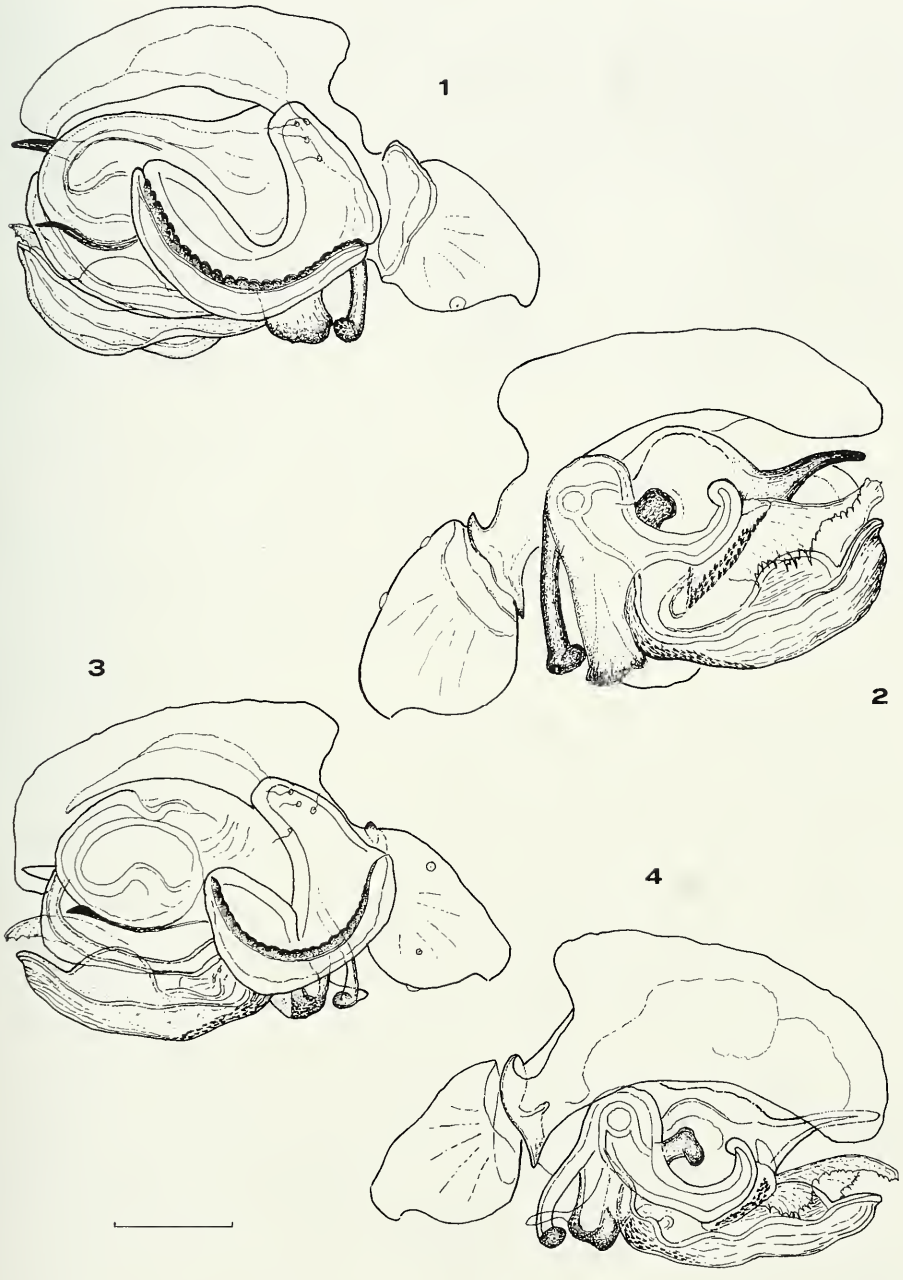
Diagnosis: *C. serbicus* sp. n. is a blind species, closely related to *C. bulgarianus* and *C. dacicus*, distinguished from them by the following differential features (figs 1-7): *C. serbicus* sp. n. is larger and possesses a larger palp; the embolic division is similar but the terminal apophysis is longer and larger (figs 5-7); the lamella (sensu Merret, 1963) appears to be similar to those of *C. bulgarianus* and *C. dacicus*, but differs in details (figs 1-4); females are almost indistinguishable, but there are differences in details of the epigyne.

Description: Male/female: Total length 1.8/2.16. Cephalothorax, length 0.79/.0.82, width 0.61/0.57; sternum, length 0.39/0.42, width 0.42/0.42; abdomen, length 0.97/1.26. Cephalothorax similar in both sexes, yellow to yellow brown. Abdomen grey to pale grey. Eyes completely absent. Chelicerae yellow brown, armed with 3 teeth on outer row and 3-4 denticles on inner row. Legs: IV-I-II-III. I: Fe. 1.15/1.26 , Pl+Ti. 1.40/1.40, Mt. 0.9/0.9, Ta. 0.61/0.57. Femora I with a prolateral spine in apical half. Tibiae I-III with 2 dorsal spines. Tibia IV with 1 dorsal spine. Metatarsi I-II with 1 small dorsal spine.

Male palp (figs 1, 2, 7). With a strong dorsal spine on patella. Cymbium with a postero-dorsal protuberance. Paracymbium large, with serrated inner margin; 3-4 short hairs near proximal end. Embolic membrane well - presented, with strongly serrated outer margin. Terminal apophysis lamellar. Lamella characteristically built, continuous with radix.

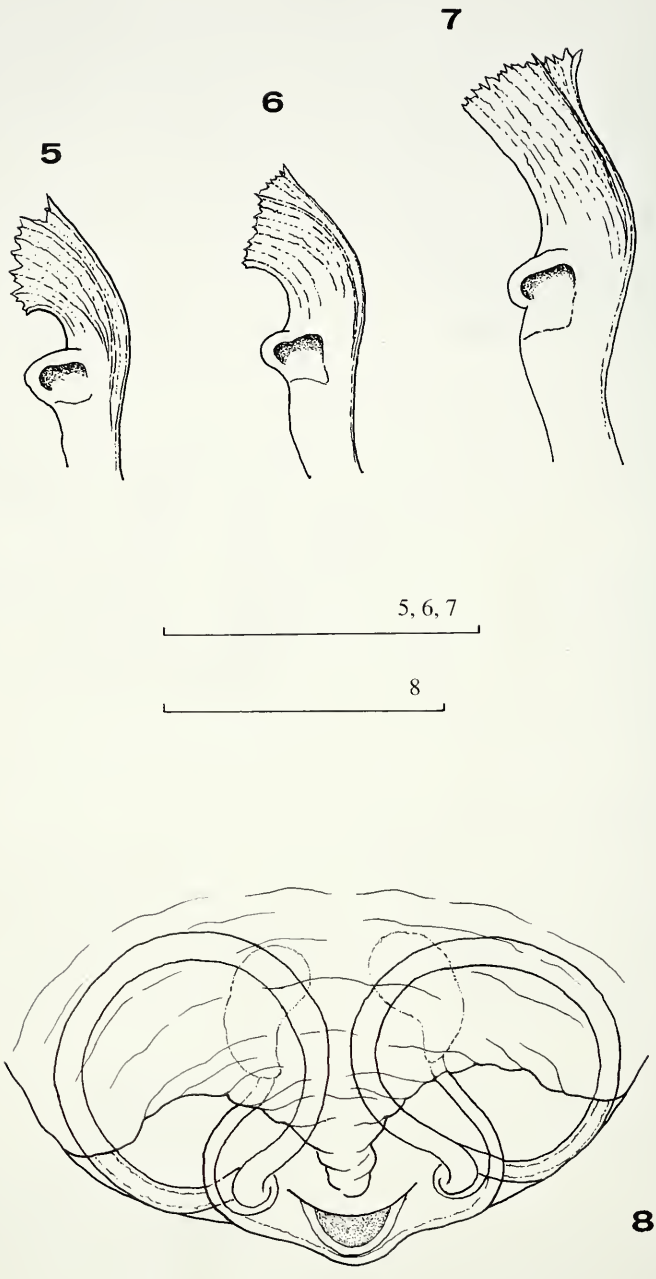
Epigyne presented on figure 8.

Affinities: *C. serbicus* sp. n., *C. bulgarianus* and *C. dacicus* are closely allied and strictly vicariant species forming a superspecies. They belong to the *europaens*-group of the genus *Centromerus* on the Balkan peninsula. All these taxa are similar, they have limited ranges and probably, represent the descendants of a common ancestor; it is assumed that this ancestral form is no longer present in the epigean fauna and that it has been replaced by an extant *Centromerus* (Deeleman-Reinhold, 1976, Deltshev & Ćurčić, 1997).



FIGS 1-4

1, *Centromerus serbicus* Deltshev sp. n., left male palp, external view; 2, ditto, internal view; 3, *C. dacicus* Dumitrescu & Georgescu, left male palp, external view; 4, ditto, internal view. Scale line 0.1 mm.



FIGS 5-8

5-7, terminal apophysis of *Centromerus bulgarianus* (Drensky) (5), *C. dacicus* Dumitrescu & Georgescu (6), *C. serbicus* Deltshev sp. n. (7); 8, *C. serbicus* Deltshev sp. n. vulva and epigyne, ventral view. Scale lines 0.1 mm.

Centromerus acutidentatus Deltshev sp. n. Figs 9-21

Centromerus obenbergeri (Kratochvíl & Miller): Ćurčić *et al.*, 1999 (misidentifucation): 7P.

Material examined: YUGOSLAVIA: Monastery Cave I (at the entrance in leaf litter), vill. Selacka near Minicevo, Serbia, 1 ♂ holotype, 4 ♀ paratypes, 15 November 1997 (coll. RND, OSK, VTT, SBĆ, NBĆ); Avala, Carpivev Best (leaf litter) 1 ♀ paratype, 21-24.09.1997 (coll. BPMC, SEM, LRL, VTT); MACEDONIA: Ubava Cave, Matka, klisura Treske, 1 ♂ paratype, 1 juv, 13 July 2000 (coll. SEM, VTT, SBĆ, GSS, EAS, SVS); BULGARIA: Sturshelitsa Cave, vill. Goleshevo, 1 ♀ paratype, 14 April 1993 (coll. BP); Gaber Reserve, Mt. Pianets, Kjustendil, 1 ♂ paratype, 06 April 2001 (coll. BP).

Depository: The holotype and 1 paratype (Monastery Cave I) are deposited in the collection of the Muséum d'historie naturelle in Geneva, Switzerland. The rest, 2 female paratypes from the same locality, as well as the material of Ubava Cave, Macedonia is in the collection of the Institute of Zoology, Faculty of Biology, University of Belgrade, Yugoslavia. The material from the Sturshelithsa Cave and Gaber Reserve, Bulgaria is in the collection of the Institute of Zoology, Sofia, Bulgaria.

Etymology: Latin : acutus = sharp; dentatus = dentate.The specific name refers to the sharp teeth on the paracymbium.

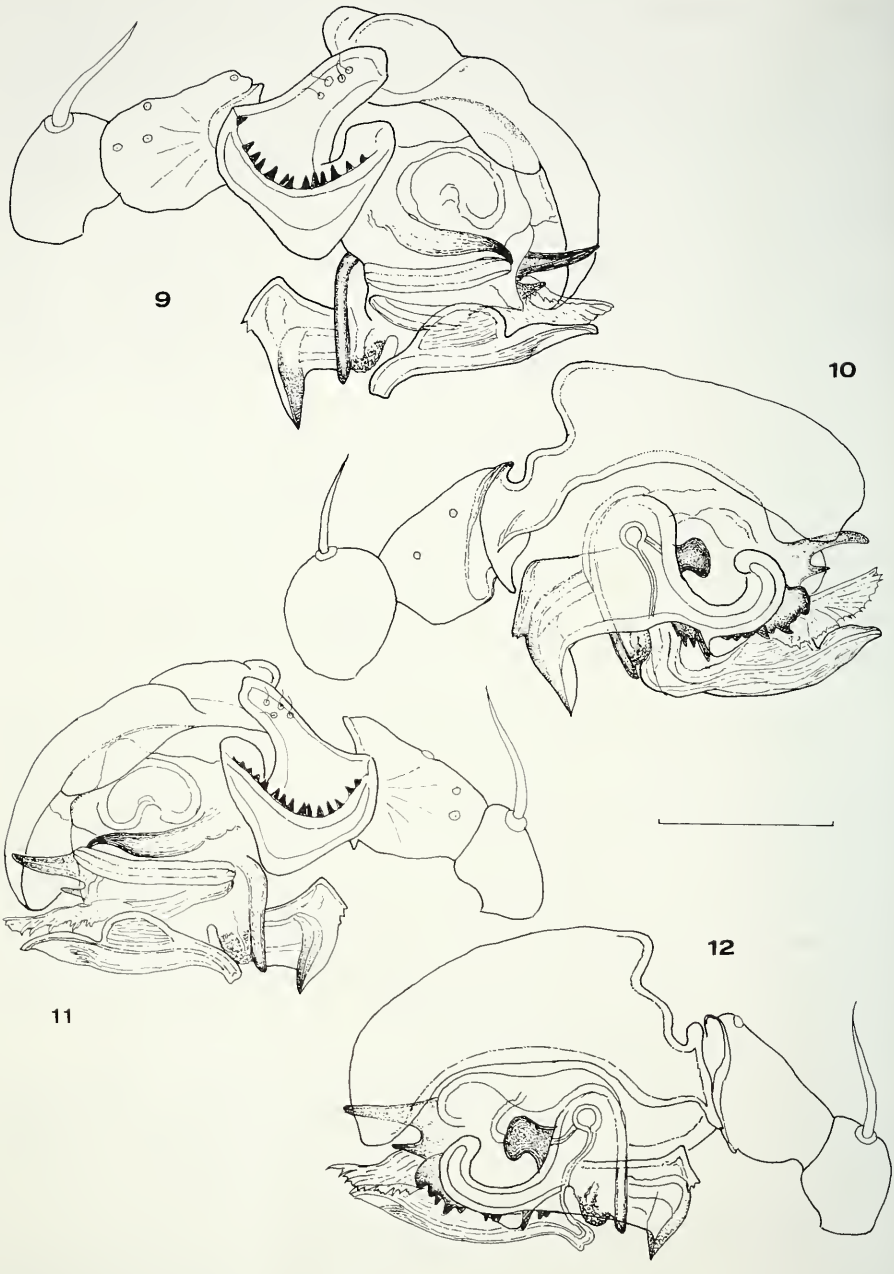
Diagnosis: C. *acutidentatus* sp. n. is clearly related to C. *gentilis* Dumitresco & Georgesco and to *C. obenbergeri* Kratochvíl & Miller known from the caves in Romania and Montenegro. The new species differs from them by the larger paracymbium armed with the bigger and sharper teeth, by a caharacteristic lamella with two denticles on its posterior border and by a longer terminal apophysis (figs 9-17). Females are very similar, but there are differences in details of the epigynes and vulvae (figs 18-21).

Description: Male/female: Total length 2.16/1.80. Cephalothorax, length 1.0/0.72, width 0.79/0.51; sternum, length 0.54/0.54, width 0.42/0.42; abdomen, length 1.08/1.08. Cephalothorax similar in both sexes, yellow to yellow brown. Abdomen grey to pale grey. Eyes surrounded by a narrow black area; anterior medians almost in contact with each other and *ca.* 0.75 diam. apart from the laterals; posterior medians *ca.* 1.25 diam. apart from each other and *ca.* 0.75 diam. from laterals. Chelicerae yellow brown, armed with 3 teeth on outer row and 4 denticles on inner row. Legs: IV-I-II-III. I: Fe. 0.9/0.72, Pl.+Ti. 1.07/1.07, Mt. 0.61/0.50, Ta. 0.54/0.42. Femora I with a prolateral spine in apical half. Tibiae I-III with 2 dorsal spines. Tibia IV with 1 dorsal spine. Metatarsi I-II with small 1 dorsal spine. Metatarsi I-III with a single trichobothrium.

Male palp (figs 9-17). A strong dorsal spine on patella. Cymbium with a postero-dorsal protuberance. Paracymbium large, with 13-16 well - developed and sharp teeth on inner margin; 4-5 short hairs near proximal end. Embolic membrane well - presented, with strongly serrated outer margin. Terminal apophysis lamellar. Lamella characteristically built, continuous with radix.

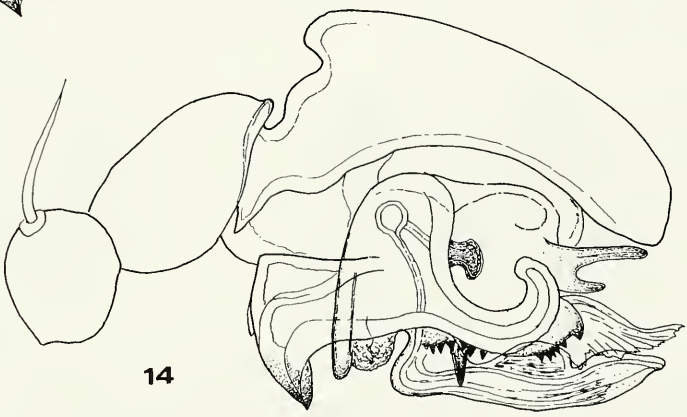
Epigyne and vulva presented on figures 18-21.

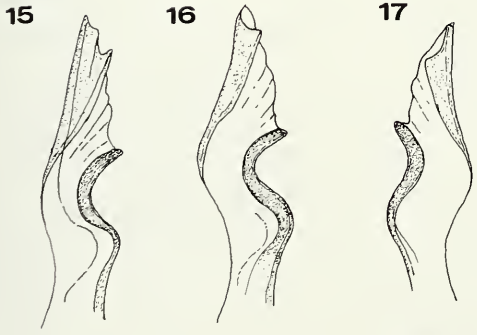
Affinities: *C. acutidentatus* sp. n., *C. gentilis* and *C. obenbergeri* are closely allied. They belong to the *sylvaticus*-group of the genus *Centromerus* on the Balkan peninsula. *C. obenbergeri* and *C. gentilis* are known only from caves, *C. acutidentatus* was collected in caves and from forest.



FIGS 9-12

9, *Centromerus acutidentatus* Deltshev sp. n., right male palp, external view; 10, ditto, internal view (specimen from Monastery Cave I, Serbia); 11, ditto left male palp, external view; 12, ditto, internal view (specimen from Gabra Reserve, Bulgaria). Scale line 0.2 mm.



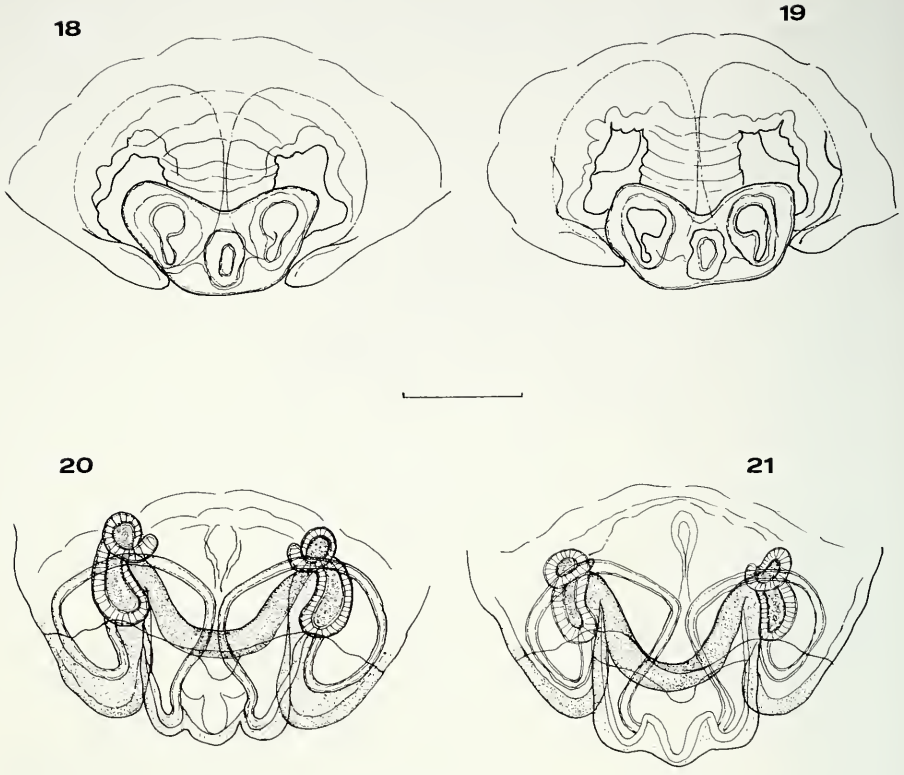


13, 14

15, 16, 17

FIGS 13-17

13, *Centromerus acutidentatus* Deltshev sp. n., right male palp external view; 14, ditto, internal view (specimen from Ubava Cave, Macedonia); 15, *C. acutidentatus* Deltshev sp. n., terminal apopysis (Monastery Cave I, Serbia); 16, ditto (Gabra Reserve, Bulgaria); ditto (Ubava Cave, Macedonia). Scale lines 2.0. mm.



Figs 18-21

18, 20, *Centromerus acutidentatus* Deltshev sp. n., epigyne and vulva, ventral (18) and dorsal (20) view (specimen from Monastery Cave I, Serbia); 19, 21, ditto (Gabra Reserve, Bulgaria). Scale line 0.1mm.

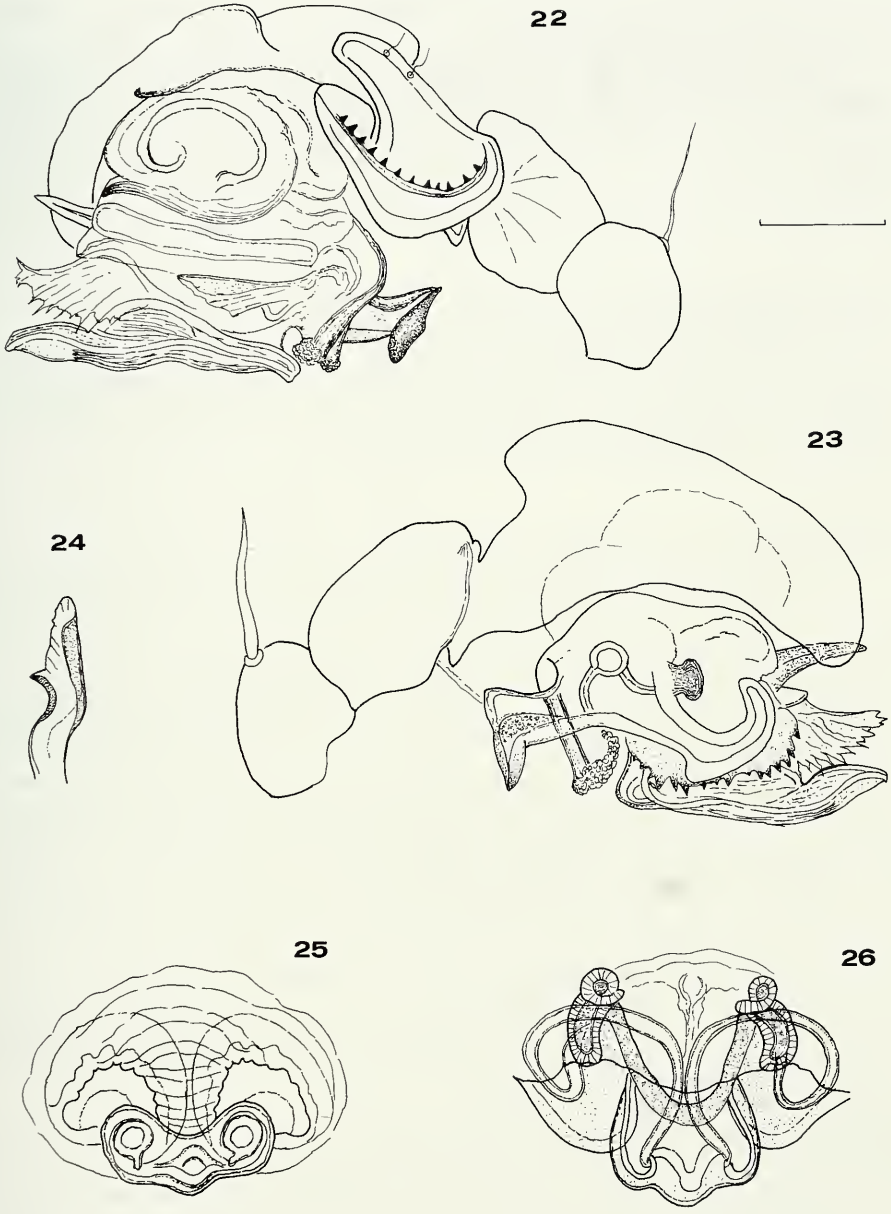
Centromerus obenbergeri Kratochvíl & Miller Figs 22-26

Centromerus subcaecus (Kulczyński): Kratochvíl, 1934 (misidentification): 188-189, fig. 6.; *C. obenbergeri*: Kratochvíl & Miller, 1938: 113.

Material examined: MONTENEGRO: Lipska Pečina cave, vill. Lipa, Cetinje, 1 ♂, 1 ♀, 8. September 2000 (coll. SBĆ, AMP, VMP).

Depository: The collection of the Muséum d'histoire naturelle in Geneva, Switzerland.

Description: Male/female: Total length 1.44/1.44. Cephalothorax, length 0.79/0.72, width 0.64/0.54; sternum, length 0.34/0.42, width 0.46/0.42; abdomen, length 0.72/0.9. Cephalothorax similar in both sexes, yellow to yellow brown. Abdomen grey to pale grey. Eyes, small and surrounded by a narrow black area; anterior medians almost in contact with each other and *ca.* 0.75 diam. apart from the laterals; posterior medians *ca.* 1.25 diam. apart from each other and *ca.* 0.75 diam. from laterals. Chelicerae yellow brown, armed with 3 teeth on outer row and 4 denticles on inner row. Legs: IV-I-II-III. I: Fe. 1.0/0.9, Pl.+Ti. 1.21/1.11, Mt. 0.82/0.72, Ta. 0.54/0.54. Femora I with a prolateral spine in apical half. Tibiae I-III with 2 dorsal



FIGS 22-26

22, *Centromerus obenbergeri* Kratochvíl & Miller, left male palp, external view; 23, ditto, internal view; 24, terminal apophysis; 25, epigyne, ventral view; 26, vulva, dorsal view. Scale line 0.1 mm (all figures).

spines. Tibia IV with 1 dorsal spine. Metatarsi I-II with 1 small dorsal spine. Metatarsi I-III with a single trichobothrium.

Male palp (figs 22-24). A strong dorsal spine on patella. Cymbium with a postero-dorsal protuberance. Paracymbium large, with 12 teeth on inner margin; 4 short hairs near proximal end. Embolic membrane well - presented, with strongly serrated outer margin. Terminal apophysis lamellar. Lamella characteristically built, continuous with radix.

Epigyne and vulva presented on figures 25, 26.

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We thank the following colleagues: R.N. Dimitrijević, L.R. Lučić, S.E. Makarov, O.S. Karamata, V.T. Tomić; S.B. Ćurčić, N.B. Ćurčić (Belgrade), B. Petrov (Sofia), G.S. Stojanović, E.A. Stojkoska, S.V. Stancović (Scopie), A.M. Petrović, V.M. Pesić (Podgorica) for presenting their materials.

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Revue suisse de Zoologie 109 (1): 177-187; mars 2002

Zwei Bythinini neu für Friaul-Julisch Venetien (Italien): *Gasparobythus kahleni* sp. n. und *Tychobythinus xambeui manfredi* ssp. n. (Coleoptera, Staphylinidae, Pselaphinae)

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Two Bythinini new to Italy: *Gasparobythus kahleni* sp. n. and *Tychobythinus xambeui manfredi* ssp. n. (Coleoptera, Staphylinidae, Pselaphinae). – *Gasparobythus kahleni* sp. n. is described from Friaul near to the borderline of Italy and Slovenia and is the second species of the genus. *Tychobythinus xambeui manfredi* ssp. n. is described from the riverbanks of the Tagliamento near to Udine. The main characters of *T. xambeui* (Guillebeau, 1888) are provided.

Key-words: Coleoptera - Staphylinidae - Pselaphinae - *Gasparobythus* - *Tychobythinus* - new species - north-eastern Italy.

EINLEITUNG

Besuchet (1985) hat basierend auf der Kombination von drei Merkmalspaaren (Fehlen bzw. Vorhandensein von basaler Halsschildfurche sowie einem marginalen Basalgrübchen und Kielchen auf den Flügeldecken) vier, wenige Arten umfassende Gattungen mit ausschließlich troglobionten Vertretern innerhalb des Bythinini-Subtribus Machaeritina unterschieden und in einem Bestimmungsschlüssel dargestellt (*Machaerites*, *Bathybythus*, *Prionobythus*, *Antrobythus*). Im Unterschied zu den anderen Gattungen des Subtribus Machaeritina ist diesen zumindest das Fehlen eines der oben genannten Positivmerkmale gemeinsam.

Aufgrund des Auftretens einer neuen Merkmalskombination wurde von Poggi (1992) erst vor wenigen Jahren mit der Typusart *Gasparobythus tergestinus* eine neue Gattung begründet. Diese ist durch das Fehlen der basalen Halsschildfurche bei gleichzeitigem Vorhandensein des marginalen Grübchens und Kielchens auf den Flügeldecken ausgezeichnet.

