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TOME 110—FASCICULE 3

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Société suisse de Zoologie

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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.

Les manuscrits sont soumis à des experts d'institutions suisses ou étrangères selon le sujet étudié.

La préférence sera donnée aux travaux concernant les domaines suivants: biogéographie, systématique, évolution, écologie, éthologie, morphologie et anatomie comparée, physiologie.

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REVUE SUISSE DE ZOOLOGIE 110 (3): 453-481; septembre 2003

Oribatids from Switzerland VIII (Acari: Oribatida: Ptyctima). (*Acarologica Genavensia* CII)

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Oribatids from Switzerland VIII (Acari: Oribatida: Ptyctima). (*Acarologica Genavensia* CII). - Earlier published and newly determined Swiss moss mites belonging to the "ptychoid" groups are listed, discussed or described. From the 20 named species in the literature 10 are confirmed after critical discussion. New identifications of a total of 42 taxa are given, 3 of which (*Phthiracarus besuchetianus* sp. n., *Steganacarus* (*S.*) *antennatus* sp. n. and *Steganacarus* (*S.*) *schweizeri* sp. n.) are new to science and 30 new for the Fauna of Switzerland. Some new or additional morphological data as well as some notes on the taxonomy and distribution of this group are given.

Key-words: Acari - Oribatida - Ptyctima - taxonomy - new species - Switzerland.

INTRODUCTION

The present paper, the 8th part of the series (concerning our project, started in July 1983 see Mahunka & Mahunka-Papp, 2001), proposes to discuss our results gained on the ptychoid groups of the Swiss Fauna comprising the already published references and our recent results.

New identifications of 42 species and subspecies belonging to the families Phthiracaridae, Steganacaridae, Euphthiracaridae, Oribotritiidae and Mesoplophoridae, found on the territory of Switzerland, are given. Among them 3 are new for science and 30 are new for the Fauna of Switzerland. Some rare species are recorded and the locality data for all our identifications are given. Morphological details, corrections and the interpretation of some species are also given.

Unfortunately, the early data are mostly uncertain because there is perhaps no other oribatid group in recent decades which has suffered so many changes than this one due to the arduous work of Parry/Kamill (Parry, 1979; Kamill & Baker, 1980; Kamill, 1981), Niedbała (Niedbała, 1986a; Niedbała, 1986b; Niedbała, 1992) Bernini (e.g. Bernini & Avanzati, 1986) and others (see Balogh & Mahunka, 1983; Balogh & Balogh, 1992). The 20 named species (under the same name different authors understand different species) known from the earlier literature are critically discussed, the existing slides partly revised and 10 of them accepted as members of the Swiss Fauna.

Manuscript accepted 10.12.2002

This contribution follows the system of Niedbała (1986a, 1992) with some slight modifications, also the terminology of the morphological descriptions is modified as in our previous papers (e.g. Mahunka, 1990). Contrary to our earlier practice we introduce a significant change in systematics, i.e. the abandonment of the subgenus *Archiphthiracarus* Balogh & Mahunka, 1979, heretofore retained for practical purposes. Since there is not a single species of the "*Archiphthiracarus*" group (5 pairs of anoadanal setae) known in which a complete reduction of two pairs of the adanal setae could be observed (there are always 1-2 partially vestigial pairs of setae), we see no reason to conserve this subgenus. Presently the species *P. globosus* (C. L. Koch, 1841) displays both variations, consequently, the concept of Niedbała (1992) should be followed.

HITHERTO PUBLISHED SPECIES OF SWISS PTYCTIMA

HISTORY

This group has been studied and results published by Schweizer (1922, 1948, 1956), Borcard (1988, 1991) and Mahunka (1993a, 1993b).

The following chronological list recapitulates all recorded species with the published name and the actual valid name or, in the case of misidentifications, the correct species.

SCHWEIZER, 1922

Hoploderma magnum (Nic.) = ***Steganacarus magnus*** (Nicolet, 1855)
Hoploderma dasypus (Ant. Dugès) = species inquirenda
Hoploderma globosum (C. L. Koch) = ***Phthiracarus globosus*** (C. L. Koch, 1841)
Hoploderma striculum (C. L. Koch) = ***Atropacarus striculus*** (C. L. Koch, 1835)
Phthiracarus arduus (C. L. Koch) = ***Rhysotritia ardua*** (C. L. Koch, 1841)

SCHWEIZER, 1948

Hoploderma laevigatum (C. L. Koch) = ?
Hoploderma spinosum (Sellnick) = ?
Hoploderma magnum (Nic.) = ***Steganacarus magnus*** (Nicolet, 1855)
Phthiracarus pavidus (Berl.) = ?
Phthiracarus piger (Scopoli) = species inquirenda
Phthiracarus globosus (C. L. Koch)

SCHWEIZER, 1956

Phthiracarus borealis (Trhgd.) = ?
Phthiracarus crenophilus Willmann, 1951
Hoploderma laevigatum (C. L. Koch) = ?
Hoploderma spinosum (Sellnick) = ***Steganacrus antennatus*** sp. n.
Hoploderma striculum (C. L. Koch) = ***Atropacarus striculus*** (C. L. Koch, 1835)
Hoploderma pavidum Berlese, 1913 = ?
Hoploderma clavigerum Berlese, 1903 = ?
Oribotrita [sic!] *nuda* (Berlese) = ***Mesotritia nuda*** (Berlese, 1887)
Oribotrita [sic!] *canestrinii* Berlese [sic!] = ***Rhysotritia ardua*** (C. L. Koch, 1841)

BORCARD, 1991

Hoplophthiracarus pavidus (Berlese) 1913 = ? *Hoplophthiracarus vanderhammeni* Niedbała, 1991
Phthiracarus cf. *tardus* Forsslund 1956 = *Phthiracarus* cf. *longulus* (C. L. Koch, 1841)

Phthiracarus sp. A = ?
Phthiracarus sp. B = ?
Phthiracarus sp. C = ?
Steganacarus herculaneus Willmann, 1951
Steganacarus striculus (C. L. Koch) 1836 = ***Atropacarus striculus*** (C. L. Koch, 1835)
Rhysotritia ardua (C. L. Koch) 1841

MAHUNKA, 1993a

Helvetacarus genavensis Mahunka, 1993

MAHUNKA, 1993b

Rhysotritia a. ardua C. L. Koch, 1841
Atropacarus wandae Niedbała, 1981
Phthiracarus (*Archiphthiracarus*) *bryobius* Jacot, 1930 = ***Phthiracarus bryobius*** Jacot, 1930
Phthiracarus (*Phthiracarus*) *globosus* (C. L. Koch, 1841) = ***Phthiracarus globosus*** (C. L. Koch, 1841)

CRITICAL CONSIDERATIONS

GENERAL REMARKS ON SCHWEIZER'S PUBLICATIONS

It was Schweizer who published the most numerous data on ptychoid groups similarly to other superfamilies. A significant part of the species mentioned by him could be studied due to the help of the late custodian of the Naturhistorisches Museum Basel, Dr C. Bader, our good friend (see also Bader, 1969). Unfortunately, the material is in poor condition, which is partly due to the permanent slides (which, for obvious reasons, could not be remounted), and partly to the fact that some of the slides suffered heavy damage, so could not be studied at all, and also because Schweizer – out of necessity – amassed sometimes 10–20 specimens on a single slide. These slides occasionally include specimens belonging to 5–6 genera, which he obviously knew. Furthermore, he also committed mistakes in the grouping of specimens, at the species or even at the generic level, in such cases the specimens of 2–3 different *Phthiracarus* species are found side by side and, to further aggravate the problem, under one species name.

So partly for these and some other reasons we could not study all his available slides, so his identifications in the collection need further, thorough investigation.

Schweizer listed a total of 14 "ptychoid" species in his works. On the basis of his drawings and slides this number is reduced to six as belonging to the fauna of Switzerland. Quite obviously he understood different species under other names. We accept the following six species of Schweizer to be members of the Swiss Fauna:

Phthiracarus crenophilus Willmann, 1951
Phthiracarus globosus (C. L. Koch, 1841)
Steganacarus magnus (Nicolet, 1855)
Atropacarus striculus (C. L. Koch, 1835)
Rhysotritia ardua (C. L. Koch, 1841)
Mesotritia nuda (Berlese, 1887)

SCHWEIZER, 1922

In his first work he mentioned five species, which had been identified most likely by using the work of Michael (1898). However, no voucher specimens have been found in the collection of the Naturhistorisches Museum, Basel. In all probability, from among the five species *Hoploderma magnum*, *Hoploderma globosum*, *Hoploderma striculum* and *Phthiracarus arduus* were correctly determined, although *H. magnum* was interpreted in his subsequent works as a *Phthiracarus* species. In the case of *H. dasypus* it is best to accept the standpoint of Niedbała (1992), i.e. the status of the species is wholly uncertain, so the identification of Schweizer cannot be evaluated at all.

Generally Schweizer has not made reference to his earlier data, so he makes no reference to his identifications of 1922 in his subsequent papers of 1948 or 1956. Indeed he makes no particular reference to his species listed in 1948 in his paper published in 1956, although it appears quite obvious that he has these 1948 species in mind. Part of the recovered slides also supports this suggestion.

SCHWEIZER, 1948

This work listed six species. However, only two species (*H. magnum*, *H. globosum*) were mentioned in 1922, but three *(H. laevigatum*, *H. spinosum* and *H. pavidum*) are repeated in 1956. Oddly he does not mention the species *H. magnum*, *Phthiracarus piger* and *P. globosus* in 1956.

Of the three species *H. magnum* and *P. globosus* may be accepted as good identifications, however, *P. piger* Scopoli, 1763 is a species inquirenda as is the already mentioned *P. dasypus* (see Niedbała, 1992: 3). In connection with this species we cannot accept the view of Berg *et al.* (1990) that it is *P. piger*, because the neotypes were designated by van der Hammen (1963, 1964) upon the redescription of *P. laevigatus* and *P. nitens* (= *P. piger* sensu Berg *et al.*, 1990) (which was not made in the work of Berg *et al.*, 1990). Consequently, the rule of the ICZN should be applied, according to which the name of the first specialist (§ 24) revising the name should be used.

We have not found a single specimen of the species *H. globosus*. The material of *P. piger* which we had received contained only slides: N 786 ("Mtr. Pr. 1, 13. VII. 30, V. d. Botsch, 2100 m. Wurzelgefl.")[1], N 1426 and N 1427 ("No. 8, Scarl, Lawiner, 12. VII. 1932, v. Holz"). The species name of *piger* on all three slides was crossed out, most likely by Schweizer himself: One slide bears the name *borealis*, the other two *crenophilus*, displaying identical hand-writing as for the generic name. We have established that the slide bearing *borealis* includes specimens of the species *P. bryobius* Jacot, 1930, while the other two bearing the name *P. crenophilus* Willmann, 1951 had been correctly identified.

SCHWEIZER, 1956

The species of *Hoploderma pavidum* (Berlese, 1913) was misunderstood by Schweizer. The slides (N 668, N 1288 and N 1745) said to contain these specimens, in fact, display a so far unidentified *Steganacarus* species. Consequently, *H. pavidum* as referred to by Schweizer should be deleted from the fauna of Switzerland.

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[1] Orthography is reported just as on the labels of the slides.

We have also found the slide N 583 ("Mtr. Pr. 6, 20. VII. 29, Val Cluozza, Valetta, Bachmoos 1900 m.") containing the species *Hoploderma laevigatum* as listed and figured by Schweizer. In fact, it has nothing to do with *P. laevigatum* itself. Quite unequivocally it may be stated again that it is an unidentified *Steganacarus* species. On this very same slide were also embedded the species *P. spadix* Niedbała, 1983 and another *Phthiracarus* species. So *P. laevigatus* should also be deleted from the fauna list of Switzerland, and this applies for the previous publications too.

The species *Hoploderma striculum* (C.L. Koch, 1835) was recorded by Schweizer several times (1922, 1956). We have found it on a number of slides, as for example N 1267, 1268 and 1274 ("Mtr. Pr. XII, Punt Perif, 23. VII. 1930, Moos, Wasser-Kante d. Spöl."), and the well-preserved specimens confirm a correct identification.

We have found several specimens of the species *Hoploderma clavigerum* as identified by Schweizer on slides N 1819 and N 1820 ("Mtr. Pr. XV, Scarl, 2000 m, 24. VII. 1932, in Mull von Bergföhren-Nadeln, Sammelpräparat"), so it is certain that the species had been identified by Schweizer on the basis of these specimens. However, they belong to a so far undescribed *Steganacarus* species, since the chaetotaxy of leg IV is clearly discernible. This species again should be deleted from the list of the Swiss fauna.

The Schweizer identified *Hoploderma spinosum* has also been recovered in the collection. This species is however a new one which is described in this contribution in the *Steganacarus* genus (*S. antennatus* sp. n.). *S. spinosus* (Sellnick, 1920) should also be deleted from the Swiss fauna list.

In his work of 1956 Schweizer also identified two *Oribotrita* [sic!] species. *Oribotritia* (= *Mesotritia*) *nuda* (Berlese, 1887) was represented only on one slide (N 891) with the following data: "N 53, 17. VII. 1930 Stavel–chod, 2100, u. Holz". Although the examined specimen is well preserved, without remounting a true identification is impossible, for many significant features cannot be studied. Nevertheless, we consider the identification to be correct.

The specimens referring to the species of *Oribitritia canestrinii* (Michael, 1898) were located and studied on the slides marked by H 18 226 and H 18 231. The specimens deriving from the collecting locality of "Scanfs 1700 m. Heide mit Wacholder + Erikas" were unequivocally identified with *Rhysotritia a. ardua*. So the otherwise synonymous name of *canestrinii* should be deleted from the fauna of Switzerland, and all these data henceforth refered to *R. a. ardua*.

REMARKS ON BORCARD, 1991

Borcard (1991) names five species with species names, but the identified *Phthiracarus tardus* is accompanied by cf., rendering it uncertain. With high probability we consider *Hoplophthiracarus pavidus* (Berlese, 1913) to be *H. vanderhammeni* Niedbała, 1991. The other three species listed by him (*Steganacarus herculeanus*, *S. striculus* and *Rhysotritia ardua*) are most probably correctly identified.

Concerning his 3 species of *Phthiracarus* with "open nomenclature" a correct identification is impossible without revision of the material.

REMARKS ON MAHUNKA, 1993a, b

Concerning the 5 published species, only the abandonment of the subgenus *Archiphthiracarus* has to be mentioned. Its synonymy with *Phthiracarus* (see Niedbała, 1992) is here confirmed.

LIST OF THE PUBLISHED SPECIES ACCEPTED FOR THE SWISS FAUNA

Phthiracaridae
Phthiracarus bryobius Jacot, 1936
Phthiracarus crenophilus Willmann, 1951
Phthiracarus globosus (C. L. Koch, 1841)

Steganacaridae
Atropacarus striculus (C. L. Koch, 1835)
Atropacarus wandae (Niedbała, 1981)
Helvetacarus genavensis Mahunka, 1993a
Steganacarus herculeanus Willmann, 1951
Steganacarus magnus (Nicolet, 1855)

Oribotritiidae
Mesotritia nuda (Berlese, 1887)

Euphthiracaridae
Rhysotritia a. ardua (C. L. Koch, 1841)

LIST OF THE SPECIES TO BE DELETED FROM THE SWISS FAUNA

"*Phthiracarus*" *dasypus* (Dugès, 1834)
"*Phthiracarus*" *piger* (Scopoli, 1763)
Phthiracarus borealis (Trägårdh, 1910)
Phthiracarus laevigatus (C. L. Koch, 1844)
Calyptophthiracarus pavidus (Berlese, 1913)
Steganacarus clavigerus (Berlese, 1903)
Steganacarus spinosus (Sellnick, 1920)

LIST OF LOCALITIES

AG-4 = SWITZERLAND: **Argovia:** Koblenz, ramification of the river Aar, swamp; 30.IX.1967; leg. C. Besuchet — (159).

AG-5 = SWITZERLAND: **Argovia:** Densbüren, old beech stumps; 4.X.1975; leg. C. Besuchet — (160).

AP-1 = SWITZERLAND: **Appenzell:** Hoher Kasten, sifting, 1600-1700m; 18.VIII.1982; leg. C. Besuchet — (86).

AP-2 = SWITZERLAND: **Appenzell:** Säntis, 2450m; 10.VII.1967; leg. A. Comellini — (161).

AP-4 = SWITZERLAND: **Appenzell:** Schwägalp, 1400m; 26.VII.2001; leg. C. Besuchet — (196).

BE-8 = SWITZERLAND: **Berne:** Uebischisee near Thun, moss at edge of swamp; 6.VI.1996; leg. C. Besuchet — (106).

BE-9 = SWITZERLAND: **Berne:** Stockhorn, Oberstockensee, mosses at base of rocks, 1700m; 26.VII.1979; leg. C. Besuchet & I. Löbl — (165).

BL-1 = SWITZERLAND: **Basle-Land:** "Reinacher-Heide" near Reinach, Nature Reserve, xerothermic meadows, sifting, 600-700m; 12.X.1989; leg. C. Besuchet — (85).

BL-8 = SWITZERLAND: **Basle-Land:** above Belchen/Eptingen, sifting, 1000m; 29.IX.1979; leg. C. Besuchet — (164).

FR-4 = SWITZERLAND: **Fribourg:** Düdingen, hollow poplar at about 15 metres above ground; 27.I.1983; leg. S. Vit — (169).

GE-1 = SWITZERLAND: **Geneva:** Allondon, Les Baillets, desiccated mosses and lichens; 19.IX.1983; leg. C. Besuchet — (58).

GE-2 = SWITZERLAND: **Geneva:** Bois de Jussy, waterlogged mosses; 30.VI.1983; leg. C. Besuchet — (35).

GE-3 = SWITZERLAND: **Geneva**: Frontenex, bases of oak stumps; 14.VII.1980; leg. C. Besuchet — (6).

GE-5 = SWITZERLAND: **Geneva**: Malval, mosses and grass; 22.X.1982; leg. C. Besuchet — (31).

GE-6 = SWITZERLAND: **Geneva:** Malval, mosses and lichens; 22.X.1982; leg. C. Besuchet — (34).

GL-3 = SWITZERLAND: **Glarus:** Klöntal above Riedern, old tree stumps, 700m; 30.VIII.1980; leg. C. Besuchet — (1).

GR-4 = SWITZERLAND: **the Grisons:** Felsberg near Chur, dry needles and bark from pine (*Pinus* sp.) forest; 27.IX.1983; leg. C. Besuchet — (57).

GR-5: Switzerland: **the Grisons:**Swiss National Park, Il Fuorn, under a pile of dead branches, 1800m; 22.IX.1995; leg. C. Besuchet — (104).

GR-6 = SWITZERLAND: **the Grisons:** Landquart, at base of alders (*Alnus* sp.); 26.IX.1983; leg. C. Besuchet — (118).

GR-8 = SWITZERLAND: **the Grisons:** Samnaun, alpine meadows with *Rhododendron* sp., sifting, 2050m; 26.VIII.1968; leg. C. Besuchet — (26).

GR-9 = SWITZERLAND: **the Grisons:** Santa Maria – Umbrail Pass, sifting, 2000m; 5.VIII.1974; leg. C. Besuchet — (37).

GR-11 = SWITZERLAND: **the Grisons:** Untervaz near Chur, mosses; 29.IX.1983; leg. C. Besuchet — (126).

GR-13 = SWITZERLAND: **the Grisons:** Val Bregaglia - Val Bondasca, dead leaves and mosses at base of alders (*Alnus* sp.), 1400 m; 19.VII.1984; leg. C. Besuchet — (59).

GR-15 = SWITZERLAND: **the Grisons:** Umbrail Pass, 2000m; 25.VIII.1968; leg. C. Besuchet — (149).

GR-16 = SWITZERLAND: **the Grisons:** Val Bregaglia, Soglio, hollow chestnut stumps, 900m; 10.IX.1985; leg. C. Besuchet — (146).

GR-17 = SWITZERLAND: **the Grisons:** Val Poschiavo, above Cavajone, at base of rocks and *Rhododendron* sp., 2050-2100m; 27.VIII.1983; leg. C. Besuchet — (151).

GR-21 = SWITZERLAND: **the Grisons:** Swiss National Park, Ova Spin, moss at spring-head, 1700m; 28.VII.1929; leg. J. Schweizer — (200).

GR-22 = Switzerland: **the Grisons:** Swiss National Park, S-charl, decaying needles of Mountain Pine (*Pinus montana* Mill.), 2000m; 24.VII.1032; leg. J. Schweizer — (201).

JU-3 = Switzerland: **Jura:** between Boncourt and Buix, dead leaves; 11.III.1978; leg. C. Besuchet — (174).

JU-4 = SWITZERLAND: **Jura:** Montfaucon, mosses in old peat-bog; 5.VII.2000; leg. C. Besuchet — (206).

LU-1 = SWITZERLAND: **Lucerne:** Eigenthal, peat-bog Forenmoos near the village of Eigenthal, *Sphagnum* sp., 970m; 2.VIII.1996; leg. C. Besuchet — (108).

LU-2 = SWITZERLAND: **Lucerne:** above Gettnau (between Zell and Willisau), old ant-hill of *Formica rufa*; 1.VIII.1996; leg. C. Besuchet — (107).

LU-5 = SWITZERLAND: **Lucerne:** Wohlhusen, old tree stumps; 17.III.1979; leg. C. Besuchet — (176).

NW-3 = SWITZERLAND: **Nidwalden:** Trübsee, mosses near spring-head, 1800m; 8.IX.1997; leg. C. Besuchet — (127).

SG-8 = SWITZERLAND: **St. Gall:** Schwendisee above Unterwasser, mosses and grass at lakeside, 1159m; 12.IX.1981; leg. C. Besuchet — (179).

SH-1 = SWITZERLAND: **Schaffhausen:** above Hallau, mosses and dead leaves; 1983; leg. C. Besuchet — (50).

SH-3 = SWITZERLAND: **Schaffhausen:** Bargen, dead leaves; 25.III.1978; leg. C. Besuchet — (180).

SO-1 = SWITZERLAND: **Solothurn:** Ammansegg, mosses on floor of decidous forest; 14.V.1972; leg. S. Mahunka & L. Mahunka-Papp — (10).

SO-2 = SWITZERLAND: **Solothurn:** Ammansegg, litter and dry leaves in mixed forest; 14.V.1972; leg. S. Mahunka & L. Mahunka-Papp — (11).

SO-5 = SWITZERLAND: **Solothurn:** Schnottwil, Bucheggberg, mosses on bark of a live deciduous tree; 27.IX.1987; leg. S. Mahunka & L. Mahunka-Papp — (47).

SO-6 = SWITZERLAND: **Solothurn:** Schnottwil, Bucheggberg, dry needles in pine (*Pinus* sp.) forest; 27.IX.1987; leg. S. Mahunka & L. Mahunka-Papp — (48).

SO-8 = SWITZERLAND: **Solothurn:** Weissenstein, dead leaves, 1250m; 6.VIII.1979; leg. C. Besuchet — (181).

TG-3 = SWITZERLAND: **Thurgau:** Hudelmoos near Hagenwil, peat-bog with *Sphagnum* sp., 600m; 13.IX.1993; leg. C. Besuchet — (88).

TG-7 = SWITZERLAND: **Thurgau:** Müllheim, dry leaves in mixed forest; 13.IX.1987; leg. S. Mahunka & L. Mahunka-Papp — (42).

TG-8 = SWITZERLAND: **Thurgau:** Müllheim; rotten trunk with mosses; 13.IX.1987, leg. S. Mahunka & L. Mahunka-Papp — (43).

TG-9 = SWITZERLAND: **Thurgau:** between Bischofszell and Hauptwil, moss on forest floor with ferns; 11.VI.1983; leg. T. & Z. Adamis — (21).

TG-10 = SWITZERLAND: **Thurgau:** between Bischofszell and Hauptwil, moss on forest floor anddry needles in pine (*Pinus* sp.) forest; 11.VI.1983; leg. T. & Z. Adamis — (22).

TG-12 = SWITZERLAND: **Thurgau:** between Bischofszell and Hauptwil, dry leaves and mosses on floor in beech forest; 11.VI.1983; leg. T. & Z. Adamis — (23).

TI-3 = SWITZERLAND: **Ticino:** Bordei at base of Mount Gridone ("massif de refuge"), old chestnut stumps in forest, sifting, 700m; 24.IV.1992; leg. C. Besuchet — (90).

TI-10 = SWITZERLAND: **Ticino:** Orselina near Locarno, leaf litter in ravine; 29.VII.1972; leg. C. Besuchet — (24).

TI-11 = SWITZERLAND: **Ticino:** Rancate, chestnut forest, sifting; 7.IX.1965; leg. C. Besuchet — (25).

TI-21 = SWITZERLAND: **Ticino:** Brusino-Arsizio, mosses near rivulet; 20.VII.1990; leg. C. Besuchet — (158).

TI-22 = SWITZERLAND: **Ticino:** Cortascio above Brissago, sifting in ravine, 1050m; 22.IV.1992; leg. C. Besuchet — (157).

TI-23 = SWITZERLAND: **Ticino:** Alpe d'Arena above Vergeletto, at base of rocks, 1700m; 22.VII.1983; leg. C. Besuchet — (142).

TI-24 = SWITZERLAND: **Ticino:** Caprino, compost; 29.V.1982; leg. Besuchet — (154).

TI-25 = SWITZERLAND: **Ticino:** Centovalli, Moneto, dead leaves, 800m; 23.VII.1983; leg. C. Besuchet — (144).

TI-26 = SWITZERLAND: **Ticino:** Valle Onsernone, Spruga, mosses and humus, 1000m; 22.VII.1983; leg. C. Besuchet — (141).

TI-28 = SWITZERLAND: **Ticino:** Rancate, horse-chestnuts; 8.VII.1963; leg. C. Besuchet — (183).

TI-32 = SWITZERLAND: **Ticino:** Valle di Muggio, Bruzella, dead leaves; 3.VI.1969; leg. C. Besuchet — (187).

TI-34 = SWITZERLAND: **Ticino:** Morbio Superiore, tree stump; 6.V.1969; leg. C. Besuchet (Te-69/35) — (189).

TI-37 = SWITZERLAND: **Ticino:** Rancate, old tree stump, extraction by flotation of soil; 5.VI.1969; leg. C. Besuchet & I. Löbl (Te-69/34) — (192).

UR-1 = SWITZERLAND: **Uri:** Klausen Pass, litter of *Rhododendron* sp., 2000m; 23.VIII.1983; leg. I. Löbl — (60).

UR-2 = SWITZERLAND: **Uri:** above Urnerboden, dead leaves and dead grass, 1600m; 24.IX.1985; leg. C. Besuchet — (147).

UR-3 = SWITZERLAND: **Uri:** Klausen Pass, sifting under alders, 1950m; 24.VIII.1983; leg. C. Besuchet — (150).

UR-5 = SWITZERLAND: **Uri:** above Klausen Pass, 2000m; 12.VII.1967; leg. A. Comellini — (194).

UR-6 = SWITZERLAND: **Uri:** Susten Pass, 2000m; 12.VII.1967; leg. A. Comellini — (195).

VD-1b = SWITZERLAND: **Vaud:** Bonvillars, La Coudre, dead oak branch; 6.VII.1989; leg. J. Steffen — (62b).

VD-8 = SWITZERLAND: **Vaud:** Ollon, old stump; 30.XII.1982; leg. C. Besuchet — (56).

VD-9 = SWITZERLAND: **Vaud:** Vallorbe, source of the river Orbe, roots and soil at base of rocks; 13.V.1982; leg. C. Besuchet & I. Löbl — (81).

VS-3 = SWITZERLAND: **Valais:** Daubensee, mosses and grass, 2200m; 11.VIII.1980; leg. C. Besuchet — (4).

VS-4 = SWITZERLAND: **Valais:** Daubensee, mosses and grass, 2200m; 11.VIII.1980; leg. C. Besuchet — (32).

VS-5 = SWITZERLAND: **Valais:** Fluhalp near Leukerbad, mosses and dead leaves, 2000m; 14.VIII.1980; leg. C. Besuchet — (2).

VS-7 = SWITZERLAND: **Valais:** Finges Forest, pine (*Pinus* sp.) stumps; 13.VIII.1980; leg. C. Besuchet — (36).

VS-12 = SWITZERLAND: **Valais:** Grand-St-Bernard, mosses on and at base of rocks, 2150m; 10.IX.1996; leg. C. Besuchet — (109).

VS-13 = SWITZERLAND: **Valais:** La Vernaz, waterlogged mosses, 1100m; 4.VI.1985; leg. C. Besuchet — (124).

VS-22 = SWITZERLAND: **Valais:** Simplon Pass, old cow-dung; 2030m; 23.VIII.1997; leg. C. Besuchet – (111).

VS-28b = SWITZERLAND: **Valais:** Vouvry, cave "Grotte de la Pierre à Perret" (VS 13), 490m; 10.VIII.1989; leg. B. Hauser — (63b).

VS-29 = SWITZERLAND: **Valais:** Randonne above Saillon, under bark, 1100-1350m; 8.XI.1982; leg. C. Besuchet — (140).

VS-31 = SWITZERLAND: **Valais:** Val de Bagnes: Fionnay, mosses and dead leaves; 1450m; 15.V.1990; leg. C. Besuchet — (156).

VS-32 = SWITZERLAND: **Valais:** Zermatt, Riffelberg, mosses, 2500m; 14.VIII.1969; leg. C. Besuchet — (148).

VS-33 = SWITZERLAND: **Valais:** Evolène, mosses in swamp, 1350m; 3.IX.2001; leg. C. Besuchet — (198).

VS-34 = SWITZERLAND: **Valais:** Monthey, outside of the cave "Grotte de Saint-Martin" (VS 1), 540m; 2.V.1980; leg. P. Strinati & V. Aellen — (199).

LIST OF NEWLY IDENTIFIED SPECIES
(including also the data already published by Mahunka, 1993a, b))

Phthiracaridae Perty, 1841

Helvetacarus genavensis Mahunka, 1993
Locality: GL-3 (Mahunka, 1993a).
Distribution: endemic to Switzerland.

Phthiracarus baloghi Feider & Suciu, 1957
Locality: TI-24.
Distribution: Near East, SE Europe, Romania, Hungary; **first record for Switzerland** (the westernmost finding of the species).

Phthiracarus besuchetianus sp. n.
Locality: JU-3. Description see below.

Phthiracarus boresetosus Jacot, 1930
Localities: AG-5; BL-8; GE-3; GE-5; GR-4; JU-4; SH-3; TG-3.
Distribution: Holarctic Region; **first record for Switzerland.**

Phthiracarus bryobius Jacot, 1930
Locality: VS-34 (Mahunka, 1993b).
Distribution: HolarcticRegion.

Phthiracarus clavatus Parry, 1979
Localities: AP-1; GR-8; JU-4; TI-21; UR-2; VS-22; VS-31.
Distribution: Europe; **first record for Switzerland.**

Phthiracarus compressus Jacot, 1930
Localities: AG-4; GL-3; GR-9; JU-3; JU-4; TI-10; VS-4; VS-32.
Distribution: Holarctic Region; **first record for Switzerland.**

Phthiracarus crenophilus Willmann,1951
Locality: BL-8.
Distribution: Europe.

Phthiracarus crinitus (C. L. Koch, 1841)
Localities: AG-4; AG-5; LU-5; SH-3; SO-1; TG-3; TG-7; TG-8; TG-9.
Distribution: Palaearctic Region, excluding the Far East; **first record for Switzerland.**

Phthiracarus ferrugineus (C. L. Koch, 1841)
Localities: AG-4; BE-8; SG-8; SO-8; TI-11; TI-24; TI-25.
Distribution: Europe; **first record for Switzerland.**

Phthiracarus globosus (C. L. Koch, 1841)
Localities: GE-2; TI-22; UR-2; UR-6; VS-13; VS-28b (Mahunka, 1993b).
Distribution: Holarctic Region.

Phthiracarus incertus Niedbała, 1983
Locality: SO-8.
Distribution: Holarctic Region; **first record for Switzerland.**

Phthiracarus laevigatus (C. L. Koch, 1844)
Localities: BL-1; GE-1; GR-4; GR-11; GR-13; GR-15; GR-16; SH-1; SO-1; TI-11; TI-28; VD-1b.
Distribution: Europe; **first record for Switzerland.**

Phthiracarus lentulus (C. L. Koch,1841)
Localities: TI-22; TI-28; VS-32.
Distribution: Palaearctic Region; **first record for Switzerland.**

Phthiracarus longulus (C. L. Koch, 1841)
Localities: FR-4; GR-4; GR-13; LU-5; SH-1; SO-5; SO-6; TG-8; TG-12; TI-10; TI-21; TI-22; TI-25; TI-26; TI-28.
Distribution: Holarctic Region; **first record for Switzerland.**

Phthiracarus montanus Pérez-Íñigo, 1969
Localities: AP-1; AP-2; SO-8; TI-22; UR-1; VS-3, VS-7.
Distribution: Western Palearctic Region; **first record for Switzerland.**

Phthiracarus nitens (Nicolet, 1855)
Localities: AG-4; BL-8; JU-3; JU-4; LU-5; SH-3; TG-3.
Distribution: Western Palaearctic Region.

Phthiracarus opacus Niedbała, 1986
Localities: BL-8; VS-5.
Distribution: Palaearctic Region; **first record for Switzerland.**

Phthiracarus peristomaticus Willmann, 1951
Locality: GR-13; GR-15; TI-25; TI-26; UR-2; UR-6.
Distribution: Palearctic Region; **first record for Switzerland.**

Phthiracarus setosus (Banks, 1885)
Locality: TI-32.
Distribution: Holarctic Region; **first record for Switzerland.**

Phthiracarus spadix Niedbała, 1983
Localities: AP-1; GR-8; GR-9; GR-13; GR-15; GR-17; NW-3; TI-23; UR-2; UR-3; UR-5; UR-6; VS-5; VS-22.
Distribution: Alps and Carpathian Moutains; **first record for Switzerland.**

Steganacaridae Niedbała, 1986

Atropacarus csiszarae (Balogh & Mahunka, 1979)
Localities: GR-4; TI-22; TI-37.
Distribution: Europe, Caucasus; **first record for Switzerland.**

Atropacarus striculus (C. L. Koch, 1835)
Localities: BE-8; BE-9; FR-4; GL-3; GR-4; LU-1; LU-5; SG-8; SO-6; TG-3; TI-10; TI-11; TI-24; TI-25; TI-26; TI-28; TI-37; UR-2; VS-12; VS-22; VS-33.
Distribution: Holarctic Region

Atropacarus wandae (Niedbała, 1981)
Localities: AG-5; JU-3; SH-3; TI-21; VS-34 (Mahunka, 1993b).
Distribution: Europe.

Calyptophthiracarus c. cretensis (Mahunka, 1979)
Locality: TI-22.
Distribution: Palearctic Region; **first record for Switzerland.**

Steganacarus (S.) antennatus sp. n.
Localities: GR-21; GR-22. Description see below.

Steganacarus (S.) applicatus (Sellnick, 1920)
Localities: BL-8; GL-3; LU-1; LU-5; TG-7; TG-8; TG-9.
Distribution: WesternPalearctic Region; **first record for Switzerland.**

Steganacarus (S.) herculeanus Willmann, 1953
Localities: AG-5; AP-1; AP-4; BL-8; GL-3; LU-5; SO-6; SO-8; VS-4.
Distribution: Europe.

Steganacarus (S.) hirsutus Pérez-Íñigo, 1974
Localities: JU-4; LU-1; SO-1; SO-6; VD-9.
Distribution: Western Europe; **first record for Switzerland.**

Steganacarus (S.) magnus (Nicolet, 1855)
Localities: JU-3; SH-3.
Distribution: Europe.

Steganacarus (S.) magnus f. *anomalus* (Berlese, 1883)
Locality: SH-3.
Distribution: Palearctic Region; **first record for Switzerland.**

Steganacarus (S.) schweizeri sp. n.
Localities: GL-3; LU-5. Description see below.

Steganacarus (Tropacarus) carinatus (C. L. Koch, 1841)
Localities: GR-11; LU-1; LU-2; TG-3; TI-3; TI-10; TI-22; TI-25.
Distribution: Palearctic Region; **first record for Switzerland.**

Oribotritiidae Grandjean, 1954

Mesotritia nuda Berlese, 1887
Locality: GR-5.
Distribution: Europe.

Microtritia minima (Berlese, 1904)
Localities: GR-16; LU-2; SH-3; TI-11; TI-22; TI-28; TI-37.
Distribution: Europe; **first record for Switzerland.**

Protoribotritia aberrans Märkel & Meyer, 1959
Locality: GL-3; TI-25.
Distribution: Europe; **first record for Switzerland.**

Protoribotritia oligotricha Märkel, 1963
Locality: GR-5.
Distribution: Sweden; **first record for Switzerland.**

Paratritia baloghi Moritz, 1966
Locality: TI-34.
Distribution: Central Europe; **first record for Switzerland.**

Euphthiracaridae Jacot, 1930

Euphthiracarus cribrarius (Berlese, 1904)
Localities: AG-5; GL-3; GR-4; GR-13; JU-4; LU-2; LU-5; SH-3; TG-7; TI-26; VS-29.
Distribution: Europe; **first record for Switzerland.**

Euphthiracarus monodactylus (Willmann, 1919)
Localities: AG-4; AG-5; GE-5; GR-6; TI-11; TI-22; TI-37.
Distribution: Palearctic Region; **first record for Switzerland.**

Rhysotritia a. ardua (C. L. Koch, 1841)
Localities: AG-4; BL-1; FR-4; GE-1; GE-5; GE-6; GR-4; GR-11; JU-3; SH-1; SH-3; TG-3; TI-11; TI-24; TI-28; TI-37; VD-8; VS-4; VS-29; VS-34 (Mahunka, 1993b).
Distribution: Holarctic Region (?).

Rhysotritia ardua hyeroglyphica (Berlese, 1916)
Locality: GE-6.
Distribution: Europe; **first record for Switzerland.**

Rhysotritia duplicata (Grandjean, 1953)
Localities: LU-2; SO-2; TG-3; TG-9; TG-10; TI-22.
Distribution: Europe; **first record for Switzerland.**

Mesoplophoridae Ewing, 1917

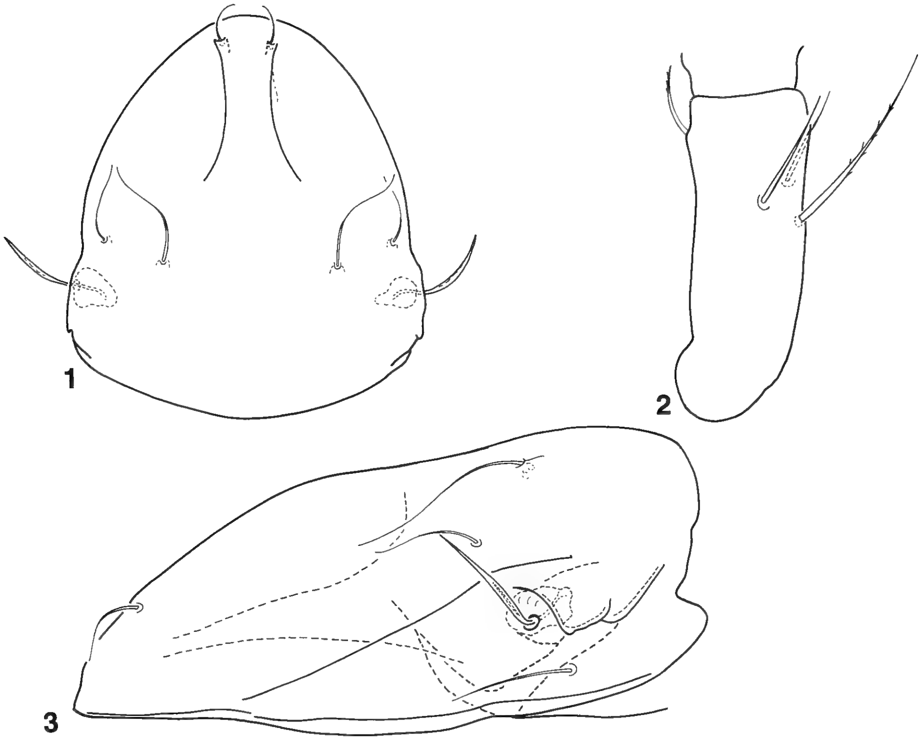
Mesoplophora pulchra Sellnick, 1928
Localities: AG-4; AG-5; GE-3.
Distribution: Holarctic Region; **first record for Switzerland.**

DESCRIPTION AND DISCUSSION OF SOME SPECIES

Phthiracarus baloghi Feider & Suciu, 1957 Figs 1-3

Phthiracarus baloghi Feider & Suciu, 1957: 28, figs 44-55.
Phthiracarus baloghi: Niedbała, 1992: 87, pl. 8A-J, 9A-I.

The Swiss specimens differ slightly from the specimens on which the redescription of Niedbała was based. The principal differences occur in the thickness of the sensillus (much longer and narrower on the Swiss specimens, see fig. 3), in the shape of the bothridial squama (significantly longer in the Swiss specimens), and, the proportion of v' and v" setae on the femur of leg I. The species is also well charac-



FIGS 1-3

Phthiracarus baloghi Feider & Suciu, 1957 – 1: aspis in dorsal view, 2: femur I, 3: aspis in lateral view.

terised by the 1–3 pairs of long *c* setae, the great length differences of the notogastral setae, as well as the extraordinarily long exobothridial setae.

The dimensions of the Swiss specimens fall within the known range.

Phthiracarus besuchetianus sp. n. Figs 4-7

Material examined: Switzerland: Holotype: Jura: JU-3; 13 paratypes: from the same sample. Holotype and 8 paratypes: MHNG[2] and 5 paratypes (1661-P0-01): HNHM[3].

Diagnosis: Sensillus lanceolate, short. 15 pairs of notogastral setae and four pairs of notogastral lyrifissures present. Setae c_1, located far from the collar line. The leg chetotaxy is of the "complete type".

Measurements: Length of aspis: 218-340 μm, length of notogaster: 534-608 μm, height of notogaster: 388-454 μm.

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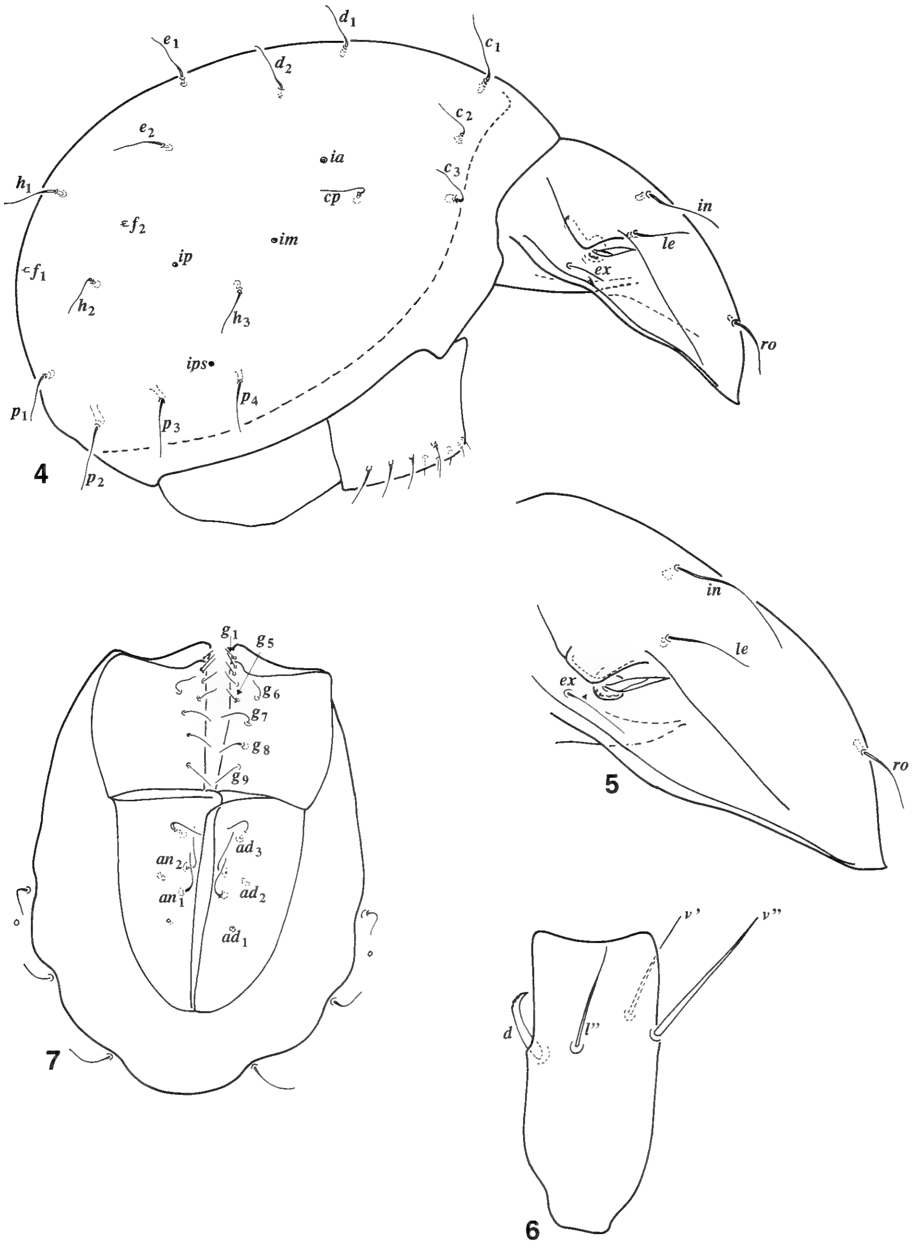
[2] MHNG: deposited in the Muséum d'histoire naturelle, Geneva.

[3] HNHM: deposited in the Hungarian Natural History Museum, Budapest, with identification number of the specimens in the Collection of Arachnida.



FIGS 4-7

Phthiracarus besuchetianus sp. n. – 4: body in lateral view, 5: aspis, 6: femur I, 7: anogenital region.

Aspis: Median crista absent, its outline straight basally, convex anteriorly, with a small concave part rostrally (Fig. 5). Lateral carina distinct, long, reaching over the posterobothridial squama. Lateral rim well developed, sinus line not observable. All prodorsal setae very fine, comparatively short, but setae *ex* not shorter than the rostral ones. Sensillus lanceolate, with sharply pointed distal end.

Notogaster (Fig. 4)*:* All fifteen pairs of notogastral setae short, fine, filiform, somewhat flagellate at their distal ends. Among setae c_1, c_2 and $c_{3,}$ setae c_1 arise furthest, setae c_3 nearest to the collar line. Four pairs of lyrifissures present. Vestigial setae of f_1 located far below setae h_1.

Anogenital region (Fig. 7): Typical for the genus, four pairs of long setae arising in the lateral, and five pairs of short setae arising in the medial position. Five pairs of setae present on the anoadanal plates, two of which are much reduced. All short and fine.

Legs: The legs chaetotaxy is of the "complete type", with setal formula:

I: 1 – 4 – 2+1 – 5+1 – 16+3 – 1.
IV: 2 – 1 – 1 – 2+1 – 10 – 1.

Setae *d* of femur I (Fig. 6) located far from the anterior margin of the segment, thick and strongly curved, serrate distal end. Seta *l'* on genu IV present.

Remarks: The four pairs of notogastral lyrifissures, the short and lanceolate sensillus and the position of setae *c* on the notogaster characterize the new species well. It resembles *Phthiracarus occultus* Niedbała, 1981, but, the new species has 4 pairs of lyrifissures (in *occultus* only 3), setae c_1 stand further from the collar line than in *occultus*, setae *d* on the femora arise near to the distal margin in *occultus* (far from the distal margin in the new species) and setae *l'* is absent in *occultus* (present in the new species).

Derivatio nominis: We dedicate the new species to Dr C. Besuchet (Geneva), the renowned coleopterist, for his collecting activity: he gathered the major part of the Swiss soil samples.

Phthiracarus clavatus Parry, 1979

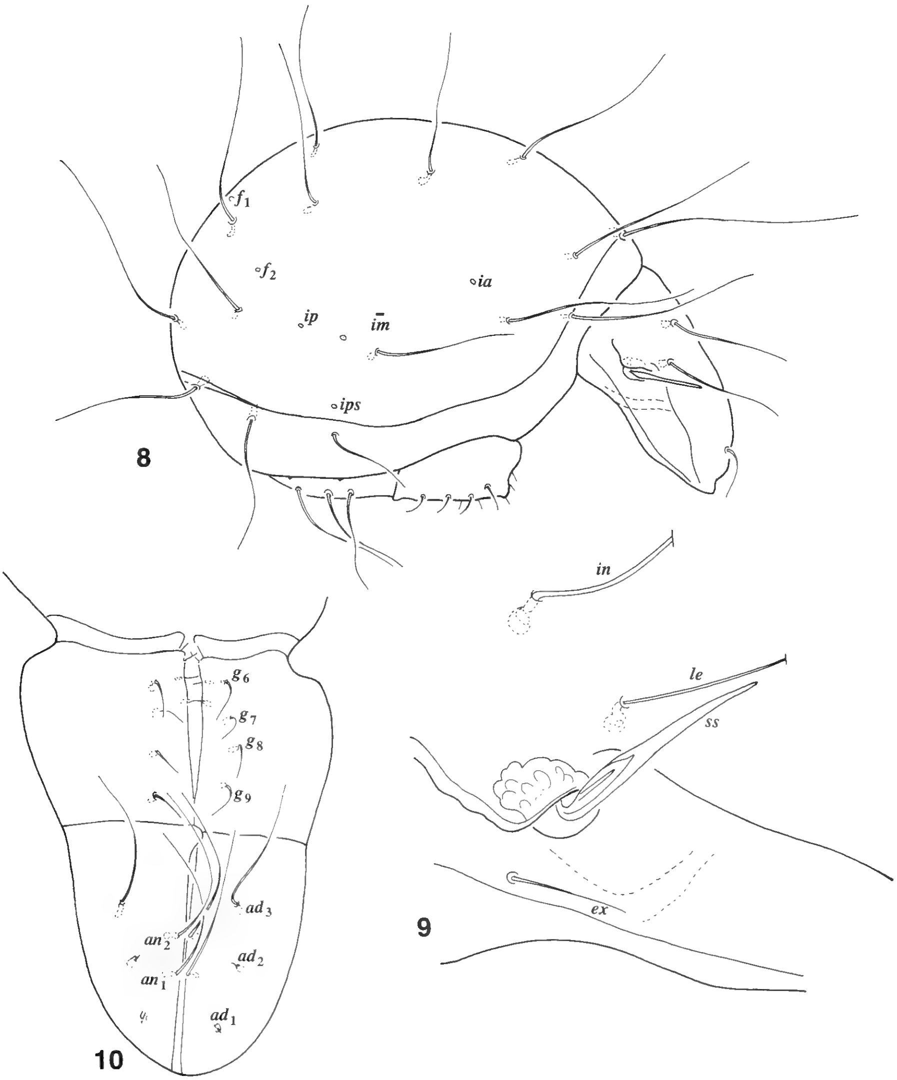
Phthiracarus (*Phthiracarus*) *clavatus* Parry, 1979: 338, figs 7a-c, pl. 3: c, f.
Phthiracarus (*Phthiracarus*) *clavatus*: Niedbała, 1992: 93, pl. 27: a-i, pl. 28: a-e.

It may easily be differentiated from the other species by its long notogastral setae, and the characteristically short distance of setae *c* from the collar line. The species is new for the fauna of Switzerland.

Phthiracarus crinitus (C. L. Koch, 1841) Figs 8-12

Hoplophora crinita C. L. Koch, 1841: f. 32, fig. 8.
Phthiracarus crinitus: Kamill, 1981: 263, figs1-7.
Phthiracarus crinitus: Niedbała, 1992: 99, pl. 18: a-e, 21: h-l.

The species is readily identified on the basis of the works of Kamill and Niedbała. The Swiss specimens differ somewhat especially from the figure of Kamill, so we also present a figure (see Figs 8-12). The rostral part of the aspis is high, in lateral

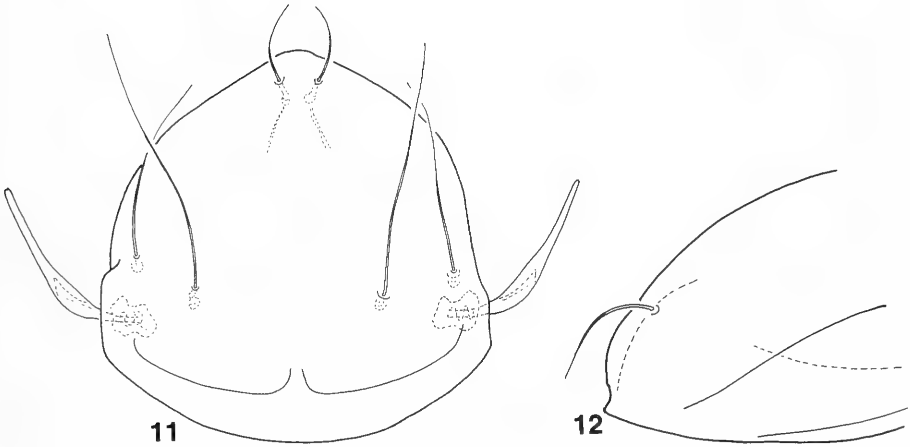


Figs 8-10

Phthiracarus crinitus (C. L. Koch, 1841) – 8: body in lateral view, 9: bothridial part of the aspis, 10: anogenital region.

view almost appearing cristate. The rostrum projects forward. Seta c_2 is emitted close to the collar line on the notogaster. Lyrifissure *ip* sometimes difficult to discern, much weaker than *ips*. A characteristic feature of the species is that out of the three pairs of setae on the anogenital plate, ad_3 is not shorter than the anal setae.

The dimensions of the Swiss specimens are within the so far recorded range.



FIGS 11-12
Phthiracarus crinitus (C. L. Koch, 1841) – 11: aspis in dorsal view, 12: rostral part of the aspis.

Phthiracarus laevigatus (C. L. Koch, 1841)

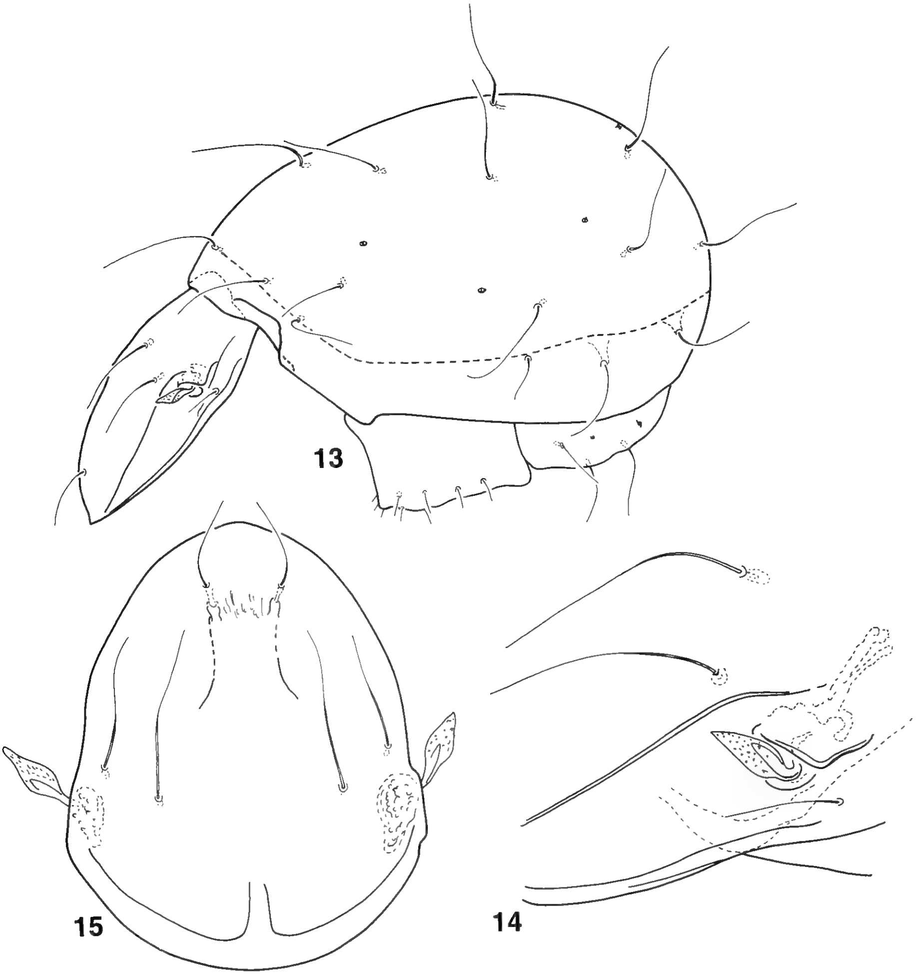
Hoplophora laevigata (C. L. Koch, 1841): f. 38, fig. 16.
Phthiracarus laevigatus: van der Hammen, 1963: 706, figs 1-6.
Phthiracarus laevigatus: Niedbała, 1992: 82, pl 1: a-j.

It is one of the most common species in Switzerland. We identified the species by following the opinion and the redescription of van der Hammen, which had also been accepted by Niedbała (1992). To separate the species of *P. laevigatus* and *P. nitens* is not an easy task, further investigation is needed.

Phthiracarus longulus (C. L. Koch, 1841) Figs 13-18

Hoplophora longula C. L. Koch, 1841: f. 32, fig. 17.
Phthiracarus longulus: Kamill, 1981: 270, figs 25-31.
Phthiracarus longulus: Niedbała, 1992: 116, pl. 71-76.

To identify the species is rather problematic, in spite of the redescriptions prepared by Kamill and Niedbała, due to the fact that the two redescriptions themselves and the recently collected Swiss specimens somewhat differ from one another. However, the redescriptions and the specimens confirm that the setation of the legs belong to the "reduced" type, the notogaster bears two pairs of lyrifissures, the notogastral setae are moderately long, the prodorsal carina is long, the sensillus is lanceolate and visibly spiculate. The notogaster is slightly elongate and generally light coloured. Kamill defined setae *c* as arranged in "a row immediately behind the posterior collar margin", though she depicted them as further away. On the other hand, Niedbała placed them on the collar line, which corresponds well with the situation on the Swiss specimens. However, the latter unequivocally differ from the data of Kamill and Niedbała in the position of the vestigial f_1, since both authors place it before h_1; the



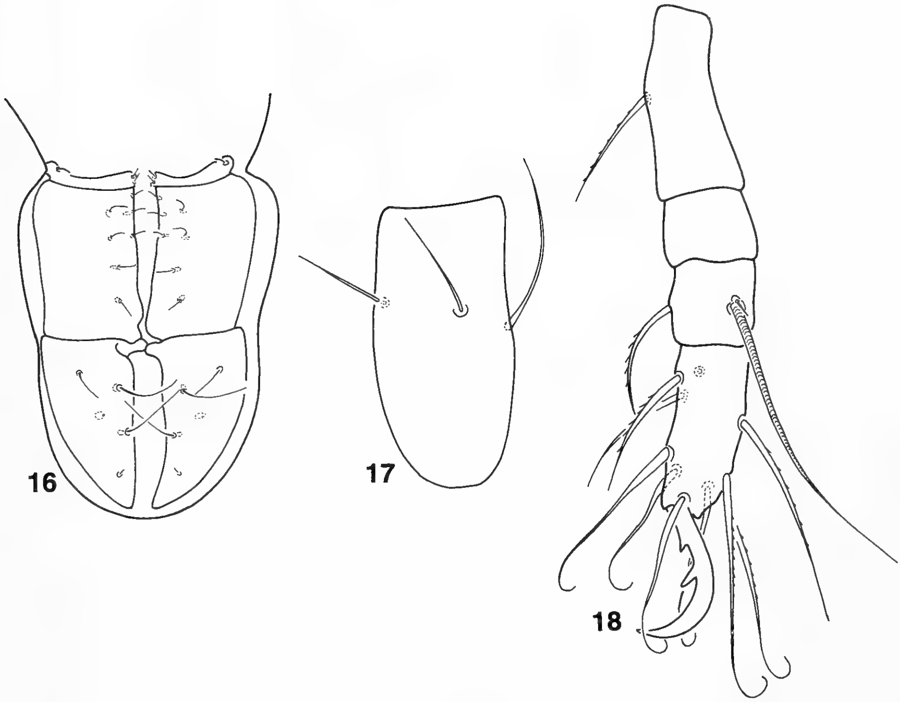
FIGS 13-15
Phthiracarus longulus (C. L. Koch, 1841) – 13: body in lateral view, 14: bothridial part of the aspis, 15: aspis in dorsal view.

Swiss specimens display it behind h_1. Another difference is the shape of seta *d* on the femur of leg I; on the Swiss specimens this seta is simple and setiform.

For the time being we consider these differences as intraspecific variations only.

Phthiracarus opacus Niedbała, 1986 Figs 19-22

Phthiracarus opacus Niedbała, 1986:
Phthiracarus opacus: Niedbała, 1992: 125, pl. 88: A-F.



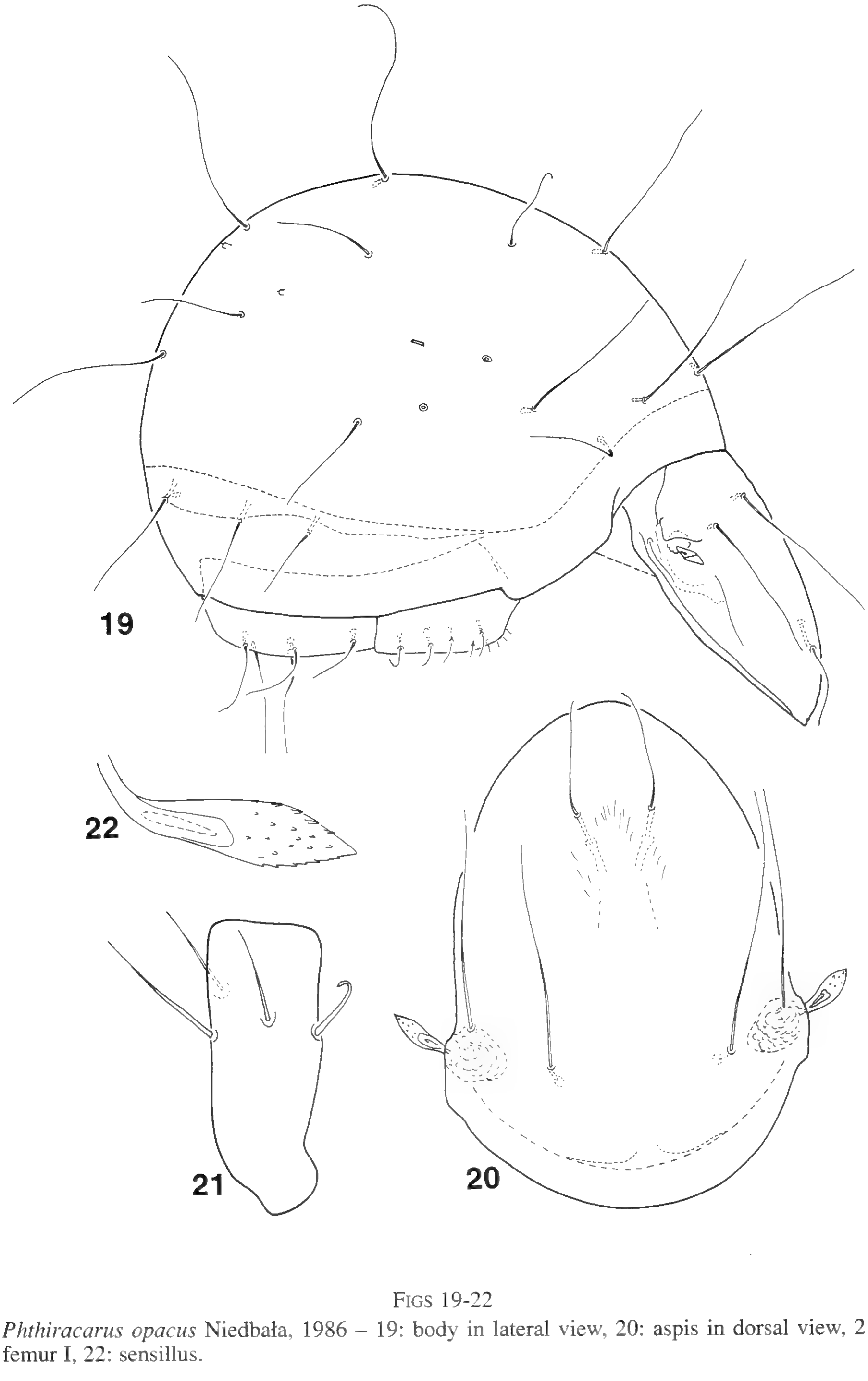
Figs 16-18
Phthiracarus longulus (C. L. Koch, 1841) – 16: anogenital region, 17: femur I, 18: leg IV.

Our experiences show that the species may be confused with *P. peristomaticus*. A significant feature is the lack of crista on the aspis. Seta c_2 on *peristomaticus* is emitted somewhat further from the collar line (Fig. 19) than on *opacus*. From among the adanal setae ad_3 is shorter than either the anal or the other two pairs of adanal setae. Niedbała does not mention seta d on the femur of leg I, which is located somewhere in the middle section on *opacus*, and is apically uncate (Fig. 21), while on *peristomaticus* the same is a simple, bent seta.

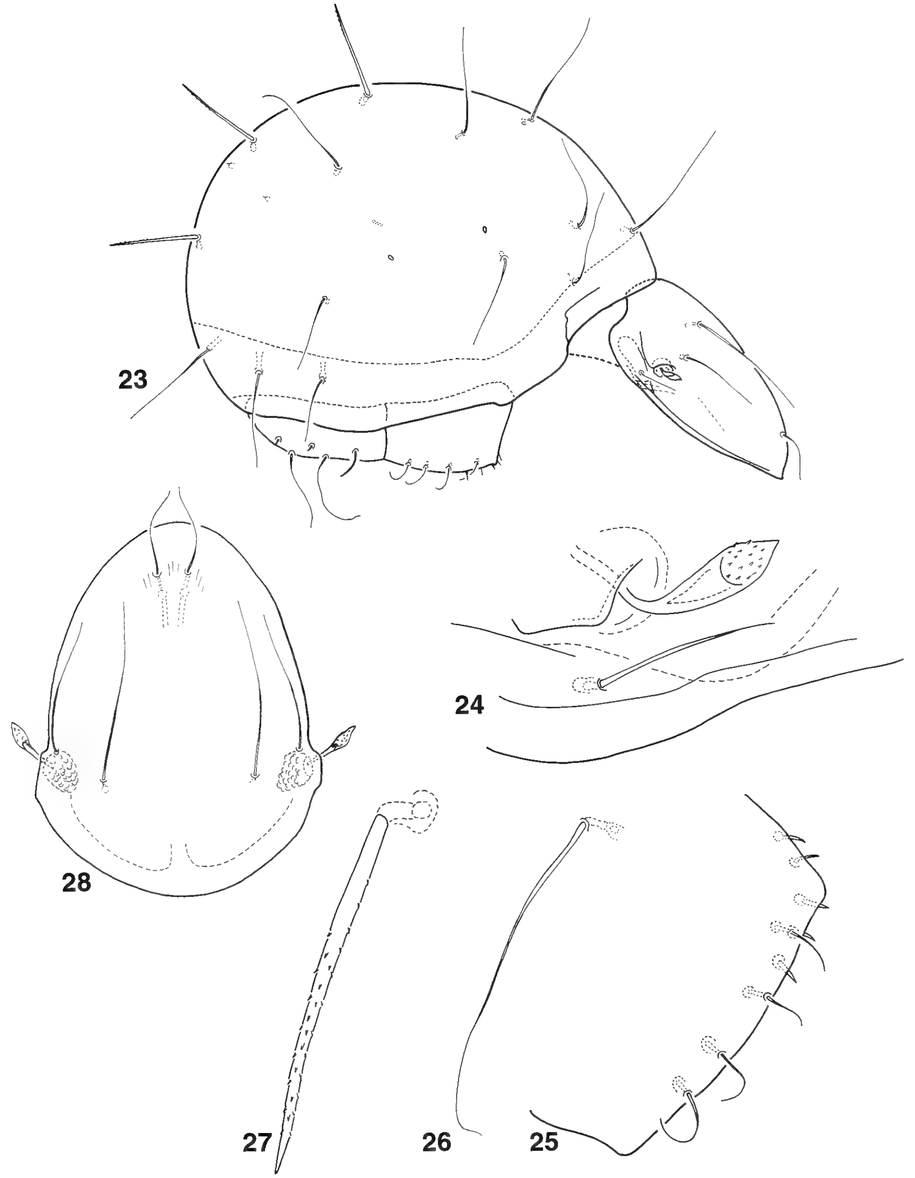
Phthiracarus spadix Niedbała, 1983 Figs 23-28

Phthiracarus spadix Niedbała, 1983: 143, figs 1-17.
Phthiracarus spadix: Niedbała, 1992: 136, pl. 101: a-h.

The description of Niedbała corresponds well with the Swiss specimens. Some additional features: on the aspis the lateral keel is often hardly visible. The distal half of sensillus is ornamented with fine spicules. Setae h_1 and e_1 clearly bear a few short cilia or spicules. The anterior anal setae are slightly longer, strongly bending forwards and strongly attenuating. From among the genital setae g_6–g_9 are strikingly long, g_3–g_5 somewhat thickened. Seta d is emitted in the middle section of the femur, arcuate, finely ciliate, not reaching the anterior end of this pedal segment.



FIGS 19-22
Phthiracarus opacus Niedbała, 1986 – 19: body in lateral view, 20: aspis in dorsal view, 21: femur I, 22: sensillus.



Figs 23-28

Phthiracarus spadix Niedbała, 1983 – 23: body in lateral view, 24: bothridial part of the aspis, 25: genital plate, 26: seta c_1, 27: seta h_1, 28: aspis in dorsal view.

The dimensions of the Swiss specimens: length of aspis: 265–317 µm, length of notogaster: 484–705 µm, height of notogaster: 386–500 µm.

Atropacarus csiszarae (Balogh & Mahunka, 1979) Figs 29-33

Steganacarus csiszarae Balogh & Mahunka, 1979: 284, figs 7-9.
Atropacarus csiszarae: Niedbała, 1992: 236, pl. 255: a-i.

The species was described from Hungary, whilst Niedbała (1992) also recorded it from several central and east European countries. It has not been known hitherto from Western Europe. Subsequent to the original description Niedbała discussed the species on the basis of specimens collected in Poland. This may well be compared both to the type series and the Swiss specimens. Only slight differences may be observed in the length and thickness of the notogastral setae. In the drawing made from the Polish specimens these setae are thinner and longer than on those examined by us. Characteristic features of the species are the 19 pairs of notogastral setae, the ciliate rostral seta, the fine sensillus with an acuminate apex and distinct cilia. The position of lyrifissues *ia* and *im* is also noteworthy.

Owing to the small differences we thought it wise to provide some figures based on the Swiss specimens.

Calyptophthiracarus c. cretensis (Mahunka, 1979)

Hoplophthiracarus cretensis Mahunka, 1979: 558, figs. 27-30.

The Swiss specimens belong to the nominate subspecies. The validity of the subspecies *inopinatus* Mahunka, 1991 needs further investigation.

Steganacarus antennatus sp. n. Figs 34-37

Material examined: Switzerland: Holotype: the Grisons: GR-21 (on slide N 708); 1 paratype: from the same sample (on slide N 668); 2 paratypes: the Grisons: GR-22 (on slide N 1819); 1 paratype: from the same sample (on slide N 1820). Holotype and the 4 paratypes: NHMB[4].

Diagnosis: Setae of the aspis and the notogaster simple, spiniform, slightly spiculate. Sensillus very long, directed forwards, its head small, clavate. 15 pairs of notogastral setae, all equal in length. Two pairs of notogastral lyrifissures. Four pairs of anoadanal setae arising along the inner margins of the anoadanal plates.

Measurements: Length of aspis: 224 µm, length of notogaster: 408 µm, height of notogaster: 265 µm.

Aspis: Dorsal outline uniformly convex anteriorly and medially, straight basally in lateral view. Median crista and lateral carina absent. Surface ornamented by foveolae dorsally and laterally, some longitudinal rugae also observable in the basal part. Lateral surface along the margin nearly smooth. Lateral rim weakly developed, absent anteriorly. Rostral setae short, straight and erect. Lamellar and interlamellar setae setiform, lamellar setae twice as long as the interlamellar and rostral ones. Exobothridial setae distinct. Sensillus directed forwards, its peduncle conspicuously long, a dilated but small head well separated (Fig. 37).

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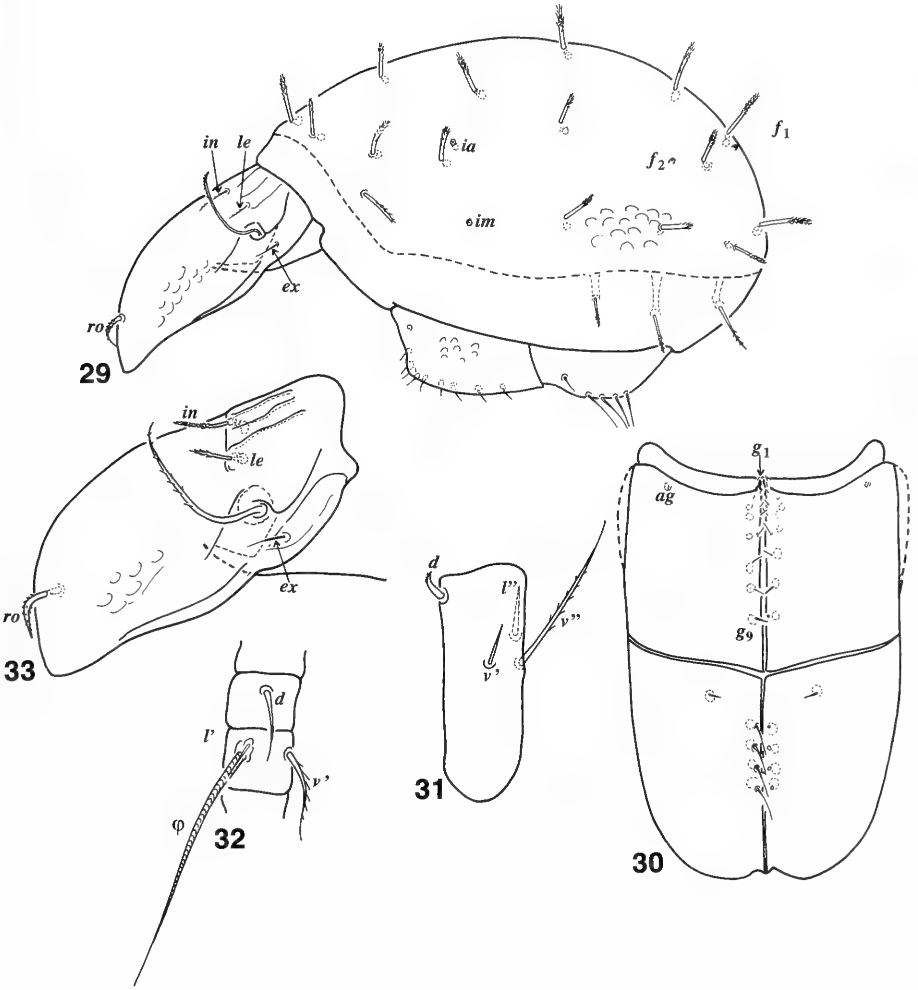
[4] NHMB: deposited in the Naturhistorisches Museum, Basle.

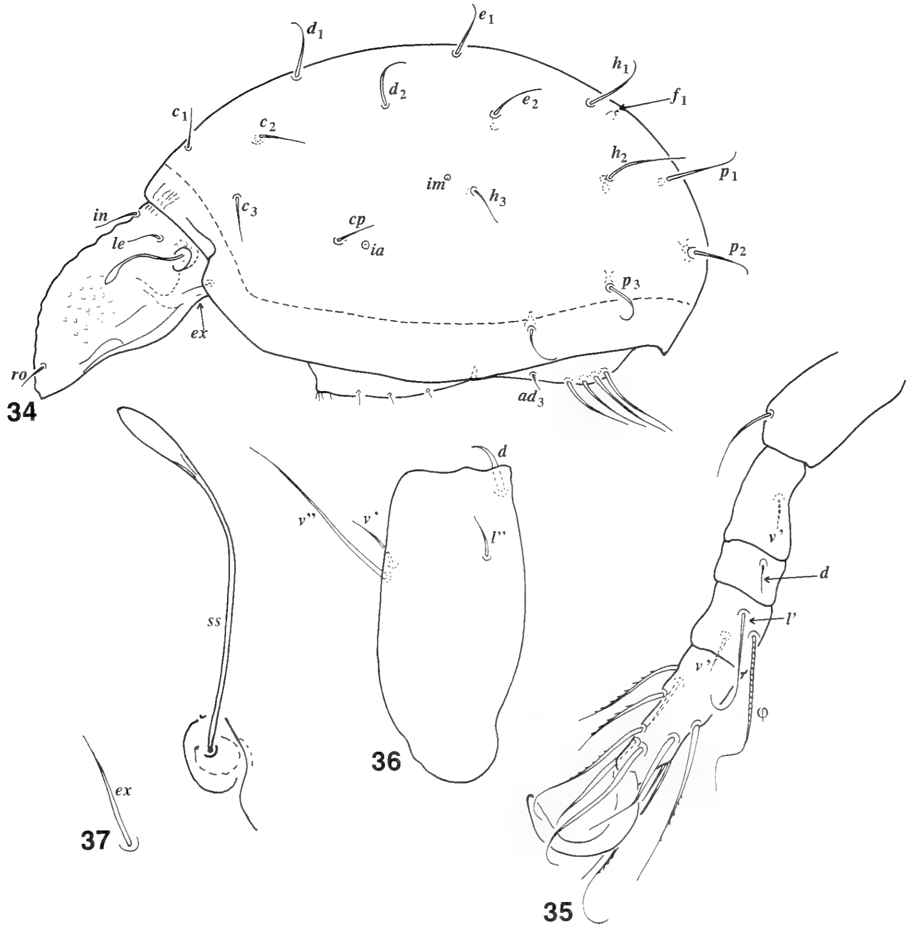


Figs 29-33

Atropacarus csiszarae (Balogh & Mahunka, 1969) – 29: body in lateral view, 30: anogenital region, 31: femur I, 32: genu and tibia of leg IV, 33: aspis in lateral view.