Während eine der zwei in der vorliegenden Arbeit behandelten Arten des Subtribus Machaeritina der umfangreichen Gattung *Tychobythinus* angehört, konnte die zweite Art der neuen Gattung *Gasparobythus* zugeordnet werden und ist somit erst die zweite Art dieses bislang nur aus Friaul-Julisch Venetien bekannten Taxons. Aufgrund dieser Sachlage wurde die Beschreibung der neuen Art ausführlicher gestaltet und mit einer Habitusabbildung sowie mit weiteren Detailansichten ergänzt. Auch hinsichtlich der *Tychobythinus*-Art erfolgt – aufgrund bislang ungenauer und fehlerhafter Angaben zu dieser Art – eine Kurzbeschreibung.

Manuskript angenommen 08.08.2001

Die Belegtiere beider Arten stammen von Manfred Kahlen (Hall in Tirol), dessen systematische, nach detaillierten tiergeografischen und ökologischen Gesichtspunkten ausgerichteten Aufsammlungen in den Südalpen bereits in den vergangenen Jahren und Jahrzehnten zu zahlreichen bemerkenswerten Nachweisen geführt haben und auf dessen Initiative die nunmehr vorliegenden Untersuchungen zurückgehen. In beiden Fällen wurden im Gebiet der Fundlokalitäten – u.a. auch unter Beisein des Autors – Nachsuchen betrieben, die jedoch nur hinsichtlich der neuen *Gasparobythus*-Art zu einem weiteren Fund durch Kahlen führten. In diesem Zusammenhang ist anzumerken, dass aufgrund ihrer versteckten Lebensweise Nachweise dieser Arten nur ausgesprochen schwer zu erbringen sind; so konnten von beiden Arten der Gattung *Gasparobythus* bis heute noch keine Weibchen gefunden werden. Die spärlichen Nachweise der zweiten im Folgenden behandelten Art der Gattung *Tychobythinus* gelangen bislang überhaupt nur in Sekundärlebensräumen, die eine autökologische Charakterisierung derzeit nicht zulassen.

MATERIAL

Das untersuchte Belegmaterial stammt aus folgenden Museen:
TLMF = Tiroler Landesmuseum Ferdinandeum, Innsbruck (Coll. Kahlen)
MHNG = Muséum d'histoire naturelle, Genève
MSNG = Museum civico di Storia naturale "G. Doria", Genova

Gasparobythus kahleni sp. n.

Holotypus (♂): Val. Clabocgnac bei Prepotto-Bodigoi, W Udine (46°04'N, 13°31'E), 150m, Bachgraben, Wurzelwerk in lehmigem Kies in Felsnischen, 5.5.1989, Manfred Kahlen leg. (TLMF). Paratypus (♂): Val. Nestadiuzza bei Prepotto-Bodigoi, W Udine (46°03'N, 13°30'E), 150m, Wurzelgesiebe, 3.5.1986, Manfred Kahlen leg. (TLMF).

Habitusansicht: Abb. 1.

Beschreibung: Länge: 1,08-1,14 mm; Färbung gelblich-rotbraun; Fühler, Maxillarpalpen und Beine gelbbraun; grobe Behaarung goldglänzend und aus ca. 0,06 mm langen Haaren zusammengesetzt; zusätzlich zur Grundbehaarung auf der Oberseite von Kopf, Halsschild, Flügeldecken und Hinterleib mit bis zu 0,25 mm langen, abstehenden Borsten, diese an ihrer Spitze mit einem abgesetzten dünnen Endteil.

Kopf: deutlich breiter (0,26-0,3 mm) als lang (0,22-0,23 mm); Stirnbreite (0,13-0,14 mm) ca. halb so groß wie die maximale Kopfbreite, diese nur wenig vor dem Hinterrand gelegen, sodass die Kopfform eine charakteristische, an Arten der Gattung *Decatocerus* erinnernde dreieckige Grundform erhält; Medianeindruck der Stirn mit vereinzelten oberflächlichen Punkten besetzt und glänzend, doppelt so lang wie breit und gegen den Vorderrand stärker vertieft; die Außenkanten der Stirn scharfkantig, auf einer Strecke von 0.05 mm subparallel verlaufend, danach kontinuierlich erweitert; über der Fühlereinlenkung mit jeweils einer kleinen, aber markanten Aufwölbung; Kopfoberseite beidseitig der Stirnfurche punktiert, gegen den Kopfhinterrand Punktierung oberflächlich; Scheitel mit breit abgeflachter Beule, die gegen die Stirnfurche, die tentorialen Grübchen und den schmalen jeweils von diesen

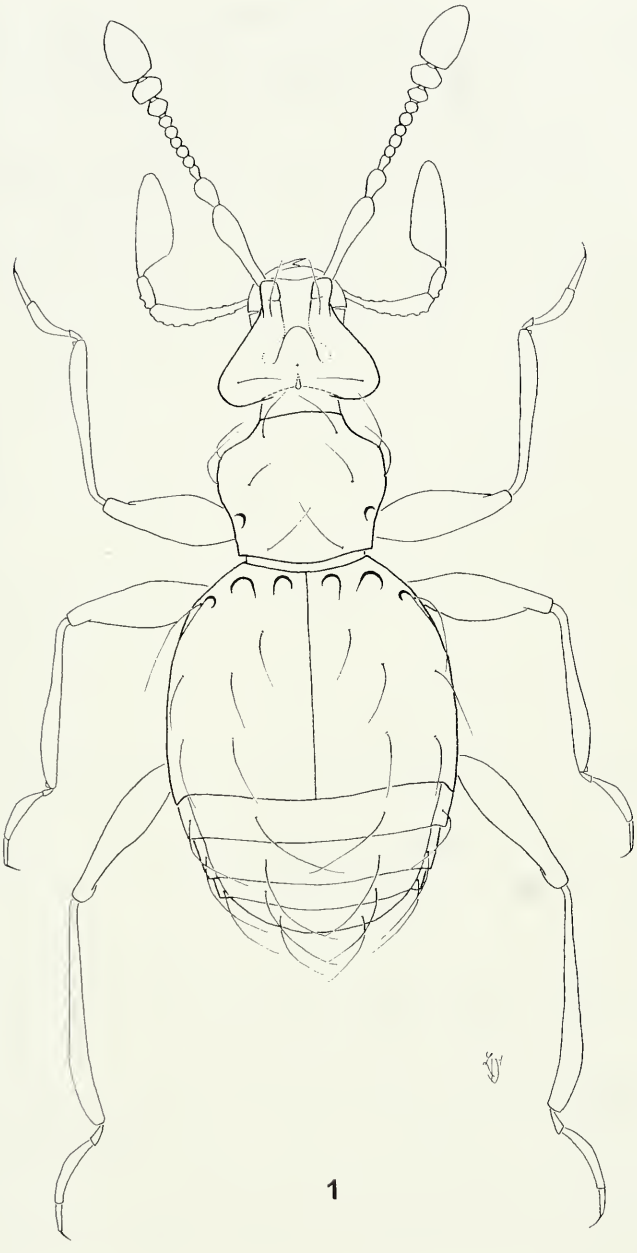


Abb. 1
Gasparobythus kahleni sp. n., Dorsalansicht. Maßstab: 0,5 mm.

zur Stirnfurche verlaufenden Rinnen steil abfällt; Hinterrand des Kopfes deutlich konkav, median mit kleinem Kielchen, das dorsal nach kurzem Verlauf verflacht und mit einem kleinen aber distinkten Körnchen endet; Augen fehlen; Schläfen mit etwas verdichteter nach hinten gegen den Hals gerichteter längerer Behaarung; Unterseite des Kopfes mit tiefer Querfurche, dahinter jeweils ein kurzes von den Seiten schräg nach vorne gegen die Mitte und bis zur Basis der Querfurche verlaufendes Kielchen; die Kielchen voneinander durch ein medianes, von hinten in die Querfurche mündendes Grübchen getrennt, zwischen den Kielchen beidseitig des medianen Grübchens einige kurze Borsten; unterseits vor dem Kopfhinterrand mit einer Querreihe von 10 langen, geschwungenen Borsten (Abb. 2); Maxillarpalpen (Abb. 4): 2. Glied (Länge: 0,15 mm) ventral mit 13 in schrägen Querreihen angeordneten Tuberkeln, 3. Gld. (Länge: 0,05-0,055 mm) in seiner Vorderhälfte ventral mit 3 Tuberkeln, 4. Gld. von normalem Aussehen (0,17-0,18 mm lang, max. Breite 0,065 mm); Fühler: so lang wie Kopf und Halsschild zusammen, 1. Glied 0,15 mm lang, ca. 4 mal so lang wie maximal breit, in seinem ersten Drittel bei dorsaler Aufsicht nur von halber Breite und apical keulenförmig verdickt, 2. Gld. so breit wie das vorhergehende, deutlich länger (0,055 mm) als breit (0,04 mm), 3. Gld. schmäler als das vorhergehende, geringfügig länger (0,03 mm) als breit (0,025 mm), 4. bis 8. Gld. etwa so breit wie das 3. Glied, etwa gleich lang wie breit, davon das 4. und 6. kaum merklich kleiner dimensioniert, 9., 10. und 11. Gld. breiter als das jeweils vorhergehende, 9. fast, 10. deutlich doppelt so breit wie lang, 11. Gld. um ein Viertel länger als breit.

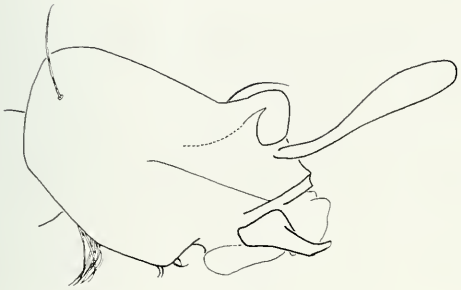
Halsschild: deutlich breiter (0,29-0,32 mm) als lang (0,25-0,27 mm); glatt und glänzend, nur an den Seiten mit sehr oberflächlicher Punktierung; in der Mitte auf einer breiten, sich vom Vorder- bis Hinterrand erstreckenden Fläche unbehaart und mit Spiegelglanz; Halsschildseiten gegen den Vorderrand in steilem und etwas kantigem Bogen verschmälert und vor dem Vorderrand seitlich eingeschnürt, gegen die Basis sanft und leicht konkav verengt; im hinteren Drittel der Halsschildseiten mit einem tiefen Grübchen; basale Halsschildfurche fehlt; Hinterrand gerandet und leicht doppelbuchtig.

Flügeldecken: miteinander verwachsen, zusammen deutlich breiter als lang (max. Breite: 0,46-0,52 mm, Nahtlänge: 0,36-0,41 mm); entlang der Naht glatt und nur verstreut punktiert, ansonsten besonders gegen die Seiten mit dichterer und gröberer Punktierung, wobei der Abstand der Punkte zueinander meist nicht kleiner als ihr Durchmesser ist; an der Flügeldeckenbasis mit 2 tiefen ovalen Grübchen, wovon das äußere etwas breiter ist; zwischen beiden mit kurzer Dorsalfalte; Humeralfalte fehlt; seitlich hinter dem äußeren Basalgrübchen mit einem kleineren, ebenso tiefen marginalen Grübchen, von dessen Außenrand ein Kielchen gegen den umgeschlagenen Hinterrand der Flügeldecken verläuft.

Hinterleib: glänzend und gegen die Seiten mit sehr verstreuter und nur angedeuteter körnchenartiger und flachgrubiger Punktierung.

Flügel: fehlen.

Beine: schlank, besonders der Metafemur von auffällig geringer Dicke (0,065 mm); Metatibia am apicalen Ende leicht nach innen gebogen.



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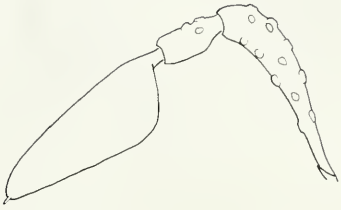

4

3

ABB. 2-4

Lateralansicht des Kopfes von *Gasparobythus kahleni* sp. n. (2) und *Tychobythinus xambeui manfredi* ssp. n. (3); Maxillarpalpen von *Gasparobythus kahleni* sp. n., Ventralansicht (4). Maßstab: 0,1 mm.

Aedeagus (Abb. 5): Innensackstrukturen asymmetrisch und schwach sklerotisiert; ihr zentraler Teil terminal breit abgerundet und mit horizontalen Zähnchenreihen versehen; laterale Teile in geschwungene abgerundete Spitzen auslaufend.

Weibchen: bisher unbekannt.

Artdiagnostische Merkmale: Die Art ist von *Gasparobythus tergestinus* Poggi nur genitalmorphologisch einwandfrei zu unterscheiden. Während die Innensackstrukturen von *G. tergestinus* aus einem weit vorgestreckten, spitz zulaufenden und mit zahlreichen Zähnchen versehenen zentralen Endteil bestehen, sind diese bei *G. kahleni* sp. n. durch einen breit abgerundeten, niemals so weit herausragenden und mit weniger Zähnchen besetzten zentralen Endteil ausgezeichnet. Äußerlich bestehen zwischen den Individuen beider Arten nur ausgesprochen geringe Merkmalsunterschiede, die aufgrund der geringen Zahl an bisher verfügbaren Individuen nicht mit Sicherheit als konstante Merkmale bewertet werden können. Die Kopfoberseite von *G. kaheni* sp. n. ist demnach ein wenig flacher und an ihren Hinterseiten geringfügig deutlicher punktiert als bei *G. tergestinus*.

Etymologie: Benannt zu Ehren von Manfred Kahlen (Hall in Tirol), der die Art gesammelt hat und sie mir bereits in Kenntnis ihres Status als neue Art zur Untersuchung und Beschreibung bereitgestellt hat. Kahlen gelang darüber hinaus mit dieser Art 1986 die Entdeckung des ersten bekannten Individuums dieser Gattung.

Ökologie: Die bisherigen Funde deuten auf eine Lebensweise im ausgedehnten unterirdischen Spaltensystem hin. Nachweise dieser Art stellen ein schwieriges Unterfangen dar, wobei die Gesiebeentnahme von tief in Spalten eindringenden Wurzeln bei entsprechend lockerem Substrat nach Kahlen (in lit.) die vermutlich geeignetste Sammelmethode sein dürfte. Die nah verwandte Art *G. tergestinus* konnte nach Poggi (1992) zwar bislang nur in Höhlen gefunden werden (Grotta Moser, Grotta Cosmini), ist jedoch vermutlich ebenso wie *G. kahleni* sp. n. ein typischer Spaltenbewohner. Das lockere und hohlraumreiche Substrat am Boden und in den Spalten der engen, nur auf ca. 20 Meter begehbaren Grotta Moser (Locus typicus von *G. tergestinus*) sprechen für diesen Sachverhalt.

Verbreitung: Die Fundlokalitäten sowohl von *G. tergestinus* als auch *G. kahleni* sp. n. liegen in unmittelbarer Nachbarschaft zueinander und sind auf der Verbreitungskarte daher jeweils nur als ein Punkt dargestellt (Abb. 9).

Tychobythinus xambeui manfredi ssp. n.

Holotypus (♂): Tagliamento-Ufer bei Cornino, NE Udine (46°13'N, 13°00'E), 160m, rechtsufriger Auwald, Hochwassergenist, 23.6.1996, Manfred Kahlen leg. (TLMF).

Die von Kahlen anlässlich der großen Hochwässer im Jahre 1996 durchgeführten Aufsammlungen entlang des Tagliamento führten zu dem sehr überraschenden Nachweis einer neuen Unterart von *Tychobythinus xambeui* (Guillebeau, 1888). Der aktuelle Nachweis liegt mehr als 500 km vom bisher östlichsten bekannten Vorkommen dieser Art in den Französischen Seealpen entfernt. Bisher waren von *Tychobythinus xambeui* nur wenige Funde aus Südostfrankreich aus den Regionen Drôme, Vaucluse, Alpes-Maritimes bekannt (Jeannel, 1950; Poggi, 1977). Die Art wurde basierend auf einem weiblichen Exemplar von den Ufern der Rubion bei Montélimar (Drôme) beschrieben (Guillebeau, 1888; vgl. auch Ganglbauer, 1895). Jeannel (1950) konnte erstmals ein Männchen dieser Art untersuchen, wobei seine Ausführungen jedoch ungenau und fehlerhaft sind. Aufgrund des schlechten Präparationszustandes des Aedeagus des einzigen von Jeannel untersuchten Exemplars ist darüber hinaus auch die Beschreibung des männlichen Geschlechtsapparates gerade hinsichtlich seiner besonderen Auszeichnungen unvollständig geblieben. Da eine Identifizierung der Art anhand der bisherigen Beschreibungen daher nahezu unmöglich ist, werden – neben den genitalmorphologischen Unterscheidungsmöglichkeiten beider Unterarten – auch die wichtigsten Merkmale der Art nochmals zusammenfassend dargestellt. Für die nachstehende Kurzbeschreibung standen dem Autor neben dem männlichen Individuum vom Tagliamento noch drei weitere von Besuchet kontrollierte Belege aus Südostfrankreich (♀: "Inond. Rhône, Avignon II, Ch. Fagniez", ♂: "Drôme"; ♂: "In. Loup, A.M. X.53", alle Coll. MHNG) sowie drei von Poggi determinierte Individuen der nahe verwandten süditalienischen Art *Tychobythinus gularis* (Dodero, 1919) (♂ & ♀: "Puglia, Gioia del Colle: Grotta della Chiesa di M. Sannace, 24.2.1990, Angelini leg.", ♂: "Basilicata, Oasi WWF Lago Pantano di Pignola, 14.-31.7.1991, Angelini leg.", alle Coll. MSNG) zur Verfügung.

Beschreibung: Länge: 1,3-1,4 mm; Körper rotbraun; Flügeldecken etwas heller gefärbt; Behaarung normal.

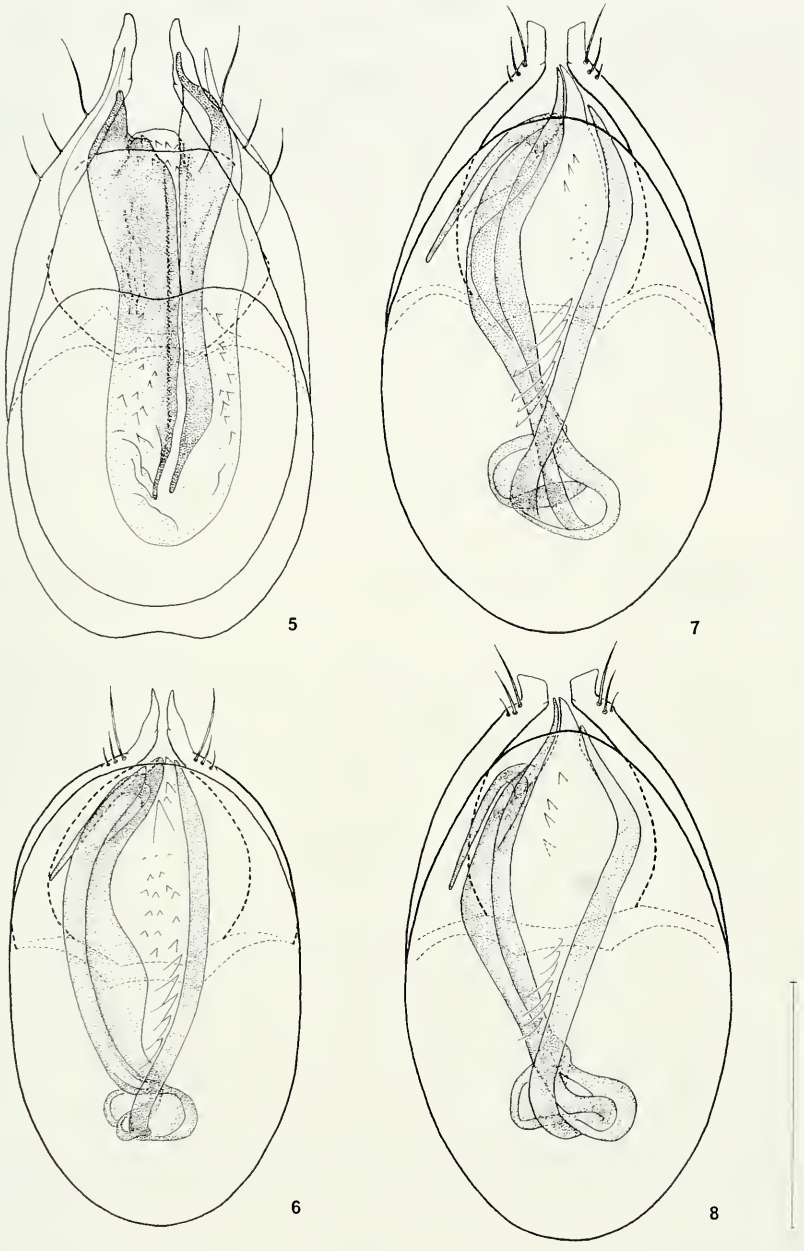

ABB. 5-8
Dorsalansicht des Aedeagus von *Gasparobythus kahleni* sp. n. (5), *Tychobythinus gularis* (Dodero) (6), *T. xambeui manfredi* ssp. n. (7) und *T. xambeui xambeui* (Guillebeau) (8). Maßstab: 0,1 mm.

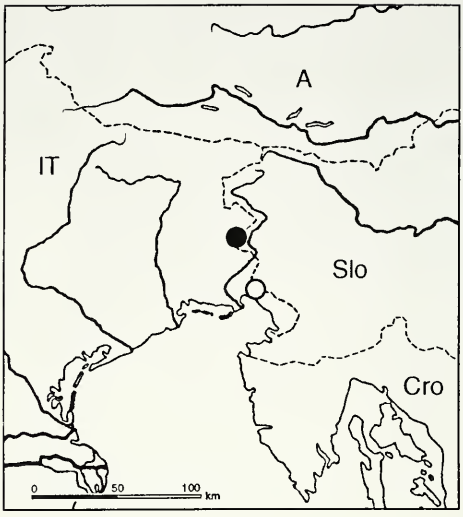

ABB. 9
Bisher bekannte Fundlokalitäten von *Gasparobythus kahleni* sp. n. (Punkt) und *G. tergestinus* Poggi (Kreis).

Kopf: ein Viertel breiter als lang, stark und grob punktiert; der tiefe und breite Medianeindruck der Stirn hingegen größtenteils glatt und glänzend; Stirn halb so breit wie der Kopf über den Augen und auf einer Strecke von ca. einem Drittel der Kopflänge scharfkantig und parallel zueinander nach hinten verlaufend, Kopf danach gegen die Augen erweitert; Augen bei den untersuchten Männchen aus 5-7 nicht immer zur Gänze pigmentierten Ommatidien bestehend (nach Jeannel bis ca. 20 Ommatidien!); Weibchen mit normal ausgebildeten Augen (nach Guillebeau und Jeannel hingegen microphthalm!); Kopfunterseite der Männchen mit einer nach vorne gebogenen, die ganze Breite der Kopfunterseite einnehmenden Lamelle; diese an ihren Seiten halbkreisförmig ausgeschnitten und median mit einem dreikieligen nach hinten verlängerten Teil; Vorderteil der Lamelle median flach ausgerandet und in der Mitte mit einem nach vorne gerichteten Vorsprung auf dem ein Trichombüschel entspringt (Abb. 3); Maxillarpalpen: 2. Glied ventral mit 13 kleinen Tuberkeln, die sich größtenteils im stark erweiterten distalen Drittel befinden, an der Außenseite beim Männchen mit deutlichem eckigen Vorsprung und auf der Innenseite ventrolateral mit oberflächlicher Eindellung, 3. Gld. mit 3-4 Tuberkeln, 4. Gld. von der Länge des Kopfes und von normalem Aussehen; Fühler: lang und schlank, deutlich länger als Kopf und Halsschild zusammen. 1. Fühlerglied ca. 3,5 mal so lang wie breit, in seinem ersten Drittel kaum schmäler, 2. Gld. so breit wie das vorhergehende, deutlich länger als breit, 3. Gld. schmäler als das vorhergehende, ebenfalls länger als breit, 4. bis 8. Gld. etwa so breit wie das 3. Glied und etwa gleich lang wie breit.

Halsschild: größtenteils glatt und glänzend; an den Seiten mit wenigen oberflächlichen Punkten; zwischen Hinterrand und der basaler Halsschildfurche hingegen mit sehr deutlicher, dichter und grober Punktierung.

ABB. 10

Bisher bekannte Verbreitung von *Tychobythinus xambeui xambeui* (Guillebeau) (Punkte), *T. xambeui manfredi* ssp. n. (Kreis mit Punkt) und *T. gularis* (Dodero) (Quadrate). Die Nachweise von *T. gularis* stammen aus Poggi (1994).

Flügeldecken: nicht miteinander verwachsen; nur um ca. 1/10 breiter als lang; mit grober und tiefer Punktierung, der Abstand der Punkte zueinander ca. 2-3 mal so groß wie ihr Durchmesser.

Hinterleib: glatt und glänzend.

Flügel: vorhanden.

Beine: auffallend schlank; Metatibia im apicalen Drittel leicht nach innen gebogen.

Aedeagus: Die asymmetrischen Innensackstrukturen sind durch einen charakteristischen zurückgebogenen Sklerit ausgezeichnet. Die zwei Unterarten unterscheiden sich in der Ausprägung der Innensackstrukturen und Parameren sowie in der Größe des Aedeagus (Abb. 7, 8). Die Paramerenenden sind bei *T. xambeui manfredi* ssp. n. demnach schmäler und länger als bei *T. xambeui xambeui*, die terminale Spitze des linken Sklerites ist im Unterschied zur Nominatunterart nach dem zurückgebogenen Skleritast weniger stark verlängert und der rechte Sklerit ist nicht winkelig gebogen. Der Aedeagus von *T. xambeui manfredi* ssp. n. ist darüber hinaus größer als der von *T. xambeui* s. str.

Verwandtschaftsverhältnisse: Im Grundbauplan des Aedeagus bestehen auffällige Übereinstimmungen mit der süditalienischen, bisher in ihren verwandtschaftlichen Verhältnissen vermeintlich isoliert stehenden *T. gularis* (Abb. 6). Alle drei Taxa sind durch einen charakteristischen zurückgebogenen Sklerit ausgezeichnet. Unterschiede bestehen hinsichtlich der Parameren und den Innensackproportionen. Während bei *T. xambeui* s. str. der linke Sklerit der Innensackstrukturen nach seinem zurückgebogenen Ast stark verlängert und spitz ist, ist dieser Teil bei *T. xambeui manfredi* ssp. n. zwar ebenso spitz aber deutlich kürzer. Bei *T. gularis* ist dieser Abschnitt nur mehr sehr undeutlich als abgerundeter Fortsatz erkennbar. Der rechte Sklerit von *T. xambeui* s. str. ist im Gegensatz zu *T. xambeui manfredi* ssp. n. gewinkelt, bei letzterer Unterart flacher gebogen, der von *T. gularis* ist deutlich gestreckter. Auch hinsichtlich der Parameren besteht eine Abfolge von breiten, schräg abgestutzten (*T. xambeui* s. str.), schmalen und langen schräg abgestutzten (*T. xambeui manfredi* ssp. n.) sowie spitz ausgezogenen Enden (*T. gularis*). Die große Ähnlichkeit der sekundären Geschlechtsmerkmale auf der Kopfunterseite der Männchen beider Arten kann als weiteres Indiz für die nahe Verwandtschaft von *T. xambeui* und *T. gularis* gedeutet werden (vgl. Abb. 1 in Karaman, 1959; Abb. 3).

Etymologie: Benannt nach Manfred Kahlen (Hall in Tirol), der die Art gesammelt und für das Studium zur Verfügung gestellt hat.

Angaben zur Autökologie von *T. xambeui* fehlen. Da beide Unterarten bislang nur in Hochwassergenisten gefunden wurde, bleibt der Primärlebensraum vorerst ungeklärt. Ihre nahe Verwandtschaft mit *T. gularis*, der mit einer Ausnahme (Lichtfang!) bisher ausschließlich in Höhlen gefunden wurde, legt die Vermutung nahe, dass auch von *T. xambeui* s. str. und *T. xambeui manfredi* ssp. n. – zumindest temporär – ähnliche Lebensräume besiedelt werden könnten. Die Kleinäugigkeit bei *Tychobythinus* spricht in erster Linie für eine verborgene Lebensweise im Spaltensystem des Bodens. Erst weitere gezielte Nachsuchen können zur Klärung des Primärlebensraumes von *T. xambeui* s. str. und *T. xambeui manfredi* ssp. n. sowie ihrer Verbreitung führen. Da zwischen den bekannten Vorkommen dieser Taxa weite Distanzen liegen (vgl. Abb. 10), ist auch die Möglichkeit des Auftretens weiterer Arten aus dieser Verwandtschaftsgruppe nicht auszuschließen.

DANKSAGUNG

Für kritische Anmerkungen und die Möglichkeit des Studiums von Belegmaterial am Muséum d'histoire naturelle in Genf ergeht mein besonderer Dank and Dr. Claude Besuchet. Dr. Roberto Poggi danke ich für die zuvorkommende Unterstützung und für wichtige Anregungen während meines Aufenthaltes am Museo civico di Storia naturale "G. Doria" in Genua. Für die gemeinsamen Exkursionen, die vielen Sammelhinweise und mitgeteilten Erfahrungen sowie für das bereitgestellte Material bin ich Herrn Manfred Kahlen (Hall in Tirol) zu großem Dank verpflichtet.