Notogaster (Fig. 34): Ornamented by weak sculpture consisting of small foveolae. All 15 pairs of notogastral setae setiform, with narrowed distal end. No great differences in their lengths. Their distal part bearing small spicules. Two pairs of lyrifissures (*ia* and *im*) present, alveoli of vestigial setae clearly visible, setae f_1 arising behind setae h_1.

Anogenital region: Among the anoadanal setae four pairs originate on the inner margins of the anoadanal plates, their length gradually becoming shorter anteriorly, all simple, setiform. The fifth setae (ad_3) much shorter and simple. Nine pairs of genital setae present, all originating in longitudinal rows, but setae g_6 stand behind g_5 and g_4.



FIGS 34-37

Steganacarus antennatus sp. n. – 34: body in lateral view, 35: leg IV, 36: femur of leg I, 37: bothridial region.

Palps: Three-segmented with the typical setal formula: 2 - 2 - 7+1.

Legs: The formulae of the leg setae are:

I: 1 - 4 - 2+1 - 4+2 - 16+3 - 1 (Fig. 36).
IV: 2 - 1 - 1 - 2+1 - 10 - 1 (Fig. 35).

Setae *d* on femur I short, well curved anteriorly, spiculate. Setae *v*” much longer, nearly five times longer than *v*’.

Remarks: On the basis of the chaetotaxy of tibia IV the new species belongs to the genus *Steganacarus* Ewing, 1917. The conspicuously long sensillus, with small clavate head, is unique in this genus.

Derivatio nominis: The new species is named after the remarkable length and form of its sensillus.

Steganacarus hirsutus Pérez-Íñigo, 1974

Steganacarus hirsutus Pérez-Íñigo, 1974: 419.
Steganacarus hirsutus: Bernini & Avanzati, 1986: 379, figs 1-5.
Steganacarus hirsutus: Niedbała, 1992: 171, pl.138: d-o.

Besides giving a redescription Bernini & Avanzati (1986) discussed in detail the relationships and the distribution of the species. In 1992 Niedbała gave similarly profound analysis of the same, and established the presence of the species in France. The presently studied Swiss specimens are perfectly identifiable with the redescription of Bernini & Avanzati but stand closer to the Spanish specimens (see p. 382, fig. I) than to those from Italy (p. 383, fig. III)

The species is new to the fauna of Switzerland.

Steganacarus schweizeri sp.n. Figs 38-42

Material examined: Switzerland: Holotype: Glarus: GL-3; 2 paratypes: from the same sample; 12 paratypes: Lucerne: LU-5. Holotype and 9 paratypes: MHNG and 6 paratypes (1662-P0-01): HNHM.

Diagnosis: Setae of the aspis and the notogaster spiniform. Sensillus sword-shaped, directed forwards. 15 pairs of notogastral setae, all equal in length. Four pairs of anoadanal setae arising along the inner margin of the anoadanal plates.

Measurements. - Length of aspis: 224-237 µm, length of notogaster: 408-456 µm, height of notogaster: 265-278 µm.

Aspis: Median crista absent. Dorsal outline weakly convex, straight dorsally in lateral view and bent downwards abruptly to rostral setae, so that it is nearly angular in lateral view. Lateral carina absent. Surface ornamented by large foveolae dorsally and laterally, 5 pairs longitudinal rugae also present in the basal part. Lateral surface along the margin nearly smooth (Fig. 39). Lateral rim weakly developed, absent anteriorly. Rostral setae short, straight and erect. Lamellar and interlamellar setae arising nearly in a transverse line, both pairs setiform, thin, lamellar setae three times longer than the interlamellar and rostral ones, nearly as long as the interlamellar setae. Exobothridial setae conspicuous. Sensillus directed forwards, conspicuously long, slightly dilated by a thin velum, nearly sword-shaped (Fig. 42).

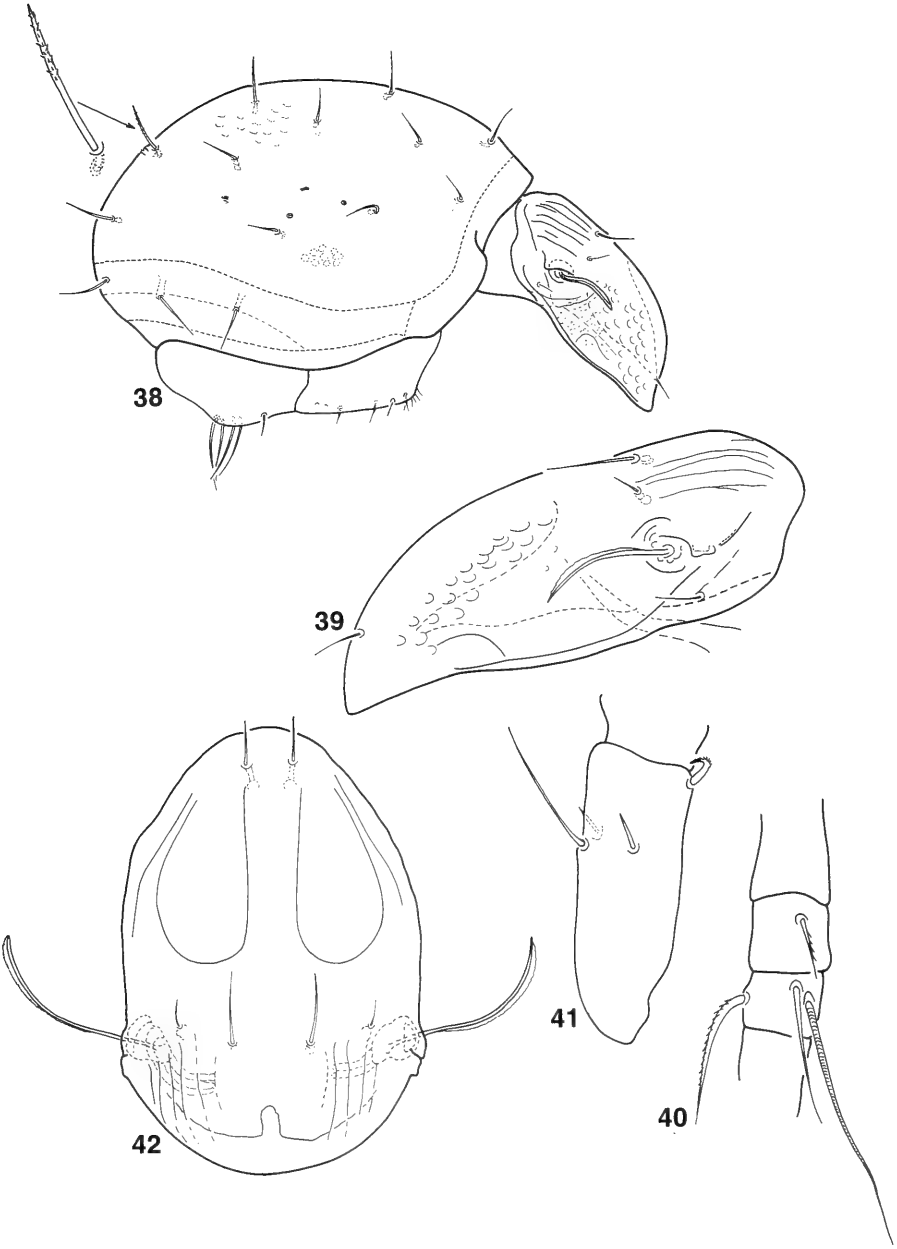
Notogaster (Fig. 38): Ornamented by weak sculpture consisting of sporadic foveolae. All 15 pairs of notogastral setae setiform, with a narrow and straight distal end. No great differences in their lengths. Their distal part bearing small spicules. Two pairs of lyrifissures (*ia* and *im*) present, alveoli of vestigial setae clearly visible, of them setae f_1 arising behind setae h_1, near to them.

Anogenital region: Among the anoadanal setae four pairs originate on the inner margin of the anoadanal plates, their length gradually becoming shorter anteriorly, all simple, setiform. The fifth setae (ad_3) much shorter and simple. Nine pairs of genital setae present, all originating in longitudinal rows, but setae g_6 stand behind g_5 and g_4.

Palps: Three-segmented with the typical setal formula: 2 - 2 - 7+1.

Legs: The formulae of the leg setae are:

I: 1 - 4 - 2+1 - 4+2 - 16+3 - 1 (Fig. 41).
IV: 2 - 1 - 1 - 2+1 - 10 - 1 (Fig. 40).



FIGS 38-42

Steganacarus schweizeri sp. n. – 38: body in lateral view, 39: aspis in lateral view, 40: genu and tibia of leg IV, 41: femur of leg I, 42: aspis in dorsal view.

Setae *d* on femur 1 short, well curved interiorly, spiculate. Setae *v* nearly five times longer than *v*".

Remarks: On the basis of the chaetotaxy of tibia IV the new species belongs to the genus *Steganacarus* Ewing, 1917. On the basis of the long and sword-shaped sensillus and the simple notogastral setae it belongs to the "*Steganacarus coniunctus* Niedbała, 1983 — *vernaculus* Niedbała, 1982 species group". It stands nearest to *vernaculus,* but is well distinguished from this species by the two pairs of lyrifissures (three pairs in *vernaculus*), the distance between the lamellar and interlamellar setae and the very long and narrow sensilli, which are much shorter and broader in *vernaculus.*

Derivatio nominis: We dedicate the new species to the memory of Prof. Dr J. Schweizer, one of the pioneer researchers of terrestrial Acari in Switzerland.

Rhysotritia a. ardua (C. L. Koch, 1841)

Hoplophora ardua C. L. Koch, 1841: f.32, fig. 15.
Rhysotritia ardua ardua: Pérez-Íñigo, 1974: 212, figs 27-28.

The species was recorded by Schweizer (1922, 1948, 1956) and by Borcard (1991). The former author also published it as sub *canestrinii* Berlese, 1887. It is one of the most commonly occurring ptychoid oribatids in Switzerland.

Rhysotritia ardua hyeroglyphica (Berlese, 1916)

Tritia lentula var. *hyeroglyphica* Berlese, 1916: 337.
Rhysotritia ardua hyeroglyphica: Mahunka, 1991: 39, fig. 15.
Rhysotritia ardua penicillata Pérez-Íñigo, 1969: 378, figs 4-5.

The sensillus differs from the basic form by having a clearly dilated distal end. It is much rarer than the nominate subspecies, and has never been collected simultaneously with the latter. Consequently, we consider it to be a good subspecies (see Mahunka, 1991: 39, fig. 15). The subspecies was recovered in Switzerland only at a single locality.

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Note sur l'écologie d'*Acanthochelys macrocephala* (Rhodin, Mittermeier & McMorris, 1984) au Paraguay (Reptilia, Chelidae)

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Note on the ecology of *Acanthochelys macrocephala* (Rhodin, Mittermeier & McMorris, 1984) in Paraguay (Reptilia, Chelidae). - Eight individuals of *Acanthochelys macrocephala* were caught in February 2002 in the Chaco region of Paraguay (21°35.64' S / 59°53.74' W). Various morphometric measurements were recorded; the stomach contents and feces were also collected and analyzed. The status of the species in this Paraguayan region is discussed. *Kinosternon scorpioides* was found living in sympatry in some areas with *Acanthochelys macrocephala*.

Key-words: Reptilia - Chelidae - *Acanthochelys macrocepahala* - *Kinosternon scorpioides* - Paraguay - ecology - reproduction - habitat - diet - behaviour.

INTRODUCTION

La Platémyde à grosse tête, *Acanthochelys macrocephala* (Rhodin, Mittermeier & McMorris, 1984) est la plus grande espèce de son genre (L = 23,5 cm). Décrite dans le genre *Platemys*, elle fut ensuite classée dans le genre *Acanthochelys* lors de la révision du genre par McBee *et al.* (1985), qui reconnaissent *A. macrocepahala, A. spixii* (Duméril & Bibron, 1835), *A. radiolata* (Mikan, 1820) et *A. pallidipectoris* (Freiberg, 1945). La localité type d'*A. macrocephala* se situe au Brésil (Caiçara, Rio Paraguay, Mato Grosso, Brésil; 16°03' S / 57°43' W). L'holotype collecté par J. Natterer en 1826 est conservé au Naturhistorisches Museum de Vienne (Autriche). Notons que l'espèce *Phrynops chacoensis* décrite par Fritz & Pauler (1992) a été reconnue comme synonyme d'*A. macrocephala* lors de la révision par Fritz & Pauler (1999).

Acanthochelys macrocephala se rencontre du nord-est de la Bolivie jusqu'à la région du Pantanal dans la partie ouest du Mato Grosso au Brésil et au nord-ouest du Paraguay. Très peu de travaux ont été publiés sur cette espèce. Son écologie, en particulier, reste encore pratiquement inconnue.

MÉTHODES

Des piégeages ont été menés durant 3 jours dans une localité de l'Alto Paraguay en février 2002 dans la région du Chaco paraguayen (21°35.64' S / 59°53.74' W, altitude 138 m). Le site était composé de 3 mares (appelés "tajamares") aménagées et

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entretenues par le propriétaire du terrain. La couche argileuse présente dans la région du Chaco facilite la création des tajamares. Leur profondeur reste toutefois limitée par l'épaisseur de cette couche de sédiment imperméable qui atteint généralement un maximum de 3 ou 4 mètres. Ces réserves d'eau sont habituellement utilisées pour l'élevage du bétail. Seules deux des trois mares, celles les plus éloignées, l'une de l'autre (500 mètres environ) ont fait l'objet de cette étude.

Le biotope 1 s'étend sur 600 mètres carrés environ pour une profondeur maximale de 1,5 mètre. 30 % des berges sont constitués de hautes herbes et d'arbustes, le reste est de forme rectiligne et à peine recouverte de végétation.

Le biotope 2 s'étend sur 2000 mètres carrés environ pour une profondeur maximale de 3 mètres. La totalité des berges est rectiligne et recouverte d'herbe. Il n'y a pas de massif d'arbres ou d'arbustes important à plus de 400 mètres des rives.

Durant les 5 jours précédents la période de l'étude, de fréquentes pluies avaient élevé le niveau de l'eau à son maximum. Les animaux ont été capturés à l'aide de nasses sans appât. Un piège a été placé dans chaque biotope. Leur emplacement a été modifié de manière aléatoire après chaque relevé. Les durées des différentes phases de piégeage varient entre 4 et 12 heures et elles sont présentées dans le tableau 1. Le même rythme a été adopté pour les deux biotopes. Deux périodes de fortes averses de pluie ont été observées durant l'étude. Les spécimens observés ont été à chaque fois mesurés et photographiés. Le contenu stomacal de deux tortues sub-adultes mortes accidentellement quelques heures après leur capture a été analysé. Ces deux spécimens ont été déposés en collection au Muséum d'histoire naturelle de Genève (MHNG 2626.007 et 2626.008). Les autres tortues capturées ont été conservées en observation, in situ, dans un bassin artificiel durant 10 jours.

RÉSULTATS

CAPTURE

Dans le biotope 1 qui constitue la plus petite étendue d'eau, des tortues ont été capturées durant 4 des 6 sessions de piégeage. Durant la première session (S1): nous avons obtenu 3 *Kinosternon scorpioides* (Linné, 1766) adultes ainsi que 3 *Acanthochelys macrocephala* (deux sub-adultes et un juvénile) ; durant la seconde session (S2) : 2 *A. macrocephala* sub-adultes; durant la cinquième session (S5): 1 *K. scorpioides* adulte et durant la sixième session (S6): 1 *K. scorpioides* adulte.

Dans le biotope 2, des tortues ont été capturées uniquement durant 2 des 6 sessions de piégeages, lors de la première session (S1): 2 *A. macrocephala* adultes (un mâle et une femelle) et lors de la quatrième session (S4): 1 *A. macrocephala* femelle adulte. Aucun autre animal n'a été capturé dans les nasses des deux biotopes. Selon la population locale, un anaconda (*Eunectes* sp.) fréquenterait ce point d'eau. *Acanthochelys macrocephala* a été observée dans les deux mares. Les spécimens adultes (N3) ont été observés dans le biotope 2, le plus étendu et le plus profond. Les autres spécimens, sub-adulte (N4) et juvénile (N1), ont été observés dans le biotope 1, plus petit et disposant de berges végétalisées. Tous les *A. macrocephala*, sauf le juvénile, portaient des algues filamenteuses sur leur dossière, ce qui peut indiquer une préférence pour une exposition au soleil en eau peu profonde, près des berges. Comme

Tableau 1: Répartitions des phases de piégeage.

Jours	J1				J2						J3		
Heures	9-12	13-16	17-20	21-24	1-4	5-8	9-12	13-16	17-20	21-24	1-4	5-8	9-12
Sessions de piégeage			S1			S2	S3	S4	S5	S6			
	Pluies							Pluies					
			NUIT						NUIT				

Vinke & Vinke (2001), nous n'avons toutefois pas observé d'individus hors de l'eau. Dans le biotope 2, des *Kinosternon scorpioides* (N5) ont également été observés. Cette espèce vit donc dans ce biotope en syntopie avec des sub-adultes et des juvéniles. Il s'agit de 2 mâles et 3 femelles capturés à l'occasion de 3 sessions de capture (S1, S5 et S6). Aucune analyse de salinité n'a été effectuée dans les biotopes observés, et nous ne pouvons donc pas étayer dans notre cas les hypothèses de Vinke & Vinke (2001) sur une différence de tolérance de salinité entre *A. macrocephala* et *K. scorpioides*.

MORPHOLOGIE

Les animaux mesurent entre 207 et 54.5 mm (long. dossière). Quelques spécimens, et particulièrement l'individu 7, possèdent de petites taches jaunes sur le dessus de la tête. Comme pour les autres espèces du genre *Acanthochelys*, le juvénile de cette espèce présente un plastron coloré. Pour *A. macrocephala*, il s'agit de grandes taches orangées. La coloration du plastron s'assombrit en grandissant, il est brun noirâtre chez les sub-adultes, puis elle s'éclaircit pour devenir jaunâtre à l'âge adulte. Le spécimen mâle adulte 1 présente une blessure à la base du cou.

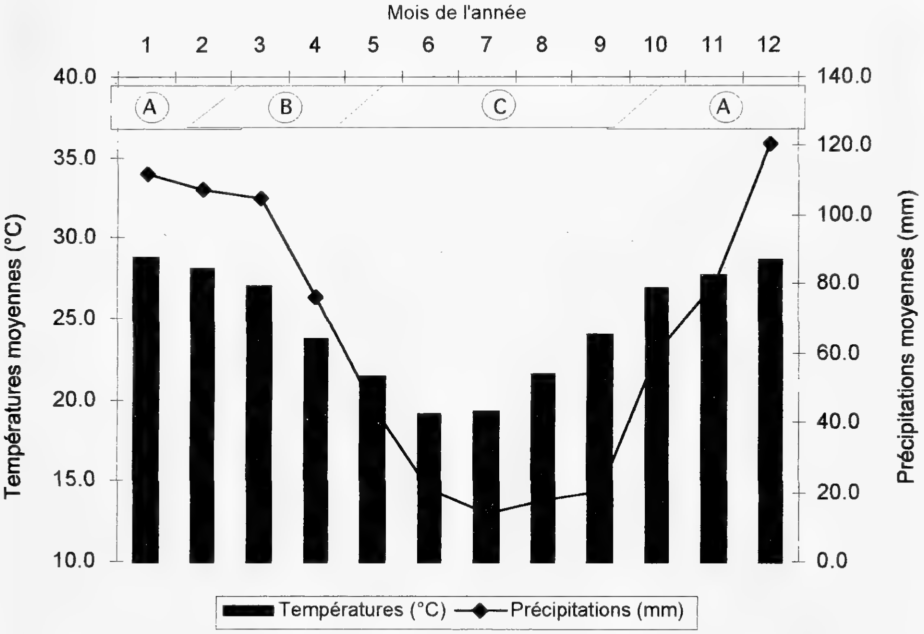
RÉGIME ALIMENTAIRE

Le régime alimentaire des individus observés est entièrement composé de petits insectes aquatiques (dytiques et nèpes principalement). Les plus grands insectes retrouvés, aussi bien dans les déjections que dans les contenus stomacaux, n'atteignent que 14 mm. Cette petite taille est assez surprenante si l'on considère la taille particulièrement remarquable de la gueule de la tortue. Aucun poisson, têtard, crustacé, escargot, œufs d'escargot ou autre animal aquatique n'a d'ailleurs été observé dans les biotopes occupés. Les insectes aquatiques présentaient donc sans doute les seules proies disponibles à ce moment. Selon Yamashita, comm. pers. in Rhodin *et al.* (1984), *A. macrocephala* se nourrit de Gastéropodes dans la région du Pantanal, mais consomme volontiers du poisson en captivité. Vinke & Vinke (2001) mentionnent l'observation en février 2001 d'un individu chassant des poissons ou des batraciens dans des zones peu profondes et plantée d'un tajamar. En janvier 2001, j'avais pu observer quelques spécimens d'*Acanthochelys pallidipectoris* dans le nord du Chaco argentin. Ces individus vivaient dans un biotope identique à celui observé pour *A. macrocephala*. Les seuls animaux aquatiques, qui avaient alors été observés en compagnie des tortues, étaient des têtards dont l'espèce n'a pas pu être identifiée (Métrailler, 2001). Ces derniers consti-

TABLEAU 2: Tailles des *Acanthochelys macrocephala* (Rhodin, Mittermeier & McMorris) observées (mesures en mm).

	1	2	3	4	5	6	7	8
A. macrocephala	mâle adulte	femelle adulte	femelle adulte	mâle sub-adulte	femelle sub-adulte	? sub-adulte	? sub-adulte	? juvénile
Biotope	2	2	2	1	1	1	1	1
Sessions de piégeage	S1	S1	S4	S1	S1	S2	S2	S1
Long dossière	207.0	204.0	208.0	162.0	141.0	136.0	134.0	54.5
Larg dossière *(8 – 9 marginales)*	143.0	150.0	155.0	120.0	104.0	99.0	96.0	40.5
Hauteur *(4ème dorsale)*	66.0	76.0	76.0	60.0	46.0	47.5	45.0	16.5
Long plastron *(la plus grande)*	170.0	196.0	189.0	152.0	129.5	125.0	119.0	45.5
Larg plastron 1 *(antérieur pont)*	90.0	104.0	100.0	79.0	66.5	67.5	64.0	22.0
Larg plastron 2 *(postérieur pont)*	73.0	89.0	87.0	70.0	56.0	58.0	57.0	20.0
Long intergulaire	25.0	48.0	46.0	42.0	33.0	34.0	33.0	11.0
Suture humérale	26.0	23.5	24.0	16.5	16.5	14.0	12.5	5.0
Suture pectorale	13.0	18.0	14.0	13.0	11.5	11.0	11.0	5.0
Suture abdominale	29.0	32.5	33.0	22.5	18.0	17.0	18.0	7.5
Suture femorale	40.0	43.5	39.5	30.0	26.0	25.0	23.0	10.0
Suture anale	16.0	21.0	20.5	19.0	13.0	16.0	16.0	5.0

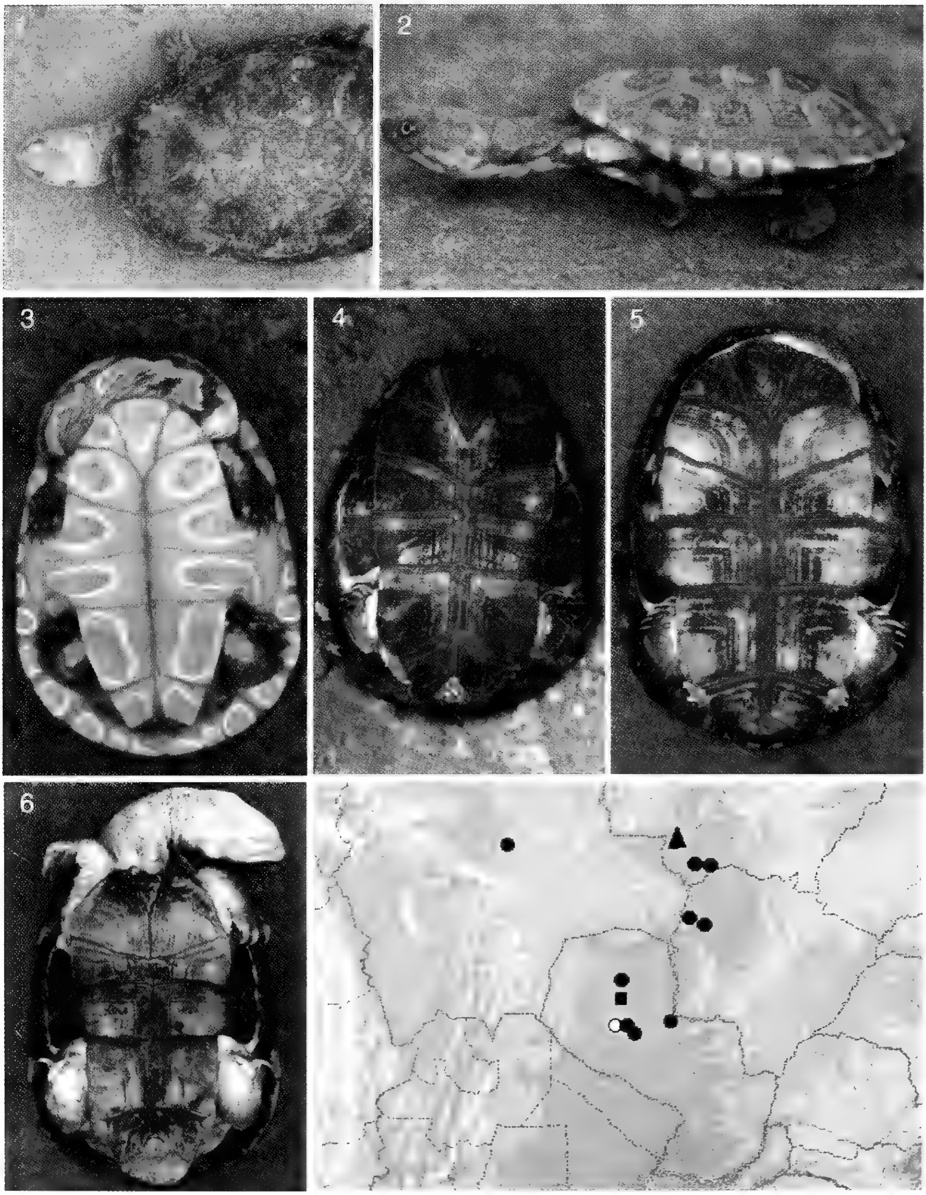
TABLEAU 3: Variations climatiques annuelles dans les environs de la région de l'étude (22°02' S / 60°60' W, alt 172 m, données de 1951 à 1990) et cycle annuel de *Acanthochelys macrocephala* au Paraguay. (A) Eclosions puis accouplements (début période chaude et humide); (B) Pontes (fin période chaude et humide); (C) Repos annuel et incubation des œufs (période sèche et fraîche).



tuaient sans doute, à ce moment, la base de leur alimentation. Durant la période d'observation in situ, *A. macrocephala* s'est nourrie de morceaux de viande. Dans la région étudiée, *A. macrocephala* semble donc adopter un comportement alimentaire très opportuniste.

COMPORTEMENT

Tous les spécimens ont été capturés durant une nuit pluvieuse (S1), durant les premières heures du matin suivant une nuit pluvieuse (S2) ou durant un orage de fin d'après-midi (S4). Aucune *A. macrocephala* n'a été capturée durant la journée ensoleillée. Durant les 10 jours d'observation in situ, les tortues se sont montrées actives uniquement durant la nuit ou durant de grandes averses de pluie. Le reste du temps, les animaux demeuraient presque immobiles dans une partie ombragée du bassin. Les aliments distribués dans la journée n'ont été consommés que durant la nuit. Ces informations confirment le caractère crépusculaire de *A. macrocephala*. Aucun comportement agressif n'a été observé entre les différents individus adultes, subadultes ou juvéniles. Les animaux se montrent également dociles lorsqu'ils sont manipulés.



FIGS 1-7. *Acanthochelys macrocephala*. 1: Spécimen 7, sub-adulte présentant des taches jaunes sur la tête. 2: Spécimen 8, juvénile. 3: Spécimen 8, juvénile, coloration caractéristique du plastron. 4: Spécimen 5, femelle sub-adulte, coloration foncée du plastron. 5: Spécimen 3, femelle adulte, plastron. 6: Spécimen 1, mâle adulte, plastron. 7: Répartition géographique actuelle de *Acanthochelys macrocephala*: triangle = localité type Rhodin *et al.*, 1984 / cercle blanc = Fritz & Pauler, 1992 (décrit sous *Phrynops chacoensis*) / carré = nouvelle localité (Alto Paraguay, 21°35.64' S / 59°53.74' W) / cercles noirs = autres localités (Rhodin *et al.*, 1984; Bour & Pauler, 1987; Buskirk, 1988; Cintra & Yamashita, 1989; Rhodin *et al.*, 1990; Iverson, 1992; Vinke & Vinke, 2001; Ziegler *et al.*, 2002).

REPRODUCTION

Les deux femelles adultes étaient gravides et l'une d'entre elles a pondu un œuf dans l'eau durant les 10 jours d'observation in situ. Ce dernier mesure 27,5 mm par 26 mm et présente une coquille dure. Le juvénile capturé est sans doute né la saison précédente. Comme les 2 femelles adultes capturées sont gravides, la période de ponte de ces animaux se situe probablement entre mars et mai. Cette observation peut être appuyée par les indications de Vinke & Vinke (2001) qui ont observé un accouplement en février 2001 dans la même région ainsi que par les données de Rhodin *et al.* (1984), qui situe la période de ponte de cette espèce entre les mois d'avril et de mai dans la région du Pantanal. Le juvénile capturé présente une ligne de croissance sur les écailles de la dossière, ce qui indique qu'il aurait suivi une période de repos. Si l'on ajoute à cela l'information rapportée par Cintra & Yamashita (1989) sur leur observation d'une naissance après 6 mois d'incubation artificielle observée dans la région du Pantanal, le juvénile capturé en février 2001 est probablement né entre octobre et décembre 2000. Il aurait ensuite observé une période de repos annuel durant la saison sèche et fraîche qui s'étend de mai à août. A la lumière de ces différentes informations, le cycle annuel de *A. macrocephala* pourrait se dérouler comme présenté dans le tableau 3.

DISCUSSION

Quelques informations publiées sur l'écologie de *A. macrocephala* (Cintra & Yamashita, 1989 et Rhodin *et al.*, 1984) proviennent d'observations effectuées dans la région du Pantanal au Brésil. Les conditions écologiques de cette région sont différentes de celle de la région du Chaco paraguayen. Les variations climatiques sont plus marquées dans le Chaco. L'amplitude des températures peut s'étendre de 0 à 40°C. Durant la période plus sèche et moins chaude la température peut ainsi s'abaisser de près de 15°C en quelques heures. Des cycles pluriannuels alternant des périodes plus ou moins humides sont également observés: une période de sécheresse inhabituelle a par exemple été observée durant la saison humide 2001-2002 (D. Dlouhy, com. pers.). Tous ces éléments doivent permettre de relativiser les moyennes annuelles présentées dans le tableau 3. Les biotopes humides du Chaco sont souvent peu étendus et isolés. Les animaux aquatiques se retrouvent regroupés, sans possibilité apparente de rejoindre une autre population. Le brassage génétique ne semble alors possible que durant de grandes inondations. D'autres animaux comme les poissons ou certains batraciens profiteraient aussi de ces périodes propices au changement de biotope. Il y a une vingtaine d'années environ, la région du Chaco paraguayen formait encore un gigantesque lac durant la saison humide. La région était alors inondée par les fortes précipitations, le débordement des affluents du rio Paraguay gonflés par les eaux du Pantanal et même par des eaux arrivant de Bolivie (C. Dlouhy, com. pers.). Depuis cette époque, la région n'a plus connu de telles inondations. Un pareil changement climatique pourrait à long terme mettre en péril le développement des espèces aquatiques qui ont besoin de ces inondations pour assurer un brassage génétique. Dans le Pantanal, recouvert en permanence d'une nappe d'eau, le déplacement des animaux n'est pas entravé. La principale réserve génétique de *A. macrocephala* se trouve à l'évidence dans le Pantanal.

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Revision of the Metadilepididae (Cestoda: Cyclophyllidea) from Caprimulgiformes (Aves)

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Revision of the Metadilepididae (Cestoda: Cyclophyllidea) from Caprimulgiformes (Aves). - The type series of *Metadilepis globacantha* from *Caprimulgus europaeus* in Sweden and *M. caprimulgorum* from *Chordeiles minor* in Brazil are redescribed. The occurrence of the latter cestode species in *Hydropsalis climacocerca* (as mentioned by Fuhrmann, 1908b, 1932) is questioned. Two new species of *Metadilepis* from Paraguay are described: *Metadilepis kornyushini* sp. n. from *Nyctibius griseus* and *M. spasskiorum* sp. n. from *Setopagis parvula. Metadilepis caprimulgina* from *Caprimulgus europaeus* in Central Russia is considered a species inquirenda. The diagnosis of *Metadilepis* is amended in order to conform it to the characteristics of *M. kornyushini* and *M. spasskiorum.* An identification key to the species of *Metadilepis* is proposed. *Proparuterina aruensis* from *Podargus papuensis*, Aru Island (Indonesia), the type species of *Proparuterina*, is redescribed. The genus *Proparuterina* is recognised as monotypic. *Proparuterina lali* from *Passer domesticus* in India is considered a species incertae sedis. *Mariauxilepis* gen. n. with type species *M. paraguayensis* sp. n. from *Nyctidromus albicollis* (type host) and *Setopagis parvula* from Paraguay is erected. *Urutaulepis* gen. n. is proposed as a monotypic genus for *Dilepis pifanoi* from *Nyctibius griseus* in Venezuela. The type species is redescribed on the basis of a paratype specimen and transferred from the Dilepididae to the Metadilepididae as *Urutaulepis pifanoi* comb. n.

Key-words: Cestoda - Metadilepididae - Caprimulgiformes - *Metadilepis* - *Proparuterina* - *Mariauxilepis* gen. n. - *Urutaulepis* gen. n.

INTRODUCTION

The family Metadilepididae Spasskii, 1959 was erected for three genera of the Dilepididae Railliet & Henry, 1909 exhibiting several similarities with paruterinid cestodes (Spasskii, 1959). It has been considered a full family within the superfamilies Paruterinoidea (see Spasskaya & Spasskii, 1971) or Biuterinoidea (see Kornyushin,

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1989). Recent studies on the phylogenetic relationships within the order Cyclophyllidea (Hoberg *et al.*, 1999) confirmed Metadilepididae and Paruterinidae Fuhrmann, 1907 (as defined by Kornyushin & Georgiev, 1994, and Georgiev & Kornyushin, 1994) as sister taxa. The most recent survey on the systematics of the metadilepidids recognised 8 genera in this family; they occur in the Caprimulgiformes, Coraciiformes and Passeriformes, mostly in tropical representatives of these avian orders (Kornyushin & Georgiev, 1994).

Until now, two metadilepidid genera have been known from caprimulgiform hosts, *Metadilepis* Spasskii, 1949 (three species) and *Proparuterina* Fuhrmann, 1911 (one species) (see Spasskii, 1959; Spasskii & Spasskaya, 1977; Kornyushin, 1989; Kornyushin & Georgiev, 1994). During the last 20 years, new material of metadilepidids has been collected from nightjars and nighthawks (Caprimulgidae) and potoos (Nyctibiidae) in Paraguay by expeditions of the Natural History Museum, Geneva. Preliminary studies showed that these specimens represented undescribed taxa. This stimulated a revision of the metadilepidids from caprimulgiform hosts. The results of this taxonomic study are given in the present article.

MATERIALS AND METHODS

Cestodes from the collection of the Natural History Museum, Geneva (MHNG, INVE) were studied for this revision. Some specimens of a new species have been retained in the collection of the senior author. Details of the cestodes studied are given in the text for each species.

The Paraguayan specimens were collected by expeditions of MHNG. The intestines examined were opened longitudinally, placed in water for a few minutes and fixed in hot 4% neutral formalin. Subsequently, cestodes were removed under a stereomicroscope, washed in water and stored in 70% ethanol. Strobila were stained in Mayer's hydrochloric carmine or iron acetocarmine, dehydrated in an ethanol series, cleared in eugenol and mounted in Canada balsam. Some scoleces were mounted in Berlese's medium to facilitate observations of the rostellar hooks.

The metrical and meristic data are presented as the range, the mean in parentheses and the number of measurements or counts (n). The measurements are given in µm unless otherwise stated.

Several ratios are used for more adequate characterisation and differentiation of the species of *Metadilepis*. These are:

$R_{vag/cs}$, ratio of the length of copulatory vagina (measured as curve) to the length of cirrus sac in the same proglottis (calculated for mature and post-mature proglottides);

$R_{ov/pr}$, ratio of the width of the ovary to the width of the proglottis (calculated for fully developed mature proglottides only);

$R_{cs/pr}$, ratio of the length of the cirrus sac to the width of the proglottis (calculated for mature and post-mature proglottides).

The terms used for the developmental stages of proglottides are as previously described (Georgiev & Vaucher, 2001). The nomenclature of birds follows Wolters (1982).

SYSTEMATIC SURVEY

Metadilepis Spasskii, 1947

Dilepis (*Metadilepis*) Spasskii, 1947a: 48-58.
Metaskrjabinolepis Spasskii, 1947b: 723-724.
Metadilepis Spasskii, 1947: Spasskii, 1949: 50-54; Yamaguti, 1959: 248; Schmidt, 1986: 376; Kornyushin, 1989: 173; Kornyushin & Georgiev, 1994: 586.

DIAGNOSIS

Rostellum sucker-like, armed with two rows of rostellar hooks. Hooks in each row of almost equal length; blade curved, handle and guard with large epiphyseal thickenings. Proglottides craspedote, usually wider than long, sometimes gravid proglottides as wide as long. Genital pores unilateral or irregularly alternating in long series. Genital atrium simple, infundibular, surrounded by moderately developed masses of glandular cells. Genital ducts ventral to osmoregulatory canals. Testes in two groups, lateral or postero-lateral to female glands. Cirrus sac thick-walled, overlapping or crossing poral osmoregulatory canals, containing masses of intensely staining cells situated along its walls. External vas deferens highly coiled, covered with prostate cells and forming together with them transversely elongate body situated at antiporal end of cirrus sac. Internal vas deferens coiled, in gravid proglottides may expand, resembling internal seminal vesicle. Vitellarium median, compact or slightly lobed, oval or with irregular shape, near posterior proglottis margin. Ovary wide, transversely elongate, mostly with irregular shape, not clearly divided into two wings, slightly to deeply lobed. Vagina thick-walled, opens posteriorly or postero-laterally to orifice of cirrus sac. Uterus saccular, thick-walled, entirely in median field. Eggs round, with thin outer shell; embryophore and oncosphere round. In Caprimulgiformes (Caprimulgidae and Nyctibiidae), Holarctic, South America.

Type species: *Metadilepis globacantha* (Fuhrmann, 1913) Spasskii, 1949.

REMARKS

The previous diagnosis of this genus (Kornyushin & Georgiev, 1994) has been based on the characters of the two species from which material has been available, i.e., *M. globacantha* and *M. caprimulgorum*. The present study has revealed two further species from Neotropical caprimulgiform birds, which have morphological features allowing their placement in *Metadilepis*. However, *M. kornyushini* sp. n. is characterised by genital pores alternating in long series (compared to the unilateral position in the remaining species). It has also been found that gravid proglottides of *M. spasskiorum* sp. n. and *M. globacantha* can be almost as long as wide. In addition, we have observed that the cirrus sac contains intensely staining cellular masses extending along its walls in the four species considered. These amendments are introduced in the above-presented new version of the generic diagnosis.

In the following key to the species (see also Table I), characters connected with rostellar hooks are not used because of some discrepancies in the description of *M. caprimulgorum* (see the remarks on this species). *M. caprimulgina* (Neslobinsky, 1911) is not included in the key due to the scarce data on its morphology.

TABLE 1. Metrical and meristic data of the species of the genus *Metadilepis* (all based on the present study except where otherwise stated).

	M. globacantha	*M. caprimulgorum*	*M. kornyushini*	*M. spasskiorum*
Body:				
length (mm)	-	20(2)	90	~ 60
maximum width (mm)	1.51/2.73(1)	1.03	1.99-2.05	1.12-1.53
Scolex: diameter	-	160(2)	482-505	279-310
Suckers: diameter	-	70(2)	152-183	102-120
Rostellum: diameter	-	-	148-157	123-153
Rostellar hooks:				
number	40	36(2)	38(?)-40-44	40(?)-42-46
length				
anterior hooks	38-39	50(2)	48-51	41-45
posterior hooks	32-34	30(2)	41-43	34-37
Testes: number	20-25	18-26(?)	18-25	17-25
Cirrus sac:				
mature proglottides				
length	162-212	84-117	156-224	152-172
width	63-75	32-43	58-87	50-56
pre-gravid and gravid proglottides				
length	317-382	122-151	198-254	158-192
width	195-228	49-60	94-114	50-70
Copulatory vagina:				
length	134-170	98-120	168-185	217-301
width	29-37	19-23	18-27	19-33
R vag/cs	0.77-0.90	0.85-1.16	0.95-1.13	1.38-1.74
R cs/pr	0.22-0.27	0.13-0.18	0.17-0.22	0.13-0.18
Vitellarium: width	118-155	77-99	224-291	66-124
Ovary: width	259-291	193-222	470-642	234-285
R ov/pr	0.30-0.35	0.32-0.38	0.38-0.45	0.23-0.29
Seminal receptacle:				
length	29-51	32-55	-	52-59
width	25-31	25-32	18-27	25-50
Eggs:				
outer shell: diameter	36-39	-	34-41	58-66
Embryophore: diameter	34-37	-	27-35	36-44
Oncosphere: diameter	28-31	-	26-32	28-32
Embryonic hooks				
central pair: length	19-20	-	18-19	18-19
massive: length	16-17	-	16-17	17-18
thin: length	14-15	-	16-17	13-15

(1) In Berlese's medium.
(2) After Fuhrmann (1908a).

KEY TO THE SPECIES OF THE GENUS *METADILEPIS*

1 Genital pores unilateral 2
\- Genital pores alternating . . . . *M. kornyushini*
2 Copulatory part of vagina 1.4-1.8 times longer than cirrus sac in same proglottis . . . . *M. spasskiorum*

- Copulatory part of vagina shorter or slightly (up to 1.2 times) longer than cirrus sac in same proglottis 3

3 Cirrus sac longer than 150 µm in mature and post-mature proglottides, and than 300 µm in pre-gravid and gravid proglottides . . . . . . *M. globacantha*

- Cirrus sac shorter than 130 µm in mature and post-mature proglottides, and than 200 µm in pre-gravid and gravid proglottides . . . . *M. caprimulgorum*

Metadilepis globacantha (Fuhrmann, 1913) Figs 1-8

Dilepis globacantha Fuhrmann, 1913: 14-16, Figs 4-6; Fuhrmann, 1932: 99, 292-293; López-Neyra, 1944: 233-234, Fig. 15(4-7); Spasskii, 1946: 257, Fig. 5; Matevosyan, 1963: 54-57, Figs 24-25.

Dilepis (*Metadilepis*) *globacantha* Fuhrmann, 1913: Spasskii, 1947a: 52-53.

Metaskrjabinolepis globacantha (Fuhrmann, 1913) Spasskii, 1947b: 723-724.

Metadilepis globacantha (Fuhrmann, 1913) Spasskii, 1949: 50-54; Yamaguti, 1959: 248, Fig. 263; Shumilo & Spasskii, 1976: 36; Schmidt, 1986: 376; (?) Kugi, 1988: 106, Figs 167-170; Kornyushin, 1989: 170-173, Fig. 54; Kornyushin & Georgiev, 1994: 586-587, Figs 28.1-28.6.

Hosts: Caprimulgus europaeus L. (type host), *C. ruficollis* Temminck and (? – see remarks) *C. indicus jotaka* Temminck & Schlegel (Caprimulgidae).

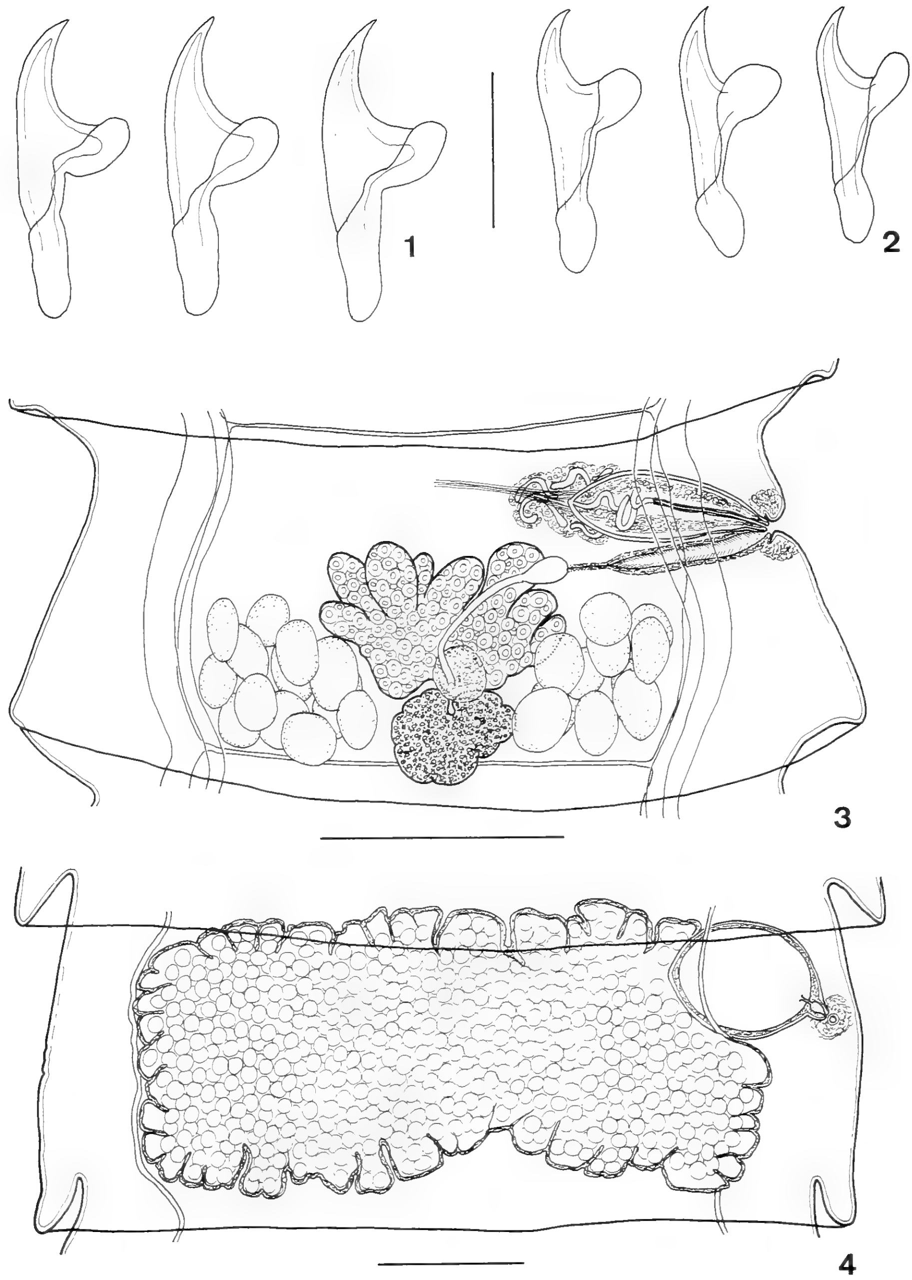
Material studied: MHNG (Collection Neuchâtel) Nos. 81/54-56, 3 slides (labelled by Fuhrmann), syntypes, Bohuslän, Busholmen, Sweden, fragments from one or two specimens. No. 81/54, two stained fragments in good condition, one consisting of 16 mature proglottides and the other of 9 pre-gravid and gravid proglottides, carmine, whole mount in Canada balsam; 81/55, a squashed scolex in Berlese's medium; 81/56, squashed gravid proglottides in Berlese's medium.

REDESCRIPTION

Rostellar hooks 40, in two regular rows. Anterior and posterior hooks of different size, with similar shape, with epiphyseal thickening comprising both handle and guard. Anterior hooks (Fig. 1) 38-39 (n = 3) long. Posterior hooks (Fig. 2) 32-34 (n = 3) long.

Maximum width of strobila at gravid proglottides, 1.51 mm in stained whole mount (2.73 mm in a squash in Berlese's medium). Proglottides craspedote, wider than long (Figs 3, 4) excluding most developed gravid proglottides, which are as long as wide. Ventral osmoregulatory canals 23-46 (n = 5) wide in mature proglottides and 52-83 (n = 5) in gravid proglottides, with narrow transverse anastomoses along posterior margin of each proglottis. Dorsal osmoregulatory canals 10-17 (n = 5) wide in mature proglottides and 8-12 (n = 5) in gravid proglottides. Genital ducts ventral to longitudinal osmoregulatory canals. Genital pores unilateral, situated in anterior half of lateral proglottis margin in both mature and gravid proglottides. Genital atrium consists of pore surrounded by circular musculature, infundibular canal widening at its bottom to form small cavity; atrium encircled by intensely stained glandular cell aggregations (Figs 5, 6). No genital papilla.

Testes 20-25 (24, n = 10), situated in two distinct compact groups lateral to vitellarium and postero-lateral to ovary (Fig. 3); antiporal group of testes larger than poral, e.g., 8+17, 9+16, 11+14, 12+13; testicular field not overlapping longitudinal osmoregulatory canals. External vas deferens forms several coils near antiporal end of cirrus sac; densely covered by prostate cells, forming together with them compact



Figs 1-4

Metadilepis globacantha (Fuhrmann, 1913), syntypes: 1, anterior rostellar hooks; 2, posterior rostellar hooks; 3, mature proglottis, dorsal view; 4, gravid proglottis, dorsal view. Scale bars: 1-2 = 20 µm; 3-4 = 250 µm.

body; overlapping antiporal end of cirrus sac both ventrally and dorsally. Cirrus sac in mature proglottides (Figs 5, 6) mostly elongate-oval, sometimes rather claviform, thick-walled, 162-212 x 63-75 (191 x 68, n = 10); relatively large: $R_{cs/pr}$ 0.22-0.27 (0.24, n = 6); crossing poral osmoregulatory canals about its middle; sometimes forming constriction near poral end (Fig. 6). Intensely stained cells extending within cirrus-sac along its walls (Figs 5, 6). Internal vas deferens may form several coils in antiporal half of cirrus sac (Figs 3) in early mature proglottides; in late mature proglottides, internal vas deferens as straight or slightly winding tube with walls forming longitudinal folds (Fig. 6). Distinct retractor muscle extending from antiporal end of cirrus sac to middle of proglottis (Figs 3, 5) in mature proglottides. In gravid proglottides, cirrus sac rounded, with tapering poral end (Figs 4, 7), 317-382 x 195-228 (334 x 215, n = 8); internal vas deferens forming large oval to spherical bladder similar to internal seminal vesicle; layers of intensely-stained cells pressed between walls of cirrus sac and walls of internal vas deferens. Evaginated cirrus cylindrical (Fig. 6), with diameter 13-15 (14, n = 4), armed with small needle-shaped spines with length between 2 and 3 mm; at maximum evagination, cirrus 94 long.

Vitellarium situated in middle of proglottis, near posterior proglottis margin; oval or with irregular shape near to oval, slightly lobed, 118-155 (135, n = 10) wide. Ovary transversely elongate, not divided into two wings, deeply lobed; 259-291 (275, n = 6) wide, relatively large, occupying about one third of width of proglottis, i.e., $R_{ov/pr}$ 0.30-0.35 (0.32, n = 6). Mehlis' gland distinct, globular, with diameter 58-66 (62, n = 6). Seminal receptacle small, drop-like to oval, situated anteriorly to poral part of ovary (Fig. 3); measuring 24-35 x 23-29 (30 x 25, n = 4) when empty and 29-51 x 25-31 (40 x 29, n = 3) when filled; connected with Mehlis' gland by wide seminal duct. Vagina opens postero-ventrally (n = 8) or posteriorly (n = 6) to male pore and passes posteriorly to cirrus sac; in one case, vagina opening rather postero-dorsally. Copulatory and conductive parts distinct (Figs 5, 6). Copulatory part straight or slightly curved, 134-170 (158, n = 10) long, slightly shorter than cirrus sac, i.e., $R_{vag/cs}$ 0.77-0.90 (0.84, n = 8); provided with thick sleeve of intensely stained cells; width of vagina together with cellular sleeve 29-37 (33, n = 10). Vaginal canal thick-walled, with diameter of lumen 12-19 (16, n = 10), lined with long microtriches. No vaginal sphincter. Conductive part as straight narrow tube.

Uterus not distinct in mature proglottides available. In pre-gravid and gravid proglottides, uterus occupying whole median field, sometimes overlapping longitudinal osmoregulatory canals (Fig. 4); its wall thick, forming distinct anterior, posterior and lateral diverticula. Eggs rounded, with diameter 36-39 (38, n = 10); outer shell thin. Embryophores rounded, with diameter 34-37 (36, n = 10). Oncospheres round, with diameter 28-31 (29, n = 10). Embryonic hooks (Fig. 8) of central pair thin, 19-20 long; lateral pairs consist of one massive hook with length 16-17 and one thin hook with length 14-15.

REMARKS

In the catalogue of the Collection Neuchâtel (Fuhrmann – Baer), the present material is mentioned as type and also as originating from the Museum of Stuttgart ("Stuttgart, 83"). Since this is the only material of this species deposited in this

TABLE II. Metrical and meristic characters of *Metadilepis globacantha* from *Caprimulgus* spp. as reported by various authors.

Host	*C. europaeus*		*C. ruficollis*	*C. europaeus*	*C. europaeus*	*C. indicus jotaka*
Locality	Sweden		Spain	Belarus	Ukraine	Japan
Source	Fuhrmann (1913)	Present study	López-Neyra (1944)	Spasskii (1949)	Kornyushin (1989)	Kugi (1988)
Body:						
length (mm)	50-60	-	40-45	30	53(2)	56-60
width (mm)	1.7	1.51/2.73(1)	0.9-1	2	1.9	1.0-1.3
Scolex: diameter	300	-	250-260	270-310	-	332
Suckers: diameter	120	-	100-130	110-140	-	126
Rostellum: diameter	120	-	105-112	135-140	-	126
Rostellar hooks:						
number	about 40	40	-	44	-	34-36
length						
anterior hooks	39.6	38-39	39.6	35	-	32
posterior hooks	30	32-34	30	30	-	28
Testes: number	about 20	20-25	20-23	20-22	18-25	20
Cirrus sac:						
mature proglottides						
length	180	162-212	75-90	-	140-150	-
width	-	63-75	-	-	50	-
gravid proglottides						
length		317-382	250	210-320	220-300	49
width		195-228	110	120-140	90-110	35
Cirrus: diameter	14	13-15	-	-	-	-
Vitellarium: width	100	118-155	100	140	45-54	70-77
Ovary: diameter	250	259-291	250	-	330-460	140-161
Seminal receptacle:						
length	-	29-51	-	-	-	-
width	-	25-31	-	-	-	-
Eggs: diameter	36-40	36-39	38-42	-	-	77-80
Oncosphere: diameter	28	28-31	28	-	25-35	39
Embryonic hooks: length	-	14-20	13-15	-	15-17	14-18

(1) In Berlese's medium.
(2) Without scolex.

collection and its present redescription corresponds very well to the original data (Fuhrmann, 1913), we believe that this is the type material from Sweden. The designation of these slides as lots received from the Stuttgart Museum is probably a *lapsus* made in the course of the initial cataloguing of this collection.

M. globacantha is predominantly known as a parasite of *Caprimulgus europaeus*. From this host species, it has been recorded from Sweden (Fuhrmann, 1913), Mogilevskaya Oblast' and Gomel'skaya Oblast', Belarus (Spasskii, 1946, 1947a, 1949), Moldova (Shumilo & Spasskii, 1976) and Vinitskaya Oblast', Ukraine (Kornyushin, 1989). There is also a record from *C. ruficollis* in Granada, Spain (López-Neyra, 1944). The previous descriptions based on specimens from Belarus (Spasskii, 1949), Ukraine (Kornyushin, 1989) and Spain (López-Neyra, 1944) exhibit good morphological correspondence with the type material, including the metrical characters (Table II). The specimens described by López-Neyra (1944) exhibited smaller dimensions of the cirrus sac in mature proglottides (perhaps very young proglottides were measured) but the measurements of the organ in gravid proglottides were in the range reported by other authors (Table II).

Kugi (1988) identified as *M. globacantha* cestodes from *C. indicus jotaka* from Oita Prefecture, Japan. Concerning many characters (number of testes, general measurements of strobila, shape of female glands, etc.), there is a correspondence between Kugi's (1988) data and the present redescription of *M. globacantha*. However, his specimens have been reported as possessing irregularly alternating genital pores, rostellar hooks 32 (anterior) and 28 (posterior) long and an ovoid cirrus sac measuring 49 x 35. The eggs of the specimens from Japan are about twice larger than eggs of those from Europe (Table II). These essential differences question the identification of the Japanese material, which probably belongs to another species.

Metadilepis caprimulgorum (Fuhrmann, 1908)

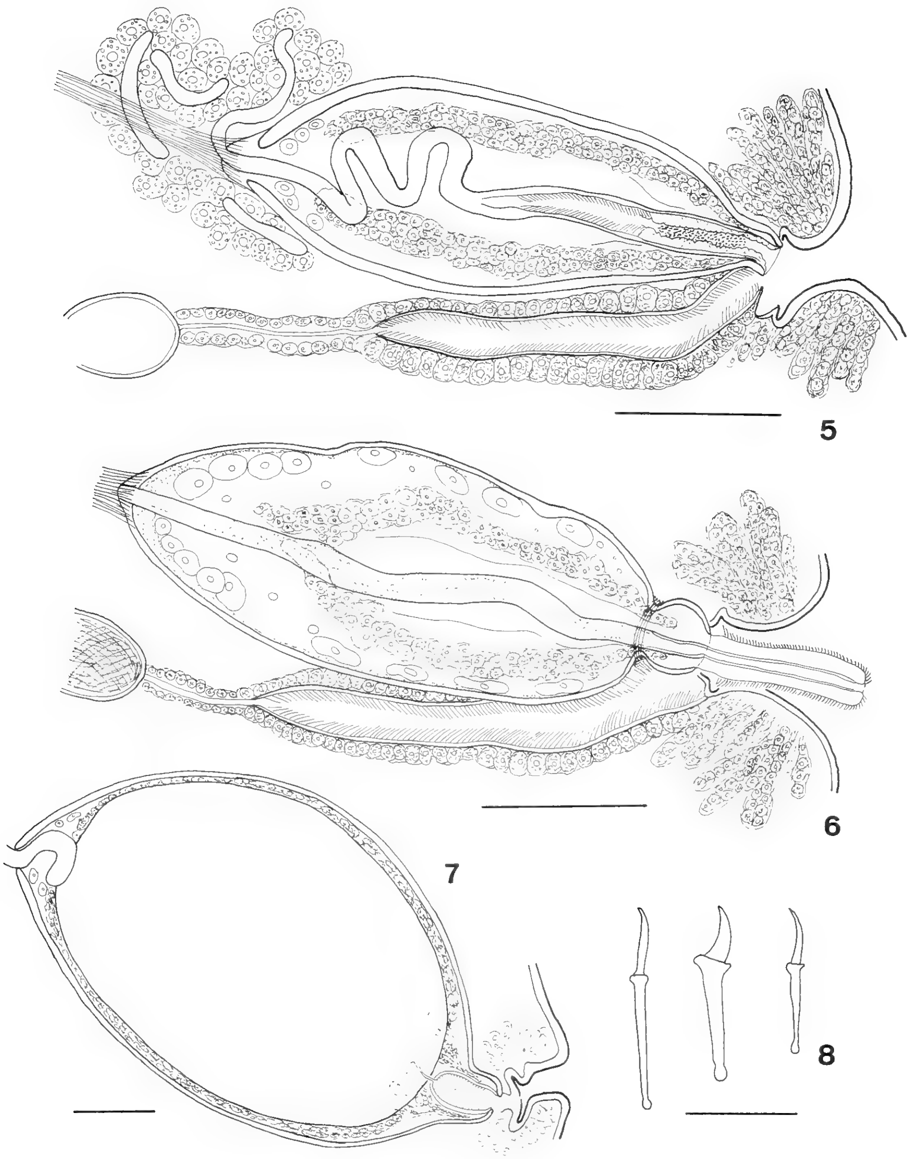
Dilepis caprimulgorum Fuhrmann, 1908a: 49-50, Fig. 35; Fuhrmann, 1908b: 52, 164, 166; Fuhrmann, 1932: 99, 292, 294; Matevosyan, 1963: 50, Fig. 18.

Metadilepis caprimulgorum (Fuhrmann, 1908) Spasskii, 1949: 54; Yamaguti, 1959: 248; Schmidt, 1986: 376.

Hosts: Chordeiles minor (J.R. Forster, 1771) = *Chordeiles virginianus* (Gmelin, 1789), and (? – see remarks) *Hydropsalis climacocerca* (Tschudi, 1844) (Caprimulgidae).

Material studied: From *C. minor*, MHNG (Collection Neuchâtel, 4 slides, Nos. 81/14, 16, 19 and 20), syntypes, Brazil, labelled by Fuhrmann "*Dilepis caprimulgorum*, *Nyctiprogne virginianum*, 440 Wien". No. 81/14 contains unrecognisable squashed fragments in Berlese's medium. No. 81/16, seven stained fragments of strobila consisting of mature or gravid proglottides (probably belonging to a single specimen), hematoxylin, whole mount in Canada balsam, in poor condition. No. 81/19, squashed fragments of proglottides with underdeveloped eggs in Berlese's medium; No. 81/20, longitudinal sections through gravid proglottides.

From *H. climacocerca*, MHNG (Collection Neuchâtel, 3 slides, Nos. 81/15, 17 and 18), Brazil, labelled by Fuhrmann "*Dilepis caprimulgorum*, *Hydropsalis climacereus*, 442 Wien"; mentioned by Fuhrmann (1908b, 1932). No. 81/15 contains squashed fragments of strobila consisting of post-mature and pre-gravid proglottides in Berlese's medium. No. 81/17, squashed fragment (scolex?) in Berlese's medium, no rostellar hooks. No. 81/18, eight stained fragments of strobila, mostly contracted, hematoxylin, whole mount in Canada balsam, in poor condition.



FIGS 5-8

Metadilepis globacantha (Fuhrmann, 1913), syntypes: 5-6, genital ducts in mature proglottides; 7, cirrus sac in gravid proglottis; 8, embryonic hooks. Scale bars: 5-7 = 50 µm; 8 = 10 µm.

REDESCRIPTION OF THE TYPE MATERIAL FROM *CHORDEILES MINOR* (based on MHNG 81/16, 20) Figs 9, 10

Total length of fragments available about 34 mm. Maximum width at pre-gravid proglottides, 1.03 mm. Proglottides craspedote (Fig. 9), wider than long at all developmental stages. Longitudinal musculature strongly developed. Dorsal osmoregulatory canals not distinct. Ventral osmoregulatory canals seen in few proglottides, 19-30 (25, n = 5) wide, with transverse anastomoses. Genital pores unilateral, situated at border of anterior quarter or third of lateral proglottis margin of mature proglottides and at border of anterior quarter of lateral proglottis margin of pre-gravid proglottides. Slightly expressed genital papilla may present (Fig. 9). Genital atrium infundibular, 11-19 (16, n = 10) deep, thin-walled, surrounded by glandular tissue.

Testes 18-26 (21, n = 6) in number, in two groups situated laterally to female glands, in two or three layers (Fig. 9); testes in antiporal group more numerous than those in poral group (e.g., 7+12, 8+13, 10+16). Some testes may overlap lateral lobes of ovary; diameter of fully developed testes 42-52 (46, n = 10). External vas deferens highly coiled, surrounded by prostate cells and forming together with them dense, transversely elongate body situated at antiporal end of cirrus sac near anterior proglottis margin; diameter of external vas deferens 3-6 (4, n = 10). Distinct retractor muscle extending from antiporal end of cirrus sac to anterior proglottis margin. Cirrus sac elongate-oval, with tapering poral end, often transformed into pipette-like protrusion; slightly tapering or rounded antiporal end. Cirrus sac thick-walled, containing aggregations of cells extending along walls (Fig. 10); cirrus sac in mature and post-mature proglottides 84-117 x 32-43 (107 x 37, n = 10), relatively small, i.e., $R_{cs/pr}$ 0.13-0.18 (0.16, n = 6); in pre-gravid proglottides 122-151 x 49-60 (134 x 55, n = 7). Internal vas deferens forms several coils in antiporal end of cirrus sac; in many pre-gravid proglottides, portion of internal vas deferens may expand to form structure resembling internal seminal vesicle (Fig. 10). Evaginated cirrus not observed. Withdrawn cirrus as thin-walled canal; armament not seen in it.

Vitellarium transversely elongate, oval, reniform or with irregular shape, compact or slightly lobed, 77-99 (91, n = 7) wide, situated at middle of posterior proglottis margin (Fig. 9). Ovary transversely elongate, with irregular shape, not forming two wings, slightly lobed, when fully developed 193-222 (205, n = 5) wide, occupying one third or more of proglottis width (Fig. 9), i.e., $R_{ov/pr}$ 0.32-0.38 (0.36, n = 5). Mehlis' gland distinct in few proglottides, globular, with diameter 29-36 (n = 3). Seminal receptacle not distinct in all proglottides; spherical to ovoid, when filled 32-55 x 25-32 (43 x 29), situated anteriorly to poral branches of ovary; connected with Mehlis' gland by wide, curved seminal duct. Vagina with distinct copulatory and conductive parts. Copulatory part 98-120 (109, n = 10), almost as long as cirrus sac, i.e., $R_{vag/cs}$ 0.85-1.16 (1.02, n = 10); opening laterally to orifice of cirrus sac and passing mostly posteriorly to cirrus sac. Vaginal canal thin-walled, surrounded by cellular sleeve. Diameter of vagina 19-23 (21, n = 6), diameter of lumen 11-17 (13, n = 6). Vagina provided with distinct sphincter situated near its orifice. Conductive part thin, straight or slightly curved.

Initial stages of uterine development not distinct. Uterus in pre-gravid proglottides occupying almost all proglottis, thick-walled, with rather short anterior, posterior and lateral diverticula (distinct in sectioned material only). Eggs underdeveloped.

OBSERVATIONS ON SPECIMENS FROM *HYDROPSALIS CLIMACOCERCA* IDENTIFIED BY FUHRMANN (1908b, 1932) AS *M. CAPRIMULGORUM* (based on MHNG 81/18) Fig. 11

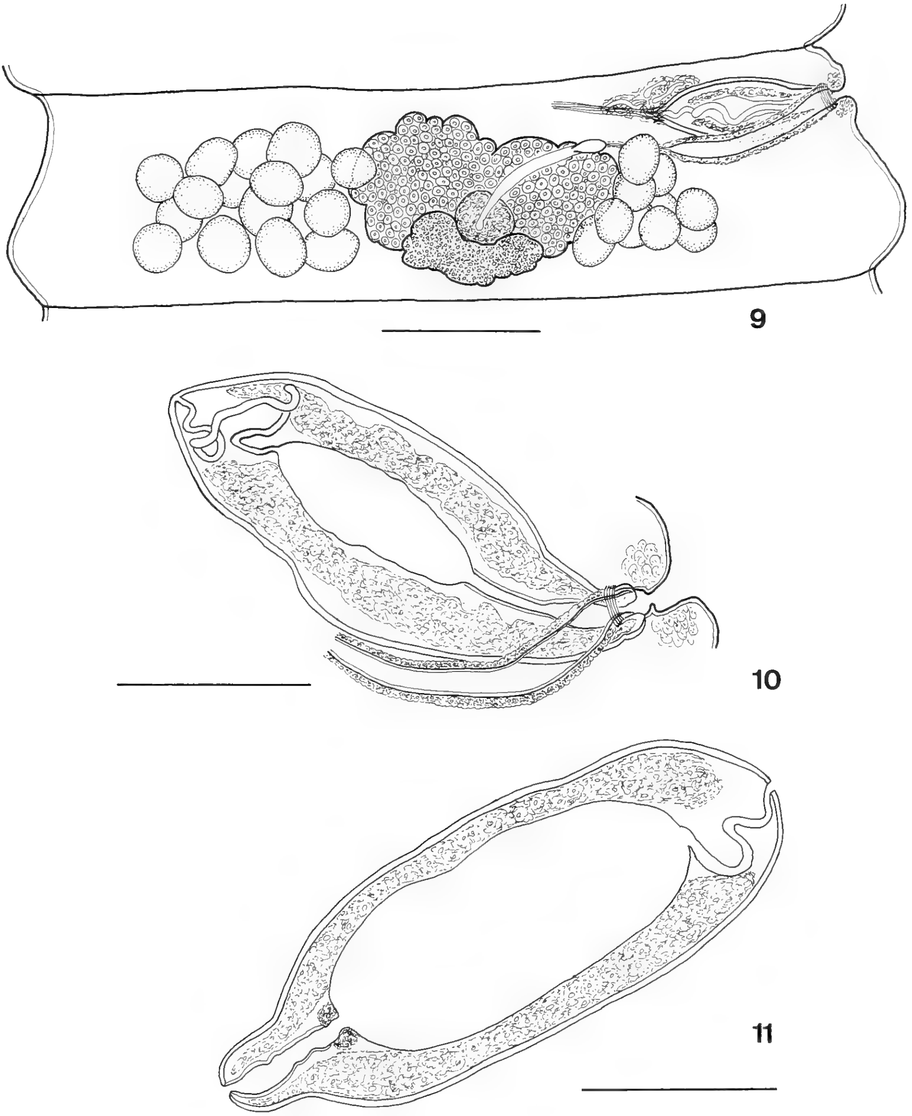
Total length of fragments about 9 mm. Maximum width at gravid proglottides, 1.06 mm. Proglottides craspedote, wider than long at all developmental stages. Longitudinal musculature very strongly developed. Genital pores unilateral. Strong genital papilla, comparable in size with velum, may present. Internal morphology not discernible, cirrus sac only can be characterised. Cirrus sac elongate-oval, thick-walled, with tapering poral end and rounded antiporal end (Fig. 11); cirrus sac 110-142 x 38-55 (130 x 45, n = 7) in mature proglottides and 147-190 x 62-81 (171 x 71, n = 7) in gravid proglottides. Internal vas deferens may expand to form structure resembling internal seminal vesicle (Fig. 11) in gravid proglottides; forming several coils in antiporal part of cirrus sac. Vagina opening laterally to orifice of cirrus sac; vaginal sphincter present. Outer shell of eggs not distinct; embryophore round, with diameter 30-38 (34, n = 10); diameter of oncosphere 28-33 (31, n = 10). Embryonic hooks of central pair thin, 16-17 long; lateral pairs consisting of one massive hook, 13-14 long, and one thin hook, 13-14 long.

REMARKS

M. caprimulgorum was described on the basis of specimens from *Chordeiles minor* from Brazil (see Fuhrmann, 1908a). Fuhrmann (1908b, 1932) identified as the same species specimens from *Hydropsalis climacocerca* from Brazil. There are no further records of this species.

The present redescription of the type material is in good agreement with the brief original description (Fuhrmann, 1908a) and adds to it numerous details concerning internal morphology of this cestode species. However, several important characters (the position of the genital ducts relative to the osmoregulatory canals, the uterine development, and the ripe eggs) remain undescribed, mostly due to the poor condition of the material. Unfortunately, we have not been able to examine scoleces and rostellar hooks of this species. Fuhrmann (1908a) described the rostellum armament as consisting of 36 hooks with length of 50 µm (anterior) and 30 µm (posterior). However, the lengths of the anterior and posterior hooks presented in his illustration are related to one another as 4:3 rather than as 5:3. If we accept that the measurements of the anterior hooks are properly presented in the original description, then the lengths of the anterior and posterior hooks are 50 µm and 37-38 µm (cf. *M. kornyushini* and *M. spasskiorum*), respectively. On the other hand, if the posterior hooks are accepted as a basis, then the lengths are 40 µm and 30 µm (cf. *M. globacantha*). According to Fuhrmann (1908a), the diameters of the scolex and the suckers are 160 µm and 70 µm, respectively. No species with such small dimensions of the scolex and the suckers were found in the new Paraguayan material. Obviously, a new Neotropical material from the type host is needed in order to fill the gaps in the description of *M. caprimulgorum*.

The re-examination revealed that the material from *H. climacocerca* is in poor condition and does not permit adequate studies on the internal morphology. Nevertheless, the comparison with the above description of the type material shows several essential differences. The specimens from *C. minor* have a slightly expressed



FIGS 9-11

Metadilepis caprimulgorum (Fuhrmann, 1908): 9-10, syntypes from *Chordeiles minor*; 9, mature proglottis; 10, cirrus sac in a pre-gravid proglottis; 11, material from *Hydropsalis climacocerca*, Brazil, cirrus sac in a pre-gravid proglottis. Scale bars: 9 = 100 µm; 10-11 = 50 µm.

genital papilla while those from *H. climacocerca* have a large genital papilla, which is comparable in size with the velum of the proglottis. The dimensions of the cirrus sac in the type material are smaller than those in cestodes from *H. climacocerca* (in gravid proglottides, 122-151 x 49-60 compared to 147-190 x 62-81). Unfortunately, no other anatomical details are available for comparisons. Therefore, we consider *M. caprimulgorum* as a specific parasite of *C. minor* and question its occurrence in *H. climacocerca.*

Yamaguti (1959) and Schmidt (1986) mentioned this species as recorded also from North America. As we do not know of other original records of *M. caprimulgorum* except those given by Fuhrmann (1908a, 1908b, 1932), we suppose that this is an error arising from the text included by Fuhrmann (1908a) concerning the geographical range of the host species.

Metadilepis* (?) *caprimulgina (Neslobinsky, 1911), species inquirenda

Dilepis caprimulgina Neslobinsky, 1911: 437-438, Figs 1-4; Fuhrmann, 1932: 99, 292-293; Matevosyan, 1963: 49, Fig. 17.

Metadilepis ? caprimulgina (Neslobinsky, 1911) Spasskii, 1965: 79.

Host: Caprimulgus europaeus (Caprimulgidae).
Material studied: none.

REMARKS

This species is known from its original description only, based on specimens from *C. europaeus* from Central Russia. According to the original description (Neslobinsky, 1911), it is characterised by a body 50 mm long and 1.1 mm wide, diameter of scolex 240, diameter suckers 106, rostellum armed with 34 hooks with length 33. The testes are 7, arranged in two groups. The cirrus sac is 160 long, internal and external seminal vesicles are present. The seminal receptacle is 160 long, the diameter of eggs is 40 and diameter of oncospheres is 20. The original illustrations show rather triangular rostellar hooks (and not elongate, as they are in the remaining species of *Metadilepis*). In addition, the vitellarium is shown as strongly disposed in the poral direction. These two characters, as well as the presence of an external seminal vesicle, question the affiliation of this species to *Metadilepis*. Unfortunately, the location of the type material is unknown. Therefore, we recognise it as a species inquirenda.

Metadilepis kornyushini sp. n. Figs 12-21

Host: Nyctibius griseus (Gmelin, 1789) (Nytibiidae).

Material studied: Three specimens, stained with hydrochloric carmine, whole mount in Canada balsam. *Holotype*: MHNG 33843 INVE, Santa Maria, province Itapua, Paraguay, 26 October 1982 (4 slides). *Paratypes*: MHNG 33844, Itaipu, province Alto Parana, Paraguay, 12 February 1989, 2 specimens (slightly contracted), 2 slides: a slide with stained scolex and fragments of two specimens and a slide with a scolex squashed in Berlese's medium.

ETYMOLOGY

The species is named after Professor V.V. Kornyushin (Institute of Zoology, Kiev, Ukraine) in recognition of his contribution to the systematics of the Metadilepididae.

DESCRIPTION

Gravid specimen band-like, with total length 90 mm, consisting of 415 proglottides (n = 1); maximum width 1.99-2.05 mm at pre-gravid proglottides.