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Nuovi generi di Aleocharinae del Borneo (Coleoptera, Staphylinidae)*

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New genera of Aleocharinae from Borneo (Coleoptera, Staphylinidae). - Twenty-three genera and 35 species are described as new. The genera are distributed in 11 tribes. Hypocyphtini: *Akanthoystera* n. gen. (4 new species); Gyrophaenini: *Mesophaena* n. gen. (1 n. sp.); Homalotini: *Psephothetemusa* n. gen. (2 n. spp.), *Aistenthusa* n. gen. (4 n. spp.), *Metechonica* n. gen. (2 n. spp.), *Megaparaglossa* n. gen. (1 n. sp.), *Apatelomixidota* n. gen. (3 n. spp.), *Episkilepta* n. gen. (1 n. sp.); Diestotini: *Anamignusa* n. gen. (1 n. sp.); Bolitocharini: *Antithetusa* n. gen. (1 n. sp.), *Panbrachyna* n. gen. (1 n. sp.); Falagriini: *Borneopora* n. gen. (1 n. sp.); Athetini: *Planadota* n. gen. for *Atheta borneensis* Cameron, *Paranomusa* n. gen. (1 n. sp.), *Dikraspedella* n. sp. (2 n. spp.), *Trigonoglossa* n. gen. (1 n. sp.), *Serikasomina* n. gen. (3 n. spp.), *Ektasitrachela* n. gen. (1 n. sp.); Thamiaraeini: *Diabainella* n. gen. (1 n. sp.); Lomechusini: *Borneozyras* n. gen. (1 n. sp.); Hoplandriini: *Borneusa* n. gen. (1 n. sp.); Oxypodini: *Apatelieida* n. gen. for *Neosilusa stricticollis* Cameron, *Syntemusa* n. gen. (2 n. spp.). New combinations are proposed for two species: *Atheta borneensis* Cameron and *Neosilusa stricticollis* Cameron. Keys to new genera and species are provided. Each new genus and species is described and illustrated.

Key-words: Coleoptera - Staphylinidae - Aleocharinae - new genera and species - taxonomy - Borneo.

INTRODUZIONE

Le accurate e ripetute ricerche effettuate sul Monte Kinabalu (Borneo, Sabah) nel corso di spedizioni zoologiche del Dr. Aleš Smetana del "Centre for Land and Biological Resources Research" di Ottawa, del Dr. Daniel Burckhardt e del Dr. Ivan Löbl, entrambi del Museo di Storia Naturale di Ginevra, hanno riportato per la conservazione in questo Museo, un importantissimo, abbondante e talvolta inatteso materiale di Aleocharinae. Affidatomi in esame, mi ha permesso di riconoscere come nuovi per la Scienza ben 23 generi. La loro descrizione è lo scopo del presente lavoro.

---

* 164° Contributo alla conoscenza delle Aleocharinae.
Manoscritto accettato il 26.03.2001

Il sospetto che anche in materiale di Aleocharinae diverso dal termitofilo, questo già studiato e pubblicato da Kistner tra il 1969 e il 1976 (vedi bibliografia in Hammond, 1984), fosse possibile scoprire nuovi generi per la Scienza, mi venne allorché esaminai i tipi di *Leptusa borneensis* Cameron, 1933, da me riconosciuta appartenere al nuovo genere *Mimopisalia* Pace, 1984. E' seguito, nel corso dell'esame di tipi di altre specie di Aleocharinae del Borneo, il riconoscimento e la pubblicazione del nuovo genere *Borneoxenia* Pace, 1993, per *Atheta (Acrotona) mjoebergi* Cameron, 1928. Il fatto che Cameron non abbia riconosciuto i nuovi generi, è che questo autore, in presenza di esemplari di taglia troppo ridotta, non procedeva all'esame dei caratteri generici e si affidava al solo aspetto dell'habitus. Purtroppo le convergenze morfologiche relative a questo rendono ingannevole la comprensione di ciò che si ha sotto gli obiettivi del microscopio. E' questo anche il caso della specie *Neosilusa stricticollis* Cameron, 1943, che non solo va attribuita a nuovo genere, ma anche a tribù differente (da Homalotini a Oxypodini).

Anche Sawada (1980) si era reso conto che alcune specie di Aleocharinae del Borneo descritte da Cameron e altri autori, non appartenevano al genere loro attribuito e talvolta andavano assegnati a generi inediti.

Gli olotipi delle nuove specie sono conservati nel Museo di Storia Naturale di Ginevra (MHNG). Due olotipi provenienti dalle raccolte di Guillaume de Rougemont e Assing sono conservati nel Museo Regionale di Scienze Naturali di Torino (MRSN). Paratipi si conservano nei medesimi Musei e in collezione V. Assing, Hannover.

METODO

Kraatz (1856, 1857) fu tra i primi stafilinidologi che compresero l'importanza dell'esame delle parti boccali anche per le specie della sottofamiglia Aleocharinae, al fine di individuare o delimitare i generi. Se l'habitus spesso uniforme, indurrebbe a credere a una uniformità di nicchie ecologiche, ci si trova invece di fronte a Stafilinidi che occupano un gran numero di nicchie ecologiche differenti, anche non note. Si trovano specie fungicole, ripicole, cacciatrici di larve di Ditteri o di Coleotteri. Pertanto l'anatomia delle parti boccali è soggetta a differenziazioni morfologiche importanti, secondo la nicchia ecologica occupata. La forma della ligula e parti annesse pertanto assumono un'importanza basilare al fine del riconoscimento dei vari generi. Nel presente lavoro però, nel delineare i generi, non sono stati trascurati i minuti caratteri dell'habitus o il tipo di edeago e di spermateca. Questi due organi presentano caratteri tali da essere decisivi nel delimitare i generi, quando si è in presenza di possibili convergenze morfologiche delle parti boccali o dell'habitus.

Di ogni genere qui descritto si dà una breve diagnosi e occasionalmente una chiave dei generi affini. Per i generi politipici si dà una chiave delle specie.

Tribù HYPOCYPHTINI Laporte, 1835 (= Oligotini)

Akanthoystera gen. n. Figg. 1-19

Diagnosi. Per le antenne di 10 antennomeri (uno vestigiale sta alla base del primo antennomero), il corpo minuto e fusiforme, il nuovo genere appare affine al

genere *Oligota* Mannerheim, 1831. Tuttavia per la presenza di formula tarsale 4-4-5-, invece di 4-4-4, va attribuito provvisoriamente a questa tribù.

Descrizione. Taglia corporea e habitus di molte specie del genere *Oligota* Mannerheim; antenne di 10 antennomeri, uno vestigiale supplementare sta alla base; antennomeri 4 a 9 trasversi, fig. 10; tempie robustamente marginate; collo stretto; palpi labiali di 2 articoli poco allungati; ligula intera e lunga, fig. 6; palpi mascellari di 4 articoli, di cui il terzo assai lungo e stretto, fig. 7; mento trapezoidale, con margine anteriore incavato, fig. 5; mesosterno carenato alla base; processo mesosternale acuto; mesocoxe contigue tra loro; addome fortemente ristretto posteriormente e ornato di robuste setole lunghe; formula tarsale 4-4-5; primo tarsomero posteriore lungo quanto i due tarsomeri seguenti riuniti; edeago fortemente strozzato a metà, figg. 2-3, 11-12, 14-15 e 18-19; bulbo distale della spermateca con appendice apicale ricurva, figg. 4, 9 e 16.

Tipo del genere. *Akanthoystera smetanai* sp. n.

Etimologia. Il nome femminile del nuovo genere significa "Irta posteriormente".

Comparazioni. Il nuovo genere si distingue per i caratteri dati nella seguente chiave.

1. Formula tarsale 4-4-4; ligula divisa in due lobi; mesocoxe separate ..... *Oligota* Mannerheim, 1831; *Liophaena* Sharp,1880; *Nematoscelis* Wollaston, 1867
- Formula tarsale 4-4-5; ligula intera; mesocoxe contigue *Akanthoystera* gen. n.

Akanthoystera smetanai sp. n. Figg. 1-7

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu N.P., summit tr. Pondok Lowii, 2300-2400 m, 28.IV.1987, A. Smetana leg. (MHNG).

Paratypi: 1 ♀, stessa provenienza; 4 es., Borneo, Sabah, Mt. Kinabalu N.P., Poring Hot Springs, 500 m, 7.V.1987, Burckhardt & Löbl leg.; 1 es., Borneo, Sabah, Mt. Kinabalu N.P., Poring Hot Springs, 500 m, 11.V.1987, Burckhardt & Löbl leg.; 2 es., Borneo, Sabah, Mt. Kinabalu N.P., Poring Hot Springs, 550-600 m, 9.V.1987, Burckhardt & Löbl leg.

Descrizione. Lungh. 1,4 mm. Corpo lucido e rossiccio con elitre e una fascia addominale brune; antenne giallo-brune con i tre antennomeri basali giallo-rossicci; zampe gialle. Non è presente reticolazione sulla superficie corporea. La granulosità del capo è distinta, quella del pronoto e delle elitre è saliente. Addome coperto di rughe longitudinali. Edeago figg 2-3, spermateca fig. 4.

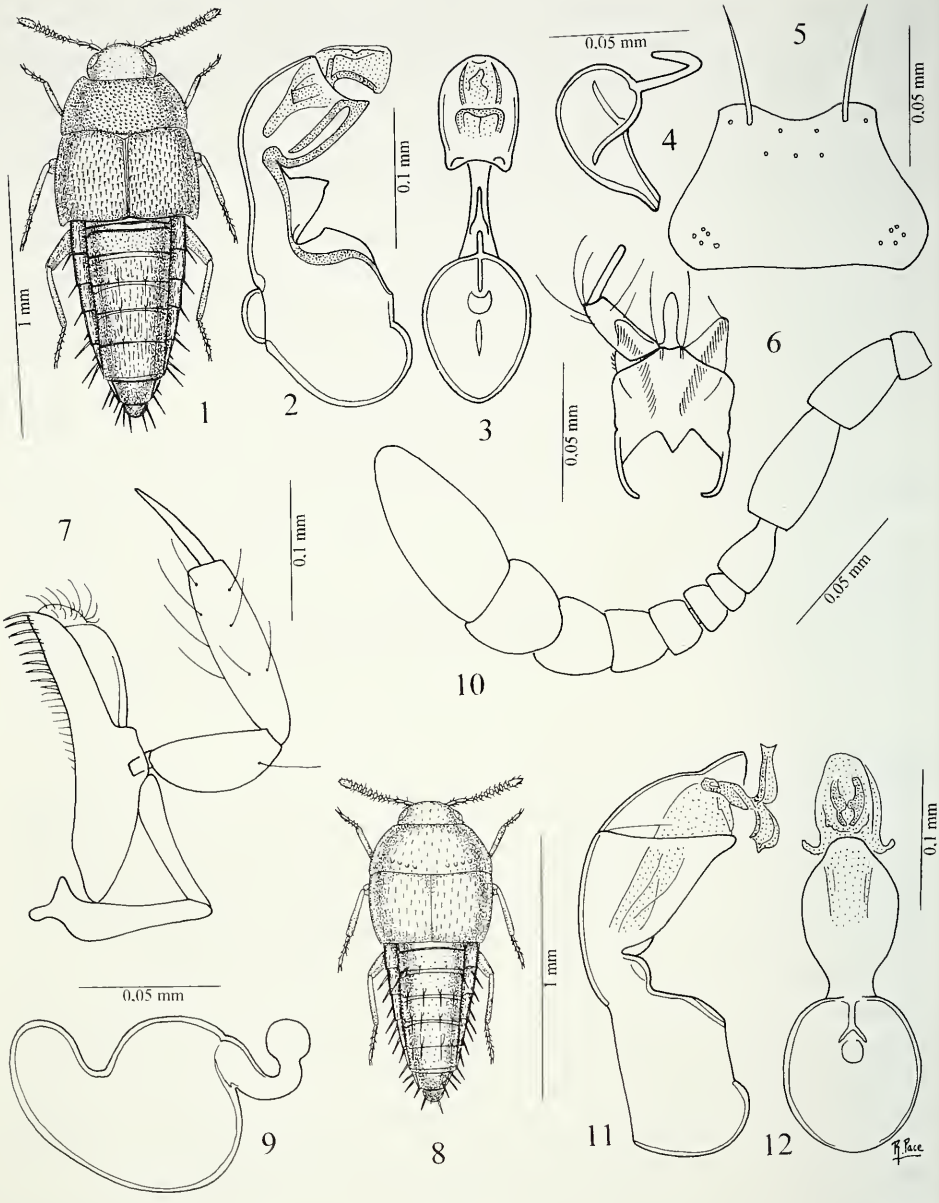
Etimologia. Specie dedicata a uno dei suoi raccoglitori, il Dr. Aleš Smetana del "Centre for Land and Biological Resources Research" di Ottawa.

Akanthoystera punctum sp. n. Figg. 8-12

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu N.P., Poring Hot Springs, 510 m, 30.VIII.1988, A. Smetana leg. (MHNG).

Paratypus: 1 ♀, stessa provenienza.

Descrizione. Lungh. 1,1 mm. Corpo lucido e giallo-rossiccio, con elitre rossicce e i quattro uriti basali bruno-rossicci; antenne giallo-brune con i tre anten-



FIGG. 1-12

Habitus, edeago in visione laterale e ventrale, spermateca, mento, labio con palpo labiale, maxilla con palpo mascellare e antenna. 1-7: *Acanthoystera smetanai* gen. n., sp. n.; 8-12: *Acanthoystera punctum* gen. n., sp. n.

nomeri basali gialli; zampe gialle. La reticolazione del capo è assente, quella del pronoto e delle elitre è estremamente superficiale. L'addome mostra dei granuli allungati. Il capo è privo di punteggiatura o di granulosità. Sul pronoto sono presenti quattro grossi granuli a ciascun lato della base: sul resto del pronoto i granuli sono fini. La granulosità delle elitre è molto superficiale e fine, L'addome mostra granuli allungati. Spermateca fig. 9, antenna fig. 10, edeago figg. 11-12.

ETIMOLOGIA. La nuova specie, prende nome di *punctum* (=punto), perché presenta un corpo piccolissimo, simile alla forma di un punto.

Akanthoystera kinabaluensis sp. n. Figg. 13-16

Holotypus ♀, Borneo, Sabah, Mt. Kinabalu N.P., 1550 m, 29.IV.1987, Burckhardt & Löbl leg. (MHNG).

Paratypi: 6 es., stessa provenienza, ma 27.IV.1987; 5 es., Borneo, Sabah, Mt. Kinabalu N.P., Poring Hot Springs, nr. Bat Cave, 600 m, 10.V.1987, Burckhardt & Löbl leg.

DESCRIZIONE. Lungh. 1,3 mm. Corpo lucido e rossiccio; antenne rossicce con i tre antennomeri basali gialli; zampe gialle. Il corpo non è reticolato. Il capo è privo di punteggiatura. La granulosità del pronoto e delle elitre è grossolana e fitta e sulle elitre in più è allungata, come quella dell'addome. Edeago figg. 14-15, spermateca fig. 16.

Akanthoystera minima sp. n. Figg. 17-19

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu N.P., Poring Hot Springs, 500 m, 11.V.1987, Burckhardt & Löbl leg. (MHNG).

DESCRIZIONE. Lungh. 1,1 mm. Corpo lucido e giallo-rossiccio, con elitre e addome giallo-bruni; antenne di un giallo sporco alla base, resto delle antenne perduto. La reticolazione del capo è assente, quella del pronoto e delle elitre è estremamente superficiale. La punteggiatura del capo è molto svanita. La granulosità del pronoto è fine e saliente sulla metà posteriore e superficiale sull'anteriore, quella delle elitre è saliente. Una rugosità allungata copre gli uroterghi. Edeago figg. 18-19.

COMPARAZIONI. Chiave delle specie del nuovo genere *Akanthoystera.*

1 Pronoto coperto di granulosità forte e distribuita su tutta la sua superficie . . . 2
- Pronoto coperto di granulosità fine: solo alcuni granuli posteriori sono forti . 3
2 Corpo uniformemente rossiccio; edeago senza lamina ventrale, con uno spigolo ottuso al suo posto; appendice del bulbo distale della spermateca robusto. Lungh. 1,3 mm. M. Kinabalu . . . . . *A. kinabaluensis* sp. n.
- Corpo rossiccio, con elitre e una fascia addominale brune; edeago con lamina ventrale; appendice del bulbo distale della spermateca esile. Lungh. 1,4 mm. M. Kinabalu . . . . . *A. smetanai* sp. n.
3 Capo, pronoto e pigidio giallo-rossicci; pronoto con una fila posteriore di granuli forti; edeago più robusto e più largo, in visione ventrale. Lungh. 1,1 mm. M: Kinabalu . . . . . *A. punctum* sp. n.
- Capo e pronoto rossicci; pigidio giallo-bruno; metà posteriore del pronoto con granuli più salienti di quelli della metà anteriore; edeago esile. Lungh. 1,1 mm. M. Kinabalu . . . . . *A. minima* sp. n.

Tribù GYROPHAENINI Kraatz, 1856

Mesophaena gen. n. Figg. 20-24

DIAGNOSI. Genere sicuramente appartenente alla tribù Gyrophaenini, per la presenza di corti denti in più file all'apice della lacinia. E' simile al genere *Adelarthra* Cameron, 1920, ma nettamente distinto per la presenza di una ligula intera (divisa in *Adelarthra*).

DESCRIZIONE. Undici antennomeri. Corpo fusiforme, con robuste setole laterali delle elitre e dell'addome. Tempie robustamente marginate; collo largo; palpi labiali di due articoli; ligula intera, larga e corta, fig. 21; apice della lacinia con corti e robusti denti in più file; mesosterno carenato alla base; mesocoxe distanziate fra loro; formula tarsale 4-4-5; primo tarsomero posteriore corto; edeago figg 22-23, spermateca fig. 24.

TIPO DEL GENERE. *Mesophaena fragilis* sp. n.

ETIMOLOGIA. Il nome femminile del nuovo genere significa "Manifestazione intermedia". Infatti sembra che il nuovo genere occupi posizione intermedia tra il genere *Adelarthra* e *Pseudoligota* Cameron, 1920.

COMPARAZIONI. Chiave dei generi affini al nuovo genere *Mesophaena.*

1 Ligula profondamente divisa in due parti 2
- Ligula intera . . . . . *Mesophaena* gen. n.
2 Ligula divisa in due larghi lobi . . . . . *Adelarthra* Cameron, 1920
- Ligula divisa in due lobi stretti e acuti 3
3 Mesosterno carenato e diviso dal metasterno . . . . *Sternotropa* Cameron, 1920
- Mesosterno non carenato, fuso con il metasterno *Pseudoligota* Cameron, 1920

Mesophaena fragilis sp. n. Figg. 20-24

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu N.P., Poring Hot Springs, 500 m, 6.V.1987, Burckhardt & Löbl leg. (MHNG).

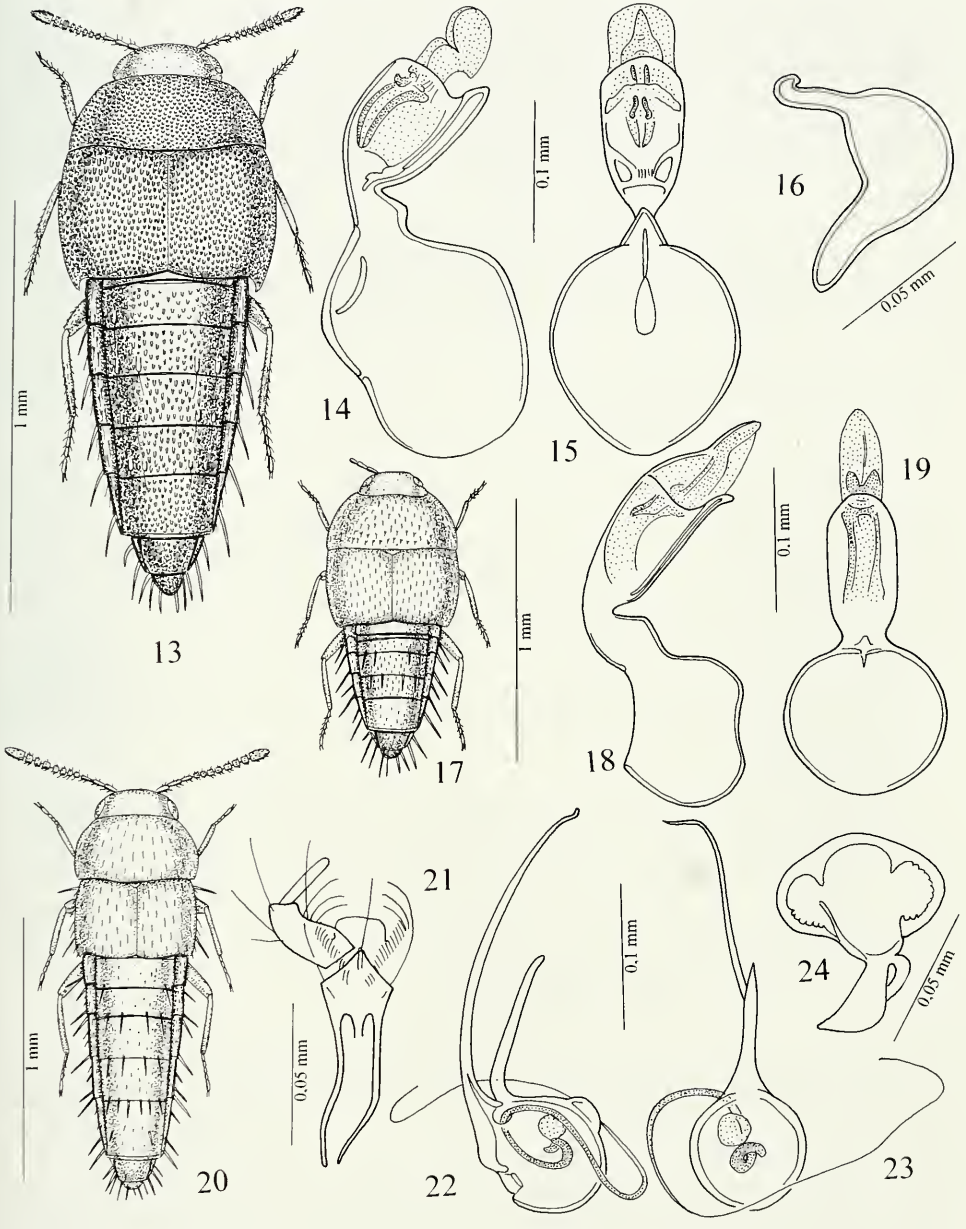
Paratypi: 1 ♂, stessa provenienza; 1 ♀, Borneo, Sabah, Mt. Kinabalu N.P., Poring Hot Springs, 500 m, 11.V.1987, Burckhardt & Löbl leg. (MHNG).

DESCRIZIONE. Lungh. 1,4 mm. Corpo lucido e giallo rossiccio; antenne giallo-rossicce con base e undicesimo antennomero gialli; zampe gialle. La reticolazione del capo è assente, quella del pronoto è estremamente superficiale e quella delle elitre è distinta. La distinta granulosità del pronoto è piuttosto rada, quella delle elitre è saliente. Edeago figg. 22-23, spermateca fig. 24.

Tribù HOMALOTINI Heer, 1839

Psephothetemusa gen. n. Figg. 25-33

DIAGNOSI. I denti della lacinia indicano che il nuovo genere non appartiene alla tribù Gyrophaenini, nonostante che l'edeago e l'habitus indichino una forte affinità con i generi di questa tribù. Per la forma della ligula, mai osservata nei generi della tribù Homalotini è genere nuovo per la Scienza.



FIGG. 13-24

Habitus, edeago in visione laterale e ventrale, spermateca e mento. 13-16: *Acanthoystera kinabaluensis* gen. n., sp. n.; 17-19: *Acanthoystera minima* gen. n., sp. n.; 20-24: *Mesophaena fragilis* gen. n., sp. n.

DESCRIZIONE. Undici antennomeri; tempie marginate; palpi labiali di 2 articoli, non stiliformi; ligula intera, con una papilla apicale; paraglosse non sporgenti, fig. 28; palpi mascellari di 4 articoli; estremità della galea con lunghe setole; lacinia con una fila di spine interne, fig. 30; mento trapezoidale, con margine anteriore retto, fig. 29; mesosterno non carenato; processo mesosternale acuto; mesocoxe contigue; formula tarsale 4-4-5; primo tarsomero posteriore allungato; edeago figg. 26-27, spermateca fig. 32.

TIPO DEL GENERE. *Psephothetemusa problematica* sp. n.

ETIMOLOGIA. Il nome femminile del nuovo genere significa "Colei che è un mosaico". Infatti il nuovo genere mostra caratteri che si riscontrano in altri generi, anche di tribù differenti, tanto da sembrare un mosaico di caratteri presi a prestito.

Psephothetemusa problematica sp. n. Figg. 25-31

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu N.P., HQ Silau-Silau trail, 1560 m, 23.V.1987, A. Smetana leg. (MHNG).

DESCRIZIONE. Lungh. 1,0 mm. Corpo lucido e bruno-rossiccio, con elitre brune; antenne brune con base del terzo antennomero giallo chiaro; zampe bruno-rossicce. La reticolazione del capo è assente, quella del pronoto e delle elitre è distinta. La punteggiatura del capo è distinta assai superficiale. La granulosità del pronoto e delle elitre sono molto salienti e forti. Edeago figg. 26-27.

Psephothetemusa introflexa sp. n. Figg. 32-33

Holotypus ♀, Borneo, Sabah, Mt. Kinabalu N.P., 1580 m, 27.IV.1987, Burckhardt & Löbl leg. (MHNG).

DESCRIZIONE. Lungh. 1,4 mm. Corpo lucido e bruno-rossiccio; antenne brune con gli antennomeri secondo e terzo giallo chiaro; zampe giallo-brune con tarsi gialli. La reticolazione del capo e del pronoto è distinta, quella delle elitre è superficiale e quella dell'addome è assente. La punteggiatura del capo è piuttosto fitta e superficiale. La granulosità del pronoto è forte e saliente, quella delle elitre è distinta. Gli uroterghi liberi terzo e quarto presentano striatura longitudinale superficiale, il quinto la presenta netta. Spermateca fig. 32.

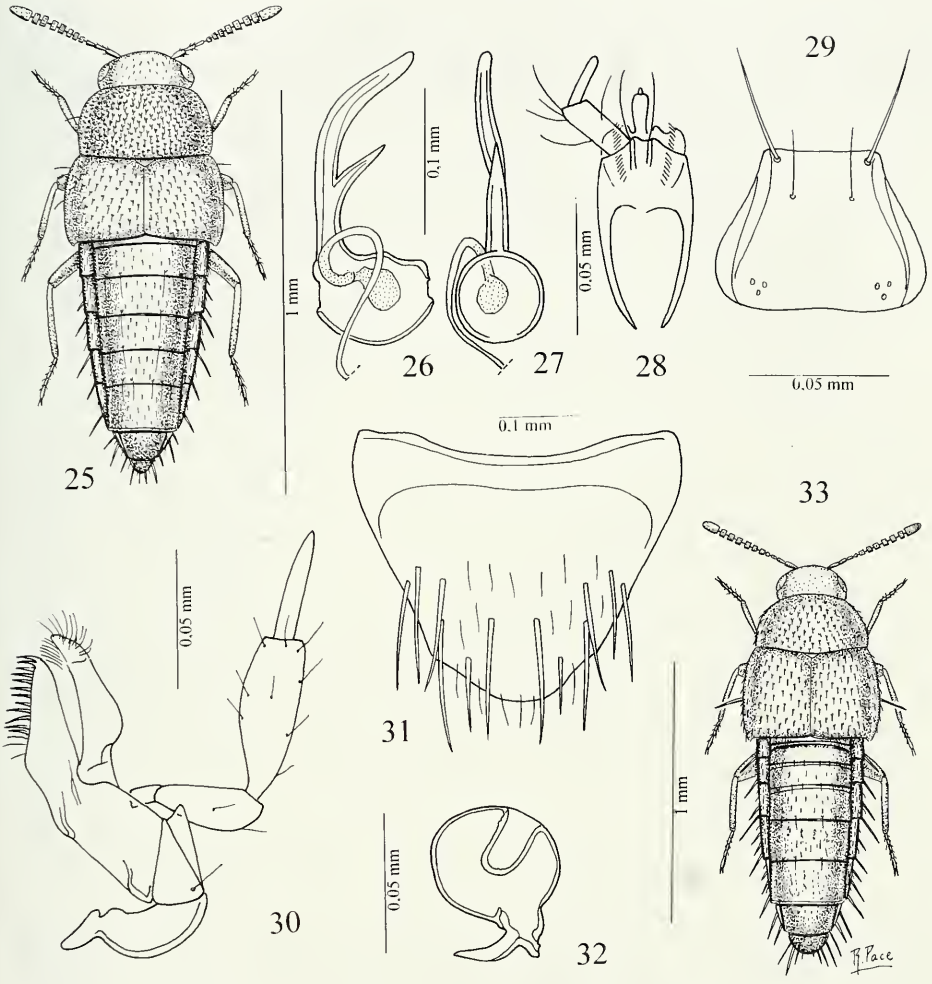
COMPARAZIONI. Chiave delle specie del nuovo genere *Psephothetemusa.*

1 Primo e secondo antennomero basale bruni; capo senza reticolazione, poco più stretto del pronoto; reticolazione delle elitre distinta. Lungh. 1,1 mm. M. Kinabalu . . . . . *P. problematica* sp. n.

\- Primo antennomero basale bruno, secondo giallo pallido; capo distintamente reticolato e molto più stretto del pronoto; reticolazione delle elitre superficiale. Lungh. 1,4 mm. M. Kinabalu . . . . . *P. introflexa* sp. n.