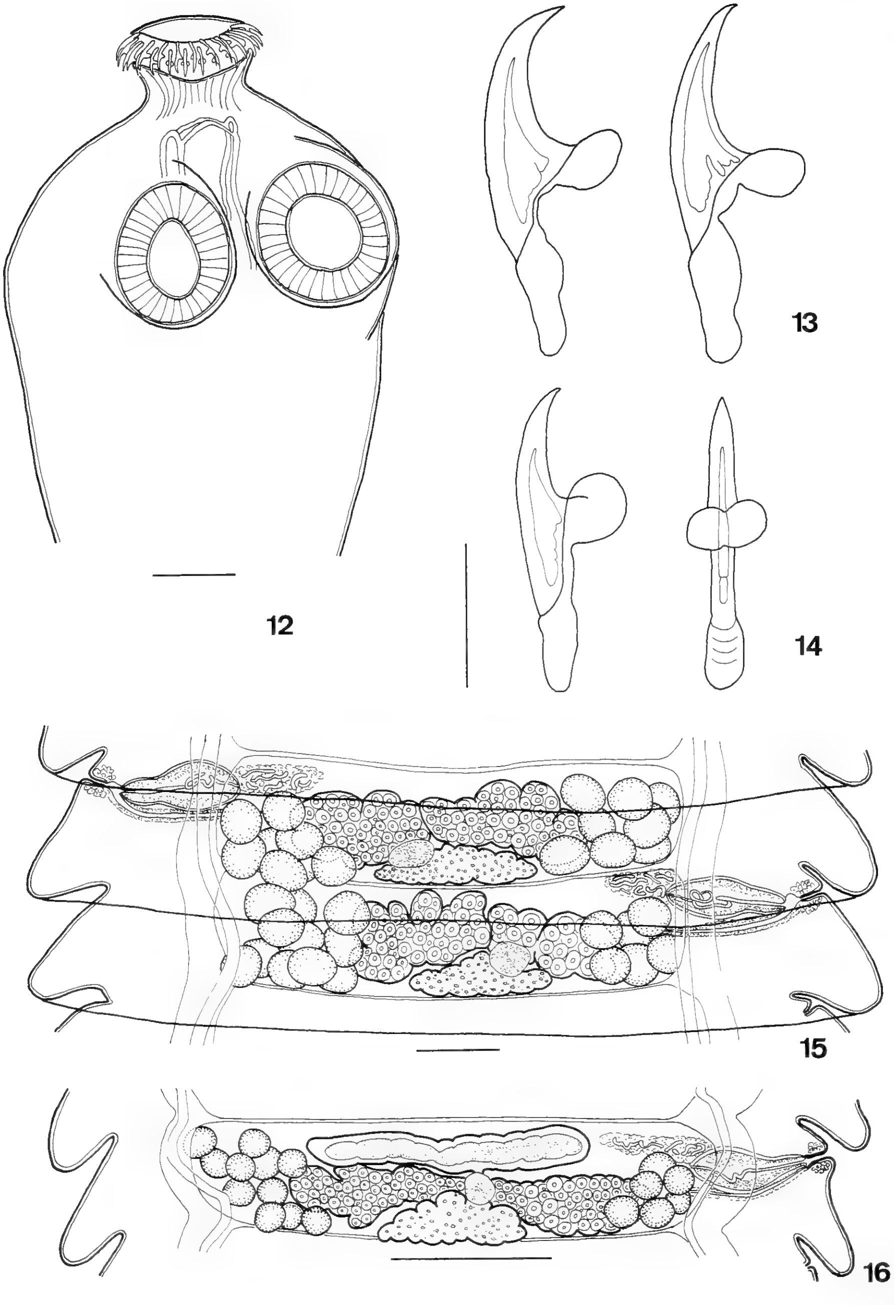
Scolex not clearly outlined from neck (Fig. 12), with maximum diameter at level of middle of suckers, 482-505 (n = 2). Rostellar pad with diameter 148-157 (n =

2); numerous muscular fibres, perpendicular to pad surface, present within it. Retractor muscles extending from rostellar pad periphery in posterior direction. Glandular elements not observed. No rostellar pouch. Rostellar hooks 38 (?), 40 or 44 (n = 3) in number, situated in two regular rows. Epiphyseal thickening of each hook comprising both handle and guard. Guard bifid. Anterior and posterior hooks of different shape and size. Anterior hooks 48-51 (50, n = 4) long, with blade slightly shorter than handle (Fig. 13). Posterior hooks 41-43 (42, n = 4) long, with blade considerably shorter than handle (Fig. 14). Suckers round to oval, with apertures directed dorsally and ventrally; their musculature well developed; diameter of suckers 152-183 (170, n = 8). Segmentation starts at 550-654 from posterior end of suckers. Neck with diameter 206-310 (n = 2) in its narrowest part.

Proglottides craspedote, wider than long at all stages of their development (Figs 15-18). Osmoregulatory canals reaching in anterior direction to level just posterior to rostellar pad (Fig. 12). In strobila, ventral osmoregulatory canals 36-125 (78, n = 10) wide, with transverse anastomoses along posterior margin of each proglottis. Dorsal osmoregulatory canals 9-28 (20, n = 10). Genital pores irregularly alternating, mostly in long series, e.g., ... 19, 16, 26, 11, 29, 11, 28..., or ... 13, 21, 32, 12, 8, or ... 48, 4, 36, 23; situated at border of anterior fifth (in mature proglottides) or anterior quarter (in gravid proglottides) of lateral proglottis margin. Slightly expressed genital papilla may present (Fig. 16). Genital atrium thick-walled, tubular, with infundibular orifice and slightly expanded base, surrounded by intensely stained cellular masses; 36-66 (51, n = 10). Genital ducts ventral to osmoregulatory canals.

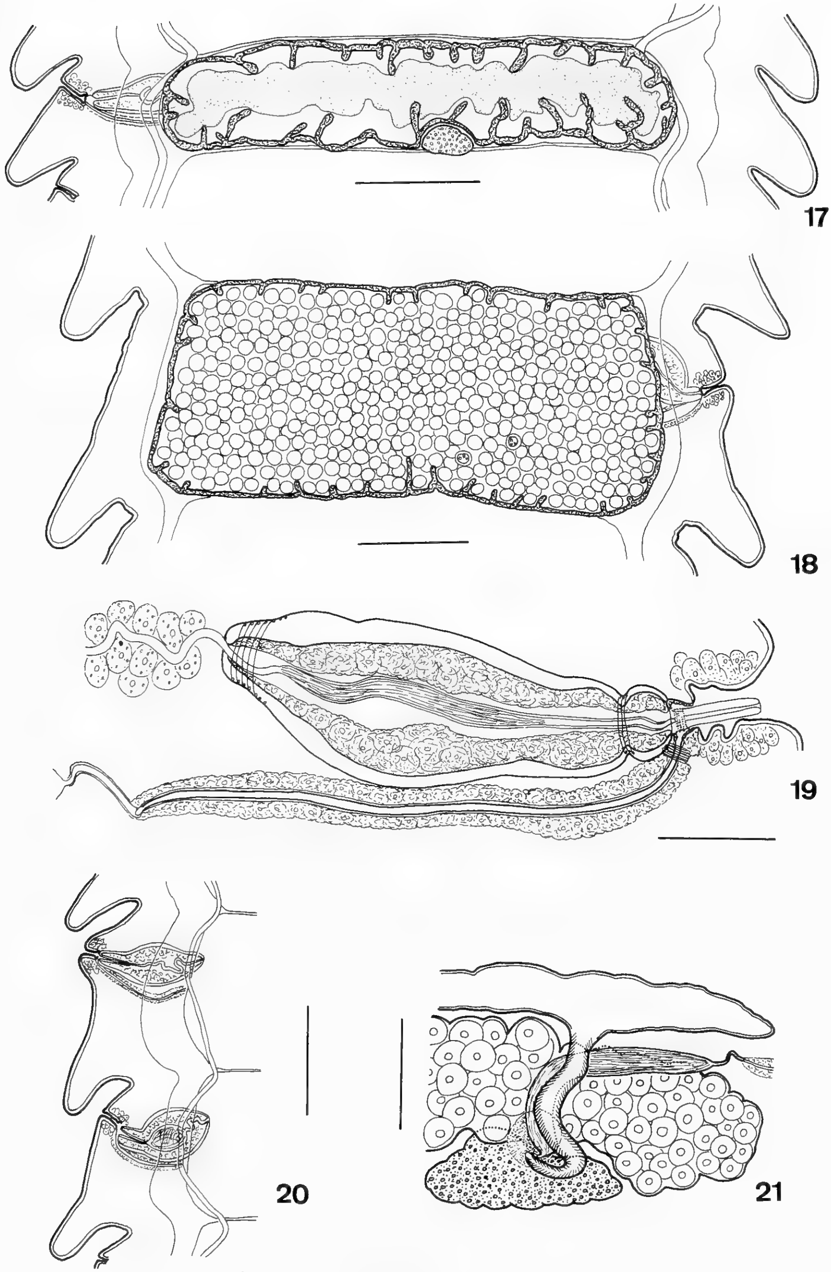
Testes 18-25 (20, n = 10) in number, in two groups lateral to female glands, round to slightly oval (Figs 15-16); may overlap lateral lobes of ovary and ventral osmoregulatory canals. Testes in antiporal group usually more numerous than those in poral group (e.g., 5 + 13, 6 + 12, 7 + 18, 8 + 13). Maximum diameter of testes 63-75 (69, n = 10). External vas deferens highly coiled; forming together with surrounding prostate cells dense, transversely elongate body situated in anterior poral corner of median field and overlapping antiporal part of cirrus sac both ventrally and dorsally; diameter of external vas deferens 7-12 (9, n = 10). Cirrus sac in mature and post-mature proglottides oval, with tapering poral end and rounded antiporal end, often with constriction near its poral end (Figs 19); 156-224 x 58-87 (186 x 75, n = 10), $R_{cs/pr}$ 0.17-0.22 (0.19, n = 10); cirrus sac overlapping or just crossing poral osmoregulatory canals. Intensely stained cells extending within cirrus sac along its walls (Fig. 19), delimiting cavity in which internal vas deferens is situated. Internal vas deferens may form few coils in cirrus sac (Fig. 15). In pre-gravid and gravid proglottides, cirrus sac 198-254 x 94-114 (219 x 107, n = 8); in few proglottides internal vas deferens is transformed in structure resembling internal seminal vesicle (Fig. 20) with dimensions 85-89 x 63-76 (n = 2). Withdrawn cirrus as thick-walled canal. Cirrus evaginated in few proglottides; cylindrical, with maximum length 54 (n = 1) and diameter at base 9-11 (10, n = 4); its base armed with sparse, small (less than 1 µm) triangular spines (Fig. 19).

Vitellarium central or slightly porally disposed, situated at posterior proglottis margin, compact or slightly lobed, transversely elongate (Figs 15-16), when fully developed with measurements 224-291 x 76-94 (250 x 83, n = 6). Ovary slightly lobed, its shape varying from transversely elongate with irregular shape to rather two-winged



Figs 12-16

Metadilepis kornyushini sp. n.: 12, scolex; 13, anterior rostellar hooks; 14, posterior rostellar hooks; 15, mature proglottides, dorsal view; 16, mature proglottis showing an early stage of uterine development, dorsal view. Scale bars: 12, 15 = 100 µm; 13-14 = 20 µm; 16 = 250 µm.



FIGS 17-21

Metadilepis kornyushini sp. n.: 17, pre-gravid proglottis; 18, gravid proglottis; 19, genital ducts in post-mature proglottis; 20, detail of genital ducts in two adjacent gravid proglottides showing different functional conditions of the internal vas deferens; 21, detail of the female genital system, dorsal view. Scale bars: 17-18, 20 = 250 μm; 19 = 50 μm; 21 = 100 μm.

(Figs 15-16); sometimes lateral branches thicker and creating impression for two-winged organ; wide, occupying between one third and almost half of proglottis width, i.e., $R_{ov/pr}$ 0.38-0.45 (0.41, n = 8); when fully developed 470-642 (547, n = 7) wide. Mehlis' gland globular, with diameter 52-67 (59, n = 8); often not distinct. Seminal receptacle tubular, with tapering poral end, often curved, with diameter 18-27 (23, n = 10). Vagina opening and passing posteriorly to cirrus sac (Fig. 19). Copulatory part (measured as curve) 168-185 (173, n = 8) long, slightly shorter or slightly longer than cirrus sac, i.e., $R_{vag/cs}$ 0.95-1.13 (1.07, n = 8); with infundibular orifice and sphincter near it (not always distinct). Vaginal canal surrounded by thick cellular sleeve. Diameter of vagina (together with cellular sleeve) 18-27 (22, n = 10). Vaginal canal thick-walled, with diameter of lumen 4-6 (5, n = 10). Conductive part straight or slightly curved, thin.

Uterus initially seen in mature proglottides as empty, transversely elongate tube situated anteriorly to ovary (Fig. 21), sometimes overlapping it dorsally. With further development, filled with developing eggs (Fig. 16). In post-mature proglottides, uterine walls thick, with deep diverticula (Fig. 17). In gravid proglottides, uterus occupying entire median field; diverticula persisting, not deep (Fig. 18). Eggs round to slightly oval, with diameter 34-41 (38, n = 10), with thin outer shell. Embryophore thick, with diameter 27-35 (32, n = 10). Oncosphere round to oval, with diameter 26-32 (30, n = 10). Embryonic hooks of central pair 18-19 (n = 10) long, of lateral pairs 16-17 (n = 10) long.

REMARKS

Only one metadilepidid species is known for the moment from potoos (Nyctibiidae), *Urutaulepis pifanoi* (Díaz-Ungría & Jordano, 1958) from *Nyctibius griseus* in Venezuela (see below for a redescription). It is characterised by longer rostellar hooks (anterior 71.5-73.5 µm, posterior 59-61 µm, compared to 48-51 and 41-43 in the new species). The rostellar hooks of *U. pifanoi* have very small epiphyseal thickenings (Figs 51-52) while those of *M. kornyushini* have handle and guard comprised by a common epiphyseal structure (Figs 13-14). There are also substantial differences in the strobilar anatomy between the two species (see Table I for metrical differences). The number of testes of *U. pifanoi* is twice as larger as in the new species. Its mature proglottis contains some postvitellarian testes while, in *M. kornyushini*, the vitellarium is situated near the posterior proglottis margin and there are no postvitellarian testes. The genital atria of the two species have very different structures (Figs 19, 56-58).

Compared with all the species of *Metadilepis*, *M. kornyushini* has a longer strobila and is the only one characterised by alternating genital pores and by a seminal receptacle which is highly elongate and curved (not oval and situated anteriorly to poral parts of ovary). It can also be easily distinguished from *M. globacantha* and *M. spasskiorum* by the longer rostellar hooks, the large relative size of the ovary and the large absolute dimensions of the ovary and vitellarium (Table I).

Metadilepis spasskiorum sp. n. Figs 22-30

Host: Setopagis parvula (Gould, 1837) (Caprimulgidae).

Material studied: 10 specimens, stained with hydrochloric carmine, whole mounts in Canada balsam. *Syntypes*: MHNG 33839 INVE, 4 specimens (fragmented, 2 slides of stained whole mounts and 2 slides of squashed scoleces in Berlese's medium), at the km 293 on the Transchaco Road, province Presidente Hayes, Paraguay, 2 November 1988. *Other material:* MHNG 33842 INVE, 2 specimens (fragmented, 1 slide of stained whole mounts), the locality and the date as for the syntypes; MHNG 33841 INVE, 1 mature specimen (fragmented, 1 slide of stained whole mounts), at km 17 of the road from Teniente Montania to Puesto Santo Domingo, province Alto Paraguay, Paraguay, 5 November 1988 (1 specimen); MHNG 38340 INVE, a specimen without scolex, stained whole mount, Santa Maria, province Itapua, Paraguay, 24 October 1982; collection of B. Georgiev, 2 specimens (fragmented, 1 slide of stained whole mounts), Santa Maria, province Itapua, Paraguay, 24 October 1982.

ETYMOLOGY

The species is named after Professor A.A. Spasskii and the late Dr L.P. Spasskaya (Institute of Zoology, Kishinev, Republic of Moldova) in recognition of their contribution to the systematics of the Metadilepididae.

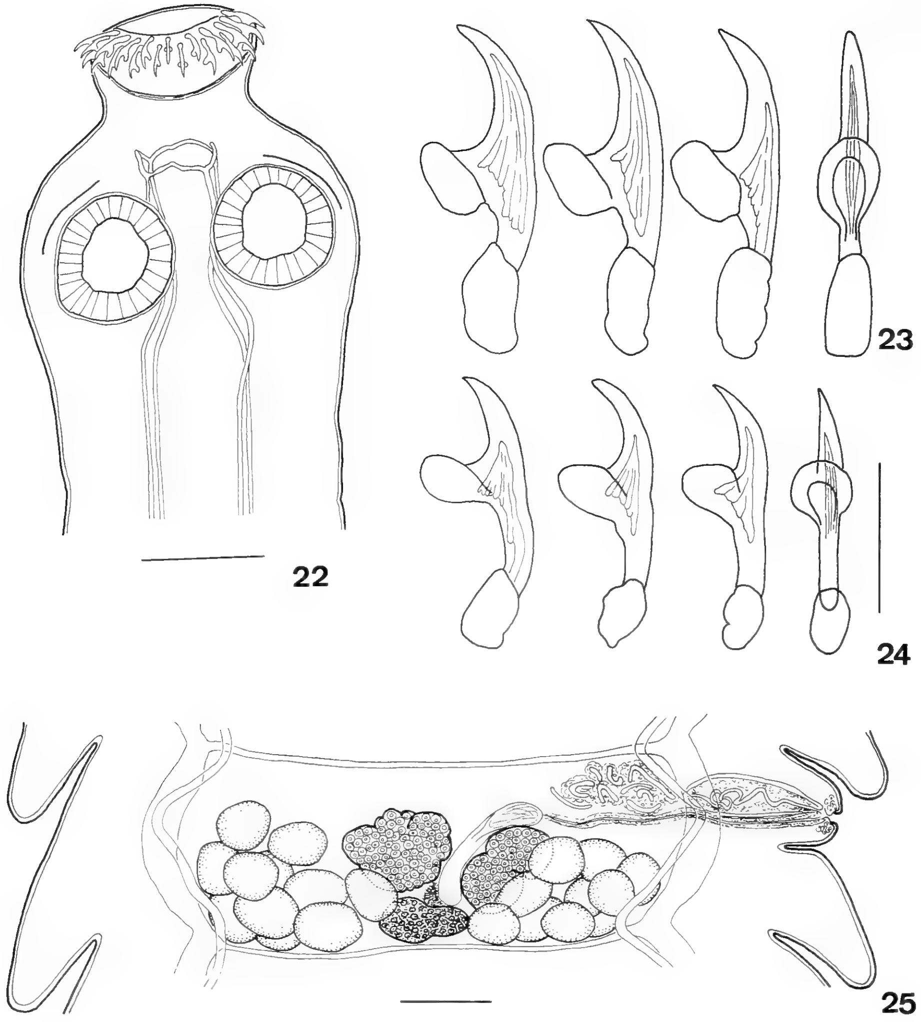
DESCRIPTION

Total length of gravid specimens estimated at about 60 mm (based on lengths of fragments available). Maximum width of strobila at pre-gravid proglottides, 1.12-1.53 mm (1.22 mm, n = 4).

Scolex not clearly outlined from neck, with maximum diameter at middle of suckers, 279-310 (292, n = 4); anterior part of scolex protruded (Fig. 22). Rostellar pad with diameter 123-153 (135, n = 4), containing numerous muscular fibres perpendicular to pad surface. No rostellar pouch. Rostellar hooks 40 (?, n = 2), 42 (n = 1), 44 (n = 1) or 46 (n = 1), in two regular rows. Anterior and posterior hooks of different size and shape; with separate epiphyseal structures of handle and guard. Anterior hooks (Fig. 23) 41-45 (43, n = 9) long. Posterior hooks (Fig. 24) 34-37 (35, n = 8) long. Suckers round to oval, with apertures directed dorsally and ventrally, with well-developed musculature; diameter of suckers 102-120 (111, n = 13). Segmentation starts at 250-380 from posterior end of suckers.

Proglottides craspedote, wider than long (Figs 25-26); most developed gravid proglottides only almost as long as wide (Fig. 27). Ventral osmoregulatory canals 22-32 (28, n = 10) wide in mature proglottides and 35-47 (41, n = 10) in gravid proglottides, with narrow transverse anastomoses along posterior margin of each proglottis. Dorsal osmoregulatory canals 7-11 (10, n = 10) wide in mature proglottides and 7-13 (12, n = 10) in gravid proglottides. Genital ducts ventral to longitudinal osmoregulatory canals. Genital pores unilateral, situated in anterior third of lateral proglottis margin in both mature and gravid proglottides. Genital atrium infundibular, slightly widening at its bottom; thick-walled, 16-34 (24, n = 8) deep; atrium encircled by intensely stained glandular cell aggregations. Well-expressed genital papilla present.

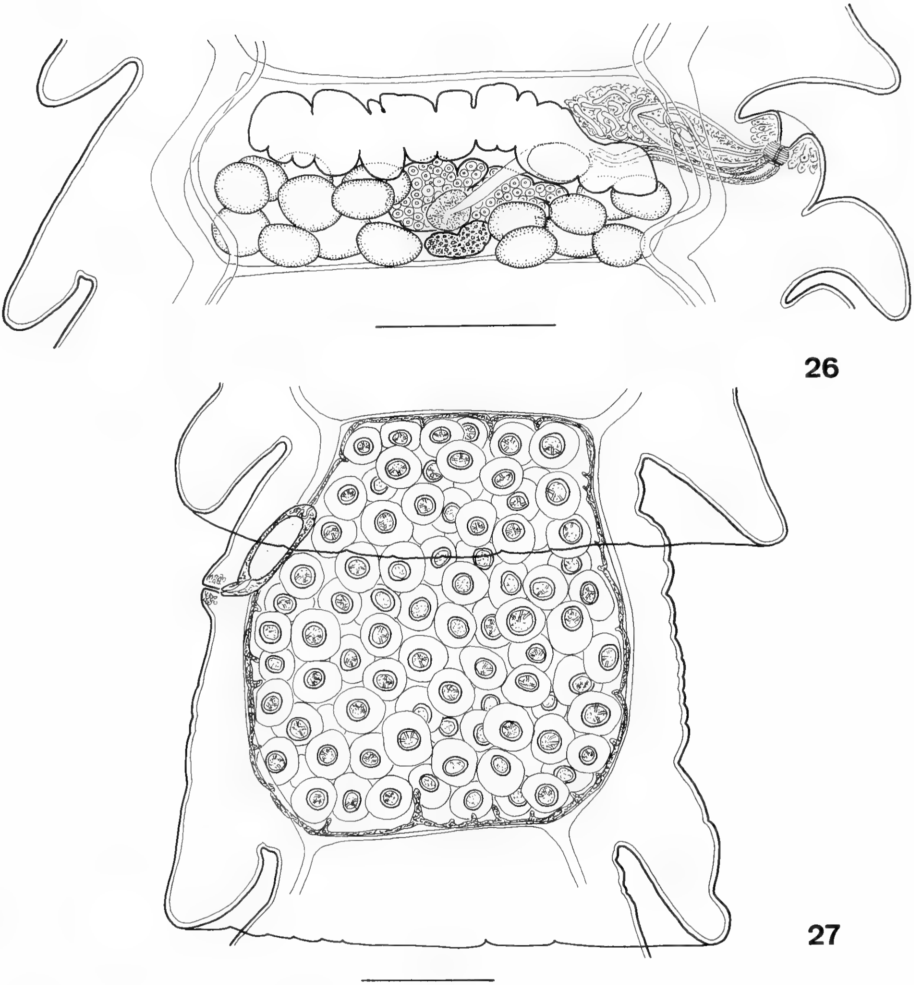
Testes 17-25 (20, n = 14), in two distinct compact groups situated laterally to vitellarium and postero-laterally to ovary (Figs 25-26); rarely, single testes situated dorsally to vitellarium and then two lateral groups merged. Testes often overlapping longitudinal osmoregulatory canals but not crossing them. Testes in antiporal group more numerous than those in poral group (e.g., 8+9, 9+13, 9+10, 11+14); sometimes two groups contain equal number of testes (e.g., 9+9, 10+10). Fully developed testes with diameter 66-88 (77, n = 10). External vas deferens highly coiled near antiporal end of cirrus sac; covered by prostate cells, forming together with them compact, trans-



FIGS 22-25

Metadilepis spasskiorum sp. n.: 22, scolex; 23, anterior rostellar hooks; 24, posterior rostellar hooks; 25, mature proglottis, dorsal view. Scale bars: 22, 25 = 100 µm; 23-24 = 20 µm.

versely elongate body situated in median field near anterior proglottis margin; diameter of external vas deferens 8-11 (9, n = 10). Cirrus sac in mature proglottides (Fig. 28) elongate-oval, with tapering poral end, thick-walled, 152-172 x 50-56 (163 x 53, n = 10), $R_{cs/pr}$ 0.13-0.18 (0.15, n = 10), overlapping or slightly crossing poral osmoregulatory canals. Distinct retractor muscle extending from antiporal end of cirrus sac to middle of anterior proglottis margin. Intensely stained cells extending within cirrus-sac along its walls (Figs 28-29). Internal vas deferens forms several coils in antiporal half of cirrus sac. In pre-gravid and gravid proglottides, cirrus sac wider, with tapering



FIGS 26-27
Metadilepis spasskiorum sp. n.: 26, mature proglottis showing an early stage of uterine development, dorsal view; 27, gravid proglottis, ventral view. Scale bars: 26-27 = 200 µm.

poral end, 158-192 x 50-70 (174 x 61, n = 10). Poral (uncoiled) part of internal vas deferens may form large elongate-oval bladder similar to internal seminal vesicle, often with irregular shape (Fig. 29), sometimes almost spherical. Layers of intensely stained cells pressed between walls of cirrus sac and walls of internal vas deferens. Several coils of internal vas deferens present in most antiporal portion of cirrus sac. Evaginated cirrus not observed; armament consisting of punctiform spines (shorter than 1 µm) seen in canal of withdrawn cirrus in pre-gravid and gravid proglottides.

Vitellarium situated in middle of proglottis, near posterior proglottis margin; reniform, elongate-oval or with irregular shape near to oval, compact or slightly lobed, 66-124 (93, n = 15) wide. Ovary with irregular shape, transversely elongate, often not divided into two wings (Fig. 26); sometimes lateral branches more developed and creating impression for two-winged organ (Fig. 25); anterior and lateral margins of ovary slightly lobed; 234-285 (259, n = 10) wide; $R_{ov/pr}$ 0.23-0.29 (0.25, n = 10), i.e., occupying about one quarter of proglottis width. Mehlis' gland globular, with diameter 39-54 (47, n = 6). Seminal receptacle oval, situated anteriorly to poral part of ovary (Figs 25-26), 52-99 x 25-50 (78 x 36, n = 10) when filled, connected with Mehlis' gland by wide seminal duct. Vagina opening postero-dorsally to cirrus-sac orifice and passing posteriorly to cirrus sac. Copulatory and conductive parts distinct (Fig. 28). Copulatory part straight or slightly curved, 217-301 (258, n = 10) long, longer than cirrus sac, $R_{vag/cs}$ 1.38-1.74 (1.60, n = 10); provided with thick sleeve of intensely stained cells; width of vagina together with cellular sleeve 19-33 (26, n = 10). Vaginal sphincter (not always distinct) present near orifice of copulatory part (Fig. 28). Vaginal canal thick-walled, with diameter of lumen 5-13 (9, n = 10), its poral part lined with long microtriches (Fig. 28). Conductive part short and narrow, straight or slightly convoluted.

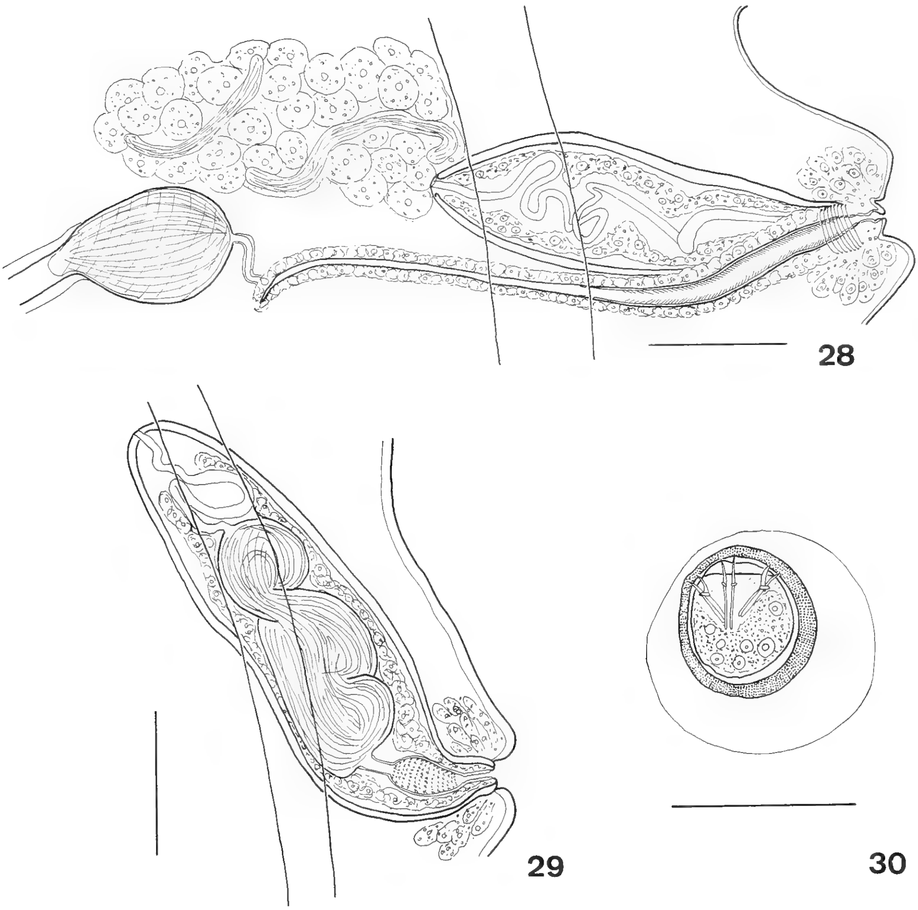
Uterus initially seen in mature proglottides as transversely elongate lobate body situated anteriorly to ovary and often overlapping it dorsally (Fig. 26). In post-mature proglottides, walls of uterus becoming thicker, with anterior, posterior and lateral diverticula. In pre-gravid and gravid proglottides, uterus occupying entire median field, often overlapping longitudinal osmoregulatory canals; diverticula of uterine walls not deep (Fig. 27). Eggs rounded, with diameter 58-66 (62, n = 10), with thin outer shell. Embryophore rounded, consisting of thick external layer with granular appearance and with diameter 36-44 (40, n = 10) and thin refractive inner layer with diameter 31-36 (34, n = 10) (Fig. 30). Oncospheres rounded, with diameter 28-32 (30, n = 10). Embryonic hooks of central pair thin, 18-19 long; lateral pairs consist of one massive hook with length 17-18 and one thin hook with length 13-15.

REMARKS

Our material resembles *M. globacantha* and *M. caprimulgorum*. It is clearly separated from both species by the very long copulatory part of the vagina, which is considerably longer than the cirrus sac ($R_{vag/cs}$ 1.38-1.74). In addition, the relative width of the ovary is smaller. This organ occupies about one quarter of the proglottis width (compared to about one-third in the other two species).

From the Palaearctic species *M. globacantha*, our specimens can also be distinguished by the longer rostellar hooks (41-45 and 34-37 compared to 38-39 and 32-34), having also a different shape (Figs 1-2, 23-24), and the relatively smaller cirrus sac ($R_{cs/pr}$ 0.13-0.18 compared to 0.22-0.27 in *M. globacantha*).

Compared with the Neotropical species *M. caprimulgorum*, the above-described cestodes from Paraguay can be distinguished by the larger absolute dimensions of the cirrus sac (152-172 x 50-56 versus 84-117 x 32-43 in mature and post-mature proglottides, and 158-192 x 50-70 versus 122-151 x 49-60 in pre-gravid and gravid proglottides). They also have a considerably wider ovary (234-285 compared to 193-222).



FIGS 28-30

Metadilepis spasskiorum sp. n.: 28, genital ducts in a mature proglottis, dorsal view; 29, cirrus sac in a gravid proglottis; 30, egg. Scale bars: 28-30 = 50 µm.

Therefore, we consider that our material from *Setopagis parvula* from Paraguay belongs to a new species.

Proparuterina Fuhrmann, 1911

Proparuterina Fuhrmann, 1911: 265-266; Fuhrmann, 1932: 113; Yamaguti, 1959: 255; Matevosyan, 1963: 209; Schmidt, 1986: 411; Kornyushin & Georgiev, 1994: 590-592.

DIAGNOSIS

Scolex with sucker-like rostellum. Rostellar hooks in two rows, elongate, handle longer than blade; handle with large epiphyseal thickening; guard bifid, also with epiphyseal thickening. Proglottides craspedote; mature proglottides wider than long, post-mature proglottides almost as wide as long, pre-gravid and gravid proglottides unknown. Genital pores irregularly alternating in short series. Genital ducts pass between osmoregulatory canals. Testes numerous, posterior to female glands. External vas deferens coiled, covered by prostate cells, forming together with them compact body. Cirrus sac elongate-oval, with thick muscular walls, can reach or overlap poral osmoregulatory canals. Vitellarium median, irregular, slightly lobed, at some distance from posterior proglottis margin. Ovary usually reniform, slightly lobed, symmetrical. Seminal receptacle elongate-oval, situated dorsally to poral part of ovary. Vagina opening postero-laterally to orifice of cirrus sac; copulatory and conductive parts distinct, both surrounded by thick cellular sleeve. Developing uterus in postmature proglottides horseshoe-shaped, with free ends directed posteriorly. Gravid uterus, eggs and oncospheres unknown. In Podargidae (Caprimulgiformes), Aru Island (Indonesia).

Type species: *Proparuterina aruensis* Fuhrmann, 1911.

REMARKS

The present diagnosis follows that proposed by Kornyushin & Georgiev (1994); few amendments are introduced, mainly in order to facilitate the easier differentiation between *Proparuterina* and the genera *Metadilepis* (in the concept as presented above) and *Mariauxilepis* gen. n.

Proparuterina lali Baugh & Saxena, 1976 was described from *Passer domesticus* (L., 1758) in India (Baugh & Saxena, 1976). The shape of the gravid uterus of this cestode corresponds to that of the developing uterus of the type species of *Proparuterina*. However, *P. lali* differs from *P. aruensis* by many morphological peculiarities, which do not permit us to consider the two species congeneric. In contrast to the type species, the vitellarium of *P. lali* is situated at the posterior proglottis margin (not at some distance from it). The ovary of the Indian species is clearly two-winged (not reniform). Its testicular field passes anteriorly to the vitellarium and some testes may reach almost to the anterior margin of the ovary as shown in figure 21 of Baugh & Saxena (1976) (not entirely postvitellarian and postovarian). The rostellar hooks of *P. lali* are small (with length 8-12 µm) and triangular while those of *P. aruensis* are relatively large (up to 58 µm) and longitudinally elongate. The morphology of the scolex and mature proglottides of *P. lali* and the shape of its gravid uterus resemble to a great extent these characters in some species of the paruterinid genus *Biuterina* Fuhrmann, 1902. Similar species are, e.g., *B. quelea* (Mettrick, 1963) and *B. ugandae* Baylis, 1919 (see redescriptions by Georgiev *et al.*, 2002). However, there are no data in the original description (Baugh & Saxena, 1976) about the presence of a paruterine organ in *P. lali* and, for this reason, we cannot transfer it to the family Paruterinidae. It cannot be excluded that this species is a representative of an undescribed genus of the family Metadilepididae. Therefore, we recognise *P. lali* as a species incertae sedis and *Proparuterina* as a monotypic genus.

Proparuterina aruensis Fuhrmann, 1911 Figs 31-38

Proparuterina aruensis Fuhrmann, 1911: 265-266, Fig. 24; Fuhrmann, 1932: 113-114, 292, 294, Fig. 88; Yamaguti, 1959: 255, Fig. 341; Matevosyan: 1963, 209-210, Fig. 154; Schmidt: 1986, 411, Fig. 436; Kornyushin & Georgiev, 1994: 590-592, Figs 28.23-28.25.

Host: Podargus papuensis Quoy & Gaimard, 1830 (Podargidae).

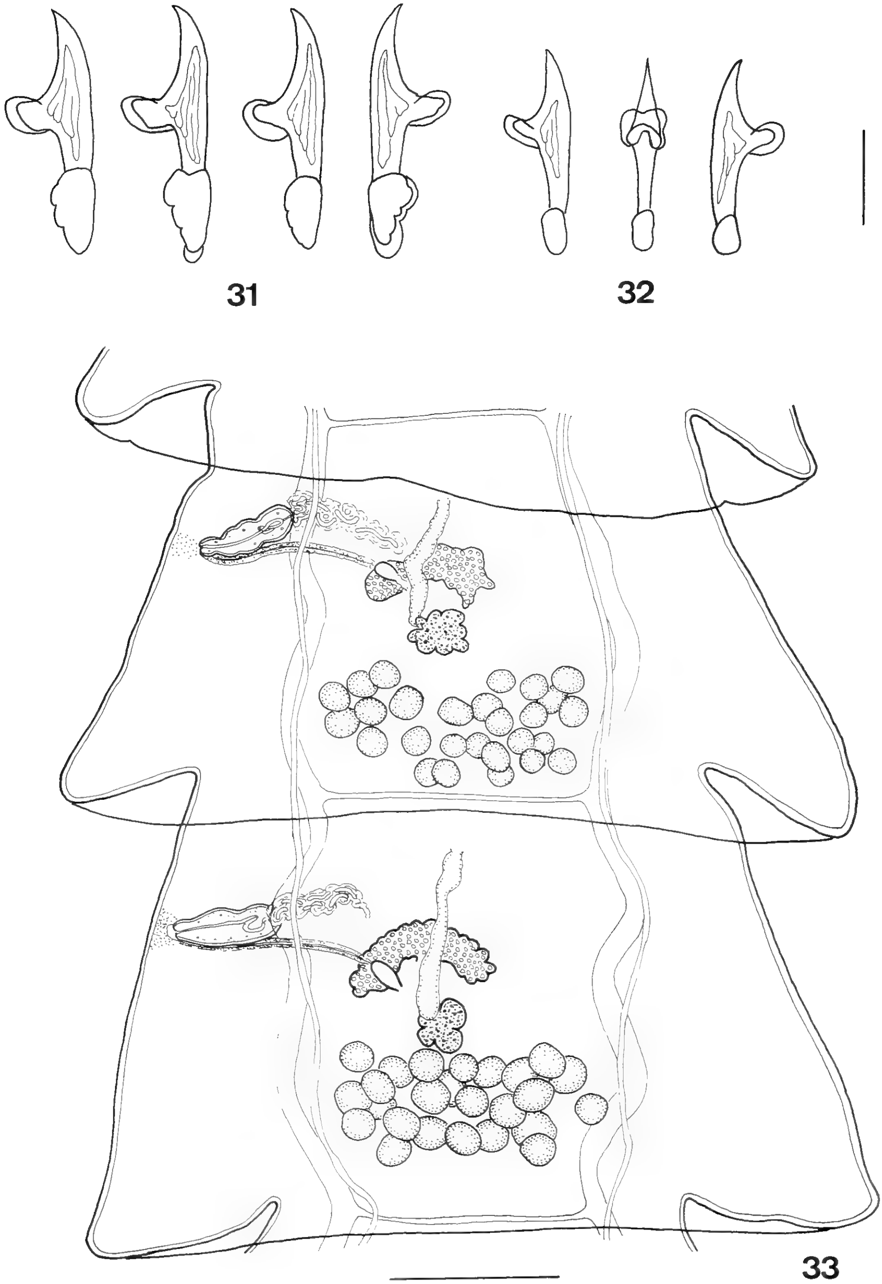
Material studied: MHNG (Collection Neuchâtel) Nos 18/49 and 18/50, 2 slides, syntypes, labelled by Fuhrmann "*T. aruensis*, *Proparuterina*, *Podagrus*, Ruix 90"; No. 18/49, fragments of 2 specimens, carmine (?), Canada balsam; No. 18/50, a scolex squashed in Berlese's medium, containing 14 large (anterior?) and 13 small (posterior?) rostellar hooks; a further slide, no 18/51, containing 2 fragments of a capillariid nematode, is labelled and catalogued as belonging to the type series.

REDESCRIPTION

Length of fragments starting with juvenile and terminating with not fully developed mature proglottides 34-36 mm. Maximum width at contracted mature proglottides (1.25 mm) or at relaxed post-mature proglottides (1.15 mm). Scolex lacking in the material studied. Rostellar hooks elongate with separate epiphyseal structures of handle and guard; guard bifid. Anterior rostellar hooks (Fig. 31) 54-58 (56, n = 7) long. Posterior rostellar hooks (Fig. 32) 41-44 (42, n = 6).

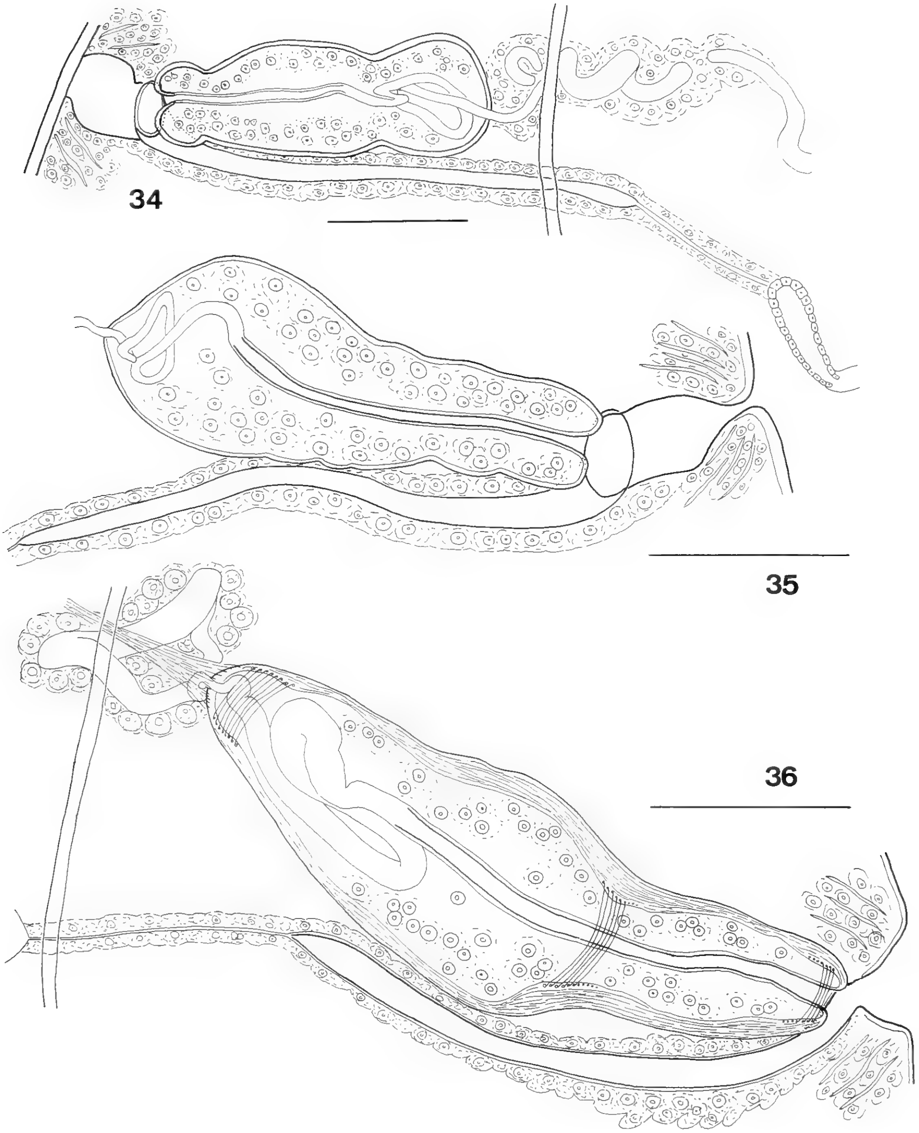
Proglottides craspedote, mature proglottides wider than long (Fig 33), post-mature proglottides might be almost as wide as long (Fig. 37). Ventral osmoregulatory canals 16-43 (33, n = 10) wide, with transverse anastomoses along posterior margin of each proglottis. Dorsal osmoregulatory canals 4-14 (8, n = 10). Genital pores irregularly alternating in short series, e.g., … 3, 3, 1, 2, 1, 2, 2, 2, 4, 2, 1, 1, 2, 1…; situated at border of anterior third of lateral proglottis margin. Genital pore appears in fully developed mature proglottides (Figs 33-35). Developed atrium thick-walled, mostly infundibular, often with tubular basal part, 9-20 (16, n = 5) deep, with diameter 23-34 at orifice and 7-11 at base; surrounded by radial muscular fibres; intensely stained cells present around atrium in mature proglottides and lacking in post-mature proglottides. Genital papilla mostly lacking (Fig 33), in some post-mature proglottides can be slightly expressed (Fig. 37). Genital ducts passing between longitudinal osmoregulatory canals.

Testes 26-30 (28, n = 5), occupying posterior part of median field (Fig. 33), entirely posterior to vitellarium and ovary (in well-relaxed proglottides); sometimes single testes overlap longitudinal osmoregulatory canals; maximum diameter of testes (in post-mature proglottides) 58-76 (68, n = 10). External vas deferens highly coiled, forming with surrounding prostate cells transversely elongate body situated in anterior poral corner of median field and in adjacent portion of poral lateral field; diameter of external vas deferens 5-11 (9, n = 6). Cirrus sac in mature proglottides oval, 111-124 x 38-45 (117 x 40, n = 5), with maximum width in middle or at antiporal third; often with one or two constrictions; walls rather thin (Figs 34-35). Cirrus sac in post-mature proglottides elongate-oval, 165-179 x 48-57 (171 x 52, n = 5), not reaching longitudinal osmoregulatory canals; walls thick, muscular (Fig. 36). Withdrawn cirrus and ejaculatory duct cannot be distinguished from one another, forming together straight or slightly curved thick-walled canal with diameter 4-7, occupying about two thirds of cirrus-sac length (Figs 35-36). Internal vas deferens forming 1-3 coils in antiporal part of cirrus sac; no formation of structure resembling internal seminal vesicle observed. Prostate cells within cirrus sac moderately developed. Evaginated cirrus (n = 1) cylindrical, conically tapering at tip, with diameter of basal part 5-6; armament not observed.



FIGS 31-33

Proparuterina aruensis Fuhrmann, 1911, syntypes: 31, anterior rostellar hooks; 32, posterior rostellar hooks; 33, mature proglottides, dorsal view. Scale bars: 31-32 = 20 µm; 33 = 200 µm.



Figs 34-36

Proparuterina aruensis Fuhrmann, 1911, syntypes, development of the genital atrium and genital ducts: 34-35, genital atrium and genital ducts in young mature proglottides; 36, genital ducts in post-mature proglottis. Scale bars: 34-36 = 50 µm.

Vitellarium median, with irregular shape, slightly lobed (Fig. 33), 58-71 (n = 4) wide. Ovary median, more or less reniform, symmetrical, slightly lobed (Figs 33, 38), 142-167 (n = 4) wide. Mehlis' gland not distinct. Seminal receptacle in early mature proglottides empty, situated dorsally to poral part of ovary, with thick walls consisting of cells arranged in single layer (Figs 34, 38); in post-mature proglottides, seminal receptacle elongate-oval, 120-140 x 43-72 (131 x 60, n = 5), ventral to uterus. Vagina opening postero-laterally (mostly postero-ventrally, sometimes postero-dorsally) and passing just posteriorly along posterior wall of cirrus sac; both copulatory and conductive part covered with thick cellular sleeve. Copulatory part (Figs 34-36) occupying about 3/4 of length of vagina; diameter of lumen 5-11 (9, n = 10), diameter of vagina together with cellular sleeve 18-29 (22, n = 10).

Uterus appearing in mature proglottides as longitudinal process starting from vitellarium, crossing ovary dorsally and reaching almost to anterior proglottis margin (Figs 33, 38). Further stages cannot be followed because relevant proglottides are lacking in material studied. In late post-mature proglottides, general shape is horseshoe-like, with free ends directed posteriorly; walls forming numerous diverticula, including very deep (Fig. 37).

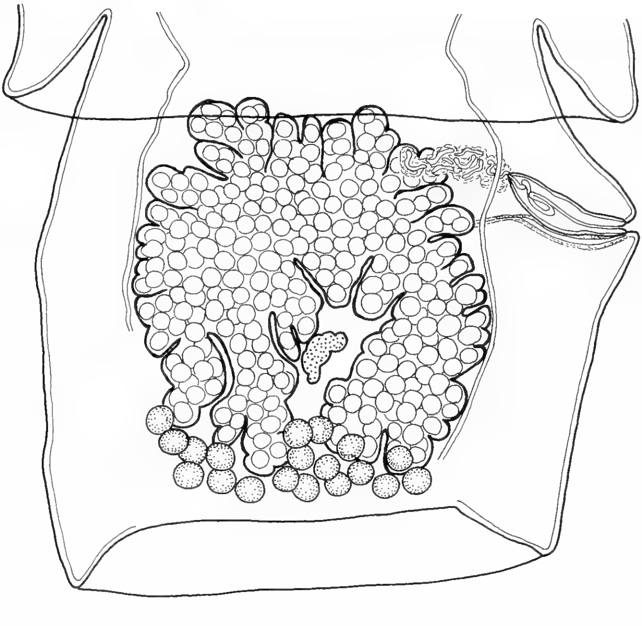
REMARKS

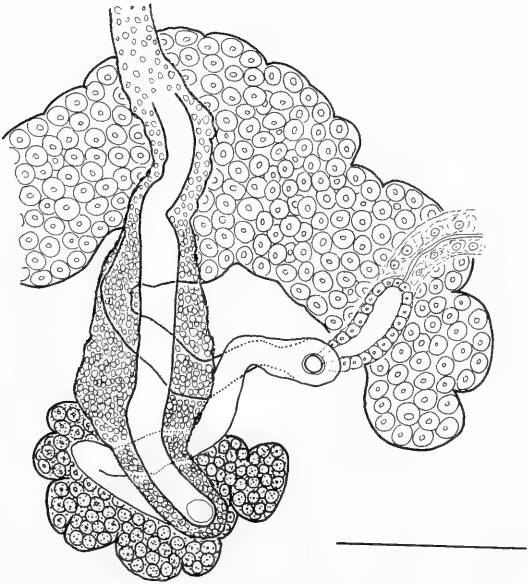
Proparuterina aruensis is known from its original record only (Fuhrmann, 1911). The present observations provide further details about the internal anatomy of this species, especially relative to the structure of the cirrus sac and vagina, female gonads and early stages of uterine development. However, because of the state of the type material, it is not possible to provide new data on the morphology of the scolex and some external characters. According to the original description (Fuhrmann, 1911), the entire specimens are 40-50 mm long and 1.3 mm wide, the scolex is with a diameter of 300-360 and the diameter of the suckers is 120. The total number of hooks has been described as 44-48.

Mariauxilepis gen. n.

DIAGNOSIS

Scolex with sucker-like rostellum. Rostellar hooks in two regular rows. Handles and guards of anterior hooks embedded by common epiphyseal structure. Posterior hooks often with indistinct epiphyseal structure of handle. Hooks of ventral/dorsal position in crown and those with lateral position with different shape and size. Proglottides craspedote, mature slightly wider than long, gravid twice as wide as long. Genital pores irregularly alternating in short series, situated about middle of lateral proglottis margin. Genital atrium simple, infundibular, surrounded by moderately developed masses of glandular cells. Genital ducts passing between osmoregulatory canals. Transverse anastomosis of ventral osmoregulatory canals very wide. Testes posterior to ovary, mostly lateral to vitellarium, few testes only postero-dorsal to vitellarium; sometimes two lateral groups of testes entirely interrupted by vitellarium. External vas deferens densely coiled, together with surrounding glandular tissue forming small dense body. Cirrus sac oblique, oval to pyriform, with rounded and thick-walled antiporal part, not reaching or slightly overlapping poral osmoregulatory canal. Internal vas deferens forming few coils in antiporal half of cirrus sac; no structure similar to internal seminal vesicle. Vitellarium central, mostly with irregular shape, transversely elongate, highly lobed. Ovary reniform, with deeply lobed anterior





FIGS 37-38
Proparuterina aruensis Fuhrmann, 1911, syntypes: 37, post-mature proglottis, dorsal view; 38, detail of the female genital system in a mature proglottis, dorsal view. Scale bars: 37 = 200 µm; 38 = 50 µm.

margin, occupying almost entire width of median field. Mehlis' gland strongly developed, large, rounded or slightly irregular. Seminal receptacle oval to fusiform. Vagina opening posteriorly, sometimes slightly postero-laterally to male pore and passing posteriorly to cirrus sac; vaginal canal thin-walled, surrounded by thick cellular sleeve; no distinct conductive part. Developing uterus lobate, transversely elongate, dorsal to ovary and seminal receptacle, with numerous diverticula; developed uterus occupying whole median field, reaching osmoregulatory canals, with deep anterior, posterior and lateral diverticula. Developing eggs oval, with oval embryophores and oncospheres. In most developed gravid proglottides only, eggs becoming elongate-oval, with thin outer envelope and thick embryophore; embryonic hooks almost parallel to each other, forming bunch with polar position in oncosphere. Parasites of Caprimulgiformes, South America.

Type species: *Mariauxilepis paraguayensis* sp. n.

ETYMOLOGY

The new genus is named after Dr J. Mariaux (Natural History Museum, Geneva) in recognition of his contribution to the systematics of the family Metadilepididae. Its name is of feminine gender.

REMARKS

Eight genera were included in the family Metadilepididae, according to the revision of Kornyushin & Georgiev (1994). Following their key, *Mariauxilepis* belongs to a group with 3 other genera characterised by irregular alternation of genital pores: *Proparuterina* (see above), *Schmidneila* Spasskii & Spasskaya, 1973 (parasites of polioptiline passeriforms in Central America) and *Hamatofuhrmannia* Spasskii, 1969 (parasites of the Formicariidae from South America). The latter two genera are characterised by a single crown of rostellar hooks, and in *Hamatofuhrmannia* the genital ducts pass dorsally to poral osmoregulatory canals.

Mariauxilepis can be considered unique among the Metadilepididae relative to two characters: the peculiar structure of the ripe eggs and the polar, almost parallel position of the embryonic hooks in them, and the wide transverse anastomoses of the ventral osmoregulatory canals. Another interesting peculiarity is the different shape and size of the rostellar hooks with ventral/dorsal position and those with lateral position on the rostellum. Among metadilepidids, a similar peculiarity has been observed only in the genus *Skrjabinoporus* Spasskii & Borgarenko, 1960 (see Spasskii & Borgarenko, 1960; Mariaux & Vaucher, 1989; Kornyushin & Georgiev, 1994), which includes parasites of the Old World coraciiform birds.

The most similar genus to the present material is *Proparuterina* (see above for the generic diagnosis and for a redescription of the type species), also including parasites of caprimulgiform birds. Compared to this genus, *Mariauxilepis* has a wide ovary, occupying the whole width of the median field (versus a small ovary, not reaching longitudinal osmoregulatory canals) and testes mostly lateral to the vitellarium (versus testes entirely postvitellarian). The type species of *Proparuterina* has separate epiphyseal thickenings of the handle and the guard of the rostellar hooks while, in *M. paraguayensis*, the handle and the guard of anterior hooks are embedded by a common epiphyseal structure. The early uterus of *Mariauxilepis* is transversely elongate, situated entirely dorsally to the ovary while the early uterus in *Proparuterina* is a longitudinally elongate process passing the anterior margin of the ovary. The shape of developing uterus of *Proparuterina* resembles an inverted U while the developing uterus of *Mariauxilepis* has never this shape. In addition, the type species of *Mariauxilepis* has well-developed and prominent Mehlis' gland; in contrast, this organ in *Proparuterina aruensis* is not distinct as a glandular structure.

The new genus has to be compared also with *Metadilepis* in its present concept, since the latter genus now includes not only species with unilateral genital pores but also a species (*M. kornyushini*) with genital pores alternating in long series. The two genera can be distinguished by the position of the osmoregulatory canals ventral to the genital ducts in *Metadilepis* and the genital ducts passing between the osmoregulatory canals in *Mariauxilepis*. Further differences are connected with the peculiarities of the ripe eggs, the possibility of the internal vas deferens forming a structure similar to internal seminal vesicle, the degree of lobation of the female gonads, etc.

Mariauxilepis paraguayensis sp. n. Figs 39-49

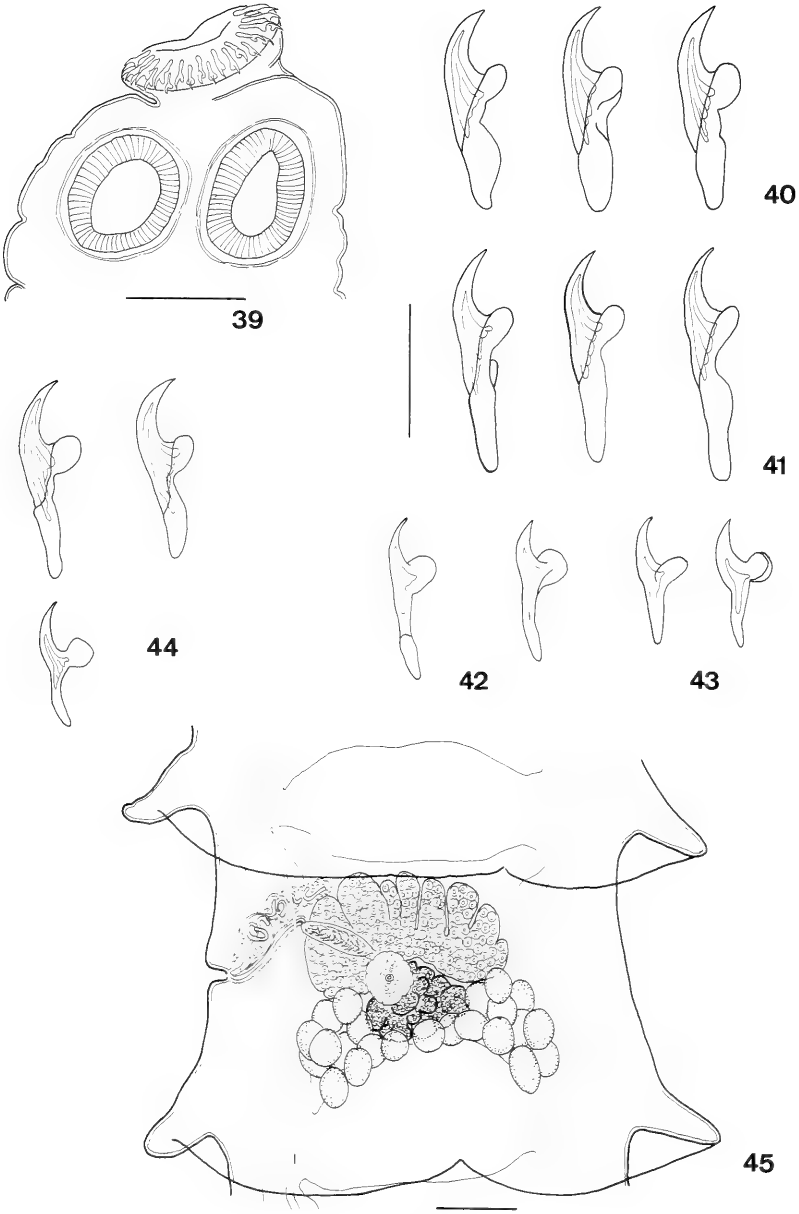
Hosts: Nyctidromus albicollis (Gmelin, 1789) (type host) and *Setopagis parvula* (Caprimulgidae).

Material studied: 2 entire specimens, stained with hydrochloric carmine, whole mount in Canada balsam. *Holotype*: MHNG 33845 INVE, from *N. albicollis*, arroyo Tagatija-Mi, province Concepcion, Paraguay, 16 October 1983 (1 slide). *Paratype*: MHNG 33846 INVE, from *S. parvula*, Pilar, province Neembucu, 19 October 1982 (1 slide).

DESCRIPTION

Holotype: Total length 37 mm. Gravid strobila consisting of 175 proglottides: primordia of gonads appearing in about 60th proglottis, functioning testes in about 110th, functioning female glands in about 115th, uterus predominating over female glands in 160th; gravid proglottides 8 in number. Maximum width at pre-gravid proglottides, 1.18 mm.

Scolex with maximum diameter 290, at level posterior to suckers; not clearly outlined from neck (Fig. 39). Rostellar pad discoid, with diameter 125; its anterior surface concave; muscular fibres, perpendicular to pad surface, present within pad. Retractor muscles and glandular elements not distinct. Rostellar hooks in two regular rows, their total number exceeding 40 (33 hooks present, perhaps 3 anterior and 8 posterior hooks lost). Anterior and posterior hooks of different shape and size (Figs 40-43). Hooks of ventral/dorsal and those of lateral position in crown with different shape and size. Anterior hooks with handles and guards comprised of common epiphyseal structure; anterior hooks of dorsal/ventral position in crown 30-31 (n = 3) long, with thicker and shorter handle (Fig. 40); anterior hooks of lateral position in crown 33-35 (n = 3) long, with slender and longer handle (Fig. 41). Posterior hooks often with indistinct epiphyseal structure of handle; posterior hooks of dorsal/ventral position 24 (n = 1) long, with longer handle (Fig. 42); these of lateral position shorter, 18-19 (n = 2) long (Fig. 43); intermediate hooks with intermediate length, e.g., 22 (n = 1). Suckers oval, 102-111 (107, n = 3), with apertures directed dorsally and ventrally; musculature moderately developed. Neck long, 183 wide in its narrowest part; proglottides appear at 880 from posterior margins of suckers.



FIGS 39-45

Mariauxilepis paraguayensis gen. n., sp. n., holotype (from *Nyctidromus albicollis*) and paratype (from *Setopagis parvula*): 39, scolex of the holotype; 40-43, rostellar hooks of the holotype: 40, anterior rostellar hooks with ventral or dorsal position in the crown; 41, anterior rostellar hooks with lateral position in the crown; 42, posterior rostellar hook with dorsal (or ventral) position (left) and rather intermediate position (right) in the crown; 43, posterior rostellar hooks with lateral position in the crown; 44, rostellar hooks of the paratype; 45, mature proglottis, dorsal view, holotype. Scale bars: 39, 45 = 100 µm; 40-44 = 20 µm.

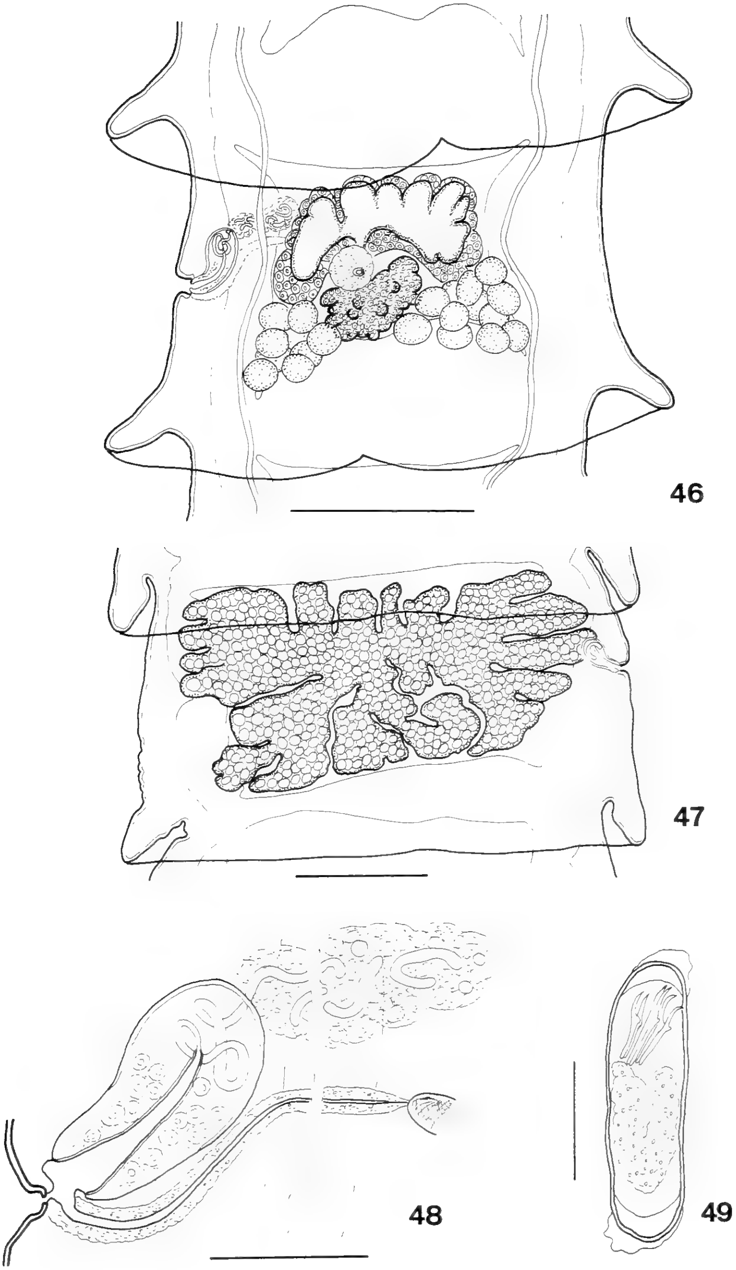
Proglottides craspedote; velum well developed (Figs 45-47). Mature proglottides slightly wider than long (Fig. 45-46); gravid proglottides twice as wide as long (Fig. 47). Genital pores irregularly alternating in short series, e.g., 2, 2, 2, 1, 2, 1, 4, 2, 1, 1, 1, 2, 1, 1, 1, 2, 3, 1, 3, 2, 1, 4, 1, 1...; situated in middle of lateral proglottis margin in mature proglottides and slightly anteriorly in gravid proglottides. Genital papilla not observed. Genital atrium 21-32 (24, n = 10) deep, with infundibular orifice and almost cylindrical basal part with diameter 14-20 (18, n = 10); its walls thick; no glandular elements observed around it (Fig. 48). Genital ducts passing between osmoregulatory canals.

Ventral osmoregulatory canals 27-89 (62, n = 10) wide, with very wide transverse anastomoses, reaching width 116-291 (186, n = 10) and occupying 1/3-1/4 of proglottis length. Dorsal osmoregulatory canals 5-9 (7, n = 10) wide.

Testes 21-28 (24, n = 10) in number, situated in posterior half of median field, slightly overlapping posterior margins of vitellarium and ovary (Fig. 45-46); most testes lateral to vitellarium, few testes only postero-dorsal to vitellarium; testes slightly overlapping ventral osmoregulatory canals and transverse anastomosis. In some proglottides, testes entirely interrupted by vitellarium and forming two lateral groups (Fig. 46). Maximum diameter of testes 46-66 (56, n = 10). External vas deferens densely coiled, together with surrounding glandular tissue forms small dense body in anterior poral part of proglottis; diameter of external vas deferens 5-9 (7, n = 10). Cirrus sac oblique, oval to pyriform, not reaching or slightly overlapping poral ventral osmoregulatory canal, rarely reaching to dorsal canal; walls of cirrus sac relatively thick (especially of antiporal part), with poorly developed musculature; antiporal end widely rounded, poral end slightly tapering; 66-88 x 39-48 (81 x 45, n = 10). Internal vas deferens forms few coils in antiporal half of cirrus sac (Figs 45-46, 48); do not form structure similar to internal seminal vesicle. Evaginated cirrus not observed; canal of withdrawn cirrus widening in poral direction; no armament observed in canal of withdrawn cirrus.

Vitellarium central, mostly with irregular shape, transversely elongate, highly lobed, 79-120 x 111-151 (93 x 133, n = 10). Ovary almost reniform, with deeply lobed anterior margin, wide, occupying almost all median field. Mehlis' gland large, rounded or slightly irregular, situated between ovary and vitellarium, disposed slightly porally, with diameter 63-77 (72, n = 10). Seminal receptacle oval to fusiform, 89-123 x 30-41 (96 x 37, n = 7), dorsal to ovary. Vagina (Fig. 48) opens posteriorly, sometimes slightly postero-laterally to male pore and passes posteriorly to cirrus sac; vaginal canal thin-walled, surrounded by thick cellular sleeve; no distinct conductive part.

In mature proglottides, uterus lobate, transversely elongate, dorsal to ovary and seminal receptacle (Fig. 46). Further uterine development comprising enlargement in anterior, posterior and lateral directions and formation of numerous diverticula. In pregravid and gravid proglottides, uterus occupying almost whole median field and just overlapping ventral osmoregulatory canals; deep anterior, posterior and lateral diverticula present (Fig. 47). Developing eggs oval, with oval embryophores and oncospheres. In most developed three gravid proglottides only, eggs becoming elongate-oval (Fig. 49), 45-51 x 13-16 (48 x 15, n = 7), with thin outer envelope; embryophore rather thick, oval, with length 40-45 x 13-16 (43 x 15, n = 7); oncospheres oval, 37-41 x 12-



FIGS 46-49

Mariauxilepis paraguayensis gen. n., sp. n., specimen from *Nyctidromus albicollis* (holotype): 46, mature proglottis showing an early stage of the uterine development, dorsal view; 47, pregravid proglottis; 48, genital ducts, dorsal view; 49, egg. Scale bars: 46-47 = 250 µm; 48 = 50 µm; 49 = 20 µm.

15 (39 x 13, n = 7). Embryonic hooks almost parallel to each other, forming bunch having polar position in oncosphere (Fig. 49); central pair 17-18 (n = 5) long, lateral pairs 14-16 (n = 5) long.

Paratype: Specimen slightly contracted; scolex deformed. Main metrical and meristic data: total length 28 mm, maximum width 1.13 mm (at pre-gravid proglottides), number of proglottides 175. Diameter of scolex 237; diameter of rostellum 122; diameter of suckers 102-118 (n = 2). Number of rostellar hooks 44; anterior hooks 30-31 (n = 3) long; posterior hooks 18-22 (n = 3) long (Fig. 44). Number of testes 19-26 (23, n = 10). Cirrus sac 76-86 x 32-39 (83 x 36, n = 10). Vitellarium 56-87 x 86-143 (64 x 120, n = 7). Eggs 39-46 (43, n = 6) long, embryophore 34-43 x 11-14 (39 x 13, n = 6), oncosphere 36-42 x 10-13 (38 x 12, n = 6). Embryonic hooks of central pairs 17-18 (n = 3) long, embryonic hooks of lateral pairs 13-14 (n = 3) long.

Urutaulepis gen. n.

DIAGNOSIS

Rostellum sucker-like, with two rows of hooks. Hooks in each row with almost equal length and shape; blade curved, handle and guard with small epiphyseal structures. Anterior hooks longer, with straight handle; posterior hooks with curved handle. Genital pores unilateral, about middle of lateral proglottis margin in mature proglottides and in anterior third in pre-gravid proglottides. Slightly expressed genital papilla may present. Genital atrium consists of long tubular canal surrounded by powerful circular musculature and internal enlargement surrounded by layer of radial muscular fibres and glandular layer. Osmoregulatory canals in strobila not seen. Testes numerous (about 40), situated mostly laterally to ovary and vitellarium, few testes posterior to them; antiporal testes more numerous than poral. External vas deferens with several large coils anterior to female genital ducts; no distinct prostate cells. Cirrus sac thick-walled, oval to pyriform, poral end may form pipette-like papilla. Internal vas deferens forming numerous coils, mainly in antiporal half but often also in poral half of cirrus sac; no structure similar to internal seminal vesicle. Vitellarium and ovary disposed slightly porally. Vitellarium transversely elongate, oval or with irregular shape, compact or slightly lobed. Ovary two-winged, deeply lobed. Mehlis' gland not distinct. Seminal receptacle highly elongate, fusiform, extending from level of cirrus sac to level of poral wing of ovary. Vagina opens posteriorly and slightly postero-laterally to male pore and passes posteriorly to cirrus sac; usually curved; vaginal canal thick-walled, surrounded by thick cellular sleeve; no distinct conductive part. Uterus in mature proglottides as transversely elongate sac, anteriorly to ovary, genital ducts and antiporal testes; further development connected with enlargement in posterior direction and overlapping ovary. In pre-gravid proglottides, uterus with distinct anterior, posterior and lateral diverticula, occupying almost whole proglottis excluding most lateral portions only. Underdeveloped eggs oval, with thin outer envelope and thicker embryophore; developing oncospheres oval. In Caprimulgiformes (Nyctibiidae), South America.

Type species: *Urutaulepis pifanoi* (Díaz-Ungría & Jordano, 1958) comb. n.

ETYMOLOGY

The name of the new genus derives from the trivial name of the host species in South America, "*urutau*". It is of feminine gender.

REMARKS

The type species of the new genus was initially described as a member of the family Dilepididae (Díaz-Ungría & Jordano, 1958). Spasskii (1965) supposed that this species might be a member of the Metadilepididae but did not transfer it to this family because of the lack of adequate data in the original description.

As seen from the present redescription, the structure of the rostellar apparatus of *U. pifanoi* is clearly different from that of the Dilepididae (see Bona, 1994; Stoitsova *et al.*, 1997) and very close to those of genera of the families Paruterinidae and Metadilepididae. Though the material does not allow us to specify the position of the developing uterus relative to the female gonads (dorsal or ventral), *Urutaulepis pifanoi* is evidently a member of the Metadilepididae by the structure of the rostellar apparatus and by the absence of a paruterine organ. Unfortunately, the only specimen available does not provide a reliable basis for the description of the position of the genital ducts relative to the osmoregulatory canals. Its unilateral genital pores correspond well to the diagnosis of *Metadilepis*. However, it differs from *Metadilepis* spp. in several essential characters, which do not allow its placement it in the latter genus. These are the presence of postvitellarian testes, the slight development of the epiphyseal structures of the rostellar hooks and the peculiar structure of the genital atrium consisting of a long tubular canal surrounded by powerful circular musculature and an internal cavity encircled by radial muscles and a thick glandular layer. Additional differentiating characters distinguishing *Urutaulepis* gen. n. from *Metadilepis* are the lack of conductive part of the vagina of the former and its presence in the latter as well as the different shape of the seminal receptacle.

The new genus differs from the remaining two metadilepidid genera from Caprimulgiformes, *Proparuterina* and *Mariauxilepis*, by the unilateral position of its genital pores and the slight development of the epiphyseal structures of its rostellar hooks.

Following the key by Kornyushin & Georgiev (1994), *Urutaulepis* gen. n. needs to be distinguished from several genera with unilateral genital pores. *Skrjabinoporus* Spasskii & Borgarenko, 1960 includes parasites of Meropidae (Coraciiformes) in the Old World. It is characterised by highly elongate suckers with weak musculature, testes forming compact group in the posterior half of the proglottis dorsally to the vitellarium, and a small globular seminal receptacle (Spasskii & Borgarenko, 1960; Mariaux & Vaucher, 1989; Kornyushin & Georgiev, 1994). *Cracticotaenia* Spasskii, 1966, a parasite of the Cracticidae (Passeriformes) in Australia, has almost triangular rostellar hooks, a large vaginal sphincter and testes forming one group posterior and dorsal to the female gonads (Kornyushin & Georgiev, 1994). *Yapolepis* Mariaux, 1991 and *Pseudadelphoscolex* Mariaux, Bona & Vaucher, 1992 from African passeriform birds are readily distinguished from the new genus because the lack of rostellum armament in the former and the peculiar T-shaped rostellar hooks in the latter (Mariaux, 1991; Mariaux *et al.*, 1992; Kornyushin & Georgiev, 1994).

Therefore, though we cannot describe some details connected with the disposition of the osmoregulatory canals, we believe that the remaining characters justify the erection of the new genus.

Urutaulepis pifanoi (Díaz-Ungría & Jordano, 1958) comb. n. Figs 50-58

Dilepis pifanoi Díaz-Ungría & Jordano, 1958: 3-7, Fig. 1-9; Yamaguti, 1959: 233; Matevosyan, 1963: 73-74, Fig. 44; Schmidt, 1986: 381.

Host: Nyctibius griseus (Gmelin, 1789) (Nyctibiidae).

Material studied: MHNG (Collection Neuchâtel) 112/77, paratype, Isla Margarita, Venezuela, single specimen, hematoxylin, whole mount in Canada balsam (1 slide).

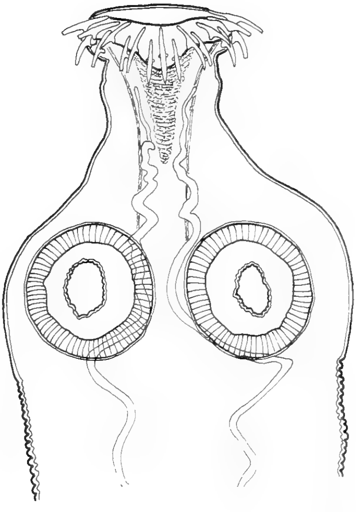
REDESCRIPTION

Specimen contracted; long portions of strobila twisted. Total length more than 35 mm. Strobila consists of 320 proglottides; maximum width at post-mature proglottides, 2.19 mm.

Scolex with maximum diameter at level of middle of suckers, 433; anterior part of scolex conically protruded (Fig. 50). Rostellar apparatus consists of muscular pad and associated with it retractor muscles, glandular elements and circular musculature; no rostellar pouch. Rostellar pad with diameter 192; its anterior surface concave; numerous muscular fibres, perpendicular to pad surface, present within pad. Retractor muscles extending from rostellar pad periphery and continuing as longitudinal muscular bundles of strobila. Glandular elements form dense granular formation, situated medially just posterior to muscular pad, gradually tapering in posterior direction; loose circular muscular fibres surround glandular aggregation. Rostellar hooks 32 in number, situated in two regular rows (few hooks in lateral position, most of hooks with broken tips). Handles and guards provided with small epiphyseal structures, often not clearly distinct (Figs 51-52). Anterior and posterior hooks of different shape and size. Anterior hooks 71.5-73.5 (n = 2) long, with straight handle (Fig. 51). Posterior hooks 59-61 (60.2, n = 3) long; handle curved (Fig. 52). Suckers round, with apertures directed dorsally and ventrally; their musculature moderately developed; diameter of suckers 165-170 (169, n = 4). Formation of proglottides starts just posterior to suckers. No distinct neck.

Osmoregulatory canals distinct in scolex only, reaching level just posterior to rostellar pad. Proglottides wider than long at all developmental stages, craspedote. Genital pores unilateral, situated about middle of lateral proglottis margin in mature proglottides and in anterior third of lateral proglottis margin in pre-gravid proglottides. Slightly expressed genital papilla may present. Genital atrium (Figs 56-58) consists of deep tubular canal leading to internal enlargement; walls of tubular canal surrounded by thick layer of circular musculature; internal cavity surrounded by layer of radial muscular fibres and layer of glandular cells.