Aisthentusa gen. n. Figg. 34-51

DIAGNOSI. Per la ligula intera e corta, il nuovo genere sembra affine al genere *Placusa* Erichson, 1837, ma le mesocoxe sono tra loro separate e il mesosterno è carenato.



FIGG. 25-33

Habitus, edeago in visione laterale e ventrale, labio con palpo labiale, mento, maxilla con palpo mascellare, sesto urotergo libero del ♂, spermateca. 25-31: *Psephothetemusa problematica* gen. n., sp. n.; 32-33: *Psephothetemusa introflexa* gen. n., sp. n.

DESCRIZIONE. Undici antennomeri; lati del corpo con lunghe e robuste setole isolate; tempie marginate; palpi labiali di 2 articoli piuttosto corti, fig. 40; palpi mascellari di 4 articoli, di cui il terzo è molto tozzo e il quinto è sottile e molto più lungo del terzo, fig. 39; mesosterno carenato, ma non alla base; mesocoxe separate fra loro; uroterghi fortemente striati longitudinalmente; formula tarsale 4-4-5; primo tarsomero posteriore allungato; edeago con un lobo preapicale distale, figg. 35, 41 e 47, spermateca fig. 37.

TIPO DEL GENERE. *Aisthentusa borneensis* sp. n.

ETIMOLOGIA. Il nome femminile del nuovo genere significa "Colei che è sensitiva" a motivo della presenza di lunghe setole laterali del corpo e di lunghe spine al margine posteriore del sesto urotergo libero del ♂.

COMPARAZIONI. Chiave del nuovo genere *Aisthentusa* e del genere *Placusa.*

1 Ligula intera a lati arrotondati; terzo articolo dei palpi mascellari più lungo del secondo e debolmente rigonfio; quarto articolo dei palpi mascellari lungo circa la metà del terzo; pronoto pubescente; mesocoxe contigue ..... *Placusa* Erichson, 1837

\- Ligula intera a lati acuti; terzo articolo dei palpi mascellari più corto del secondo e fortemente rigonfio; quarto articolo dei palpi mascellari nettamente più lungo del terzo; pronoto nudo; mesocoxe fra loro separate ..... *Aisthentusa* gen. n.

Aisthentusa borneensis sp. n. Figg. 34-40

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu N.P., below Layang Layang, 2590 m, 1.V.1987, A. Smetana leg. (MHNG).

Paratypi: 1 ♂, stessa provenienza; 19 es., Borneo, Sabah, Mt. Kinabalu N.P., 2600 m, 1.IV.1987, Burckhardt & Löbl leg.

DESCRIZIONE. Lungh. 2,1 mm. Corpo lucido e bruno; antenne brune con i quattro antennomeri basali giallo-rossicci; zampe giallo-brune con tarsi rossicci. La reticolazione del capo e dell'addome è assente, quella del pronoto e delle elitre è distinta, composta di maglie trasverse e ondulate. Il capo e il pronoto sono senza punteggiatura. Le elitre sono coperte di microgranuli sparsi e distinti.

Aisthentusa hystrix sp. n. Figg. 41-45

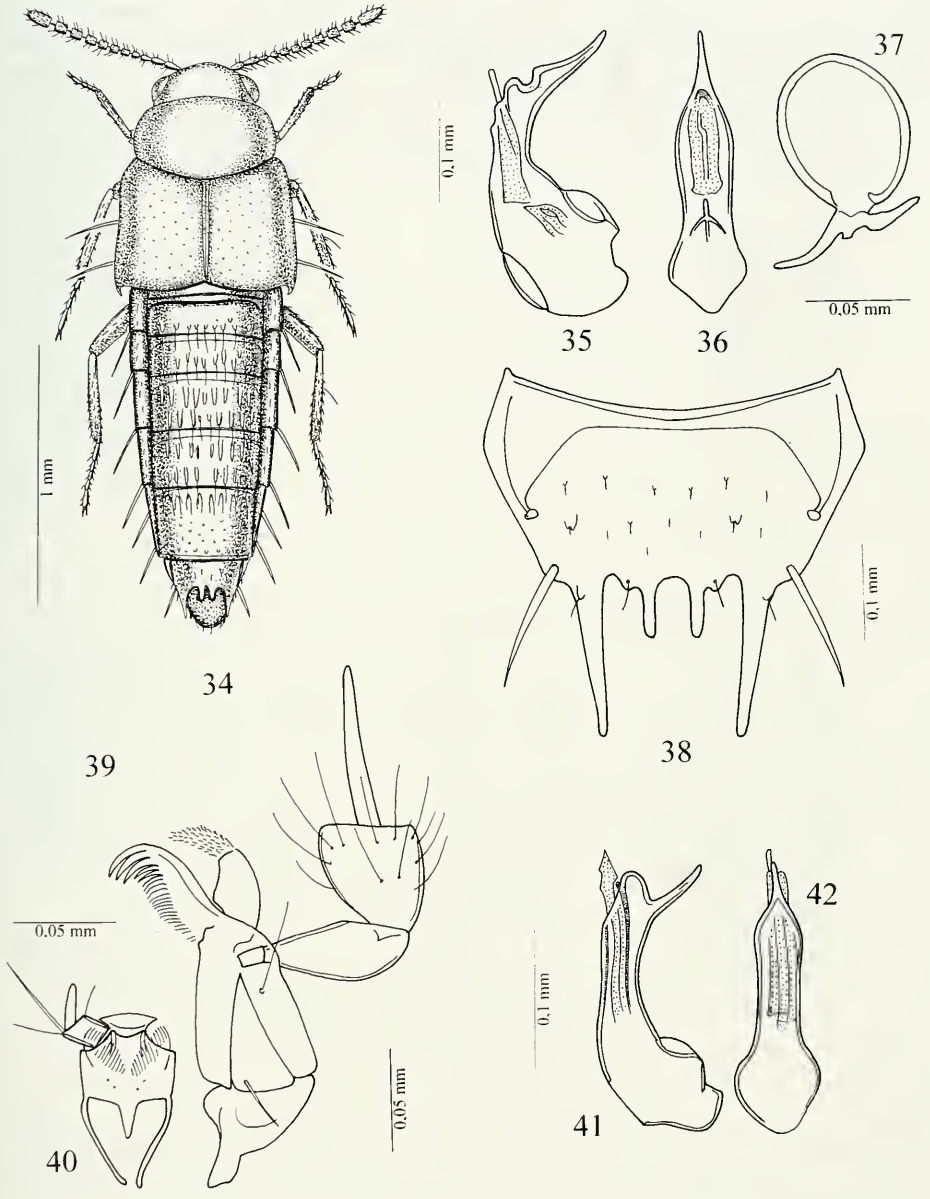
Holotypus ♂, Borneo, Sabah, Mt. Kinabalu N.P., 29.X.1990, G. de Rougemont leg. (MRSN).

Paratypi: 4 es. Borneo, Sabah, Mt. Kinabalu N.P., 1550-1650 m, 24.IV.1987, Burckhardt & Löbl leg.; 2 es., Borneo, Sabah, Mt. Kinabalu N.P., 1500 m, 25.IV.1987, Burckhardt & Löbl leg.; 1 ♂, Borneo, Sabah, Mt. Kinabalu N.P., 1580 m, 27.IV.1987, Burckhardt & Löbl leg.; 1 es. Borneo, Sabah, Mt. Kinabalu N.P., 2600 m, 28.IV.1987, Burckhardt & Löbl leg.; 2 ♂♂, Borneo, Sabah, Mt. Kinabalu N.P., 1550 m, 29.IV.1987, Burckhardt & Löbl leg.

DESCRIZIONE. Lungh. 1,8 mm. Corpo lucidissimo e bruno, con addome bruno-rossiccio, avente gli uriti liberi 3°, 4° e 5° bruni; antenne rossicce con i tre antennomeri basali gialli e gli antennomeri 9°, 10° e 11° giallo-bruni; zampe rossicce. La reticolazione è presente solo sulle elitre dove è superficiale, composta di maglie molto trasverse e ondulate. Edeago figg. 41-42, sesto urotergo libero del ♂ fig. 44, spermateca fig. 45.

Aisthentusa pacifica sp. n. Figg. 46-49

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu N.P., 1550 m, 29.IV.1987, Burckhardt & Löbl leg. (MHNG).



FIGG. 34-42

Habitus, edeago in visione laterale e ventrale, spermateca, sesto urotergo libero del ♂, labio con palpo labiale, maxilla con palpo mascellare. 34-40: *Aisthentusa borneensis* gen. n., sp. n.; 41-42: *Aisthentusa hystrix* gen. n., sp. n.

DESCRIZIONE. Lungh. 1,4 mm. Corpo lucido e nero-bruno; antenne nero-brune con i due antennomeri basali di un giallo sporco. La reticolazione del capo è assente, quella del pronoto è estremamente superficiale e quella delle elitre è distinta, composta di maglie ondulate trasverse. Il capo è senza punteggiatura. Le elitre mostrano alcuni distinti granuli sparsi. Edeago figg. 47-48, sesto urotergo libero del ♂ fig. 49.

Aisthentusa intermedia sp. n. Figg. 50-51

Holotypus ♀, Borneo, Sabah, Crocker Ra., 1550-1650 m, 16.V.1987, Burckhardt & Löbl leg. (MHNG).

Paratypi: 3 ♀♀, stessa provenienza; 1 ♀, Borneo, Sabah, Mt. Kinabalu N.P., Poring Hot Springs, 500 m, 11.V.1987, Burckhardt & Löbl leg.

DESCRIZIONE. Lungh. 1,4 mm. Corpo lucido e nero-bruno; antenne brune con i due antennomeri basali di un giallo sporco; zampe brune con tarsi rossicci. Il capo è senza reticolazione e senza punteggiatura. La reticolazione del pronoto è presente solo sul disco dove è estremamente superficiale. La punteggiatura delle elitre è netta. Spermateca fig. 50.

COMPARAZIONI. Chiave delle specie del nuovo genere *Aisthentusa.*

1 Taglia maggiore, 2,1 mm; pronoto con reticolazione ondulata trasversa distinta; lobo preapicale dell'edeago poco sviluppato. M. Kinabalu ..... *A. borneensis* sp. n.

\- Taglia minore, 1,4-1,8 mm; pronoto senza reticolazione o con reticolazione estremamente svanita; lobo preapicale dell'edeago mediamente o molto sviluppato 2

2 Antennomeri 4° a 10° trasversi. Lungh. 1,4 mm ..... *A. intermedia* sp. n.

\- Antennomeri 4° a 10° lunghi quanto larghi o più lunghi che larghi 3

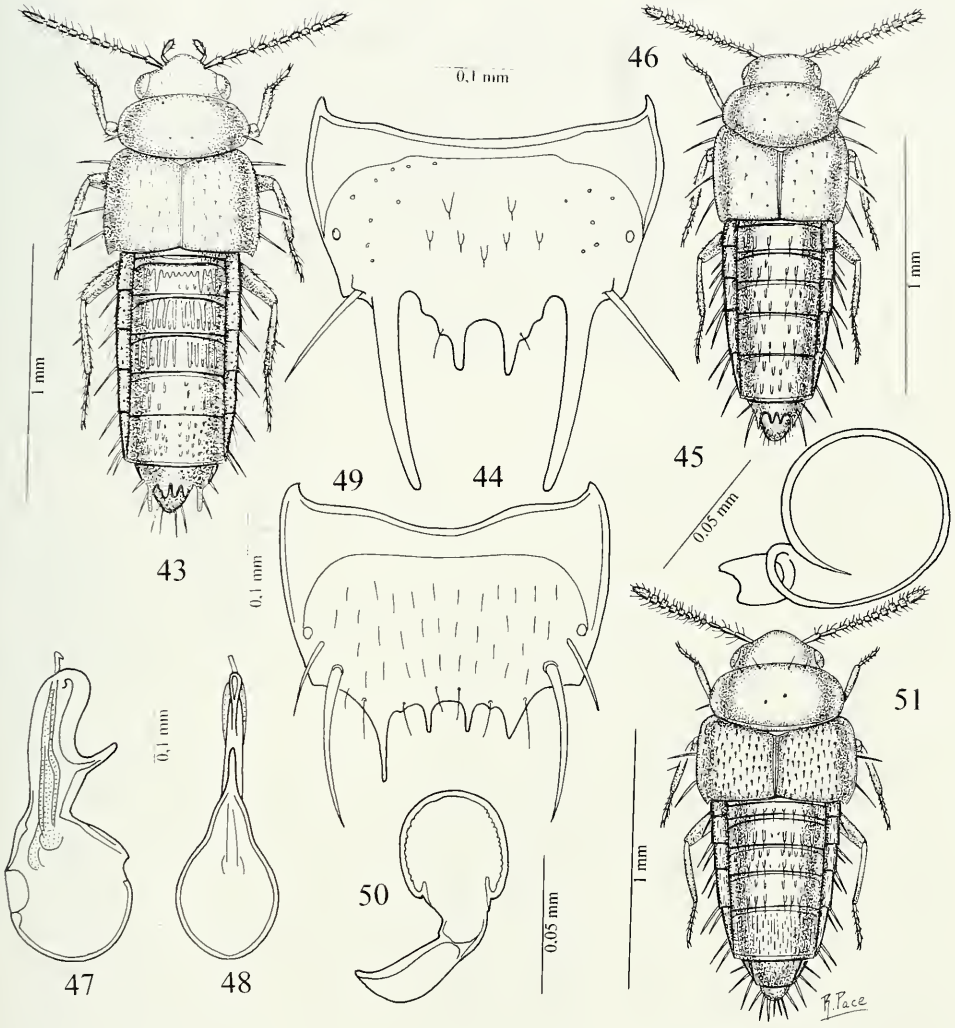
3 Taglia corporea maggiore: 1.8 mm; base dell'addome e pigidio rossicci; pronoto fortemente trasverso; spine esterne del 6° urotergo libero del ♂ lunghissime e robuste; lobo preapicale dell'edeago poco sviluppato. M. Kinabalu ..... *A. hystrix* sp. n.

\- Taglia corporea minore: 1,4 mm; addome uniformemente nero-bruno; pronoto meno trasverso; spine esterne del 6° urotergo libero del ♂ corte ed esili; lobo preapicale dell'edeago enormemente sviluppato. M. Kinabalu ..... *A. pacifica* sp. n.

Metechonica gen. n. Figg. 52-60

DIAGNOSI. Habitus del genere *Stenomastax* Cameron, 1933, ma gli articoli dei palpi labiali non sono stiliformi e la ligula termina con due larghi lobi.

DESCRIZIONE. Undici antennomeri; corpo fittamente pubescente; tempie robustamente marginate; palpi labiali di due articoli, fig. 55; palpi mascellari di 4 articoli; mento trapezoidale, con margine anteriore incavato fig. 56; processo mesosternale acuto; mesocoxe contigue tra loro; formula tarsale 4-4-5; primo tarsomero posteriore corto.



FIGG. 43-51

Habitus, sesto urotergo libero del ♂, edeago in visione laterale e ventrale e spermateca. 43-45: *Aisthentusa hystrix* gen. n., sp. n.; 46-49: *Aisthentusa pacifica* gen. n., sp. n.; 50-51: *Aisthentusa intermedia* gen. n., sp. n.

TIPO DEL GENERE. *Metechonica nova* sp. n.

ETIMOLOGIA. Il nome femminile del nuovo genere significa "Immagine partecipe", nel senso che il nuovo genere mostra dei caratteri che fanno parte anche del genere *Stenomastax*.

COMPARAZIONI. Chiave dei generi affini al nuovo genere *Metechonica*.

1 Palpi labiali stiliformi 2
- Palpi labiali non stiliformi, corti 4
2 Ligula divisa all'estremità . . . . . *Stenomastax* Cameron 1933
- Ligula intera 3
3 Ligula che in lunghezza raggiunge al massimo il livello del primo articolo dei palpi labiali . . . . . *Silusa* Erichson 1837
- Ligula che in lunghezza supera il livello del primo articolo dei palpi labiali . . . . . *Taraktinora* Pace, 1998
4 Ligula corta, essa raggiunge il livello del primo articolo dei palpi labiali . . . . . *Coenonica* Kraatz, 1857
- Ligula lunghissima, essa raggiunge l'apice del secondo articolo dei palpi labiali . . . . . *Metechonica* gen. n.

Metechonica nova sp. n. Figg. 52-56

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu N.P., HQ Liwagu Riv., 1490 m, 5.VIII.1988, A. Smetana leg. (MHNG).

Descrizione. Lungh. 2,1 mm. Corpo lucido e giallo-rossiccio, con capo ed elitre bruno-rossicci; antenne rossicce con i due antennomeri basali e l'undicesimo giallo-rossicci; zampe gialle. La reticolazione del capo e delle elitre è superficiale, quella del pronoto è distinta e quella dell'addome è assente. Sul capo e sul pronoto non sono visibili né punteggiatura, né granulosità. La punteggiatura delle elitre è distinta, fine e fitta. Edeago figg. 53-54.

Metechonica temburongensis sp. n. Figg. 57-60

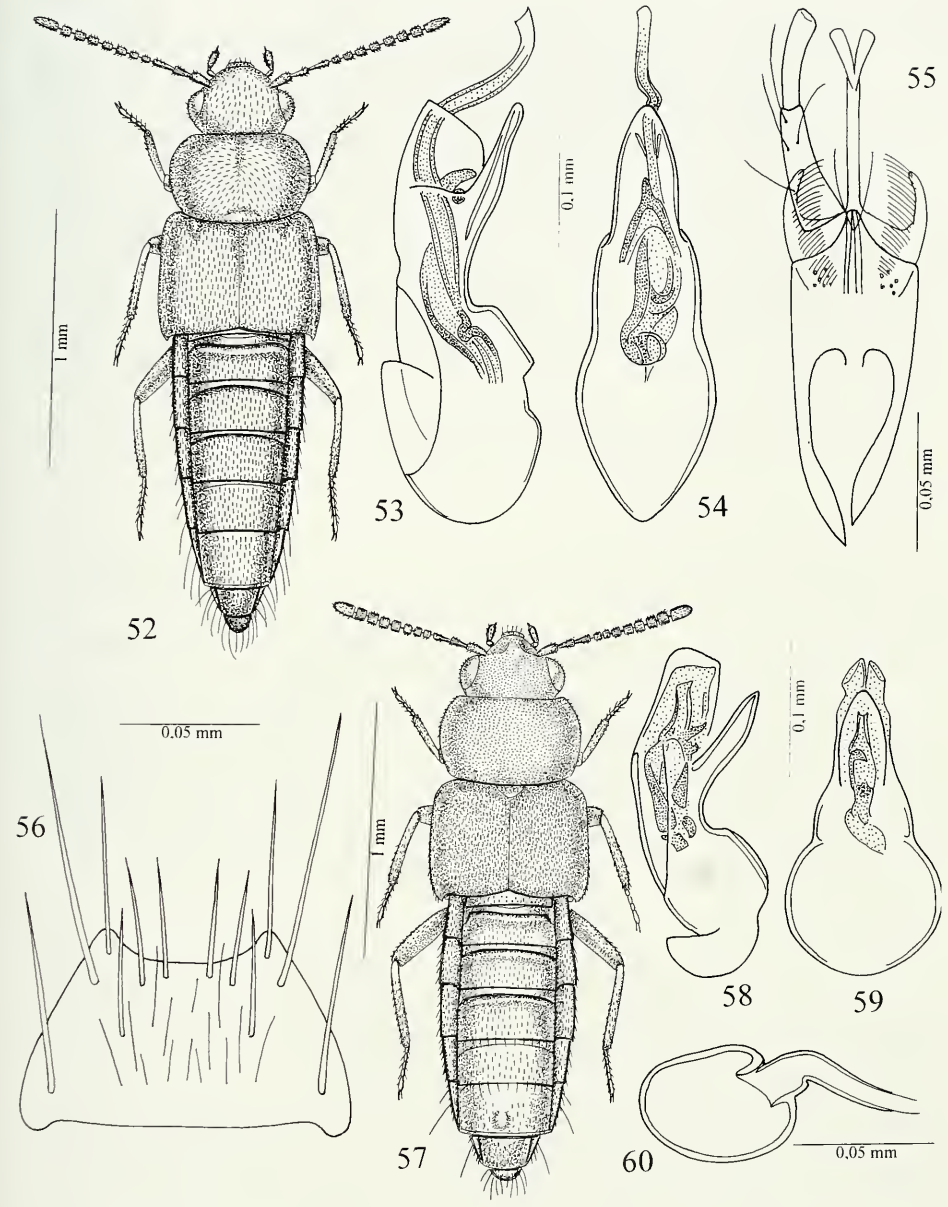
Holotypus ♂, Borneo, Brunei, Temburong, Kuala Belalong (West), 11.II.1995, Borcherding leg. (MRSN).

Paratypi: 2 ♀♀, stessa provenienza; 10 es., Borneo, Sabah, Mt. Kinabalu N.P., Poring Hot Springs, 480 m, 8.V.1987, A. Smetana leg.; 1 ♀, Borneo, Sabah, Mt. Kinabalu N.P., Poring Hot Springs, 550-600 m, 9.V.1987, Burckhardt & Löbl leg.

Descrizione. Lungh. 2,0 mm. Avancorpo debolmente lucido, addome lucido. Capo bruno, pronoto rossiccio, elitre brune con base rossiccia, addome giallo-rossiccio; antenne rossicce con i due antennomeri basali e apice dell'undicesimo giallo-rossicci; zampe gialle. La reticolazione del capo e del pronoto è distinta, quella delle elitre e dell'addome è superficiale. La granulosità del capo e del pronoto è confusa nella reticolazione, quella delle elitre è fine, fitta e distinta e quella dell'addome è saliente a raspa. Edeago figg. 58-59, spermateca fig. 60.

Comparazioni. Chiave delle specie del nuovo genere *Metechonica*.

1 Elitre interamente bruno-rossicce: penultimi antennomeri lunghi quanto larghi; edeago maggiore, meno profondamente ricurvo e con lunghissimo pezzo copulatore interno. Lungh. 2,1 mm. M. Kinabalu . . *M. nova* sp. n.
- Elitre brune, con base rossiccia; penultimi antennomeri nettamente trasversi; edeago minore, profondamente ricurvo e con profondo pezzo copulatore interno. Lungh. 2,0 mm. Brunei . . . . . *M. temburongensis* sp. n.



FIGG. 52-60

Habitus, edeago in visione laterale e ventrale, labio con palpo labiale, mento e spermateca. 52-56: *Metechonica nova* gen. n., sp. n.; 57-60: *Metechonica temburongnsis* gen. n., sp. n.

Megaparaglossa gen. n. Figg. 61-67

DIAGNOSI. Per l'enorme sviluppo delle paraglosse, il nuovo genere risulta isolato, dato che l'habitus è "normale", cioè non ultraevoluto, come si riscontra nelle specie di Aleocharinae termitofile o mirmecofile. Queste paraglosse oltremodo sviluppate si riscontrano in certi generi termitofili o mirmecofili.

DESCRIZIONE. Undici antennomeri; addome lievemente ristretto all'indietro; tempie marginate; palpi labiali di 2 articoli; ligula cortissima e incisa all'apice, quasi nascosta tra le paraglosse enormemente sviluppate e molto spinte in avanti, fig. 65; palpi mascellari di 4 articoli; galea ampiamente setolosa all'apice; denti della lacinia lunghissimi, fig. 66; mento trapezoidale, con margine anteriore retto, fig. 67; mesosterno non carenato; processo mesosternale acuto, mesocoxe appena distanziate fra loro; formula tarsale 4-4-5; primo tarsomero posteriore corto; edeago figg. 62-63, spermateca fig. 64.

TIPO DEL GENERE. *Megaparaglossa annularis* sp. n.

ETIMOLOGIA. Il nome femminile della nuova specie significa "Grande paraglossa".

Megaparaglossa annularis sp. n. Figg. 61-67

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu, 1750 m, 21.IV.1987, Burckhardt & Löbl leg. (MHNG).

Paratypi: 1 ♂ e 1 ♀, stessa provenienza; 2 ♂♂, Borneo, Sabah, Mt. Kinabalu N.P., Poring Hot Springs, 550 m, 7.V.1987, Burckhardt & Löbl leg.

DESCRIZIONE. Lungh. 1,7 mm. Corpo lucido e giallo-rossiccio, con capo rossiccio, elitre brune con base giallo-rossiccia e una fascia addominale bruna; antenne brune con i tre antennomeri basali gialli; zampe gialle. La reticolazione del capo è estremamente superficiale, quella del pronoto è assente e quella delle elitre è svanita. La punteggiatura del capo è fine e superficiale. La granulosità del pronoto è poco saliente, quella delle elitre è netta. Edeago figg. 62-63, spermateca fig. 64.

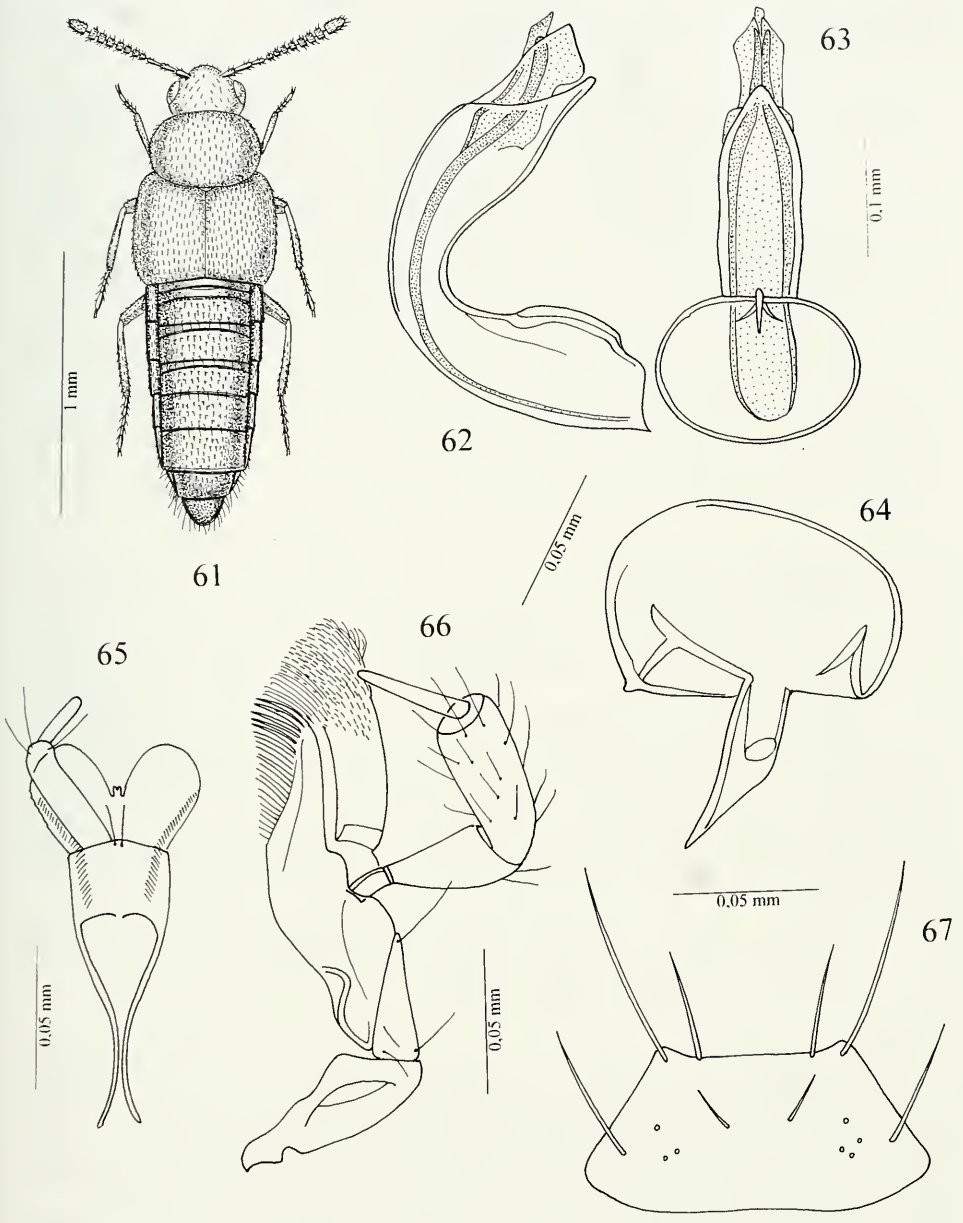
Apatelomixidota gen. n. Figg. 68-84

DIAGNOSI. In base all'habitus e alla forma della spermateca, il nuovo genere mostra affinità con varie specie del sottogenere *Datomicra* Mulsant & Rey, 1874 di *Atheta* Thomson, 1859. Ma la formula tarsale è 4-4-5 (invece di 4-5-5), gli articoli del palpi labiali sono 2 e la ligula di forma finora mai osservata.

DESCRIZIONE. Undici antennomeri; corpo simile ad *Atheta* Thomson; tempie marginate; palpi labiali di 2 articoli, tra essi vi è un articolo vestigiale; ligula divisa all'apice in due rami, ciascuno dei quali porta un lobo, fig. 73; palpi mascellari di 4 articoli; apice della galea molto lungo e coperto di setole cortissime, fig. 74; mento fig. 72; mesosterno non carenato; processo mesosternale acuto; mesocoxe tra loro contigue; formula tarsale 4-4-5; primo tarsomero posteriore lungo quanto i due seguenti riuniti; edeago figg. 69-70, spermateca fig. 71.