Testes 34-43 (38, n = 10), situated mostly laterally to ovary and vitellarium; few testes posterior to female gonads; antiporal testes more numerous than poral testes (Figs 53-54). External vas deferens forms several large coils anterior to female genital ducts; no distinct prostate cells around it. Cirrus sac oval to pyriform, with constriction about its middle; antiporal end widely rounded; poral end may form pipette-like papilla



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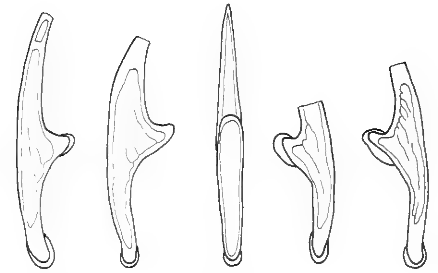

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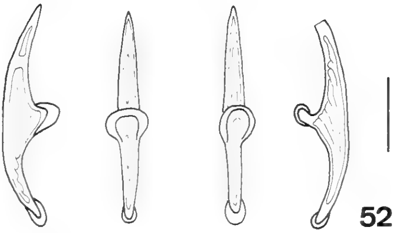

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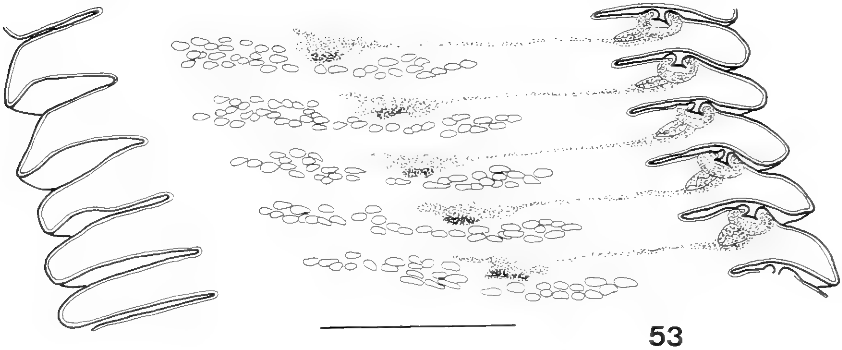

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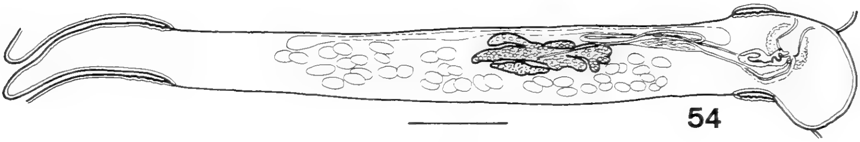

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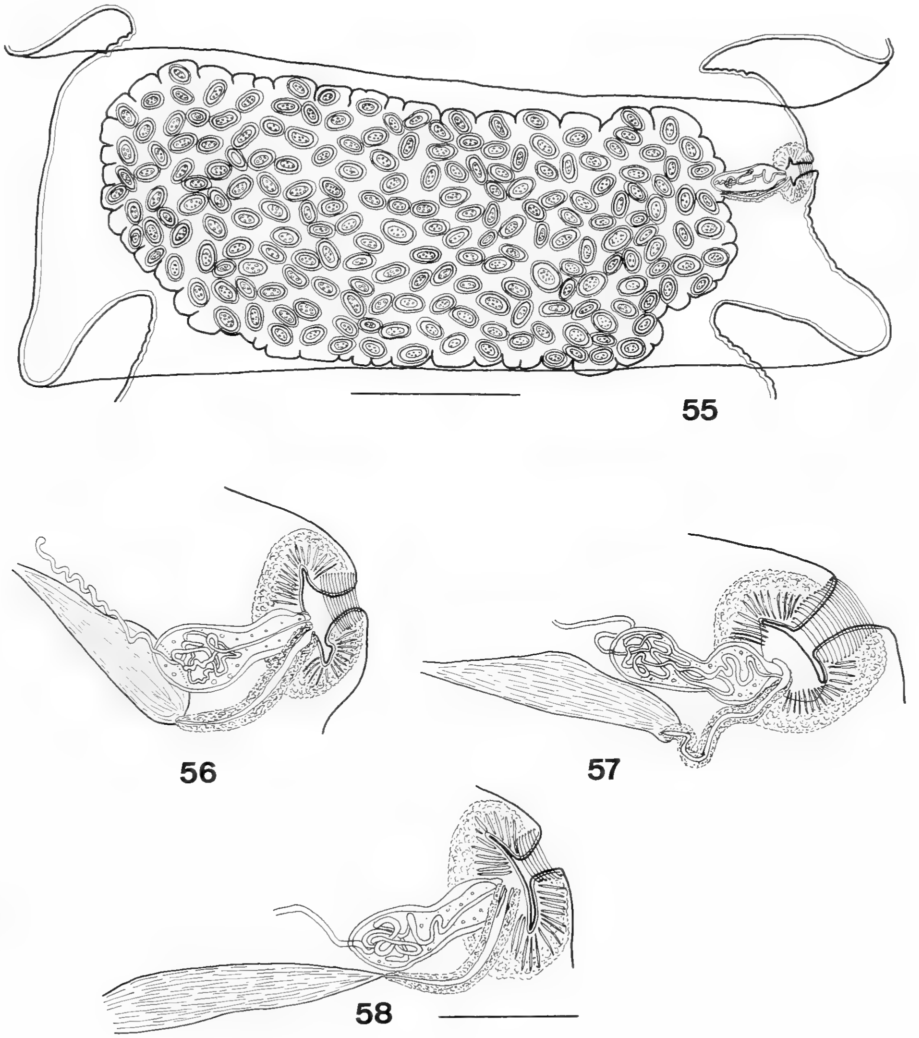
Figs 50-54

Urutaulepis pifanoi (Díaz-Ungría & Jordano, 1958) gen. n., comb. n., paratype: 50, scolex; 51, anterior rostellar hooks; 52, posterior rostellar hooks; 53, pre-mature proglottides; 54, mature proglottis. Scale bars: 50 = 100 µm; 51-52 = 20 µm; 53 = 500 µm; 54 = 250 µm.

entering into genital atrium; cirrus sac thick-walled, 113-143 x 43-52 (124 x 46, n = 10). Internal vas deferens forms numerous coils, mainly in antiporal half of cirrus sac (Figs 56, 58) but sometimes also in poral half of organ (Fig. 57); does not form



Figs 55-58

Urutaulepis pifanoi (Díaz-Ungría & Jordano, 1958) gen. n., comb. n., paratype: 55, pre-gravid proglottis; 56-58, variability of the genital atrium and terminal genital ducts. Scale bars: 55 = 250 µm; 56-58 = 100 µm.

structure similar to internal seminal vesicle. Evaginated cirrus cylindrical, unarmed, with diameter 14-17 (n = 2).

Vitellarium and ovary disposed slightly porally (at 43-47% of pre-mature proglottis width, n = 7); due to strobila twisting, some proglottides create impression of strong poral or antiporal disposition of female gonads. Vitellarium transversely elongate, oval or with irregular shape, compact or slightly lobed. Ovary two-winged (frequently, perhaps due to strobilar contraction, two wings not distinct); deeply lobed. Mehlis' gland not observed. Seminal receptacle highly elongate, fusiform, extending from level of cirrus-sac antiporal end to level of poral wing of ovary; in most typical cases, maximum width of seminal receptacle about its middle; in some cases, maximum width of seminal receptacle near its connection with vagina (Fig. 56). Vagina opens posteriorly and slightly postero-laterally to male pore and passes posteriorly to cirrus sac; copulatory part usually curved, comparable in length with cirrus sac; vaginal canal thick-walled, surrounded by thick cellular sleeve; no distinct conductive part, seminal receptacle begins just after copulatory part.

Uterus seen in some mature proglottides as sac-like transversely elongate formation along anterior proglottis margin, situated anteriorly to ovary, genital ducts and antiporal group of testes. Further development connected with enlargement of uterus in posterior direction, initially its lateral ends and then its middle part, thus overlapping ovary, testes and degenerating ovary. In pre-gravid proglottides, uterus occupying almost whole proglottis, excluding most lateral proglottis portions only; its wall forming distinct anterior, posterior and lateral diverticula (Fig. 55). Underdeveloped eggs (embryonic hooks not entirely formed) oval, with thin outer envelope and thicker embryophore; developing oncospheres oval.

CONCLUDING COMMENTS

The present study on the metadilepidid cestodes from caprimulgiform birds revealed that their diversity is considerably greater than previously known. Kornyushin & Georgiev (1994) summarised data on 8 genera and 11 species of metadilepidids; among them, 2 genera and 4 species were from the Caprimulgiformes. Our study adds further 2 genera and 4 species. Thus, the present results corroborate the belief of previous authors (Spasskii & Spasskaya, 1973; Mariaux, 1991) that the diversity of the metadilepidids is considerably greater than known in that time.

Kornyushin & Georgiev (1994) believed that the potential number of genera is considerably greater than known at the time of their publication and their discovery was a matter for the future. Their statement was based on the fact that metadilepidids were mostly known from tropical birds, which were insufficiently studied. Each extensive faunistic survey on the cestode parasites from tropical birds carried out during the last two decades has confirmed that belief. A survey of the avian cestodes of the Ivory Coast (West Africa) revealed the presence of 3 metadilepidid genera (Mariaux & Vaucher, 1989; Mariaux, 1991, 1994; Mariaux *et al.*, 1992). The present study was provoked by the extensive survey of the avian parasites in Paraguay carried out by the Natural History Museum, Geneva. It also showed a considerably higher diversity of metadilepidids than previously known.

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REVUE SUISSE DE ZOOLOGIE 110 (3): 533-539; septembre 2003

Puklina asphodelinae sp. n. from Bulgaria (Hymenoptera, Eulophidae)

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Puklina asphodelinae sp. n. from Bulgaria (Hymenoptera, Eulophidae). - *Puklina asphodelinae* sp. n., reared from seed capsules of *Asphodeline lutea* in the Besapari hills, Bulgaria, is described and illustrated.

Key-words: Hymenoptera - Eulophidae - Tetrastichinae - *Puklina asphodelinae* - taxonomy - key to species - Bulgaria.

INTRODUCTION

Graham (1991) described the genus *Puklina* with two species from Spain, Sardinia and Libya. He gave its diagnostic characters and created a key to the species. Doganlar (1993) described two new species from France and Turkey.

Species of the genus *Puklina* have the vertex with a pale, weakly-sclerotized postocellar suture, a wedge-shaped scrobal area, a distinct malar sulcus and a dorsoventrally depressed thorax.

MATERIAL AND METHODS

The species described below was reared from seed capsules of *Asphodeline lutea* Reichenbach (Liliaceae) along with *Eurytoma asphodeli* Hedqvist (Hym., Eurytomidae) in laboratory. The host plant was collected in the Besapari hills, Rhodope Mts., Bulgaria. The type specimens were fixed in 100% alcohol, dried with HMDS or air-dried, and card-mounted. The rest of the material was air-dried and card-mounted. For more accurate examination, antennae, wings, hypopygium and genitalia were slide-mounted in Canada balsam. The paratypes of *Puklina dillerae* Doganlar (3 females and 1 male) and *Puklina gelincika* Doganlar (5 females) were examined for creating a key to species. Terminology and abbreviations follow Graham (1959, 1987).

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RESULTS

Puklina asphodelinae sp. n. Figs 1-7

Puklina depilata Graham, Boyadzhiev (2001).

Material examined. *Holotype*: female, Bulgaria: Rhodope Mts., Besapari hills, 2 km W of Novo selo Village, 250 m a. s. l., 19.III.2002, reared (28.V.2002) from seed capsules of *Asphodeline lutea* (Liliaceae) with *Eurytoma asphodeli* (Eurytomidae), dried with HMDS (P. Boyadzhiev). *Allotype*: male, same locality and rearing data as holotype. *Paratypes*: 114 females, 22 males, same locality and rearing data as holotype; 10 females, 2 males, same data as holotype, reared in 18.V.2002 and air-dried; 22 females, 5 males, same data as holotype, reared in 21.V.2002 and air-dried; 50 females, 5 males, same data as holotype, reared in 23.V.2002 and dried with HMDS; 20 females, 9 males, same data as holotype, reared in 31.V.2002 and air-dried.

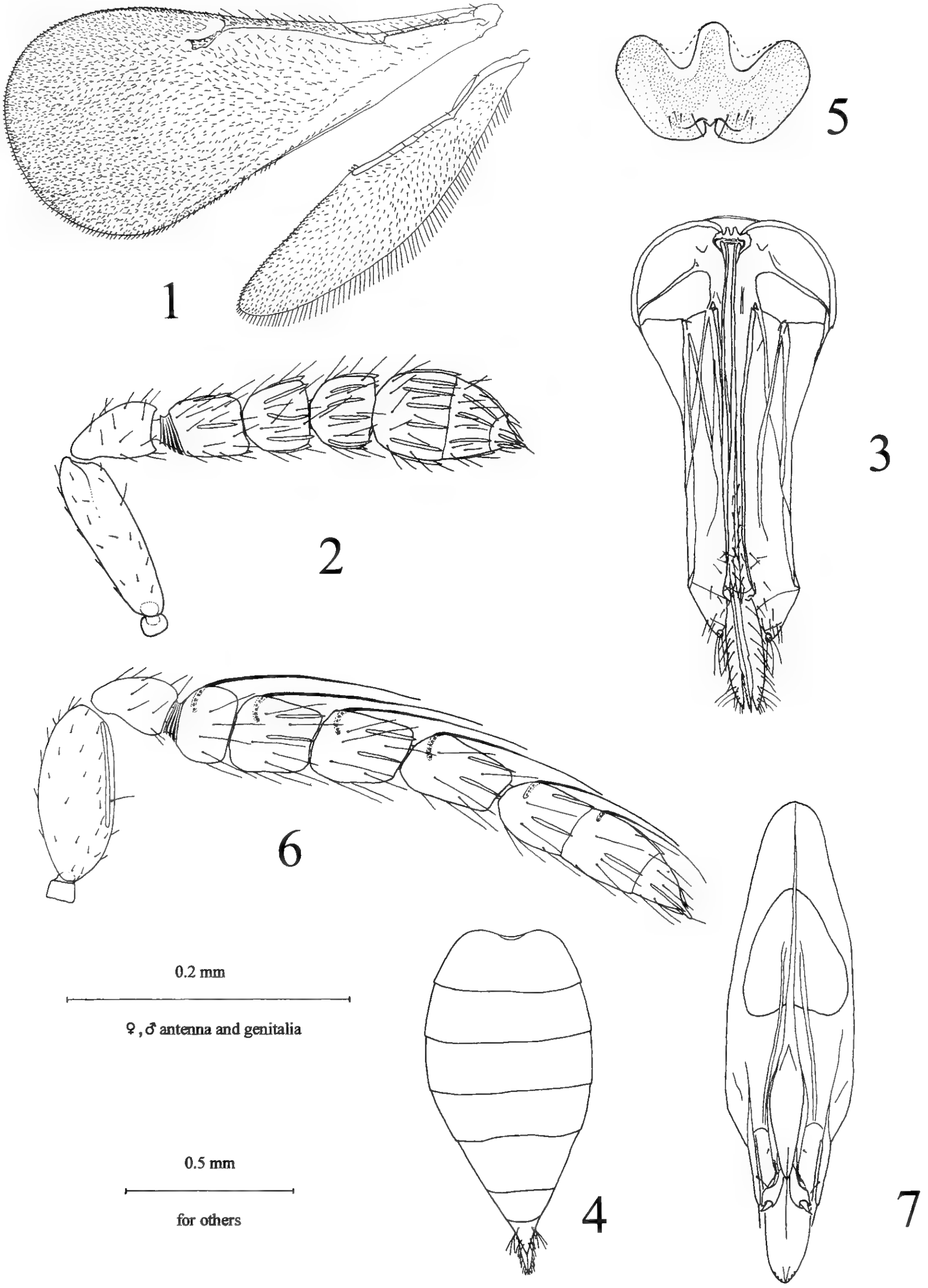
Holotype, allotype, and 30 paratypes are preserved in the collection of Muséum d'histoire naturelle, Geneva; 10 paratypes are deposited in the collection of Zoologische Staatssammlung München; 10 paratypes are deposited in the collection of British Museum (Natural History), London, and 209 paratypes in the collection of Department of Zoology, University of Plovdiv.

Additional material (in the collection of Department of Zoology, University of Plovdiv): 29 females, 11 males, Bulgaria, Rhodope Mts., Besapari hills, Isperihovo Village, 200 m, 18.VI.2000, reared from seed capsules of *Asphodeline lutea* with *Eurytoma asphodeli* (A. Stojanova) (reported as *Puklina depilata* Graham: Boyadzhiev, 2001); 17 females, 11 males, Bulgaria, Rhodope Mts., Besapari hills, Novo selo Village, 250 m, 12.VI.2001, reared from seed capsules of *Asphodeline lutea* with *Eurytoma asphodeli* (P. Boyadzhiev).

Diagnosis. The following combination of features differentiates *Puklina asphodelinae* sp. n. from other species of the genus: 1. Female antenna with 4 anelli; 2. Costal cell of forewing with 12-15 hairs on lower surface, arranged in a single or partly double row; 3. Propodeum anteromedially with narrow and shallow fovea, without median carina; 4. Male antenna with ventral plaque 0.61-0.66 times length of scape, and with 3 anelli; 5. F1 of male antenna with compact whorl of long dark setae which reach about level of the tip of the second segment following that which bears them, the rest of funicular segments with whorls of setae gradually decreasing in length distally.

Description. *Female*. POL (as measured on the uncollapsed head) 2.1-2.5 times OOL. Head in front view subtrapeziform with vertex slightly arched; genae and malar sulcus very slightly curved; scrobes defined by wedge-shaped area; below this area is another one, partly divided by a median longitudinal carina which extends by near to the toruli; Eyes 1.45-1.75 times as long as broad. Mouth about 1.4-1.9 times malar space. Antenna (fig. 2) with scape about 0.67 length of eye, its tip not reaching median ocellus, pedicellus plus flagellum about 0.81-0.92 breadth of mesoscutum; with 4 anelli; pedicellus distinctly longer than F1, 1.6-1.71 times as long as broad; funicle proximally slightly stouter than pedicellus, thickening somewhat distad, it segments subequal in length; F1 about quadrate, F2 very slightly transverse, F3 slightly to distinctly transverse; clava slightly broader than F3, 1.4-1.9 times as long as broad, slightly to distinctly longer than F2 plus F3, C1 broader than long, C2 shorter, C3 very short, spine about 0.4 length of C3, apical seta as long as spine, sensilla moderately numerous, about 0.75 as long as the segments.

Thorax 1.3-1.6 times as long as broad, much broader than high. Pronotum lunate, medially 0.2-0.3 length of mesoscutum, with 10-12 setae before hind margin. Mid lob of mesoscutum nearly flat, slightly broader than long, moderately shiny, with



FIGS 1-7

Puklina asphodelinae sp. n. 1-5, female: (1) fore- and hindwings; (2) antenna; (3) genitalia; (4) gaster; (5) hypopygium. 6-7, male: (6) antenna; (7) genitalia.

excessively fine superficial reticulation, areoles 2-5 times as long as broad; 5-6 short and weak setae on each side, the hindmost seta increase slightly in length and as long as the scutellar setae; median line usually absent, but sometimes collapsing so as to form a median line. Scutellum nearly flat, 1.3-1.5 times as broad as long, rather more finely sculptured than mesoscutum; lines distinct, submedians distinctly nearer to sublaterals than to each other, enclosing a space about 1.9-2.2 as long as broad; setae weak, their length distinctly less than distance between submedian lines, situated behind middle. Propodeum medially 1.22-1.5 times as long as dorsellum; surface weakly reticulate; anteromedially with narrow and shallow fovea about 0.5 times as long as length of propodeum, median carina absent; spiracles moderate sized, suboval, separated by their diameter from metanotum; callus with 2-4 setae. Legs of medium length and thickness: hind femora about 3.6-4.0 times as long as broad, spur of mid tibia as long as basitarsus, fourth tarsal segment slightly longer than basitarsus. Forewing (fig. 1) 2.1-2.2 times as long as broad, apical margin with extremely short and fine cilia, well visible in a high magnification, much longer after the apex; costal cell a little longer than M, with 12-15 hairs on lower surface, arranged in a single or partly double row; SM with 4-5 dorsal setae; M varying from thin to somewhat thick, 2.7-3.1 times length of ST, its front edge with 9-12 setae; ST slightly curved, rather thin and decolorized at base, gradually thickening to the subrhomboidal stigma; speculum small, closed below; basal cell, subcubital line and speculum with 3-4 extremely short hairs on its lower surface; there is two small bare areas just above and below ST; wing moderately thickly pilose, quite thickly after ST and distad. Hindwing obtuse, cilia 0.21-0.25 breadth of wing.

Gaster lanceolate (fig. 4), 1.45-1.9 length of thorax and about 1.8-2.3 times as long as broad, acuminate; last tergite from as long as broad, to slightly broader, than long. Ovipositor sheaths about 4 times as long as broad and projecting about 0.5-0.91 length of last tergite. Ovipositor sheaths plus postcercale 0.32-0.5 length of hind tibia; tip of hypopygium at 0.5 length of gaster. Hypopygium (fig. 5) with anterior margin trilobed, middle lobe obtuse. Genitalia (fig. 3).

Body black with rather weak to moderately strong olive-green to greenish-blue tints. Coxae and proximal 0.7-0.8 of all femora similarly coloured. Yellow parts as follows: a spot on each sides of clypeus up to antennal toruli, median carina of frons and postocellar suture, submedian lines of scutellum and a spot on each sides of dorsellum. Sutures of face, orbit of eyes, upper half of mesopleuron, notauli, hind edge of mesoscutum, sublateral lines of scutellum, sometimes yellowish. Remaining parts of legs yellow, the tarsi gradually darkening to fuscous at tips. Scrobal area of frons, scapular flanges, inner part of axilla, tegulae, scutellum outside sublateral lines, pedicellus and flagellum ventrally, from yellowish to fuscous. Remaining parts of antenna fuscous. Wings hyaline, venation yellowish-testaceous to brown, M not or hardly decolorized where it joins the parastigma, but ST decolorized basally. Length 1.2-1.8 mm.

Male. Differs from female as follows: Eyes 1.65-2.0 times as long as broad. Mouth about 1.2-1.4 times malar space. Antenna (fig. 6) with scape moderately swollen, about 1.9-2.3 as long as broad; ventral plaque 0.61-0.66 times length of scape; pedicellus plus flagellum about 1.2-1.4 breadth of mesoscutum; with 3 anelli; pedicellus about 1.4-1.5 times as long as broad, distinctly longer than F1; funicle proximally slightly stouter than pedicellus, F1 distinctly transverse, F2-F4 gradually increase in length distally, 1.1-1.5 times as long as broad; clava 2.7-3.2 times as long as broad, slightly longer than F3 plus F4, with C1 and C2 subequal in length, each a little longer than broad, C3 slightly shorter than C2, spine about 0.4 length of C3; sensilla sparse, shorter. Segments of funicle, and first and second segments of clava, with compact whorls of long dark setae: F1 with whorl of setae which reach about to the tip of the second segment following that which bears them, the rest of funicular segments with whorls of setae gradually decreasing in length distally. Submedian lines of scutellum enclosing a space about 2.3-2.6 as long as broad. Forewing: M 2.4-2.7 times length of ST. Gaster oval, as long as head plus thorax and about as broad as thorax, with ventral plica. Genitalia (fig. 7).

HOST. Not surely established, probably *Eurytoma asphodeli* (Hym., Eurytomidae).

ETYMOLOGY. Named after the host plant.

DISCUSSION. The new species is similar to *Puklina dillerae* Doganlar, but differs in having another combination of characters (given in the key to species, couplets 4):

KEY TO SPECIES

Females

1 Gaster obtuse at apex. Vertex, in front view of head strongly raised. Malar sulcus curved. Head and thorax not pale marked . . . . *Puklina amblyteles* Graham

\- Gaster acute at apex. Vertex, in front view of head, only slightly arched. Malar sulcus almost straight. Head and thorax with some yellowish markings of small extent 2

2 Gaster 2.5-3.7 times as long as broad 3

\- Gaster 1.7-2.3 times as long as broad 4

3 Mid lobe of mesoscutum withouth median line. Ovipositor sheaths projecting by 0.5-0.75 length of last tergite . . . . *Puklina depilata* Graham

\- Mid lobe of mesoscutum with median line. Ovipositor sheaths distinctly longer than length of last tergit . . . . *Puklina gelincika* Doganlar

4 POL 2.1-2.5 times OOL; Antenna with 4 anelli; Pedicellus plus flagellum 0.81-0.92 breadth of mesoscutum; Costal cell of forewing with 12-15 hairs on lower surface, arranged in a single or partly double row; Propodeum anteromedially with narrow and shallow fovea, without median carina; Ovipositor sheaths about 4 times as long as broad and projecting about 0.5-0.91 of last tergite (fig. 4). Ovipositor sheaths plus postcercale 0.32-0.5 length of hind tibia . . . . *Puklina asphodelinae* sp. n.

\- POL 2.75-3.0 times OOL; Antenna with 3 anelli; Pedicellus plus flagellum 0.64-0.8 breadth of mesoscutum; Costal cell of forewing with 18-21 hairs on lower surface, arranged in two complete rows; Propodeum medially smooth and shine; Ovipositor sheaths 3 times as long as broad and projecting less than half of last tergite. Ovipositor sheaths plus postcercale 0.28-0.3 length of hind tibia . . . . *Puklina dillerae* Doganlar

Males

1 Antenna with scape strongly swollen, about twice as long as broad, ventral plaque about 0.5 length of scape and situated a little below the middle; flagellum without long dark whorled setae; funicular segments strongly transverse; clava about 1.6 times as long as broad. Vertex, in front view of head strongly raised. Malar sulcus curved. Head and thorax not pale marked . . . . *Puklina amblyteles* Graham

\- Antenna with scape hardly swollen, about 2.0-3.0 times as long as broad, ventral plaque at last 0.6 length of scape; segments of funicle, and first and second segments of clava, with compact whorls of long dark setae; funicular segments subquadrate; clava 2.7-4 times as long as broad. Vertex, in front view of head, only slightly arched. Malar sulcus almost straight. Head and thorax with some yellowish markings of small exten 2

2 Ventral plaque at last 0.75 length of scape 3

\- Ventral plaque 0.61-0.71 length of scape 4

3 Antenna with scape about 3.0 times as long as broad, ventral plaque extending most of length of scape; segments of funicle, and first and second segments of clava, with compact whorls of dark setae which reach about to the tip of the segment following that which bears them . . . . *Puklina depilata* Graham

\- Antenna with scape about 2.25 times as long as broad, ventral plaque 0.75 length of scape; segments of funicle, and first and second segments of clava, with compact whorls of dark setae which reach about to the tip of the second segment following that which bears them . . . . *Puklina gelincika* Doganlar

4 Antenna (fig. 6) with scape 1.9-2.3 times as long as broad, ventral plaque 0.61-0.66 of length of scape, and with 3 anelli; segments of funicle, and first and second segments of clava, with compact whorls of long dark setae; funicular segments with whorls of setae gradually decreasing in length distally – F1 with setae which reach about to the tip of the second segment following that which bears them, F2 with setae which reach about to the middle of the second segment following that which bears them, F3 with setae which reach about to the base of the second segment following that which bears them; clava 2.7-3.2 times as long as broad . . . . *Puklina asphodelinae* sp. n.

\- Antenna with scape about 2.8 times as long as broad, ventral plaque 0.68-0.71 of length of scape, and with 2 anelli; segments of funicle, and first and second segments of clava, with compact whorls of dark setae which reach about to the tip of the second segment following that which bears them; all funicular segments with whorls of setae not decreasing in length distally; clava about 3.5-4 times as long as broad . . . . *Puklina dillerae* Doganlar

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REVUE SUISSE DE ZOOLOGIE 110 (3): 541-546; septembre 2003

Spelaeobochica muchmorei sp. n., a new cavernicolous pseudoscorpion (Pseudoscorpiones: Bochicidae) from Brazil (São Paulo State)

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Spelaeobochica muchmorei sp. n., a new cavernicolous pseudoscorpion (Pseudoscorpiones: Bochicidae) from Brazil (São Paulo State). - The new species is described and figured. It differs from the type species *Spelaeobochica allodentatus* Mahnert, 2001 mainly by its much more slender pedipalps and much bigger size. It occurs in the Areias caves complex, situated in a rainforest region (Ribeira Valley, São Paulo) of Brazil and is considered as troglobitic species (restricted to hypogean environment).

Key-words: Pseudoscorpiones - Bochicidae - *Spelaeobochica* - cave - taxonomy.

INTRODUCTION

In a recent study (Mahnert, 2001) 25 nominal species had been recorded from more than 100 Brazilian caves, including the description of the first member of the family Bochicidae from Brazil, *Spelaeobochica allodentatus* Mahnert. Of all these species, only *Pseudochthonius strinatii* Beier was considered as troglobite (restricted to subterranean environment).

In this paper, a second species of this bochicid genus is described. It lives in caves of the Ribeira Valley (the same karstic area where *P. strinatii* occurs) and seems highly adapted to the hypogean habitat.

The holotype and paratype tritonymph of this new species are deposited in the collection of the Museu de Zoologia da Universidade de São Paulo, and the paratype female at the Museum of Natural History of Geneva. The material studied is conserved in alcohol 70%.

DESCRIPTION

Spelaeobochica muchmorei sp. n. Figs 1-8

Material: Brazil, São Paulo, Gruta Ressurgência das Areias, on rock substrate (walking on the wall), lg. R. Andrade, 3.X.2001: 1 ♀ (holotype) (MZSP 21355) (fig.1) ; Gruta Areias de Cima, lg. R. B. Pascoaloto, 16.X.2001: 1 ♀ (paratype), on rock substrate; 2001: 1 tritonymph (paratype) (MZSP 21356), in crevices in silt bank.

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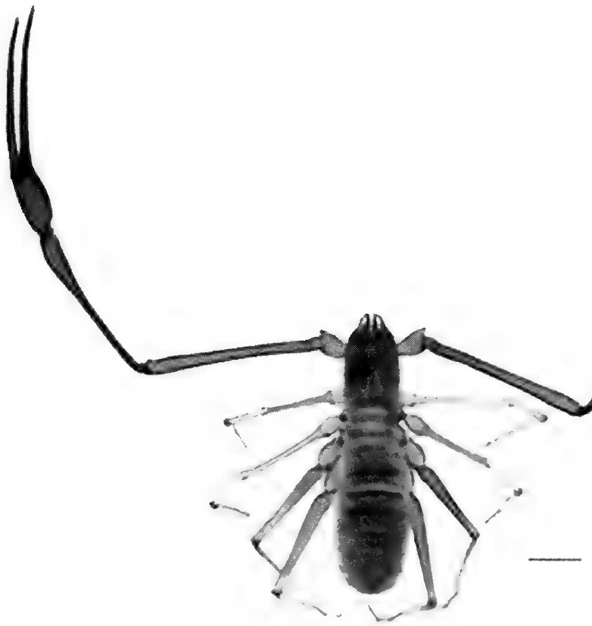
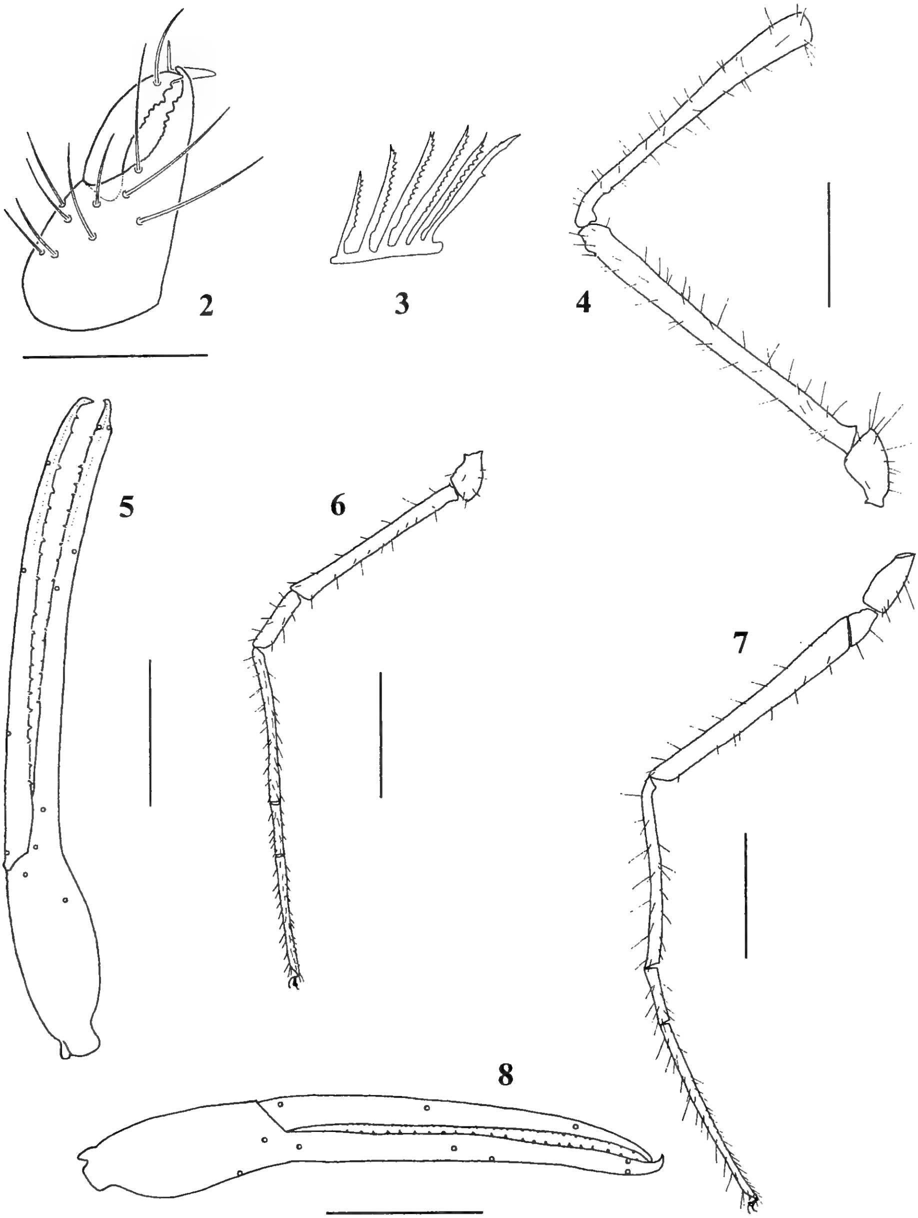


FIG. 1

Habitus of *Spelaeobochica muchmorei* sp. n. (photo R. de Andrade). Scale unit: 1 mm.

Female: Pedipalps, carapace, chelicerae, first coxae and first abdominal segments reddish brown, others parts yellowish brown. Tergites with more or less pronounced sclerotization along anterior margin. Vestitural setae delicate and long, smooth. Carapace 1,5-1,6 times longer than broad, anterior margin incurved medially, a weakly transverse depression (furrow?) near posterior margin (1/7 from posterior margin); no eyes or tubercles; about 30 setae (4-5 setae on anterior margin and 2-3 on posterior margin, 3-4 small setae on each side). Chelicera (fig. 2): 9 acuminate setae on hand, each finger with about 10 rounded teeth (3-4 distal ones larger), movable finger with a large, laterally displaced subterminal tooth, which is continuous with the remainder teeth; galea simple, serrula exterior 30, interior 18 blades; flagellum of 6 dentate setae (fig. 3). Tergites undivided, chaetotaxy: I-V 4-5, VI-IX 5-6, X 4, XI 6; pleural membranes smoothly, longitudinally striate; manducatory process acute, with 2 apical setae of unequal length (the second smaller and directed inward), 2 discal setae and 1-2 more basal small setae; palpal coxa scaly-reticulate, 9 setae, coxa I 5, II 4-5, III 5-6, IV 9; anterior genital operculum with 5-8 pores, sternite III with 19-23 marginal setae (about 5 central discal setae, smaller), about 2/3 setae at stigma, IV 4 and 2 supra-stigmal setae, remaining sternites 6/6/6/6/6/6/3; anal cone with 2 pairs of setae. Pedipalps (figs. 4-5): trochanter finely granulate basally, a rounded dorsal hump present; femur 12.5-13.3 times as long as broad, with a lateral protuberance (glandular(?) hump) near distal end, patella with a lateral protuberance near basal end,



FIGS 2-8

Spelaeobochica muchmorei sp. n. (del. R. de Andrade): 2. Left chelicera (holotype); 3. Flagellum (holotype); 4-5. Left pedipalpal femur+patella and chela (holotype); 6. Left leg I (female paratype); 7. Left leg IV (female paratype); 8. Left chela (tritonymph paratype). Scale unit: 0,5 mm (fig. 2), 0,6 mm (fig. 8) and 1 mm (figs 4, 5, 6, 7).

9.1-10 times, hand with pedicel 2.6 times, chela with pedicel 8.6-8.7 times longer than broad, finger 2.4 times longer than hand with pedicel; trichobothria: *ib* in distal half of hand dorsum; *ist* slightly distal of *est*, *est* is proximad compared to *st* on movable finger, *isb* in basal position much nearer to *esb* than to level of *sb*, *it* nearly at same level as *et*; *b-sb-st-t* nearly equidistant. Fixed finger with 79-97 teeth, movable finger with 83-102 teeth. The marginal teeth are cusped, slightly retrorsed and aligned in two or three vague rows (the more external teeth somewhat larger); the marginal teeth of fixed finger of holotype are aligned in two rows – the external one with 31 teeth; fixed finger on internal side with 24-31, movable finger with 18-24 accessory teeth; venom apparatus well developed in both fingers, nodus ramosus about 1/5 length of finger from tip. Legs slender: leg I (fig. 6): femur 10.4-11.3 times longer than deep and 2.6 times longer than patella, patella 3.7-4.1 times, tibia 15.6-15.9 times, basitarsus 6.1-6.3 times, telotarsus 16.2-17.1 times longer than deep and 2.2 times longer than basitarsus; leg IV (fig. 7): femur+patella 9.4-9.5 times, tibia 12.7-14.5 times, basitarsus 4.4-5.0 times, telotarsus 20.3-23.3 times longer than deep and 3.2-3.4 times longer than basitarsus; subterminal seta dentate, arolia undivided, shorter than smooth claws.

Measurements (mm): Carapace: 1.51/1.00 (holotype) 1.27/0.77 (paratype). Palps: femur 3.32/0.25 (2.76/0.22), patella 2.90/0.32 (2.50/0.25), hand with pedicel 1.29/0.50 (1.03/0.40), finger length 3.14 (2.46), chela length (with pedicel) 4.32 (3.48). Leg I: femur 1.70/0.15 (1.46/0.14), patella 0.66/0.18 (0.57/0.14), tibia 1.59/0.10 (1.25/0.08), basitarsus 0.55/0.09 (0.44/0.07), telotarsus 1.20/0.07 (0.97/0.06). Leg IV: femur + patella 2.75/0.29 (2.25/0.24), tibia 1.90/0.15 (1.60/0.11), basitarsus 0.61/0.14 (0.50/0.10), telotarsus 2.10/0.09 (1.62/0.08).