TIPO DEL GENERE. *Apatelomixidota borneensis* sp. n.

ETIMOLOGIA. Il nome femminile del nuovo genere significa "Colei che dà una mescolanza ingannevole". Mescolanza è in riferimento ai caratteri di altri generi che



FIGG. 61-67

Habitus, edeago in visione laterale e ventrale, labio con palpo labiale, maxilla con palpo mascellare, spermateca e mento. 61-67: *Megaparaglossa annularis* gen. n., sp. n.

convergono in parte a comporre i caratteri del nuovo, che così risulta ingannevole per colui che si limita a un'osservazione superficiale.

Apatelomixidota borneensis sp. n. Figg. 68-75

Holotypus ♀, Borneo, Sabah, Mt. Kinabalu N.P., above Poring Hot Springs, 520 m, 9.V.1987, A. Smetana leg. (MHNG).

Paratypi: 2 ♀♀, Borneo, Sabah, Mt. Kinabalu N.P., Poring Hot Springs, 550-600 m, 9.V.1987, Burckhardt & Löbl leg.; 2 ♀♀, Borneo, Sabah, Mt. Kinabalu N.P., Poring Hot Springs, Bat Cave, 600 m, 10.V.1987, Burckhardt & Löbl leg.; 1 ♂, Borneo, Sabah, Mt. Kinabalu N.P., Poring Hot Springs, Langanan Falls, 900-950 m, 12.V.1987, Burckhardt & Löbl leg.; 1 ♀, Borneo, Sabah, Mt. Kinabalu N.P.,1750 m, 27.IV.1987, Burckhardt & Löbl leg.

Descrizione. Lungh. 1,8 mm. Corpo lucido e giallo-rossiccio sporco, con elitre e quarto urite libero bruno-rossicci; antenne brune, con i due antennomeri basali e l'undicesimo giallo-rossicci; zampe gialle. La reticolazione del capo è distinta, quella del pronoto è assente e quella delle elitre è superficiale. La granulosità del capo e del pronoto è saliente, fine e fitta, quella delle elitre è distinta. Edeago figg. 69-70, spermateca fig. 71, sesto urotergo libero del ♂ fig. 75.

Apatelomixidota burckhardti sp. n. Figg. 76-79

Holotypus ♂, 1 ♀, Borneo, Sabah, Mt. Kinabalu N.P., 1750 m, 27.IV.1987, Burckhardt & Löbl leg. (MHNG).

Paratypus: 1 ♂, Borneo, Sabah, Mt. Kinabalu N.P., Poring Hot Springs, 500 m, 11.V.1987, Burckhardt & Löbl leg.

Descrizione. Lungh. 2,0 mm. Avancorpo debolmente lucido, addome lucido. Corpo giallo-bruno, con capo bruno-rossiccio ed elitre e una fascia addominale brune; antenne brune con i due antennomeri basali e l'undicesimo di un giallo sporco; zampe gialle. La reticolazione del capo e delle elitre è netta, quella delle elitre è distinta e quella dell'addome è assente. La granulosità del capo e del pronoto è appena distinta, quella del pronoto e dell'addome è distinta. Edeago figg 77-78, sesto urotergo libero del ♂ fig. 79.

Etimologia. Specie dedicata a uno dei suoi raccoglitori, il noto entomologo del Museo di Ginevra Dr. Daniel Burckhardt.

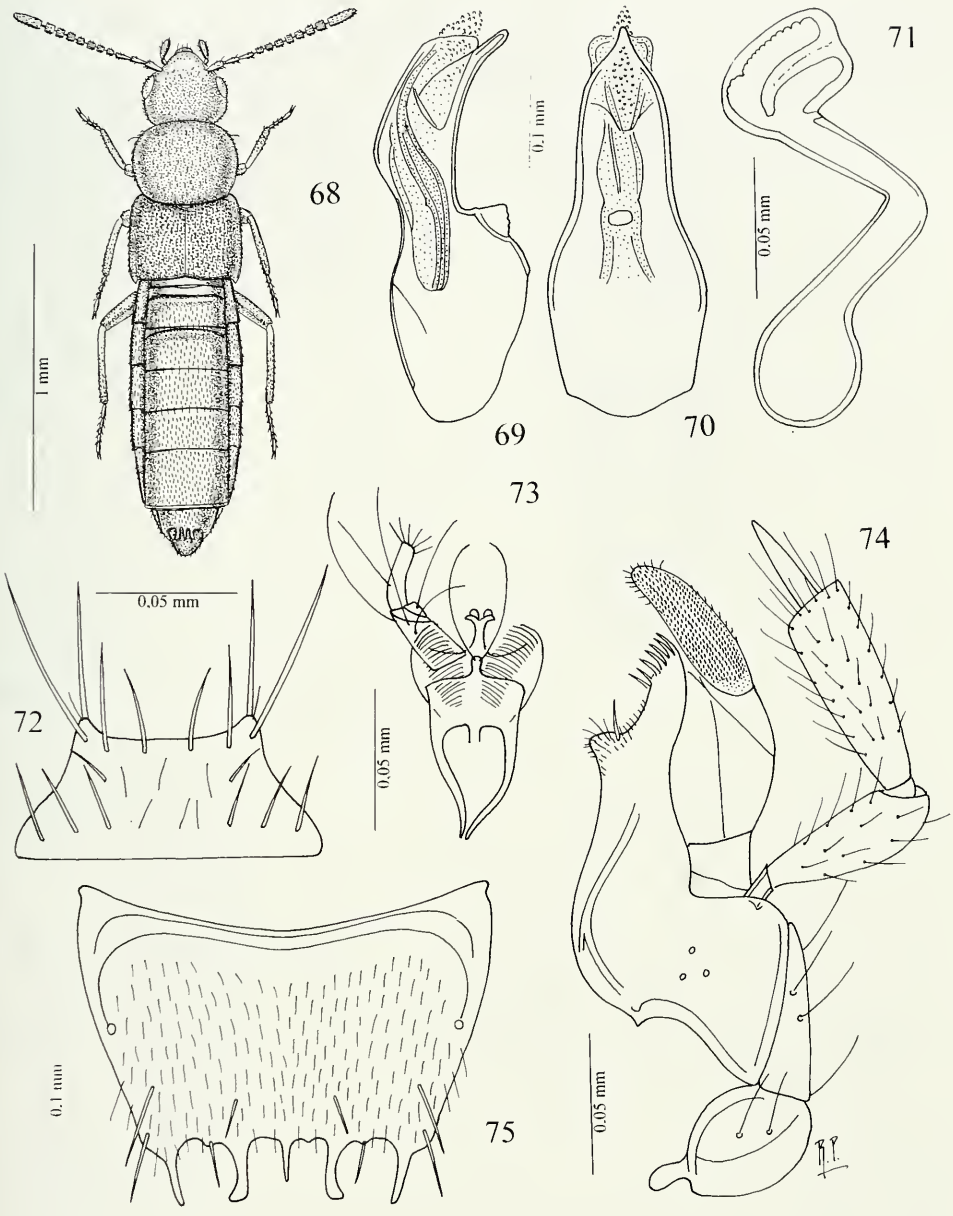
Apatelomixidota intermedia sp. n. Figg. 80-84

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu N.P., Poring Hot Springs, nr. Bat Cave, 600 m, 10.V.1987, Burckhardt & Löbl leg. (MHNG).

Paratypi: 19 es., Borneo, Sabah, Mt. Kinabalu N.P., Poring Hot Springs, 600 m, 7.V.1987, Burckhardt & Löbl leg.; 3 es., Borneo, Sabah, Mt. Kinabalu N.P., Poring Hot Springs, 550-600 m, 9.V.1987, Burckhardt & Löbl leg.

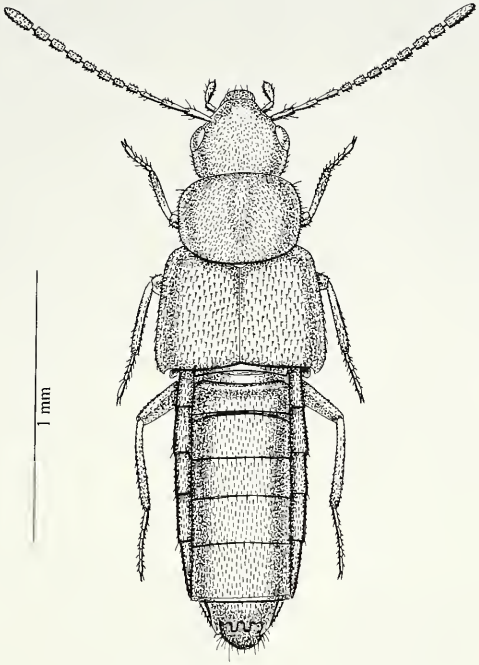
Descrizione. Lungh. 1,6 mm. Corpo lucido e giallo-bruno, con elitre e quarto urite libero bruni; antenne bruno-rossicce, con i due antennomeri basali e l'undicesimo gialli; zampe gialle. La reticolazione dell'avancorpo è distinta, quella dell'addome è assente. La granulosità dell'avancorpo è saliente, quella dell'addome è distinta. Edeago figg. 81-82, sesto urotergo libero del ♂ fig. 84.

Comparazioni. Chiave delle specie del nuovo genere *Apatelomixidota.*



FIGG. 68-75

Habitus, edeago in visione laterale e ventrale, spermateca, mento, labio con palpo labiale, maxilla con palpo mascellare. sesto urotergo libero del ♂. 68-75: *Apatelomixidota borneensis* gen. n., sp. n.



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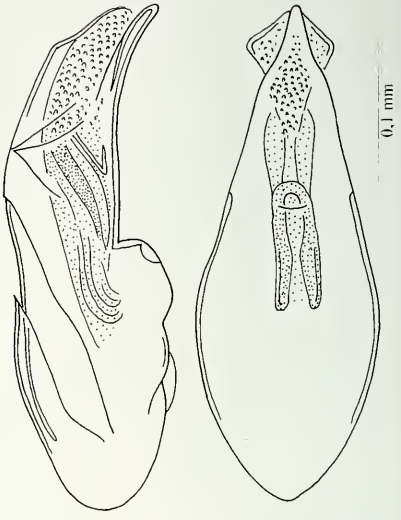

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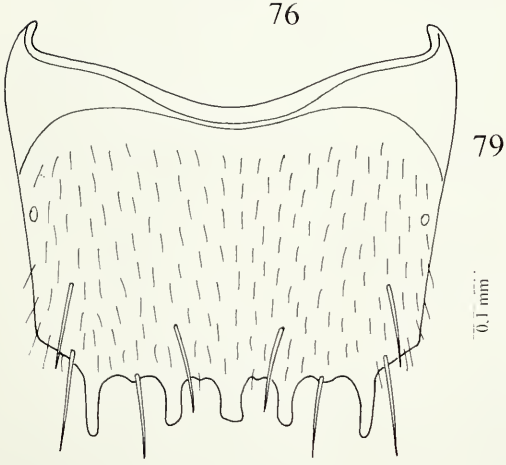

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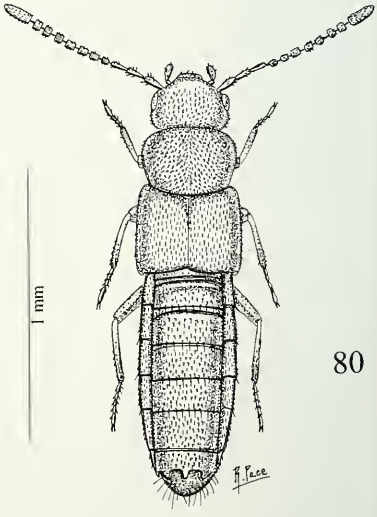

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FIGG. 76-80

Habitus, edeago in visione laterale e ventrale e sesto urotergo libero del ♂. 76-79: *Apatelomixidota burckhardti* gen. n., sp. n.; 80: *Apatelomixidota intermedia* gen. n., sp. n.

1 Antennomeri 8°, 9° e 10° chiaramente trasversi; elitre poco più larghe del pronoto. Lungh. 1,6-1,8 mm 2
- Antennomeri 8°, 9° e 10° più lunghi che larghi; elitre molto più larghe del pronoto. Lungh. 2,0 mm. M. Kinabalu ..... *A. burckhardti* sp. n.
2 Denti del margine posteriore del sesto urotergo libero del ♂, esili e ricurvi, tranne il mediano che è strettissimo e acutissimo. Lungh. 1,8 mm. M. Kinabalu ..... *A. borneensis* sp. n.
- Denti del margine posteriore del sesto urotergo libero del ♂, corti e retti, il mediano a punta arrotondata: Lungh. 1,6 mm. M. Kinabalu ..... *A. intermedia* sp. n.

Episkilepta gen. n. Figg. 85-91

DIAGNOSI. Parti boccali simili a quelle del genere *Paralinoglossa* Pace, 1982a, dell'Australia, ma le paraglosse sono brevemente setolose all'apice (con setole molto più lunghe in *Paralinoglossa*) e la taglia è estremamente ridotta (1,2 mm, invece di 2,8). Non è noto il ♂ di *Paralinoglossa.*

DESCRIZIONE. Undici antennomeri; tempie robustamente marginate; palpi labiali di due articoli corti; ligula come da fig. 88 (la sua estremità è forse amputata); palpi mascellari di 4 articoli, fig. 90; mento trapezoidale, fig. 91; mandibola, fig. 89; mesosterno non carenato; mesocoxe lievemente separate tra loro; formula tarsale 4-4-5; primo tarsomero posteriore corto. Edeago figg. 86-87.

TIPO DEL GENERE. *Episkilepta borneensis* sp. n.

ETIMOLOGIA. Il nome femminile del nuovo genere significa "Piccola e opaca".

Episkilepta borneensis sp. n. Figg. 85-91

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu N.P., above Poring Hot Springs, 550 m, 9.V.1987, A. Smetana leg. (MHNG).

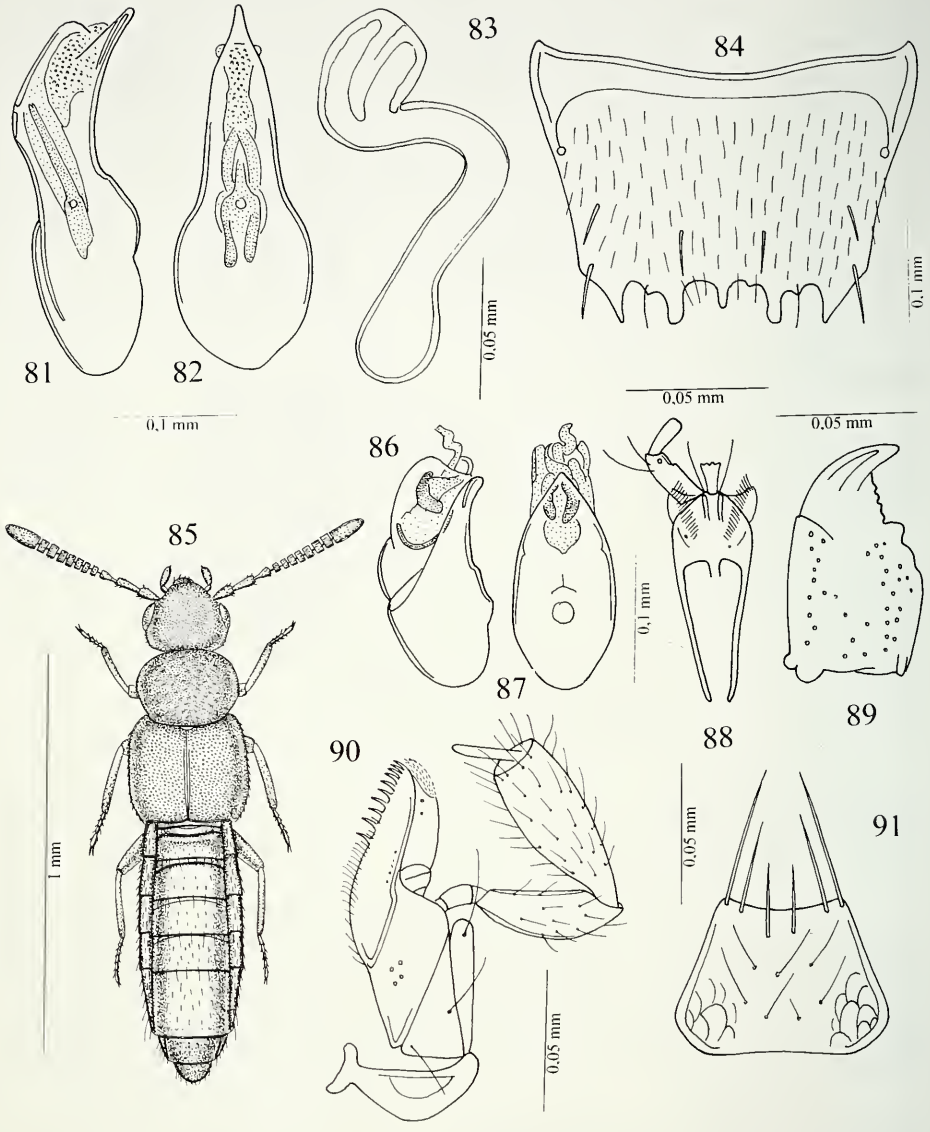
DESCRIZIONE. Lungh. 1,2 mm. Capo e pronoto assai opachi, elitre lievemente opache, addome lucido. Corpo bruno; antenne brune con i due antennomeri basali e l'undicesimo di un giallo paglierino; zampe gialle. La granulosità del capo e del pronoto è fittissima, sì da dare un aspetto scabro alla superficie. Le elitre presentano sutura saliente e granulosità fittissima. Quest'ultima sull'addome è superficiale. Edeago figg. 86-87.

Tribù DIESTOTINI Mulsant & Rey, 1871

Anamignusa gen. n. Figg. 92-96

DIAGNOSI. Alcuni caratteri (pubescenza del pronoto volto in linea retta all'indietro, ligula incisa all'apice, spermateca avvolta a matassa) permettono di avvicinare il nuovo genere al genere *Chledophila* Cameron, 1920. Ma il corpo non è a lati paralleli, ma fusiforme e i palpi labiali sono più allungati.

DESCRIZIONE. Undici antennomeri; tempie robustamente marginate; palpi labiali di 2 articoli allungati; ligula intera, appena incisa all'apice; paraglosse non



FIGG. 81-91

Edeago in visione laterale e ventrale, spermateca, sesto urotergo libero del ♂, labio con palpo labiale, mandibola, maxilla con palpo mascellare e mento. 81-84: *Apatelomixidota intermedia* gen. n., sp. n.; 85-91: *Episkilepta borneensis* gen. n., sp. n.

prominenti, fig. 94; mento trapezoidale, con base minore largamente incavata, fig. 96; palpi mascellari di 4 articoli, fig. 95 (l'ultimo articolo è andato perduto, forse in fase di raccolta dell'esemplare); mesosterno non carenato; processo mesosternale acuto; mesocoxe appena separate fra loro; formula tarsale 4-4-5; primo tarsomero posteriore corto; spermateca a matassa e spirale, fig. 93.

TIPO DEL GENERE. *Anamignusa borneensis* sp. n.

ETIMOLOGIA. Il nome femminile del nuovo genere significa "Colei che è mescolata". Esso allude a caratteri di altri generi mescolati insieme a comporre questo nuovo genere.

COMPARAZIONI. Chiave dei generi asiatici della tribù Diestotini, che comprende specie con due articoli dei palpi labiali, formula tarsale 4-4-5 e spermateca a matassa o a spirale.

1 Pubescenza del pronoto volta all'indietro in linea retta; avancorpo finemente e fittamente granuloso 2
- Pubescenza del pronoto volta in avanti obliquamente o all'indietro obliquamente; avancorpo per lo più con punteggiatura o granulosità robuste o evidenti . . . . . *Diestota* Mulsant & Rey, 1871
2 Corpo stretto e a lati paralleli; palpi labiali corti; ligula all'apice più profondamente incisa; margine anteriore del mento rettilineo . . . . . *Chledophila* Cameron, 1920
- Corpo largo e fusiforme; palpi labiali allungati; ligula all'apice appena incisa; margine anteriore del mento arcuato . . . . . *Anamignusa* gen. n.

Anamignusa borneensis sp. n. Figg. 92-96

Holotypus ♀, Borneo, Sabah, Mt. Kinabalu N.P., Poring Hot Springs, 480 m, 20.VIII.1988, A. Smetana leg. (MHNG).

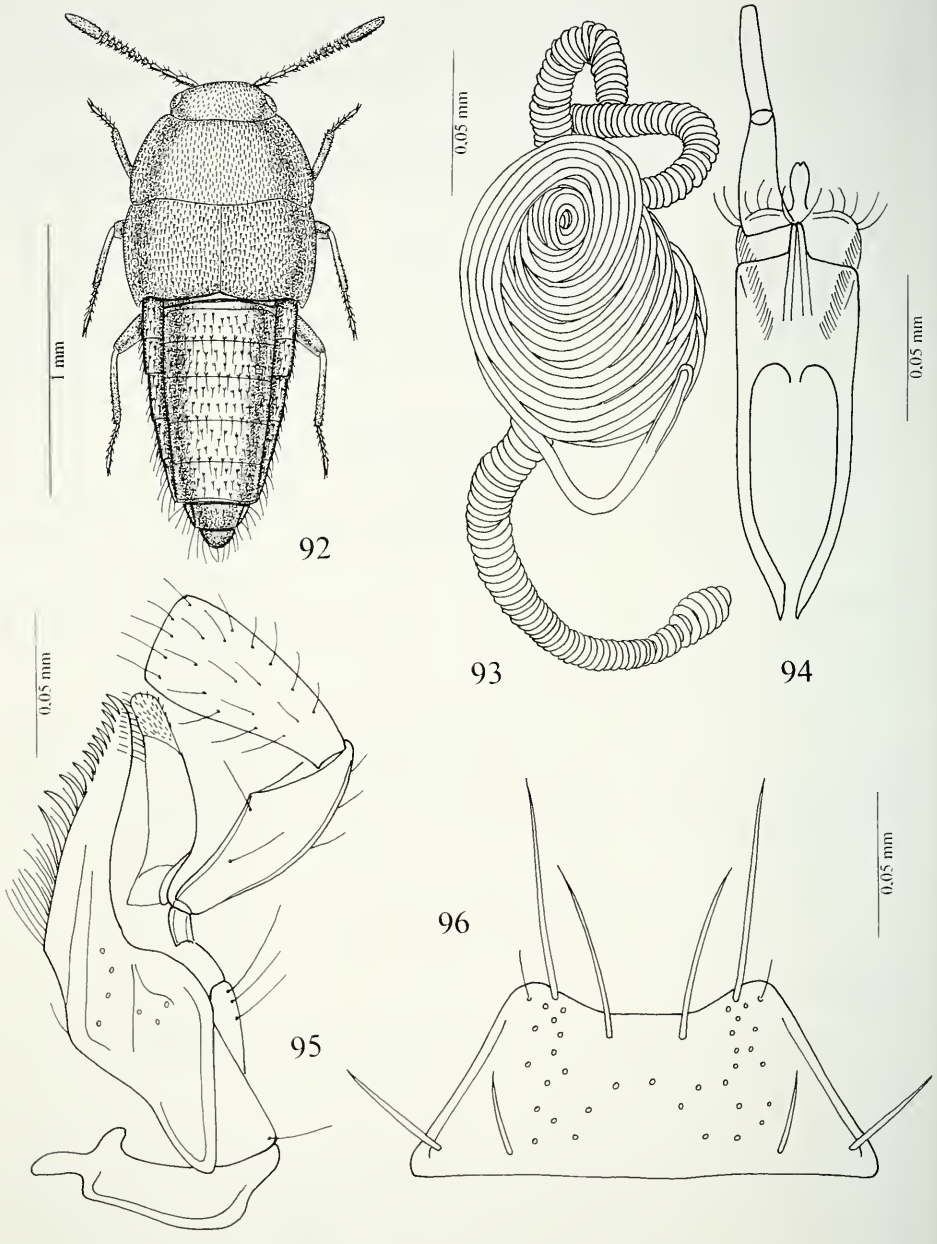
DESCRIZIONE. Lungh. 1,7 mm. Corpo lucido e rossiccio, con elitre bruno-rossicce; antenne rossicce, con i due antennomeri basali e l'apice dell'undicesimo gialli. Non è presente reticolazione sul corpo. La granulosità del capo e delle elitre è distinta, quella del pronoto è assai superficiale e quella dell'addome è molto saliente. Spermateca fig. 93.

Tribù BOLITOCHARINI Thomson, 1859

Antithetusa gen. n. Figg. 97-102

DIAGNOSI. Grazie all'eccezionale esilità della ligula e dell'articolo terminale dei palpi labiali e mascellari, è possibile avvicinare sistematicamente il nuovo genere al genere *Plesiosipalia* Bernhauer, 1943, della Nuova Zelanda. Ma il corpo è fusiforme (e non simile al genere *Geostiba* Thomson) e il primo articolo dei palpi labiali è molto più lungo del secondo (di lunghezza pari a quella del secondo in *Plesiosipalia*).

DESCRIZIONE. Undici antennomeri; tempie robustamente marginate; collo largo; palpi labiali di 3 articoli, con il primo e il terzo lunghissimi e il secondo assai breve; ligula esilissima e intera, fig. 101; palpi mascellari di 4 articoli assai lunghi, tranne il primo, fig. 100; mento trapezoidale, con base minore rettilinea, fig. 102; processo mesosternale carenato e largo, ad apice tronco; mesocoxe tra loro separate; tibie mediane e posteriori con setola isolata esterna; formula tarsale 4-4-5; primo tarsomero posteriore appena più corto dei due seguenti riuniti; edeago figg. 98-99.



FIGG. 92-96

Habitus, spermateca, labio con palpo labiale, maxilla con palpo mascellare e mento. 92-96: *Anamignusa borneensis* gen. n., sp. n.

TIPO DEL GENERE. *Antithetusa inopinata* sp. n.

ETIMOLOGIA. Il nome femminile del nuovo genere significa "Colei che è contrastante", nel senso che ha parti boccali simili a quelle del genere *Plesiosipalia*, ma l'habitus è in contrasto con quello del genere di confronto.

COMPARAZIONI. Chiave di alcuni generi asiatici e neozelandesi della tribù Bolitocharini.

1 Ligula intera 2
- Ligula divisa . . *Bolitochara* Mannerheim, 1831, *auct.*; *Pseudatheta* Cameron, 1920; *Neoleptusa* Cameron, 1939; *Omologlusa* Pace, 1998; *Methistemistiba* Pace, 1998; *Homoiobrachida* Pace, 1990; *Sulepta* Cameron, 1939; *Phymatura* Sahlberg, 1876; *Caloderina* Ganglbauer, 1895; *Tachyclara* Cameron, 1920
2 Apice della ligula arrotondato . . . . . *Leptusa* Kraatz, 1856
- Apice della ligula acutissimo 3
3 Habitus di *Oxypoda*; primo articolo dei palpi labiali molto più lungo del secondo; ligula esile e lunga circa quanto la metà del primo articolo dei palpi labiali; margine anteriore del mento rettilineo. Borneo *Antithetusa* gen. n.
- Habitus di *Geostiba*; primo articolo dei palpi labiali lungo quanto il secondo; ligula robusta e lunga quanto i due articoli basali dei palpi labiali; margine anteriore del mento bisinuato. Nuova Zelanda . . . . . *Plesiosipalia* Bernhauer, 1943

Antithetusa inopinata sp. n. Figg. 97-102

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu, 1750 m, 27.IV.1987, Burckhardt & Löbl leg. (MHNG).

DESCRIZIONE. Lungh. 1,9 mm. Corpo lucido e giallo-rossiccio, con elitre oscurate di bruno; antenne rossicce, con i due antennomeri basali gialli; zampe giallo-rossicce. La reticolazione del capo e del pronoto è assente, quella delle elitre è distinta e quella dell'addome è superficiale. La punteggiatura del capo è svanita, quella delle elitre è distinta. Una distinta granulosità fine copre il pronoto, quella dell'addome è poco distinta. Edeago figg. 98-99.

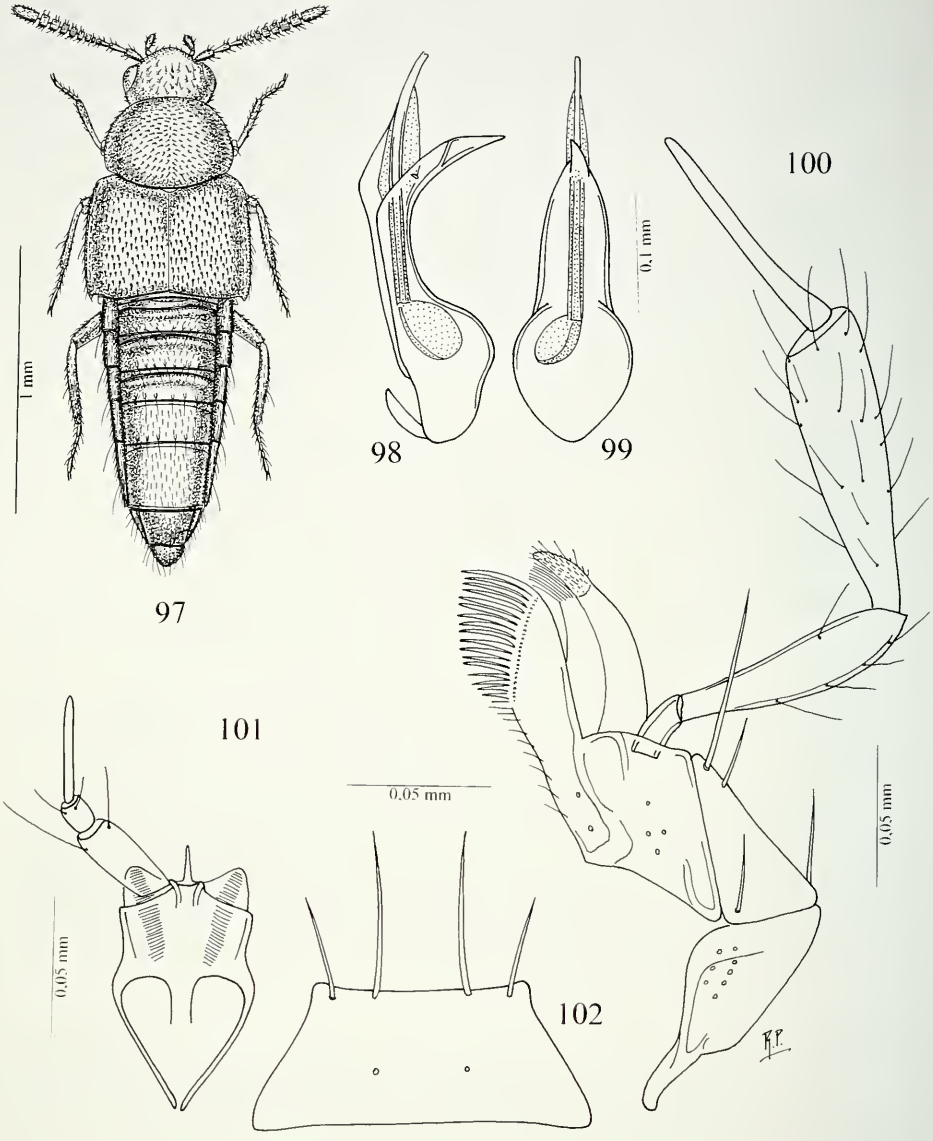
Panbrachyna gen. n. Figg. 103-109

DIAGNOSI. Per la presenza di una ligula a base larghissima e divisa all'apice, il nuovo genere è distinto da tutti quelli della tribù Bolitocharini, che nella totalità presentano ligula a base stretta.

DESCRIZIONE. Undici antennomeri; tempie marginate; palpi labiali di 3 articoli; ligula corta e a base larga, fig. 106; palpi mascellari di 4 articoli; apice della galea non setoloso, fig. 109; mento a base anteriore rettilinea, fig. 107; mesosterno non carenato; processo mesosternale acuto; mesocoxe contigue; formula tarsale 4-4-5; edeago figg. 104-105, spermateca fig. 108.

TIPO DEL GENERE. *Panbrachyna borneensis* sp. n.

ETIMOLOGIA. Il nome femminile del nuovo genere significa "Piccola tutta larga". Si allude alla larghezza della ligula.



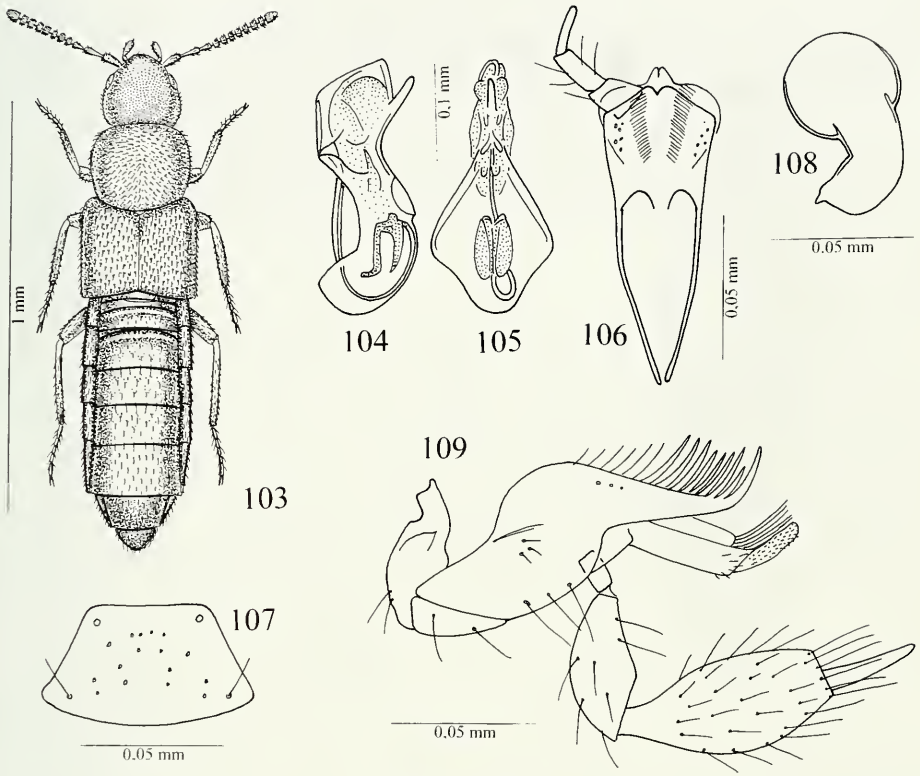
FIGG. 97-102

Habitus, edeago in visione laterale e ventrale, maxilla con palpo mascellare, labio con palpo labiale e mento. 97-102: *Antithetusa inopinata* gen. n., sp. n.

Panbrachyna borneensis sp. n. Figg. 103-109

Holotypus ♂. Borneo, Sabah, Crocker Ra., 1270 m, Km 60 rte. Kota Kinabalu-Tambunan, 17.V.1987, Burckhardt & Löbl leg. (MHNG).

Paratypi: 2 ♀♀, stessa provenienza; 1 ♀, Borneo, Sabah, Mt. Kinabalu N.P., Poring Hot Springs, 500 m, 6.V.1987, Burckhardt & Löbl leg.



FIGG. 103-109
Habitus, edeago in visione laterale e ventrale, labio con palpo labiale, spermateca, mento e maxilla con palpo mascellare. 103-109: *Panbrachyna borneensis* gen. n., sp. n.

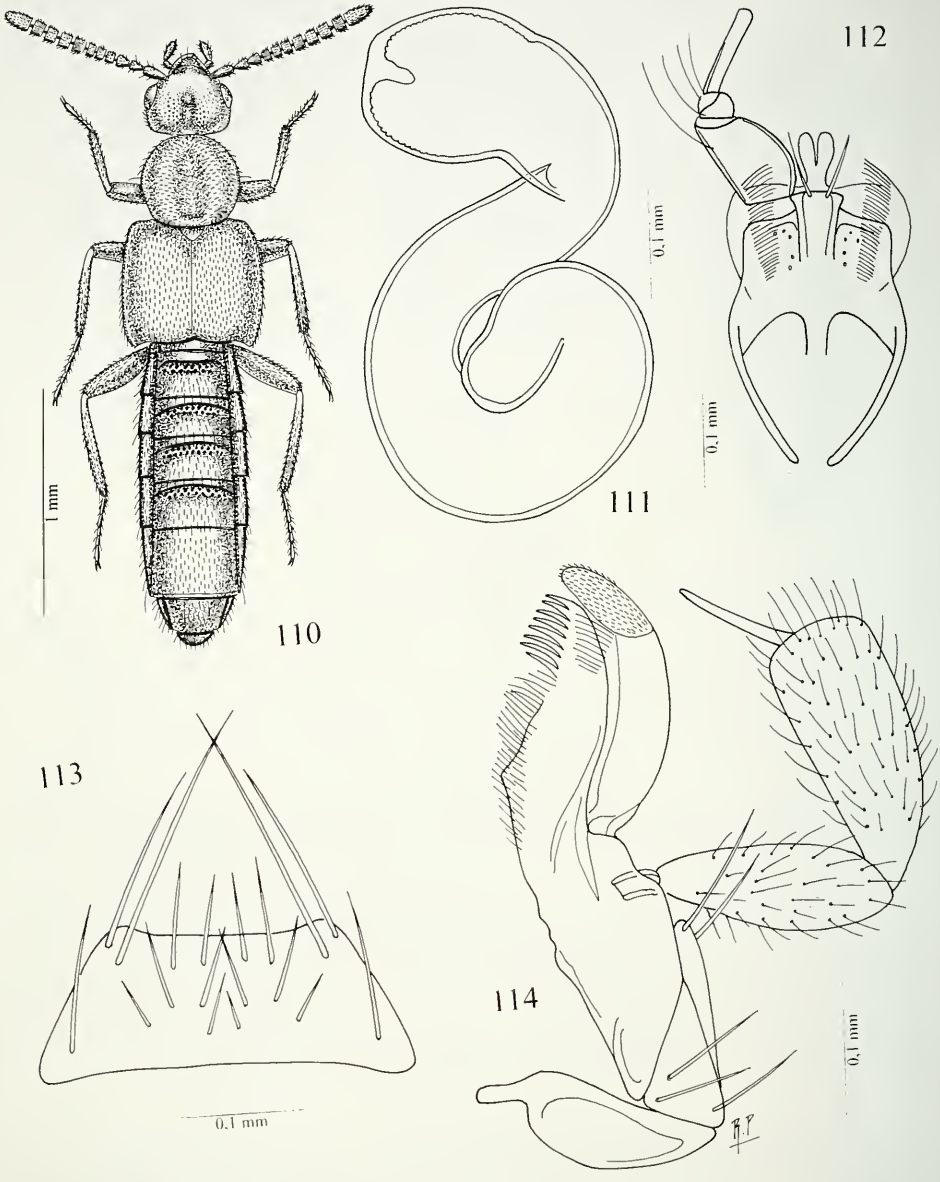
DESCRIZIONE. Lungh. 1,2 mm. Corpo lucido e giallo-bruno, con pronoto, base ed estremità dell'addome rossicci; antenne brune con i due antennomeri basali giallo-rossicci; zampe gialle. La punteggiatura del capo è così fitta da dare l'aspetto di una distinta reticolazione. Sul resto del corpo non vi è reticolazione. La granulosità del pronoto e delle elitre è distinta. Una vaga scultura squamiforme sta sugli uroterghi liberi secondo e terzo. Edeago figg 104-105, spermateca fig. 108.

Tribù FALAGRIINI Mulsant & Rey, 1873

Borneopora gen. n. Figg. 110-114

DIAGNOSI. Taxon vicino al genere *Myrmecopora* Saulcy, 1864, distinto essenzialmente per la presenza dei due rami apicali della ligula assai dilatati (stretti in *Myrmecopora*).

DESCRIZIONE. Undici antennomeri; tempie marginate; collo stretto; palpi labiali di tre articoli, di cui il secondo molto ridotto; ligula divisa in due rami larghi,



FIGG. 110-114

Habitus, spermateca, labio con palpo labiale, mento e maxilla con palpo mascellare. 110-114: *Borneopora fontis* gen. n., sp. n.

arrotondati all'estremità, fig. 112; palpi mascellari di 4 articoli, di cui l'apicale estremamente esile, fig. 114; mento fig. 113; mesosterno non carenato; processo mesosternale acuto; mesocoxe lievemente separate tra loro; formula tarsale 4-5-5; primo tarsomero posteriore lungo quanto i due seguenti riuniti; spermateca fig. 111.

TIPO DEL GENERE. *Borneopora fontis* sp. n.

ETIMOLOGIA. Il nome femminile del nuovo genere è la fusione dei sostantivi Borneo con *Myrmecopora* e significa "Colei che attraversa il Borneo", seguendo le acque dolci.

Borneopora fontis sp. n. Figg. 110-114

Holotypus ♀, Borneo, Sabah, Mt. Kinabalu N.P., above Poring Hot Springs, 520 m, 9.V.1987, A. Smetana leg. (MHNG).

DESCRIZIONE. Lungh. 2,7 mm. Corpo lucido, un po' appiattito e bruno, con pigidio giallo-rossiccio; antenne con i due antennomeri basali giallo-rossicci; zampe giallo-rossicce. Corpo senza. reticolazione. La punteggiatura del capo è netta, ma assente sulla linea longitudinale mediana, nel solco e sulla fronte. Vi è una profonda fossetta discale del capo. Il pronoto presenta un largo appiattimento mediano, una profonda impressione trasversa basale e punteggiatura finissima e fitta, come quella delle elitre. Spermateca fig. 111.

Tribù ATHETINI Casey, 1910

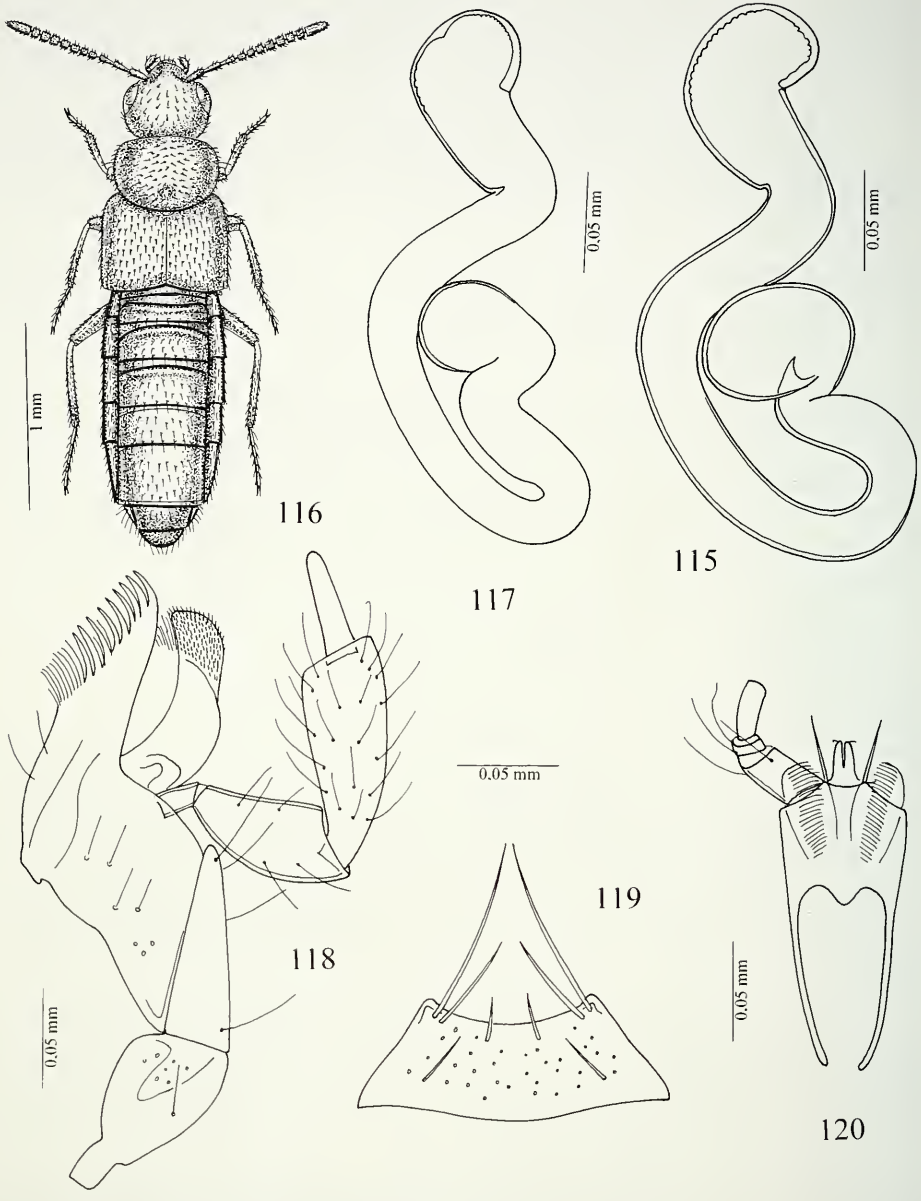
Planadota gen. n. (per *Atheta borneensis* Cameron, 1933) Figg. 115-120

NOTA. *Atheta borneensis* Cameron, 1933, è stata attribuita da Sawada (1980) al genere *Pycnota* Mulsant & Rey, 1874. Questa attribuzione generica per Sawada aveva carattere provvisorio. Infatti scriveva: *In future a new genus may be established to accommodate this species.* L'attribuzione a *Pycnota* non è più sostenibile perché questo genere è caratterizzato dalla presenza di una ligula intera e la specie *borneensis* presenta ligula divisa all'apice. Questa nuova attribuzione è effettuata a seguito dell'esame dell'olotipo ♀ di *Atheta borneensis.*

DIAGNOSI. La forma della ligula permette di avvicinare il nuovo genere ai generi *Pelioptera* Kraatz, 1857 e *Aloconota* Thomson, 1858. Dal primo si distingue per la presenza di mesocoxe contigue, dal secondo per la base della ligula stretta. Da entrambi, per la forma della spermateca. L'assenza del ♂ non permette ulteriori confronti.

DESCRIZIONE. Undici antennomeri; tempie marginate solo posteriormente; palpi labiali di tre articoli; ligula non ristretta alla base e divisa all'estremità, fig. 120; palpi mascellari di 4 articoli, fig. 118; mento fig. 119: processo mesosternale acuto; mesocoxe contigue fra loro; formula tarsale 4-5-5; primo tarsomero posteriore lungo quanto i due seguenti riuniti. Spermateca dell'olotipo fig. 115, spermateca di un esemplare fig. 117.

TIPO DEL GENERE. *Planadota borneensis* (Cameron, 1933) **comb. n.**



FIGG. 115-120

Habitus, spermateca, maxilla con palpo mascellare, mento e labio con palpo labiale. 115: *Planadota borneensis* (Cameron), comb. n., holotypus; 116-120: *Planadota borneensis* (Cameron) comb. n.

Atheta (s. str.) *borneensis* Cameron, 1933: 357
Pycnota borneensis: Sawada, 1980: 30
Atheta (s. str.) *borneensis*: Hammond, 1984: 208

ETIMOLOGIA. Il nome femminile del nuovo genere significa "Dono che induce in errore".

MATERIALE ESAMINATO (*P. borneensis*). Holotypus ♀, N. Borneo, Mt. Kinabalu, Kenokok, 3300 feet, 23 apr. 1929, *Atheta borneensis* Cam. (British Museum). 1 ♀, Borneo, Sabah, E Mt. Kinabalu, rte. Ranau-Kota Kinabalu, 1150 m, 24.V.1987, Burckhardt & Löbl leg.

Paranomusa gen. n. Figg. 121-124

DIAGNOSI. Habitus simile a quello di *Acrotona* Thomson, 1859, ma la ligula ha base larga ed è divisa fino alla base. Per questi caratteri potrebbe essere genere vicino a *Hydrosmecta* Thomson, 1858, ma l'habitus e la spermateca hanno struttura nettamente differente.

DESCRIZIONE. Undici antennomeri; tempie robustamente marginate; palpi labiali di 3 articoli, con il secondo cortissimo; ligula a base larga e divisa a metà fino alla base, fig. 123; palpi mascellari di 4 articoli; processo mesosternale acuto; mesocoxe contigue; formula tarsale 4-5-5; primo tarsomero posteriore lungo quanto i due seguenti riuniti; spermateca fig. 122.

TIPO DEL GENERE. *Paranomusa kinabaluensis* sp. n.

ETIMOLOGIA. Il nome femminile del nuovo genere significa "Dono che trasgredisce alle norme".

Paranomusa kinabaluensis sp. n. Figg. 121-124

Holotypus ♀, Borneo, Sabah, Mt. Kinabalu N.P., HQ Liwagu Rv. trail, 1520 m, 11.VIII.1988, A. Smetana leg. (MHNG).

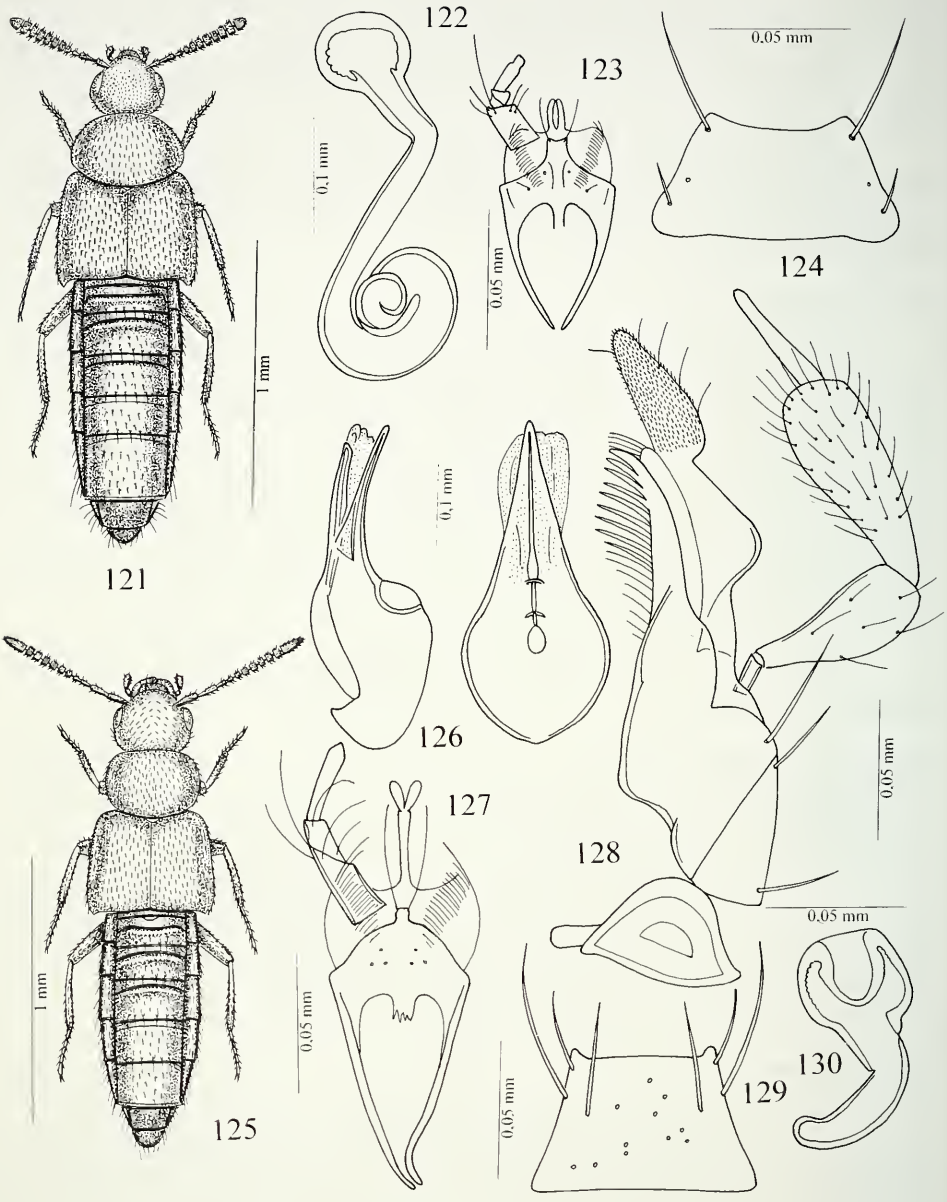
Paratypus: 1 ♀, stessa provenienza, ma 1500 m e 4.VIII.1988.

DESCRIZIONE. Lungh. 1.8 mm. Corpo lucido e giallo-rossiccio chiaro, con elitre giallo-brune; antenne brune con i quattro antennomeri basali gialli; zampe gialle. La reticolazione del capo, delle elitre e dell'addome è distinta, quella del pronoto è assente: La punteggiatura del capo è distinta, quella del pronoto è superficiale. Le elitre presentano una granulosità distinta. Spermateca fig. 122.

Dikraspedella gen. n. Figg. 125-136

DIAGNOSI. La presenza di un lunghissima ligula, avente all'estremità due lobi ovali, l'apice pubescente della galea molto sviluppato e la forma caratteristica della spermateca, sono caratteri non riscontrabili insieme in nessun genere noto della tribù Athetini.

DESCRIZIONE. Undici antennomeri; tempie robustamente marginate; palpi labiali di 3 articoli; ligula assai lunga, con due lobi apicali, fig. 127; palpi mascellari di 4 articoli; parte apicale pubescente della galea molto sviluppata, con alcune setole isolate, fig. 128; mento fig. 129; processo mesosternale acuto; mesocoxe tra loro contigue; formula tarsale 4-5-5; primo tarsomero posteriore corto; edeago figg. 126, 133-134, spermateca fig. 130.



FIGG. 121-130

Habitus, spermateca, labio con palpo labiale, mento, edeago in visione laterale e ventrale e maxilla con palpo mascellare. 121-124: *Paranomusa kinabaluensis* gen. n., sp. n.; 125-130: *Dikraspedella kinabaluensis* gen. n., sp. n.

TIPO DEL GENERE. *Dikraspedella kinabaluensis* sp. n.

ETIMOLOGIA. Il nome femminile della nuova specie significa "Piccola dai due lembi". Questi si trovano all'apice della ligula.

Dikraspedella kinabaluensis sp. n. Figg. 125-131

Holotypus ♀, Borneo, Sabah, Mt. Kinabalu N.P., HQ Liwagu Riv. trail, 1500-1550 m, 27.IV.1987, A. Smetana leg. (MHNG).

Paratypi: 3 ♂♂ e 1 ♀, Borneo, Sabah, Mt. Kinabalu N.P., 1580 m, 27.IV.1987, Burckhardt & Löbl leg.; 1 ♀, Borneo, Sabah, Mt. Kinabalu N.P., 1500 m, 30.IV.1987, Burckhardt & Löbl leg.; 1 ♂, Borneo, Sabah, Crocker Ra., 1600 m, Km 51 rte. Kinabalu-Tambunan, 18.V.1987, Burckhardt & Löbl leg.

DESCRIZIONE. Lungh. 1,7 mm. Corpo lucido e rossiccio, con elitre e addome bruno-rossicci; antenne giallo- brune con i tre antennomeri basali gialli e i tre seguenti di un giallo sporco; zampe gialle. La reticolazione dell'avancorpo è distinta. La granulosità del capo è confusa nella reticolazione, quella del pronoto e delle elitre è distinta. Edeago fig. 126, spermateca fig. 130, sesto urotergo libero del ♂ 131.

Dikraspedella smetanai sp. n. Figg. 132-136

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu N.P., HQ Liwagu Rv. tr., 1655 m, 11.VIII.1988, A. Smetana leg. (MHNG).

Paratypi: 1 ♂ e 1 ♀, stessa provenienza.

DESCRIZIONE. Lungh. 1,9 mm. Corpo lucido e bruno, con base ed estremità addominale giallo-brune; antenne brune con i tre antennomeri basali di un giallo sporco; zampe gialle. L'avancorpo è privo di reticolazione, l'addome è distintamente reticolato. La punteggiatura del capo e delle elitre è svanita, quella del pronoto è assente come la sua granulosità. Edeago figg. 133-134, spermateca fig. 135, sesto urotergo libero del ♂ fig. 135.

NOTA. La ligula di questa specie è meno lunga di quella del tipo del genere e, alla base di ciascun lobo apicale della stessa ligula, è inserita una setola. Inoltre la spermateca è piuttosto differente. Pertanto *D. smetanai* forse dovrebbe appartenere a un nuovo sottogenere di *Dikraspedella.*

ETIMOLOGIA. Specie dedicata al suo raccoglitore Dr. A. Smetana di Ottawa, noto studioso di Staphylinidae.

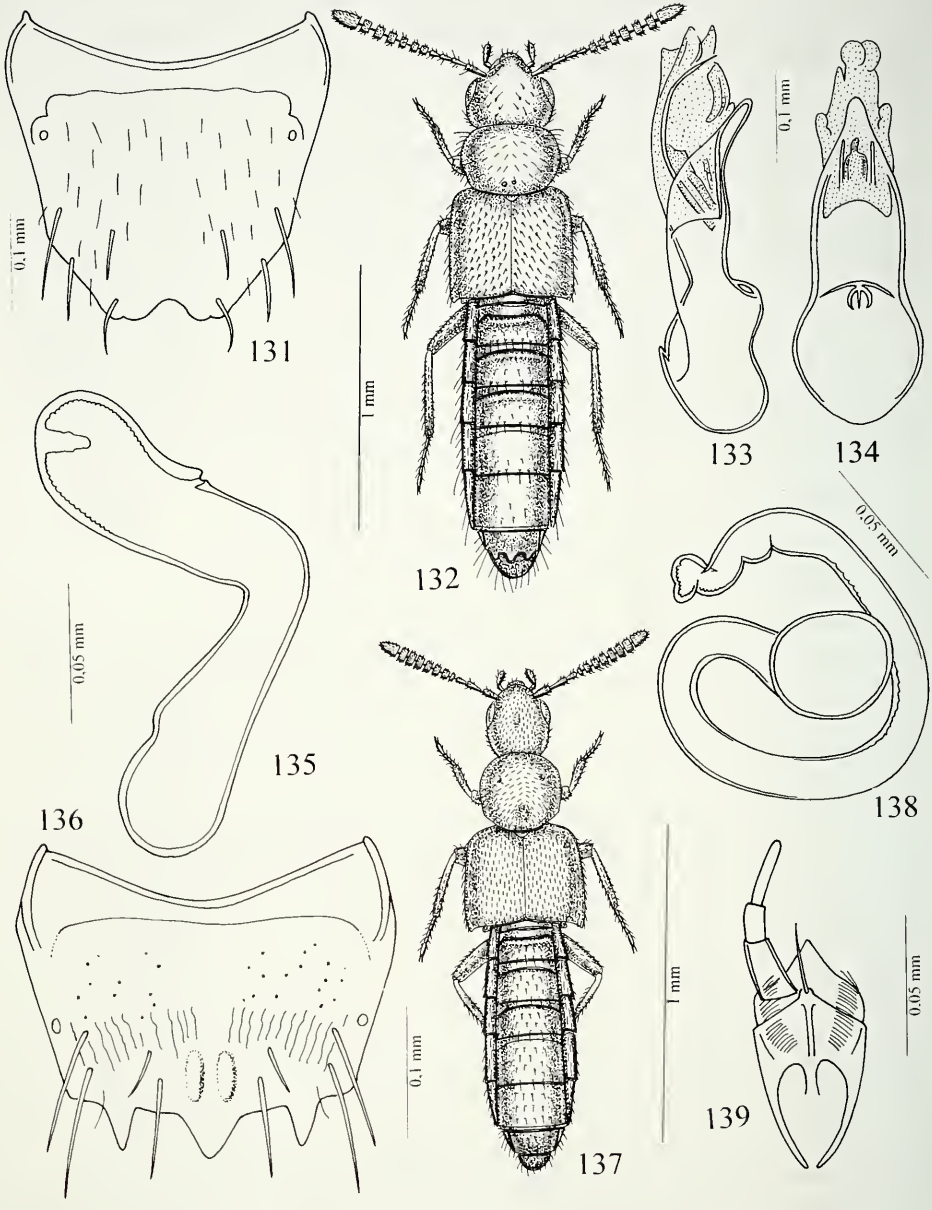
COMPARAZIONI. Chiave delle specie del nuovo genere *Dikraspedella.*

1 Capo e pronoto rossicci; reticolazione del pronoto distinta; granulosità del pronoto distinta; edeago ventralmente arcuato; spermateca corta. Lungh. 1,7 mm. M. Kinabalu . . . . . *D. kinabaluensis* sp. n.

\- Capo e pronoto bruni; reticolazione del pronoto assente; granulosità del pronoto assente; edeago ventralmente bisinuoso; spermateca allungata. Lungh. 1,9 mm. M. Kinabalu . . . . . *D. smetanai* sp. n.

Trigonoglossina gen. n. Figg. 137-141

DIAGNOSI. Grazie alla singolare forma della ligula e della spermateca, mai riscontrate nella tribù Athetini, il nuovo genere non può essere avvicinato sistematicamente a nessun genere noto, nemmeno a *Pelioptera,* a cui è simile per i caratteri dell'habitus.



FIGG. 131-139

Sesto urotergo libero del ♂, habitus, edeago in visione laterale e ventrale, spermateca e labio con palpo labiale. 131: *Dikraspedella kinabaluensis* gen. n., sp. n.; 132-136: *Dikraspedella smetanai* gen. n., sp. n.; 137-139: *Trigonoglossina borneensis* gen. n., sp. n.

DESCRIZIONE. Undici antennomeri; tempie non marginate; palpi labiali di 3 articoli; ligula intera e triangolare, fig. 139; palpi mascellari di 4 articoli, fig. 140; mento a margine anteriore sinuoso, fig. 141; mesosterno carenato; processo mesosternale acuto; mesocoxe contigue tra loro; formula tarsale 4-5-? (zampe posteriori perdute); spermateca fig. 138.

TIPO DEL GENERE. *Trigonoglossina borneensis* sp. n.

ETIMOLOGIA. Il nome femminile del nuovo genere significa "Piccola dalla lingua triangolare".

Trigonoglossina borneensis sp. n. Figg. 137-141

Holotypus ♀, Borneo, Sabah, Mt. Kinabalu N.P., HQ at Liwagu Rv., 1500 m, 30.IV.1987, A. Smetana leg. (MHNG).

DESCRIZIONE. Lungh. 1,6 mm. Corpo lucido e giallo-rossiccio, con capo rossiccio ed elitre di un giallo sporco; antenne bruno-giallicce con i tre antennomeri basali gialli; zampe gialle. La punteggiatura del capo è fitta e superficiale. La granulosità del pronoto e delle elitre è assai svanita. Spermateca fig. 138.

Serikasomina gen. n. Figg. 142-153

DIAGNOSI. Habitus e tipo di pubescenza del pronoto (cioè diretta all'indietro in linea retta) propri del genere *Gastropaga* Bernhauer, 1915, ma parti boccali e tipo di spermateca differenti, cioè rami apicali della ligula cortissimi (e non lunghi come in *Gastropaga*) e apice pubescente della galea molto sviluppato.

DESCRIZIONE. Undici antennomeri; tempie finemente marginate; palpi labiali di 3 articoli; ligula divisa all'estremità in due brevi rami, fig. 147; palpi mascellari di 4 articoli; galea con estremità apicale pubescente enormemente sviluppata, fig. 143; processo mesosternale acuto; mesocoxe contigue fra di loro; formula tarsale 4-5-5; primo tarsomero posteriore corto; edeago figg. 145-146, spermateca fig. 144.

TIPO DEL GENERE. *Serikasomina smetanai* sp. n.

ETIMOLOGIA. Il nome femminile del nuovo genere significa "Piccolo corpo sericeo".

Serikasomina smetanai sp. n. Figg. 142-148

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu N.P., Poring Hot Springs, 485 m, 29.VIII.1988, A. Smetana leg. (MHNG).

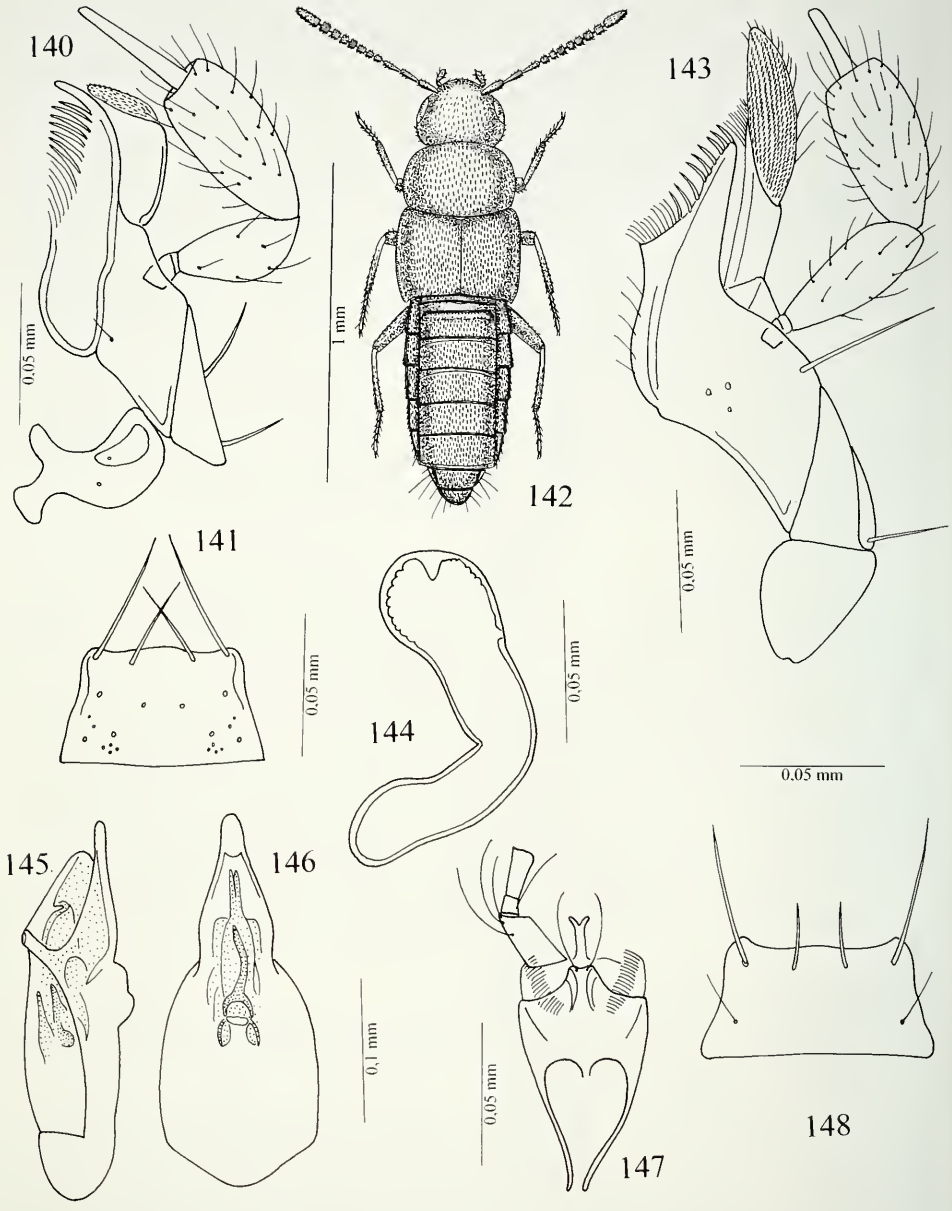
Paratypi: 15 es., stessa provenienza.

DESCRIZIONE. Lungh. 1,3 mm. Corpo lucido e bruno-rossiccio, con pronoto, base ed estremità addominale gialli, uriti liberi 3°, 4° e 5° bruni; antenne giallo-brune, con i tre antennomeri basali gialli; zampe gialle. L'intero corpo è coperto di granulosità finissima e fittissima superficiale. Edeago figg. 145-146, spermateca fig. 144.

ETIMOLOGIA. Specie dedicata al suo raccoglitore Dr. A. Smetana di Ottawa, noto studioso di Staphylinidae.

Serikasomina borneensis sp. n. Figg. 149-151

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu N.P., HQ Liwagu River, 1495 m, 21.V.1987, A. Smetana leg. (MHNG).



FIGG. 140-148

Maxilla con palpo mascellare, habitus, mento, spermateca e labio con palpo labiale. 140-141: *Trigonoglossina borneensis* gen. n., sp. n.; 142-148: *Serikasomina smetanai* gen. n., sp. n.

DESCRIZIONE. Lungh. 1,8 mm. Corpo lucido. Capo e base delle elitre rossicci, pronoto, base ed estremità addominale gialli, resto del corpo bruno; antenne brune con i due antennomeri basali e l'undicesimo gialli, antennomeri 3° e 4° di un giallo sporco; zampe gialle. La punteggiatura del capo è fitta e netta, quella del pronoto è fine e distinta. un debole solco mediano sta sul pronoto. La granulosità delle elitre è fitta e poco distinta, quella dell'addome è fittissima. Edeago figg. 150-151.

Serikasomina diversearmata sp. n. Figg. 152-153

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu N.P., Poring Hot Springs, 500 m, 11.V.1987, Burckhardt & Löbl leg. (MHNG).

Paratypi: 2 ♂♂, stessa provenienza.

DESCRIZIONE. Lungh. 1,7 mm. Corpo lucido e bruno, con pronoto e addome giallo-bruni; antenne brune con i due antennomeri basali di un giallo sporco; zampe gialle. La reticolazione dell'avancorpo è assente, quella dell'addome è a maglie molto trasverse e superficiali. La punteggiatura del capo è superficiale e assente sul disco. La granulosità del pronoto e delle elitre è distinta. I tre uroterghi basali presentano una granulosità piuttosto fitta, i due successivi granulosità rada. Edeago fig. 153.

COMPARAZIONI. Chiave delle specie del nuovo genere *Serikasomina.*

1 Elitre molto più lunghe del pronoto, fig. 149. Lungh. 1,8 mm. M. Kinabalu ..... *S. borneensis* sp. n.

\- Elitre appena più lunghe del pronoto, fig. 142 2

2 Occhi meno sviluppati; pronoto più trasverso, addome fittamente pubescente; edeago più sviluppato, nonostante la taglia corporea sia minore. Lungh. 1,3 mm. M. Kinabalu ..... *S. smetanai* sp. n.

\- Occhi più sviluppati; pronoto meno trasverso; addome largamente pubescente; edeago meno sviluppato, nonostante la taglia corporea maggiore. Lungh. 1,7 mm ..... *S. diversearmata* sp. n.

Ektasitrachela gen. n. Figg. 154-158

DIAGNOSI. Habitus simile a quello del genere *Homoeusa* Kraatz, 1856, ma le antenne sono molto lunghe, i lati del corpo portano lunghe setole, l'avancorpo è privo di punteggiatura e di pubescenza e la formula tarsale è 4-5-5, invece di 5-5-5.

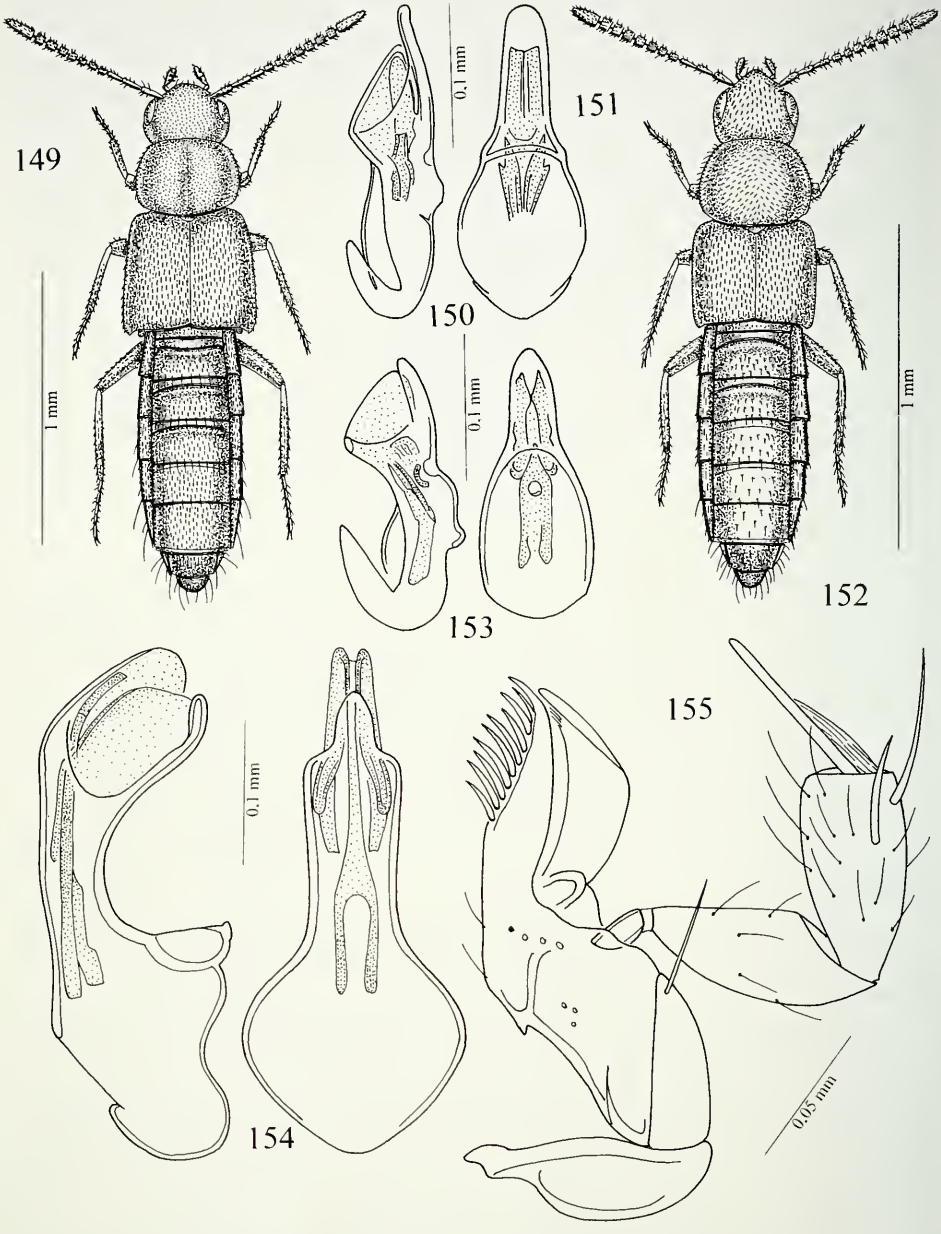
DESCRIZIONE. Undici antennomeri; tempie non marginate, palpi labiali di tre articoli; ligula corta, intera e larga, fig. 157; palpi mascellari di 4 articoli, fig. 155; mento trapezoidale molto largo e stretto, fig. 158; pronoto più largo delle elitre; mesosterno non carenato; processo mesosternale acuto; mesocoxe contigue; formula tarsale 4-5-5; primo tarsomero medio e posteriore lungo quanto i tre seguenti riuniti; edeago fig. 154.

TIPO DEL GENERE. *Ektasitrachela borneensis* sp. n.

ETIMOLOGIA. Il nome femminile del nuovo genere significa "Collo espanso". Allude al pronoto più largo delle elitre.

Ektasitrachela borneensis sp. n. Figg. 154-158

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu N.P., Poring Hot Springs, 500 m, 6.V.1987, Burckhardt & Löbl leg. (MHNG).



FIGG. 149-155

Habitus, edeago in visione laterale e ventrale, maxilla con palpo mascellare. 149-151: *Serikasomina borneensis* gen. n., sp. n.; 152-153: *Serikasomina diversearmata* gen. n., sp. n.; 154-155: *Ektasitrachela borneensis* gen. n., sp. n.

DESCRIZIONE. Lungh. 2,0 mm. Corpo lucido e bruno, con pronoto rossiccio; antenne di un giallo sporco; zampe giallo-rossicce. L'avancorpo è privo di reticolazione, l'addome mostra una reticolazione molto superficiale e solo sui tre uroterghi basali. Il capo, il pronoto e le elitre sono senza punteggiatura e senza granulosità: un solo granulo sta sulle elitre. Edeago fig. 154.

Tribù THAMIARAEINI Fenyes, 1921

Diabainella gen. n. Figg. 159-166

DIAGNOSI. In base alla struttura della spermateca (avvolta a spirale), il nuovo genere, nell'ambito della tribù Thamiaraeini, può essere comparato solo con il genere *Franzidota* Pace, 1982b. Ma la ligula nel nuovo genere è lunghissima e non corta e a base larga come in *Franzidota* e il mesosterno è carenato (senza carena in *Franzidota*).

DESCRIZIONE. Undici antennomeri; tempie robustamente marginate; palpi labiali stiliformi di 2 articoli; ligula lunghissima e divisa all'apice, fig. 163; palpi mascellari di 4 articoli; lacinia strettissima, fig. 164; mento fig. 165; mesosterno carenato; processo mesosternale acuto; mesocoxe tra loro contigue; formula tarsale 4-5-5; primo tarsomero posteriore più lungo dei due successivi riuniti; edeago figg. 160-161, spermateca fig. 162, sesto urotergo libero del ♂ fig. 166.

TIPO DEL GENERE. *Diabainella borneensis* sp. n.

ETIMOLOGIA. Il nome femminile del nuovo genere significa "Piccola che travalica", nel senso che mostra caratteri di altre tribù, così scavalcando le categorie tassonomiche stabilite.

Diabainella borneensis sp. n. Figg. 159-166

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu N.P., HQ Liwagu River Trail, 1520 m, 11.VIII.1988, A. Smetana leg. (MHNG).

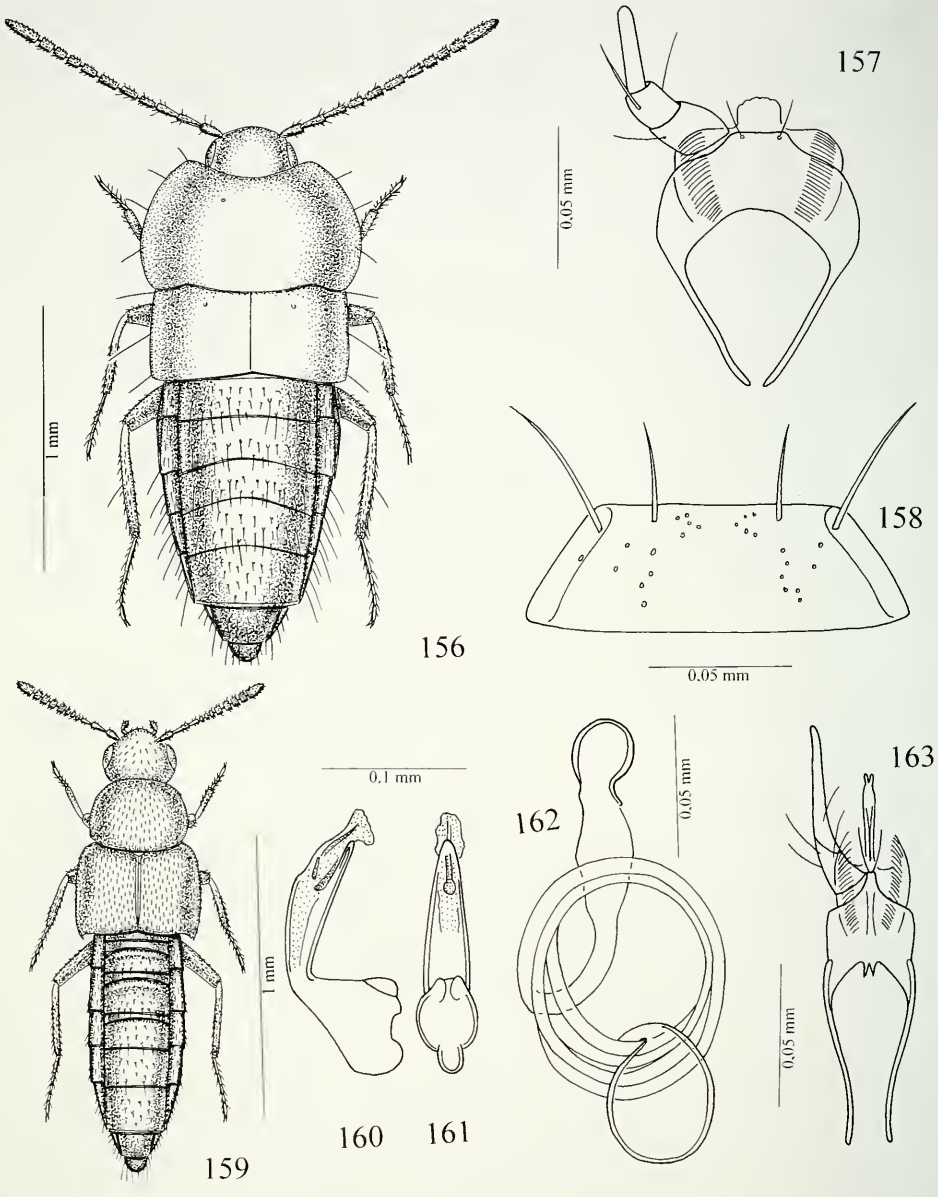
Paratypi: 14 es., stessa provenienza; 4 es., Borneo, Sabah, Mt. Kinabalu N.P., HQ Liwagu River, 1430 m, 5.VIII.1988 , A. Smetana leg.; 1 ♂, Borneo, Sabah, Mt. Kinabalu N.P., Poring Hot Springs, 550-600 m, 9.V.1987, Burckhardt & Löbl leg.; 1 ♂, Borneo, Sabah, Mt. Kinabalu N.P., Poring Hot Springs, 500 m, 13.V.1987, Burckhardt & Löbl leg.; 4 es., Borneo, Sabah, rte. Ranau-Kota Kinabalu, 1150 m, 24.V.1987, Burckhardt & Löbl leg.; 1 ♀, 1 ♂, Borneo, Sabah, Mt. Kinabalu N.P., 1500 m, 30.IV.1987, Burckhardt & Löbl leg.

DESCRIZIONE. Lungh. 1,5 mm. Corpo lucido e giallo-rossiccio, con elitre e una fascia addominale brune; antenne nero-brune con i tre antennomeri basali gialli e apice dell'undicesimo di un giallo sporco; zampe gialle. Sul corpo non è presente reticolazione. La punteggiatura del capo è molto superficiale. La granulosità del pronoto è molto svanita, quella delle elitre e dell'addome è distinta. Edeago figg. 160-161, spermateca fig. 162, sesto urotergo libero del ♂ fig. 166.

Tribù LOMECHUSINI Fleming, 1821 (=Myrmedoniini)

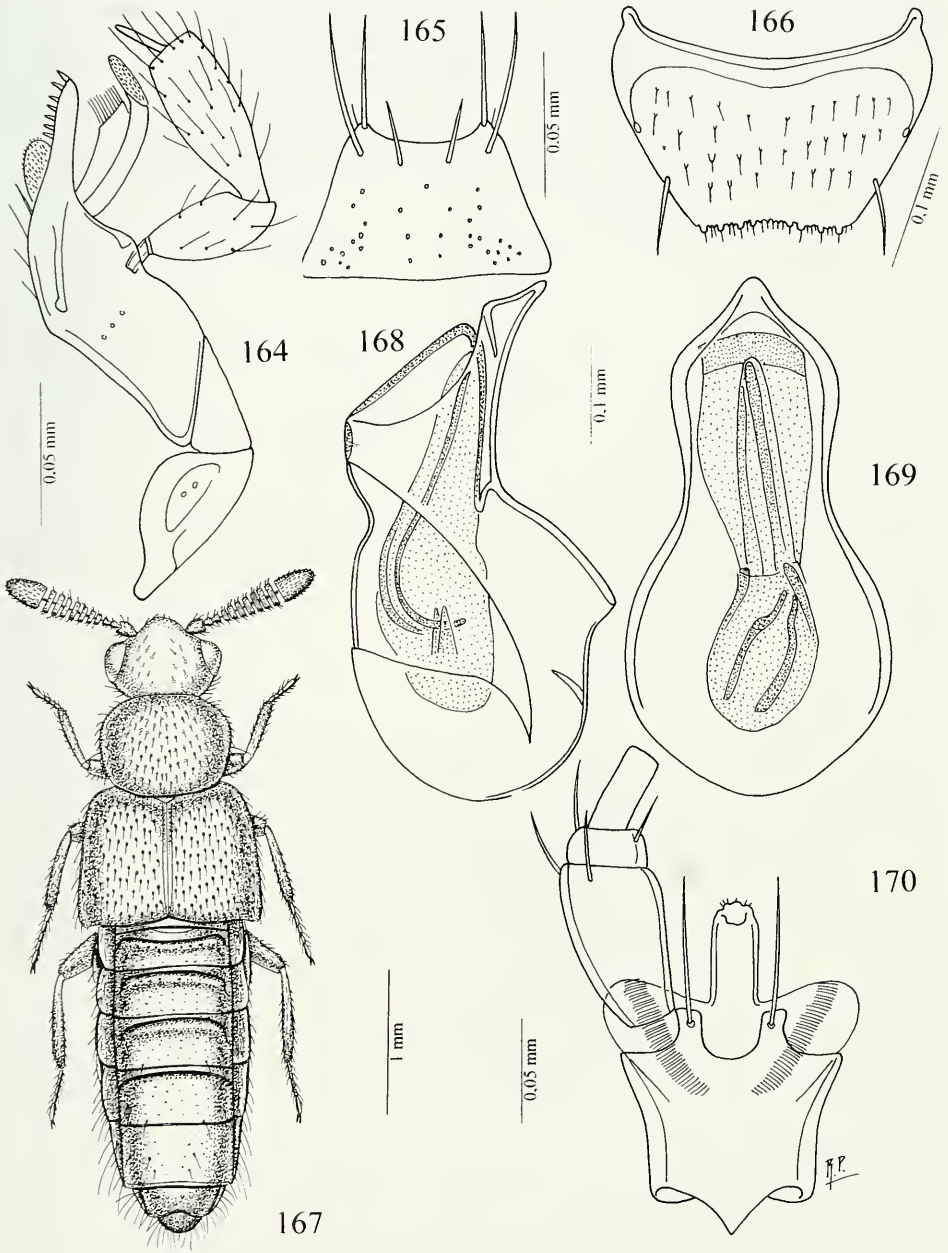
Borneozyras gen. n. Figg. 167-172

DIAGNOSI. Genere sicuramente appartenente alla tribù Lomechusini, per la presenza di setole al margine interno della lacinia (spine in altre tribù). Per la struttura



FIGG. 156-163

Habitus, labio con palpo labiale, mento, edeago in visione laterale e ventrale e spermateca. 156-158: *Ektasitrachela borneensis* gen. n., sp. n.; 159-163: *Diabainella borneensis* gen. n., sp. n.



FIGG. 164-170

Maxilla con palpo mascellare, mento, sesto urotergo libero del ♂, habitus e labio con palpo labiale. 164-166: *Diabainella borneensis* gen. n., sp. n.; 167-170: *Borneozyras smetanai* gen. n., sp. n.

dell'edeago e per l'habitus, è genere simile a *Zyras* Stephens, 1835, *auct.,* ma la ligula è intera (divisa in *Zyras*) e le antenne sono fortemente ispessite.

Descrizione. Antenne corte con antennomeri 4° a 10° fortemente trasversi; tempie marginate; palpi labiali di 3 articoli; ligula intera con alcune setole apicali, fig. 170; palpi labiali di 4 articoli, fig. 171; mento fig. 172; processo mesosternale assai largo e tronco; mesocoxe tra loro assai separate; formula tarsale 4-5-5; primo tarsomero posteriore corto; edeago figg. 168-169.

Tipo del genere. *Borneozyras smetanai* sp. n.

Etimologia. Il nome maschile del nuovo genere significa " *Zyras* del Borneo".

Borneozyras smetanai sp. n. Figg. 167-172

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu N.P., Poring Hot Springs, Area Eastern Ridge tr., 850 m, 28.VIII.1988, A. Smetana leg. (MHNG).

Descrizione. Lungh. 4,2 mm. Corpo lucido e rossiccio; antenne rossicce con i due antennomeri basali giallo-rossicci; zampe giallo-rossicce. Sul corpo non è presente reticolazione. La punteggiatura del capo è ombelicata, molto superficiale e assente sulla linea mediana, quella del pronoto è come quella del capo, ma presente sulla linea mediana, quella delle elitre è netta e quella dell'addome è fine. Edeago figg. 168-169.

Tribù HOPLANDRIINI Casey, 1910

Borneusa gen n. Figg. 173-178

Diagnosi. Genere sicuramente sistematicamente vicino al genere *Tacata* Blackwelder, 1952 (=*Atacta* Cameron, 1939), ma la ligula è decisamente più larga e appena incisa all'apice (incisa fino a metà in *Tacata*).

Descrizione. Undici antennomeri; tempie non marginate; mandibole molto lunghe e strette, la destra con dente interno, la sinistra senza; palpi labiali di 4 articoli, ligula assai larga e appena smarginata all'apice; paraglosse assai prominenti, fig. 174; palpi mascellari di 5 articoli, fig. 177; mesosterno non carenato; processo mesosternale acuto; tibie anteriori e medie spinose al lato esterno; formula tarsale 4-5-5; primo tarsomero posteriore lungo quanto i due seguenti riuniti; edeago figg. 175-176.

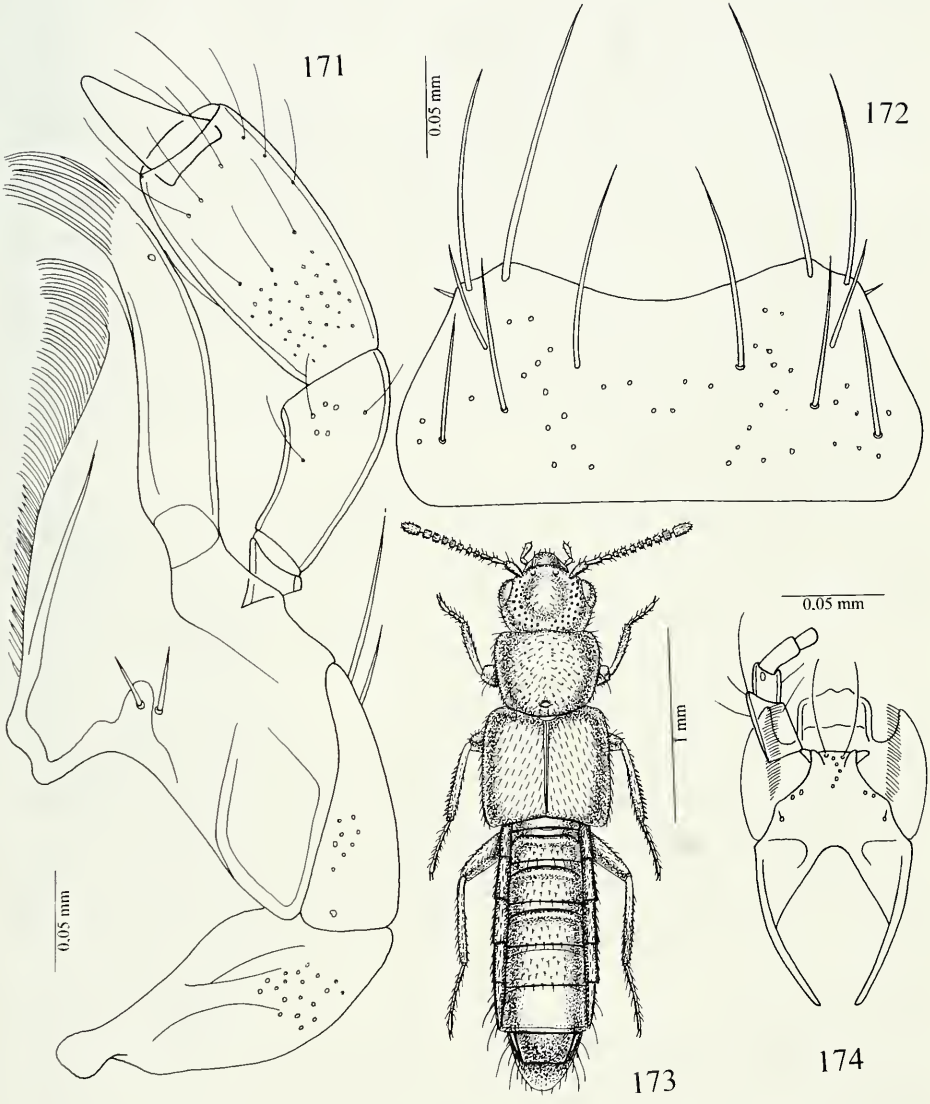
Tipo del genere. *Borneusa insolita* sp. n.

Etimologia. Il nome femminile del nuovo genere significa "Colei che è del Borneo".

Borneusa insolita sp. n. Figg. 173-178

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu N.P., Poring Hot Springs, 500 m, 6.V.1987, Burckhardt & Löbl leg. (MHNG).

Descrizione. Lungh. 2,8 mm. Corpo lucido e giallo-bruno, con addome bruno, tranne il pigidio che è bruno-rossiccio; antenne brune con i due antennomeri basali e la base del terzo gialli; zampe gialle. Il corpo è privo di reticolazione, tranne sulla metà posteriore del sesto urotergo libero, dove è robusta. La punteggiatura del capo e del pronoto è netta, sul disco del capo, che è ampiamente concavo, è largamente



FIGG. 171-174

Maxilla con palpo mascellare, mento, habitus, labio con palpo labiale. 171-172: *Borneozyras smetanai* gen. n., sp. n.; 173-174: *Borneusa insolita* gen. n., sp. n.

assente. La granulosità delle elitre è assai superficiale, quella sui quattro uroterghi basali è distinta. Edeago figg. 175-176.

Tribù OXYPODINI Thomson, 1859

Apatelieida gen. n. (per *Neosilusa stricticollis* Cameron, 1943) Figg. 179-187

Nota. Per essere attribuita al genere *Neosilusa* Cameron, 1920, la specie *stricticollis* dovrebbe presentare formula tarsale 4-4-5. Ma essa è 5-5-5 e i palpi labiali sono composti di 3 articoli, invece di 2, perciò non può più appartenere alla tribù Homalotini.

Diagnosi. Habitus di *Neosilusa* Cameron, 1920, ma per la formula tarsale 5-5-5, per la forma della spermateca e della ligula, il nuovo genere sembra affine al genere *Pseudoplandria* Fenyes, 1921. Ma i palpi labiali sono composti di 3 articoli, invece di 4 e i palpi mascellari di 4 articoli, invece di 5. Inoltre non esistono due setole laterali della ligula, presenti al contrario in *Pseudoplandria* e l'edeago mostra una struttura nettamente differente e unica.

Descrizione. Undici antennomeri; tempie marginate; palpi labiali di 3 articoli; ligula divisa fino alla sua metà, fig. 186; palpi mascellari di 4 articoli, fig. 177; mento fig. 178; mesosterno non carenato; processo mesosternale acuto; mesocoxe appena separate tra loro; formula tarsale 5-5-5; primo tarsomero posteriore appena più corto dei due seguenti riuniti; edeago figg. 180-181, spermateca figg. 182-183.

Tipo del genere. *Apatelieida stricticollis* (Cameron, 1943) **comb. n.**

Neosilusa stricticollis Cameron, 1943: 40

Neosilusa stricticollis: Hammond, 1984: 211.

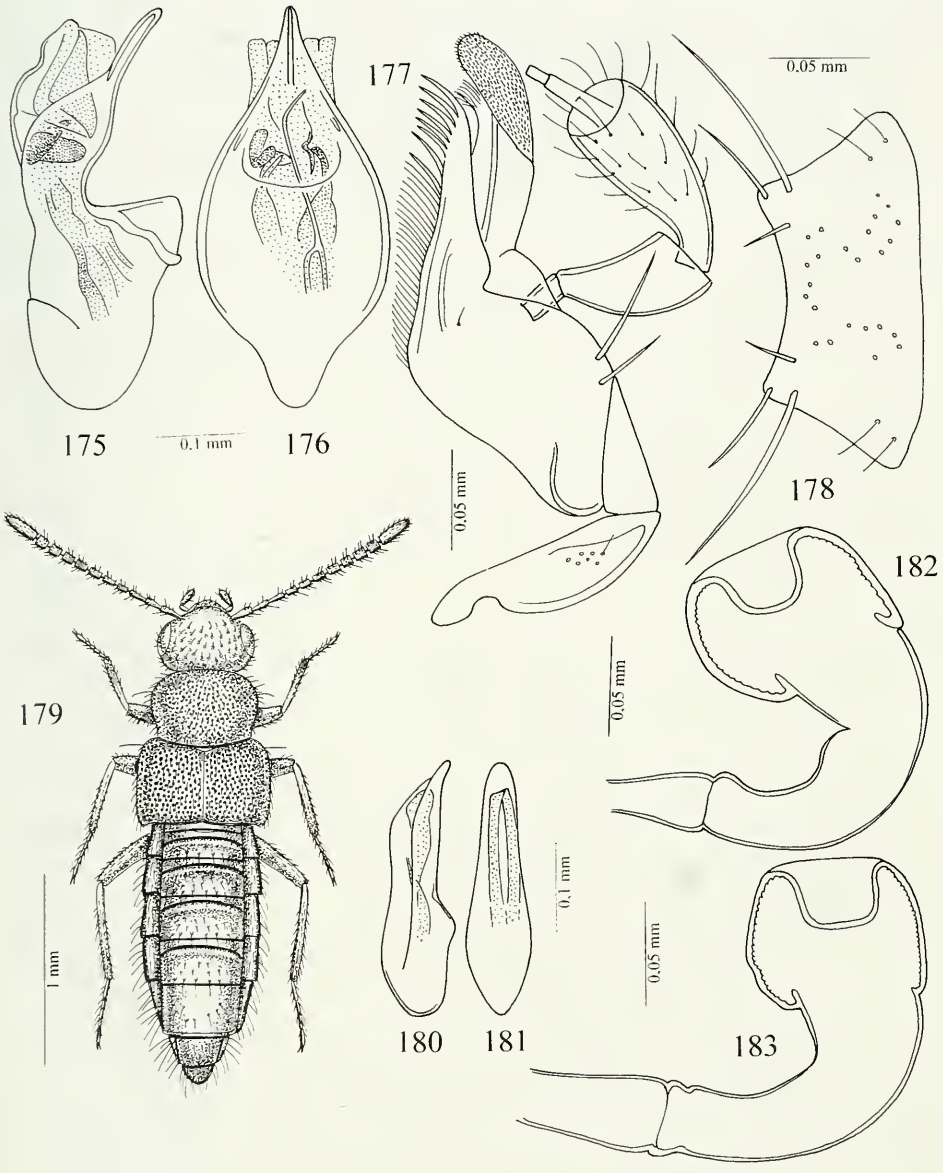
Etimologia. Il nome femminile del nuovo genere significa "Aspetto ingannevole", per il fatto che se non si esaminano in preparato microscopico la formula tarsale e le parti boccali, si è indotti, come lo è stato Cameron, ad attribuire la specie al genere *Neosilusa*, data l'impressionante somiglianza dell'habitus.

Materiale esaminato (*A. stricticollis*). Holotypus ♀, Borneo, Mt. Poi, 5000 feet, *N. stricticollis* Cam., type (British Museum). 2 ♂♂ e 4 ♀♀, Borneo, Sabah, Mt. Kinabalu N.P., Poring Hot Springs, 500 m, 7.V.1987, Burckhardt & Löbl leg.

Syntemusa gen. n. Figg. 187-198

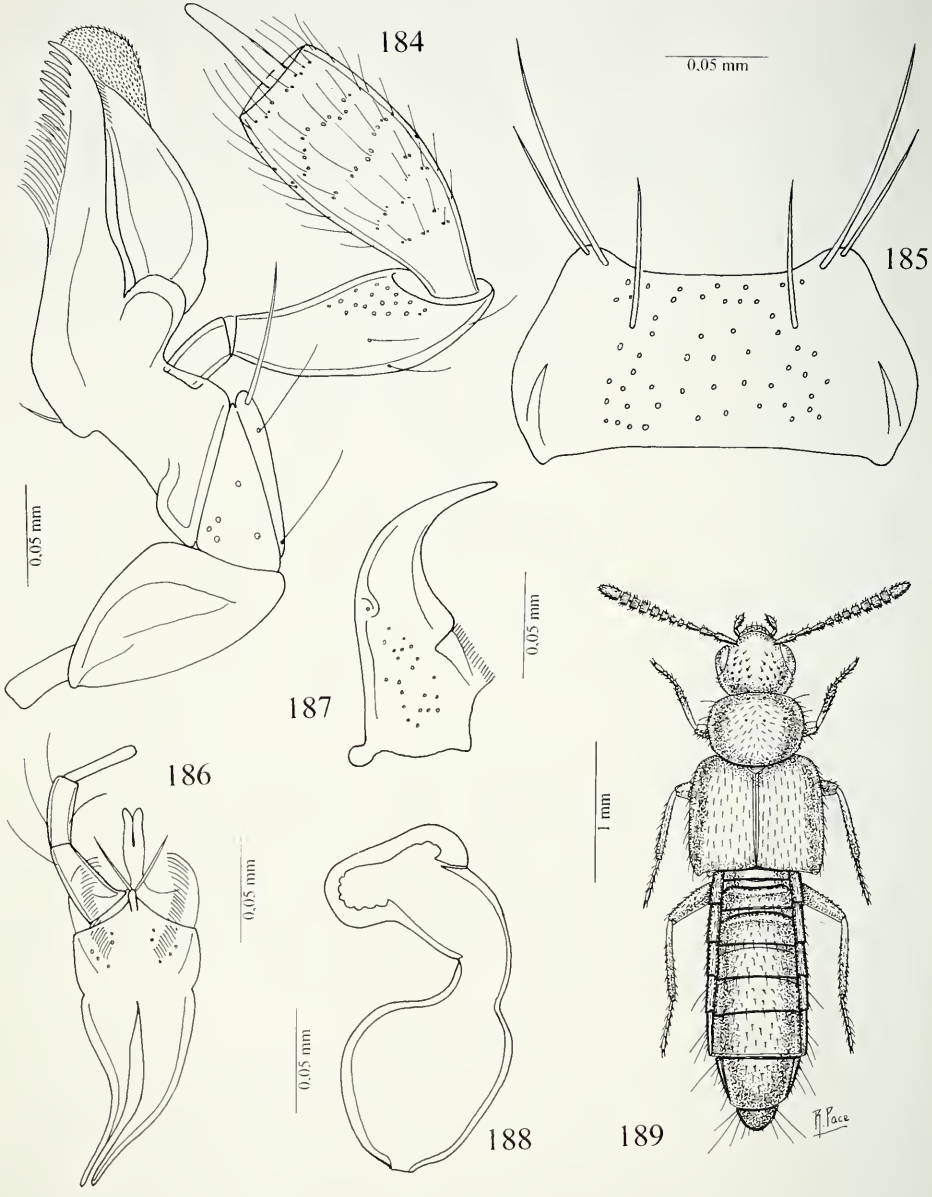
Diagnosi. Pur presentando formula tarsale 5-5-5, invece di 4-5-5, il nuovo genere si mostra affine al genere *Tacata* Blackwelder, 1952, per l'habitus e la struttura dell'edeago (serie tipica del tipo del genere *Tacata,* cioè *T. floralis* (Bernhauer, 1915) da me esaminata), ma la ligula è più stretta e ha due setole apicali (setole laterali in *Tacata*), per la lacinia lunga e fortemente ricurva (lacinia corta e rettilinea in *Tacata*) e per il primo tarsomero posteriore corto (lungo quanto i due tarsomeri successivi riuniti in *Tacata*).

Descrizione. Undici antennomeri; tempie robustamente marginate; palpi labiali di tre articoli; ligula a base larga, divisa in due lobi triangolari, con lunga setola apicale, fig. 192; palpi labiali di 4 articoli; lacinia fortemente ricurva, fig. 193; mento fortemente incavato al lato anteriore, fig. 114; processo mesosternale ad apice acuto,



FIGG. 175-183

Edeago in visione laterale e ventrale, maxilla con palpo mascellare, mento, habitus e spermateca.175-178: *Borneusa insolita* gen. n., sp. n.; 179-182: *Apatelieida stricticollis* (Cameron) comb. n.; 183: *Apatelieida stricticollis* (Cameron) comb. n., holotypus.



FIGG. 184-189

Maxilla con palpo mascellare, mento, mandibola, labio con palpo labiale e spermateca. 184-187: *Apatelieida stricticollis* (Cameron) comb. n.; 188-189: *Syntemusa kinabaluensis* gen. n., sp. n.

ma arrotondato; mesocoxe appena separate fra loro; sesto sternite libero del ♂ prolungato all'indietro; formula tarsale 5-5-5; primo tarsomero posteriore corto; edeago fortemente ricurvo, figg. 190-191 e 195-196, spermateca figg. 188 e 198.

TIPO DEL GENERE. *Syntemusa kinabaluensis* sp. n.

ETIMOLOGIA. Il nome femminile del nuovo genere significa "Maschio penetrante" e allude alla forma ricurva dell'edeago, particolarmente adatto alla penetrazione.

Syntemusa kinabaluensis sp. n. Figg. 188-194

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu N.P., HQ Bukit Ular trail, 1750 m, 29.IV.1987, A. Smetana leg. (MHNG).

Paratypi: 42 es., stessa provenienza; 150 es., Borneo, Sabah, Mt. Kinabalu N.P., HQ Liwagu River, 1500 m, 27.IV.1987 , A. Smetana leg.

DESCRIZIONE. Lungh. 3,6 mm. Corpo lucido e bruno con pigidio bruno-rossiccio; antenne rossicce, con i tre antennomeri basali giallo-rossicci e undicesimo bruno-rossiccio; zampe gialle. Il capo e l'addome presentano reticolazione molto superficiale, essa è assente sul resto del corpo. La punteggiatura del capo è distinta, quella del pronoto è superficiale, quella delle elitre è molto svanita. Spermateca fig. 188, edeago figg. 190-191.

Syntemusa smetanai sp. n. Figg. 195-198

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu N.P., HQ at Liwagu Rv., D.E. Bright leg. (MHNG).

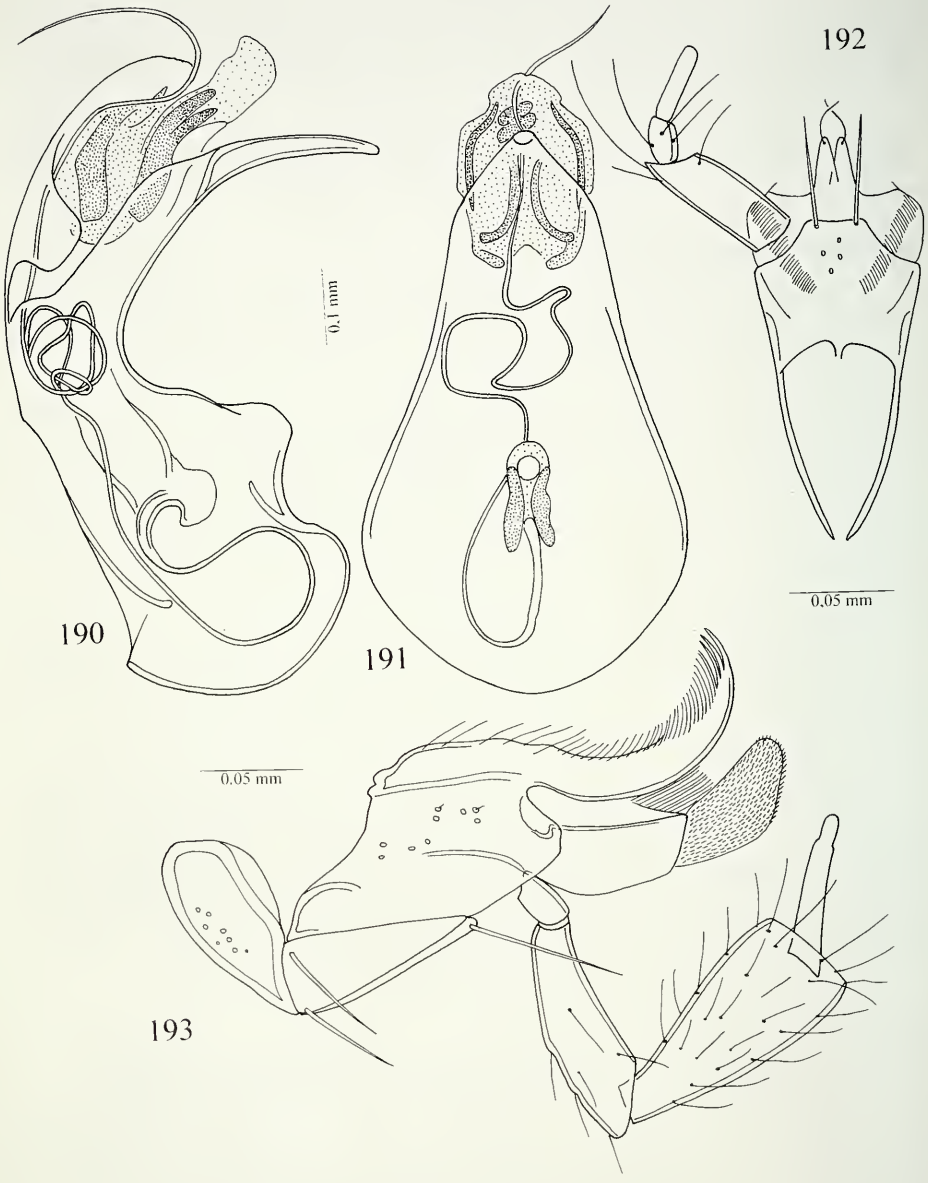
Paratypi: 4 ♂♂ e 1 ♀, Borneo, Sabah, Mt. Kinabalu N.P., 1550-1580 m, 27-28.IV.1987, Burckhardt & Löbl leg.

DESCRIZIONE. Lungh. 3,8 mm. Corpo lucido e nero-bruno; antenne brune con i cinque antennomeri basali rossicci; zampe giallo-rossicce. La reticolazione del capo e del pronoto è assente, quella delle elitre e dell'addome è superficiale. La punteggiatura del capo è molto svanita. La granulosità del pronoto è saliente solo in avanti sulla linea mediana, sul resto della superficie essa è estremamente superficiale, come quella delle elitre. Edeago figg. 195-196, spermateca fig. 198.

COMPARAZIONI. Chiave delle specie del nuovo genere *Syntemusa.*

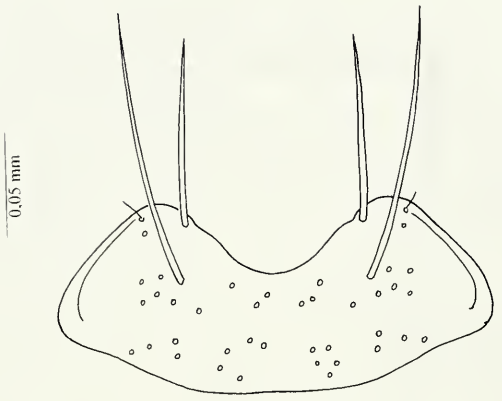
1 Punteggiatura del capo distinta; quarto antennomero più lungo che largo; pronoto meno trasverso; edeago non strozzato nella regione preapicale, in visione ventrale; spermateca corta. Lungh. 3,6 mm. M. Kinabalu ..... *S. kinabaluensis* sp. n.

\- Punteggiatura del capo superficiale; quarto antennomero trasverso; pronoto maggiormente trasverso; edeago strozzato nella regione preapicale, in visione ventrale; spermateca lunghissima. Lungh. 3,8 mm. M. Kinabalu ..... *S. smetanai* sp n.



FIGG. 190-193

Edeago in visione laterale e ventrale, labio con palpo labiale e maxilla con palpo mascellare. 190-193: *Syntemusa kinabaluensis* gen. n., sp. n.



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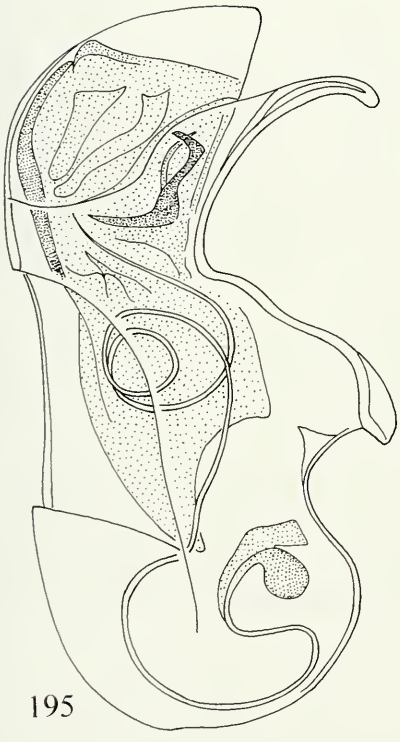

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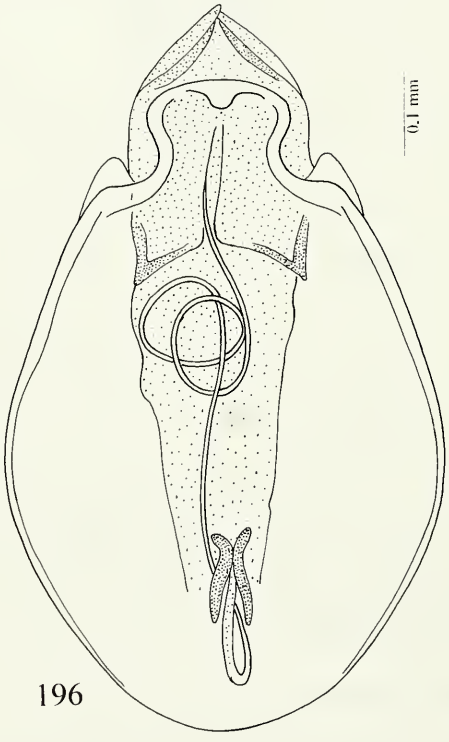

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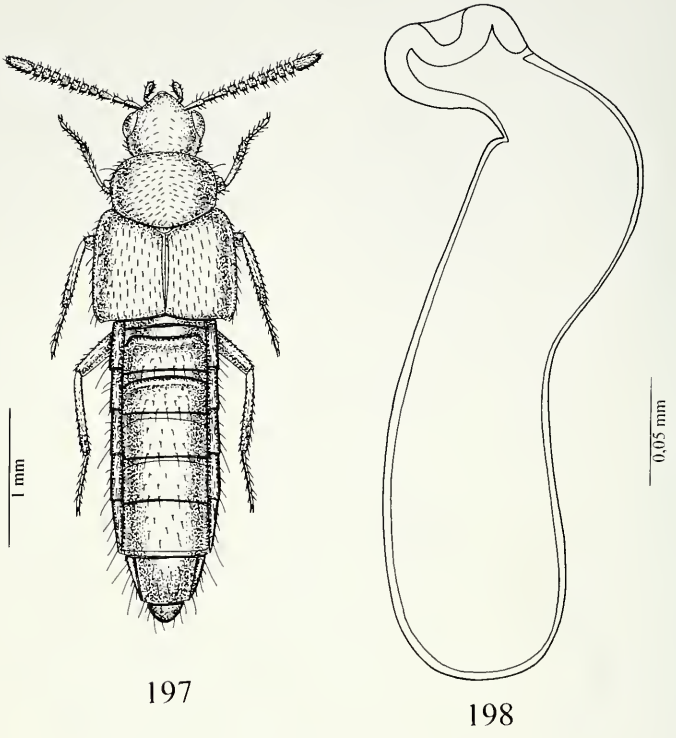
FIGG. 194-196

Mento ed edeago in visione laterale e ventrale. 194: *Syntemusa kinabaluensis* gen. n., sp. n.; 195-196: *Syntemusa smetanai* gen. n., sp. n.



FIGG. 197-198
Habitus e spermateca. 197-198: *Syntemusa smetanai* gen. n., sp. n.

RINGRAZIAMENTI

Rivolgo i miei più cordiali ringraziamenti a coloro che mi hanno affidato in studio il raro materiale oggetto del presente lavoro: il Dr. Aleš Smetana di Ottawa, il Dr. Ivan Löbl del Museo di Storia Naturale di Ginevra, il Dr. Volker Assing di Hannover e il collega Guillaume de Rougemont di Londra. Per il prestito di tipi e per l'aiuto nella ricerca bibliografica ringrazio il Dr. Brendell del Museo di Storia Naturale di Londra.

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Erratum

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Due to the insufficient printing quality of Fig. 1 published in the above mentioned paper (p. 498) a new figure is printed here.

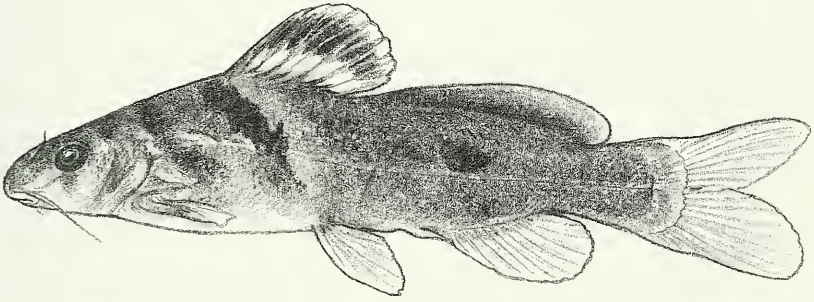

Fig. 1

Batasio affinis, after photograph of a specimen collected from Tenasserim River (drawing by Kelvin K. P. Lim).

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