Tritonymph: Paler than adult (whitish coloration) with fingers of pedipalps and chelicerae reddish. Carapace 1.6 longer than broad (0.98/0.62); 26 setae (5 setae on anterior margin and 4 on posterior margin). Chelicerae: 8 acuminate setae on hand, each finger with 9 teeth; flagellum of 5 dentate setae (with the same aspect as the flagellum of adults). Palpal coxa with 6 setae, coxa I 4, II 4, III 4, IV 5. Sternite III with 6 setae plus 2/2 supra-stigmal setae, IV 4 plus 2/2 supra-stigmal setae, remaining sternites V-X 6 setae. Pedipalps: trichobothrial pattern as in figure 8; fixed finger with 60, movable finger with 63 teeth, fixed finger on internal side with 17, movable finger with 7 accessory teeth; femur 8.8 times as long as broad (1.58/0.18), with a protuberance near distal end, patella 6.5 times (1.30/0.20), with a lateral protuberance near basal end, hand with pedicel 2.3 times (0.72/0.32), chela with pedicel 7.2 times (2.30) longer than broad, finger 2.3 times (1.65) longer than hand with pedicel. Leg I: femur 7.9 times longer than deep (0.87/0.11) and 2.7 times longer than patella, patella 2.9 times (0.32/0.11), tibia 9 times (0.63/0.07), basitarsus 3.6 times (0.25/0.07), telotarsus 7.9 times longer than deep (0.55/0.07) and 2.2 times longer than basitarsus; leg IV: femur+patella 6.9 times (1.24/0.18), tibia 8.5 times (0.85/0.10), basitarsus 3.4 times (0.31/0.09), telotarsus 10.3 times longer than deep (0.93/0.09) and 3 times longer than basitarsus, subterminal setae similar to adult.

Affinities: A member of the family Bochicidae and the subfamily Bochicinae as outlined by Muchmore (1998). Within this subfamily it is placed into the genus *Spe-*

laeobochica Mahnert, 2001, and it shares with *Spelaeobochica allodentatus* Mahnert the following important characters: presence of accessory teeth on chelal fingers; presence of a distal glandular(?) tubercle on palpal femur, the latero-basal protuberance on palpal patella, and cheliceral palm with 9 setae.

It is easily distinguishable from the type species by its much more slender and longer pedipalps (femur 12.5 times vs. 4.2 times longer than broad, length 3.3mm vs. 0.95mm; chela at least 8.6 times longer than deep vs. 4.1 times) and legs (e.g. femur+patella IV at least 9.5 times longer than deep vs. 3.8 times), number of flagellar setae (6 vs. 4), much higher number of accessory teeth and the absence of setae on the female anterior genital operculum.

The generic diagnosis has to be completed in respect to the number of flagellar setae (4-6) and the slenderness of the pedipalps and legs.

Discussion: The type species *Spelaeobochica allodentatus* has been described from Bahia (Palmeiras, Gruta do Impossivel) and does not possess any morphological specialization to subterranean life conditions (Mahnert, 2001). The presence of a highly adapted cave-dwelling *Spelaeobochica* species from São Paulo may be surprising from a biogeographical point of view, since no real affinity could be found in the pseudoscorpion fauna from caves from Bahia and São Paulo regions (Mahnert, 2001). This finding just emphasizes the difficulties of collecting and of exploring of the hypogean fauna: intensive exploration of the caves of the Areias complex (Pinto-da-Rocha, 1995) yielded in 35 years only three species: *Pseudochthonius strinatii* (collected in 1968)(Beier, 1969*); Ideoroncus cavicola* (collected in 1996) (Mahnert, 2001) and *Spelaeobochica muchmorei* sp. n. (collected in 2001). The apparent rarity of this spectacular and "giant" species may reflect a very low population density, which is typical of troglobite species (Culver, 1982).

The species is characterized as a troglobite (restricted to hypogean habitat), following the classification of cave animal classification established by Gnaspini & Hoenen (1999). The size of the specimens, especially its very elongated appendages (more than 2 times more slender than the appendages of *S. allodentatus*), and the apparently low population density support this characterization.

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Two new freshwater gammarids (Crustacea: Amphipoda) from Lake Lugu, China

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Two new freshwater gammarids (Crustacea: Amphipoda) from Lake Lugu, China. - Two new species of the genus *Gammarus* (Amphipoda, Gammaridae) are described from Lake Lugu, Yunnan Province. Both *G. curvativus* sp. n. and *G. ninglangensis* sp. n. belong to the *G. pulex*-group.

Key-words: Amphipoda - *Gammarus* - new species - China.

INTRODUCTION

Lake Lugu, with a total area of 52 square kilometers and at an elevation of 2,685 meters, is situated on the northwestern plateau of Yunnan in China. The beauty of the lake with its surrounding breath-taking scenery makes it an excellent tourist destination. At the same time, the ecological changes in the lake, probably caused by the misuse of alien fish species (Yang, 2001) also attract many biologists from all over the world. More than one decade ago, local people tried to establish grass carp in the lake, but by mistake they introduced *Pseudorasbora parva* Bleeker 1860, a species with little commercial value, which brought three species of native schizothoracine fish to near extinction (Xie & Chen, 1999). This obviously also affected the resident freshwater Amphipoda. During a recent expedition to the province of Yunnan, we were unable to collect any amphipod specimens in Lake Lugu. Therefore, the present study on the *Gammarus* amphipods of Lake Lugu is entirely based on museum specimens collected twenty years ago.

Gammarus is one of the largest genera of epigean freshwater amphipods. 117 *Gammarus* species were described before 1983 (Barnard & Barnard, 1983). Later, Stock *et al.* (1998), Hou & Li (2002a, b, c, d), Hou, Li & Zheng (2002) and Hou, Li & Morino (2002) described additional species from Iran and China. According to the study by Karaman & Pinkster (1977a, b, 1987), these species can be subdivided into three artificial species groups: (1) the *G. pulex*-group (species without dorsal carina and with dense setation on pereopods 3 and 4 and uropod 3), (2) the *G. balcanicus*-group (species without dorsal carina and poorly setose pereopods 3, 4 and uropod 3), and (3) the *G. roeseli*-group (species with dorsal carina).

The species described in the present paper belong to the *G. pulex*-group. All holotypes, allotypes and part of paratypes examined in the present study are deposited at the Institute of Zoology, Chinese Academy of Sciences, Beijing (IZCAS). Part of paratypes are deposited in the Muséum d'histoire naturelle, Geneva (MHNG).

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DESCRIPTIONS

Gammarus curvativus sp. n. Figs 1-6

Material: Holotype male (IZCAS-I-A0032), Lake Lugu (27.7°N, 100.8°E), Yongning Town, Ninglang District, Yunnan Province; collected by Guoxiao Chen; August 12, 1981. Allotype female (IZCAS-I-A0033), same data as for the holotype. Paratypes: 30 males and 20 females (IZCAS), same data as for the holotype; 10 males and 10 females (MHNG), Zhongshi Village, Ninglang District, Yunnan Province, collected by Guoxiao Chen, August 10, 1981.

Other material: 3 males and 3 females (IZCAS), Lake Lugu, April 12, 1986; 20 males and 7 females (IZCAS), fish farm near Luoshui Village, Yongning Town, Ninglang District, Yunnan Province, collected by Guoxiao Chen; August 11, 1981.

Etymology: The Latin epithet "curvativus" refers to the long, curled setae of carpus and propodus of gnathopod 2.

Diagnosis: *Gammarus curvativus* sp. n. can be easily diagnosed by the following characters: (1) accessory flagellum of first antenna 2-articulate, (2) gnathopod 2 with long curled setae on dorsal margin of carpus and weakly curled setae on dorsal margin of propodus, (3) inner ramus of uropod 3 less than half as long as article 1 of outer ramus, both rami densely armed with long, simple setae.

Description of male: Body 10.05 mm in length. Lateral lobe of head truncate, inferior antennal sinus deep, eyes reniform (Fig. 1A). Antenna 1 (Fig. 1D): peduncular articles 1-3 with length ratios of 1.0 : 0.67 : 0.47, all with distal setae and several setae on posterior margins; flagellum with 19 articles, most of them bearing aesthetascs; accessory flagellum with 2 articles. Antenna 2 (Fig. 1E): peduncular article 4 a little shorter than article 5, article 4 with 2 groups of short setae along anterior and posterior margins and with 2 groups of setae on inner surface, article 5 bearing 3-4 groups of setae along anterior and posterior margins and 3 groups of setae on inner surface; flagellum with 11 articles, posterior 7 articles with calceoli.

Upper lip rounded (Fig. 2H). Left mandible (Figs 2A, B): incisor with 5 teeth; lacinia mobilis with 4 dentitions; spine row with 9 plumose setae; molar with 1 seta; article 2 of palp with 15 stiff setae, article 3 about 85% of article 2 in length, bearing 4 B-setae, two groups of A-setae, 4 E-setae and a row of D-setae (according to Cole, 1980). Right mandible (Figs 2C, D): incisor with 4 teeth; lacinia mobilis bifurcate; article 2 of palp with 5 stiff setae, article 3 about 83% of article 2 in length, with two groups of A-setae, two groups of B-setae, 5 E-setae and a row of D-setae. Lower lip (Fig. 2I): inner plates absent. Maxilla 1 (Figs 2E, G): inner plate with 13 plumose setae; outer plate with 11 serrated spines; article 2 of left palp with 8 pointed spines accompanied by 4 stiff setae; right palp with 6 blade-like spines accompanied by 1 seta. Maxilla 2 (Fig. 2F): inner plate with 13 plumose setae on inner surface; outer plate a little longer than inner plate, with long apical setae. Maxilliped (Fig. 2J), inner plate with 3 apical blunt spines and 1 subapical spine; outer plate broad, with 11 slender spines on inner margin and 3 pectinate setae apically; article 3 of palp with 3 groups of setae, article 4 unguiform.

Coxal plate 1 (Fig. 3A) weakly dilated distally; coxal plates 2 and 3 (Figs 3C, 4B) subrectangular, bearing 1 seta on anterior corner and 1 seta on posterior corner; coxal plate 4 (Fig. 4A) with posterior excavation, longer than wide, bearing 3 setae on posterior margin; coxal plates 5 and 6 (Figs 4C, D) with small anterior lobes, posterior corners with 1 seta; coxal plate 7 (Fig. 4E) with 4 setae on posterior margin.

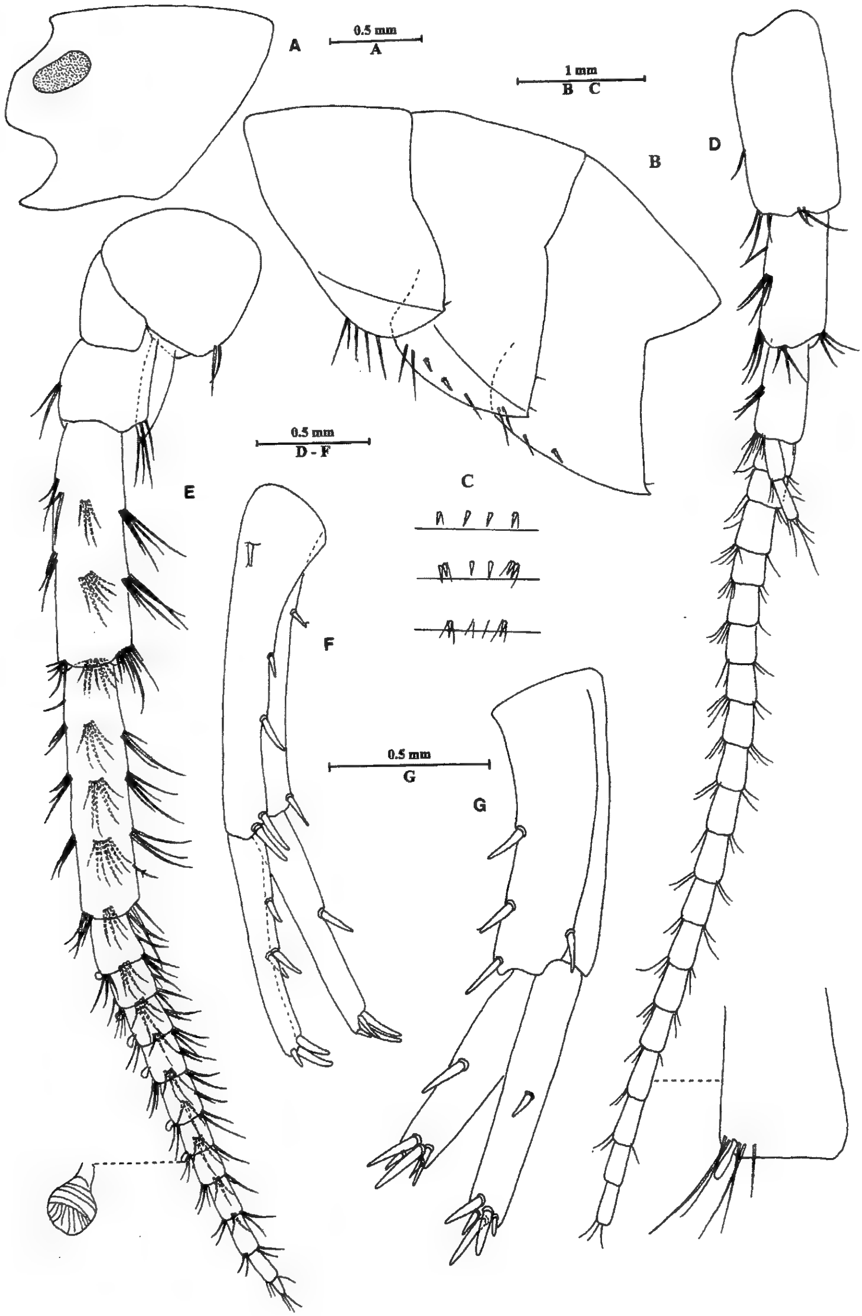

FIG. 1

Gammarus curvativus sp. n., holotype, male. A, head; B, epimeral plates; C, urosomites 1-3 (dorsal view); D, antenna 1; E, antenna 2; F, uropod 1; G, uropod 2.

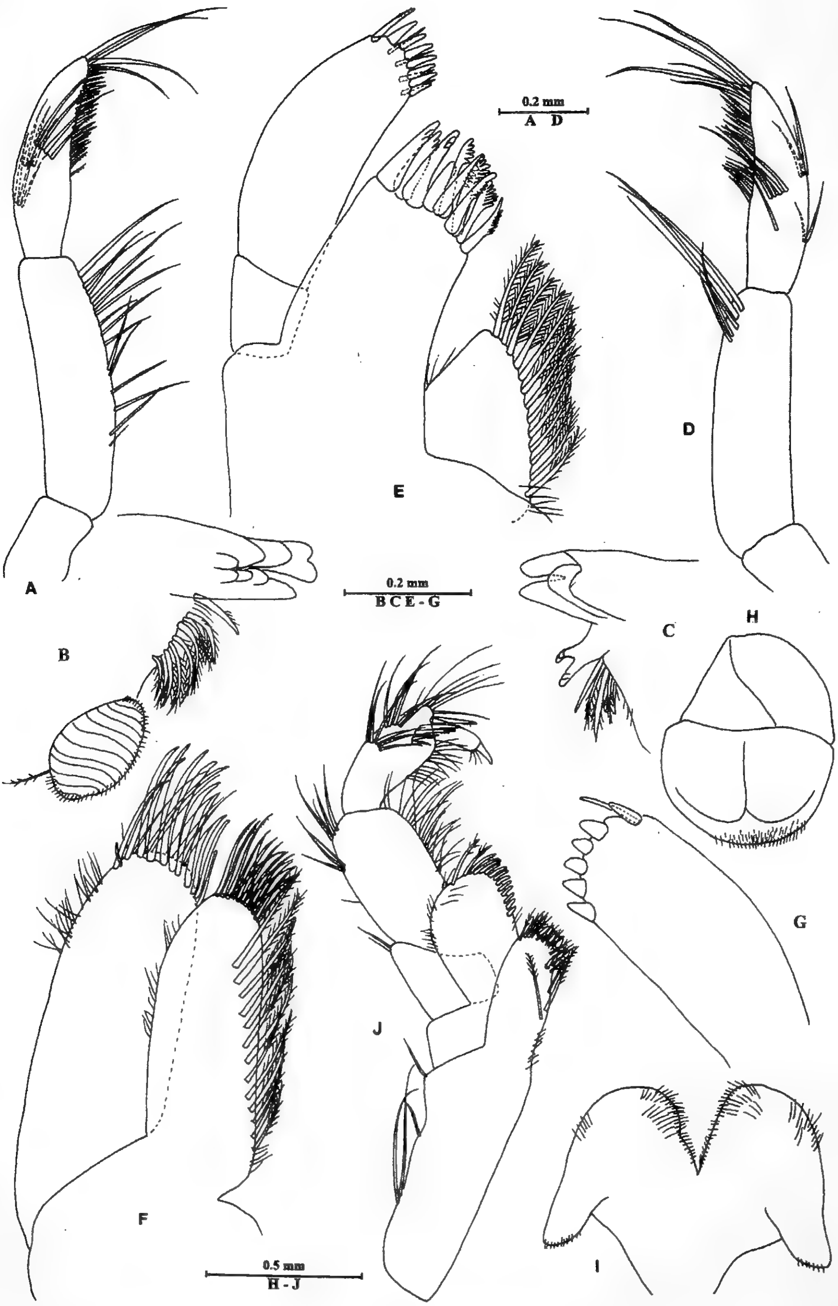

FIG. 2

Gammarus curvativus sp. n., holotype, male. A, palp of left mandible; B, incisor of left mandible; C, incisor of right mandible; D, palp of right mandible; E, left maxilla 1; F, maxilla 2; G, palp of right maxilla 1; H, upper lip; I, lower lip; J, maxilliped.

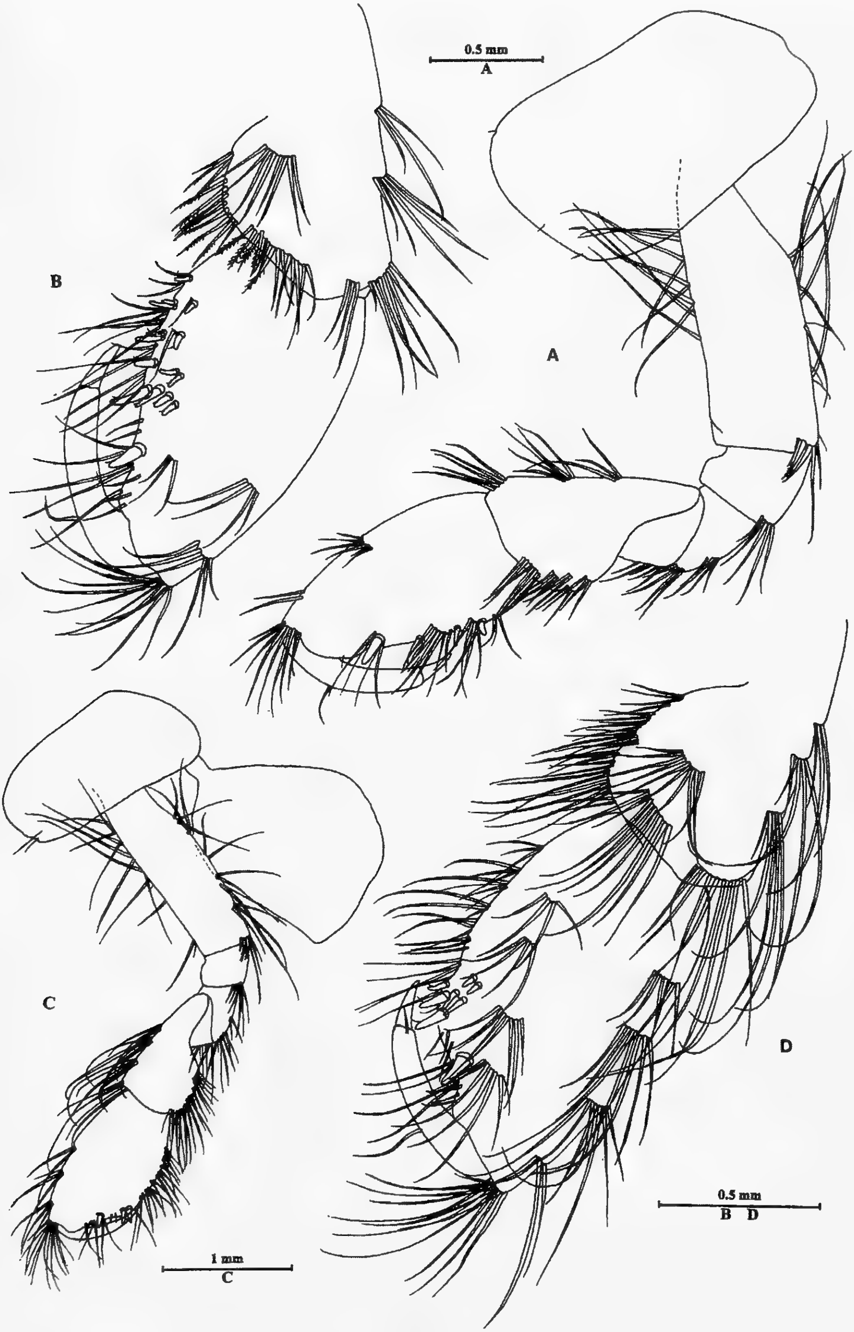

FIG. 3
Gammarus curvativus sp. n., holotype, male. A, gnathopod 1; B, propodus of gnathopod 1; C, gnathopod 2; D, propodus of gnathopod 2.

Gnathopod 1 (Figs 3A, B): basis with long setae on both sides, bearing 3 plumose setae distally; length ratio of carpus and propodus 1.0 : 1.1, carpus triangular, with 3 clusters of setae on dorsal anterior margin; palm of propodus oblique, bearing a single spine anteriorly, and 1-2-2-1-1 spines on posterior margin, and 1-1-2-3 spines on inner surface; dactylus about half as long as palm, bearing 1 seta on outer margin, nail short. Gnathopod 2 (Figs 3C, D): basis similar to that of gnathopod 1; length ratio of carpus and propodus 1.0 : 1.1, carpus parallel-sided, bearing 4 groups of long curled setae on dorsal margin; propodus with 4 groups of long and weakly curled setae on dorsal margin, palm transverse, with 1 blunt spine anteriorly, 3 single and 2 pairs of spines on outer and inner posterior corners, respectively; dactylus with 1 seta on outer margin and 1 seta at hinge of nail.

Pereopod 3 (Figs 4B, G): basis to carpus with long, straight setae on posterior margins, dactylus stout. Pereopod 4 (Figs 4A, F) similar to pereopod 3.

Pereopods 5-7 (Figs 4C-E, H-J): anterior margins of bases with several long setae and 5 short spines; posterior margin nearly straight in pereopod 5, slightly concave in pereopod 6, and expanded in pereopod 7, with about 10 short setae; inner surface of basis of pereopod 7 with 10 setae. Merus and carpus with 2 groups of 2-3 spines accompanied by short setae on anterior margin; propodus with 3 groups of 2-3 spines on anterior margin; dactylus slender, with 1 seta on outer margin and 1-2 setae at hinge of nail.

Coxal gills of pereopods 2-7 sac-like, coxal gill 7 smallest.

Epimeral plates 1-3 (Fig. 1B) with 1-2 short setae on posterior margins, epimeral plate 1 ventrally rounded, with 5 setae on anterior corner; epimeral plate 2 pointed, with 2 setae and 3 spines on ventral margin; epimeral plate 3 acute, with 2 setae and 2 spines on ventral margin. Pleopods 1-3 subequal (Figs 5C-E), peduncles with groups of long setae, bearing 2 retinaculae accompanied by 2-3 long setae; both rami about 18 articles, armed with plumose setae.

Urosomites 1-3 not humped (Fig. 1C), urosomite 1 with 1-1-1-1 spines on dorsal margin, urosomite 2 with 2-1-1-2 spines, urosomite 3 with 1-1 spines, each spine accompanied by 1-2 setae. Uropod 1 (Fig. 1F): peduncle longer than rami, with 1 basofacial spine, 1-1-2 and 1-1 spines on outer and inner margins, respectively; outer ramus with 2 spines and 1 spine on outer and inner margins, respectively; inner ramus with 1 spine. Uropod 2 (Fig. 1G): peduncle with 3 spines and 1 spine on outer and inner margins, respectively; both rami with 1 marginal spine. Uropod 3 (Fig. 5A): peduncle with 3 spines accompanied by some setae; inner ramus less than half as long as article 1 of outer ramus; article 1 of outer ramus with 2 spines on outer margin and 4 spines distally, article 2 longer than adjacent spines; both rami densely ornamented with long, simple setae.

Telson deeply cleft (Fig. 5B), as long as wide, each lobe with 2 distal spines accompanied by 4 setae, and 3-4 setae on dorsal surface.

Description of female: Length 8.3 mm. Gnathopod 1 (Figs 6A, B): basis with long setae along anterior and posterior margins, carpus shorter than propodus, palm of propodus not as oblique as that of male, with 6 spines on posterior corner. Gnathopod 2 (Figs 6C, D): carpus and propodus more densely setose than those of gnathopod 1, propodus subrectangular, palm with 4 spines on posterior corner.

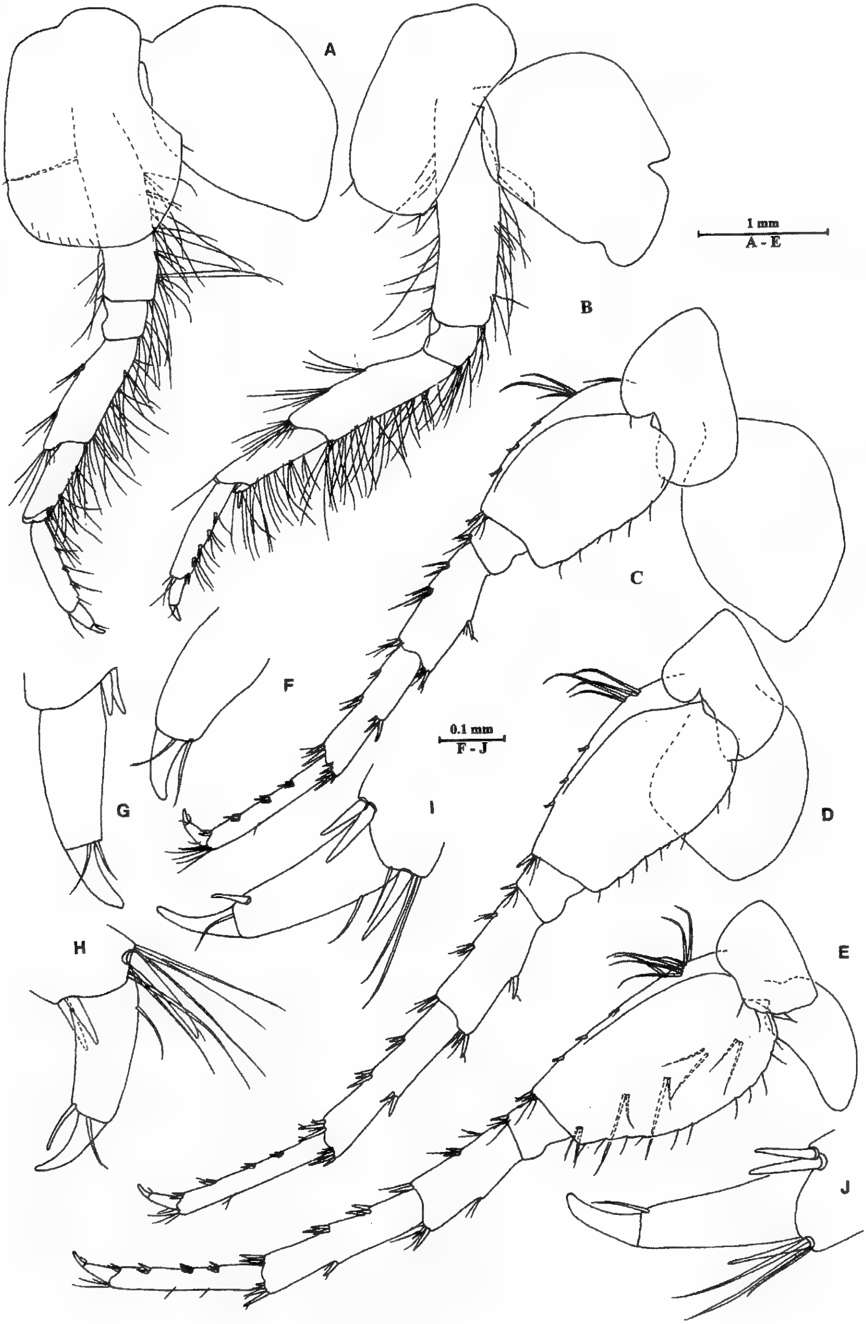

FIG. 4
Gammarus curvativus sp. n., holotype, male. A, pereopod 4; B, pereopod 3; C, pereopod 5; D, pereopod 6; E, pereopod 7; F, dactylus of pereopod 4; G, dactylus of pereopod 3; H, dactylus of pereopod 5; I, dactylus of pereopod 6; J, dactylus of pereopod 7.

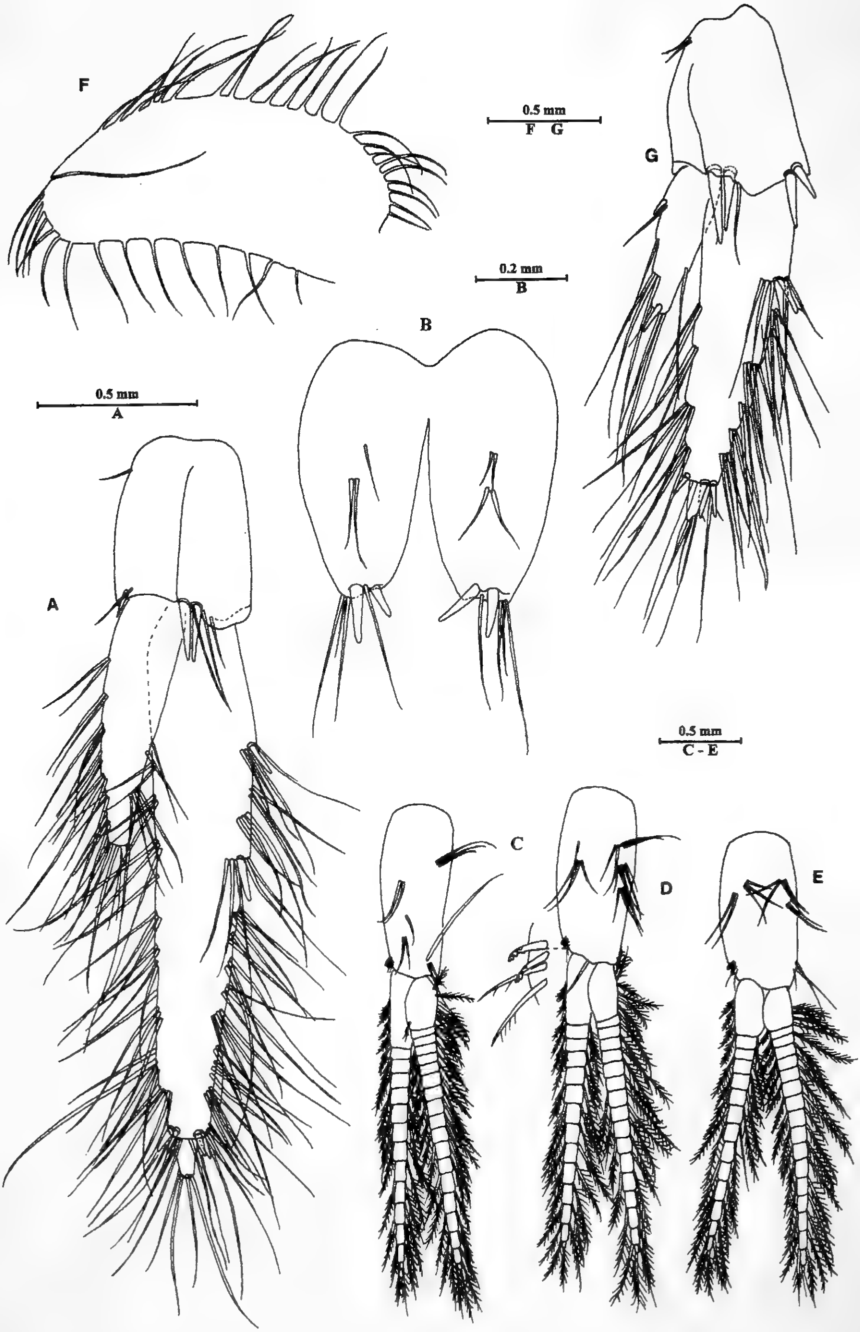

FIG. 5

Gammarus curvativus sp. n., male: A – E, female: F, G. A, uropod 3; B, telson; C, pleopod 1; D, pleopod 2; E, pleopod 3; F, oostegite of gnathopod 2; G, uropod 3.

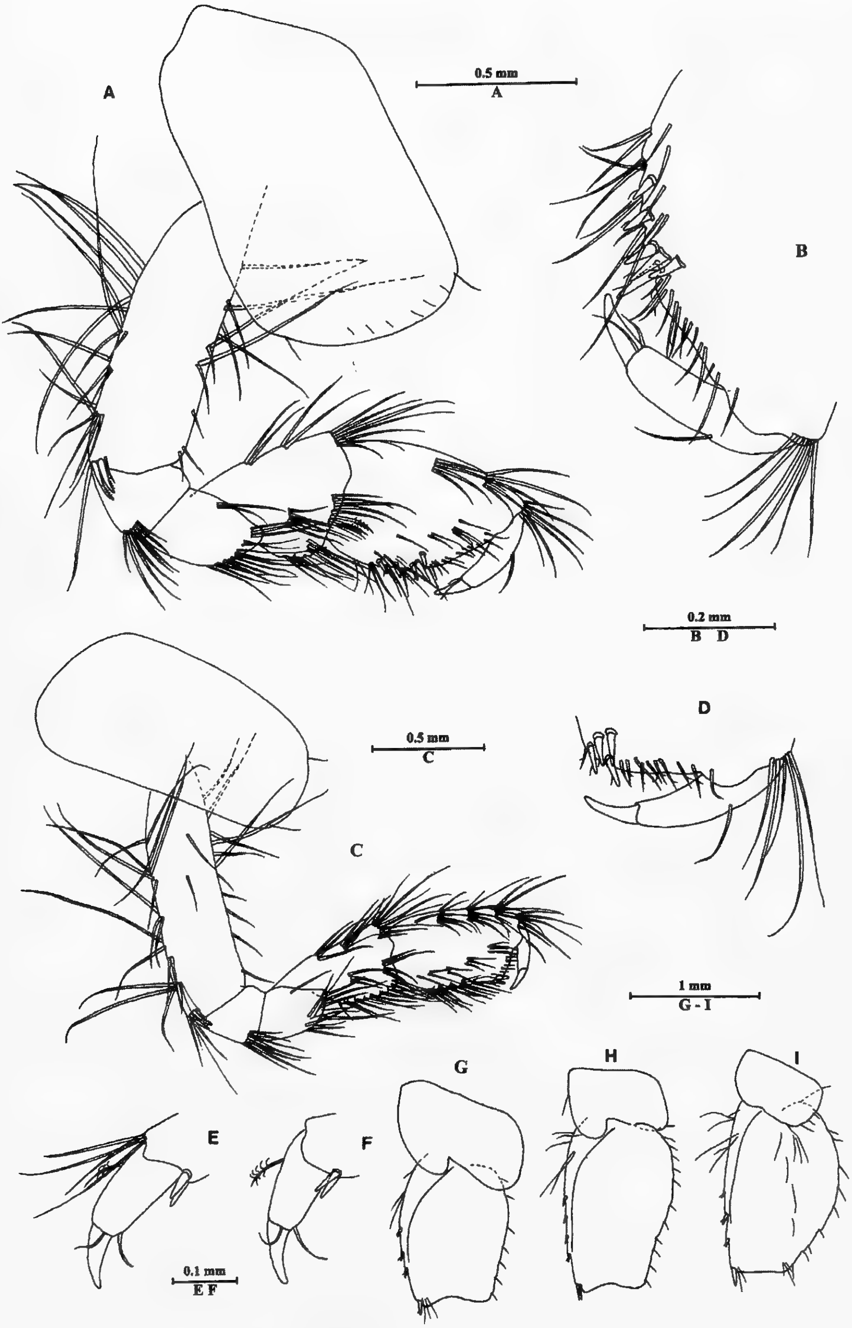

FIG. 6

Gammarus curvativus sp. n., allotype, female. A, gnathopod 1; B, propodus of gnathopod 1; C, gnathopod 2; D, propodus of gnathopod 2; E, dactylus of pereopod 3; F, dactylus of pereopod 4; G, basis of pereopod 5; H, basis of pereopod 6; I, basis of pereopod 7.

Pereopods 3 and 4 similar to those of male, dactyli curved (Figs 6E, F), bearing 1 seta on outer margins and 2 setae at hinges of nails, respectively.

Uropod 3 (Fig. 5G): inner ramus about half as long as article 1 of outer ramus, both rami with long simple setae.

Oostegites of pereopods 2-5 progressively smaller (Fig. 5A), ovoid, with long marginal setae.

Remarks: *Gammarus curvativus* sp. n. is morphologically similar to *G. gregoryi* Tattersall, 1924, in having an inner ramus of uropod 3 that is less than half as long as article 1 of the outer ramus while both rami are armed with long setae. The new species differs from the latter by the following characters: carpus and propodus of gnathopod 2 with long curled setae, inner surface of basis of pereopod 7 with setae, and urosomite 1 with 1-1-1-1 spines accompanied by setae on dorsal margin (*G. gregoryi* has no spines, but minute setae on the mid-dorsal margin of urosomite 1).

Gammarus ninglangensis sp. n. Figs 7-11

Material: Holotype male (IZCAS-I-A0034), fish farm near Luoshui Village, Yongning Town (27.7°N, 100.7°E), Ninglang District, Yunnan Province, collected by Guoxiao Chen, August 11, 1981. Allotype female (IZCAS-I-A0035); paratypes: 4 males (IZCAS), 4 males (MHNG), same data as for the holotype.

Etymology: The Latin epithet "ninglangensis" is derived from the district of origin of the new species.

Diagnosis: Gammarus ninglangensis sp. n. is characterized by the following characters: (1) gnathopod 2 with long straight setae on dorsal margins of carpus and propodus, (2) bases of pereopods 5-7 elongate relatively, bearing 3-4 short spines on anterior margins and a few short setae on posterior margins, (3) inner ramus of uropod 3 about 80% of outer ramus, outer ramus with 1 article, and both rami armed with long, plumose setae.

Description of male: Body length 11 mm. Lateral lobe of head oblique, inferior antennal sinus deep, eyes reniform, medium in size (Fig. 7B). Antenna 1 (Fig. 10A): peduncular articles 1-3 with length ratios of 1.0 : 0.72 : 0.5, each article with some marginal and distal setae; primary flagellum with 24 articles, most of them with aesthetascs; accessory flagellum with 4 articles. Antenna 2 (Fig. 10B): peduncular article 4 a little shorter than article 5, article 4 with 3 groups of setae on anterior and posterior margins, article 5 with 4 groups of setae on both margins; flagellum with 8 articles, posterior 6 articles with calceoli.

Upper lip rounded (Fig. 7L), with minute setae. Left mandible (Figs 7I, J): incisor with 5 teeth; lacinia mobilis with 4 weak dentitions; spine row with 8 plumose setae; molar triturative; article 2 of palp with 13 stiff setae, article 3 ca. 80% length of article 2, bearing 4 A-setae, three groups of B-setae, 20 D-setae and 5 E-setae. Right mandible (Fig. 7E): incisor with 4 teeth, lacinia mobilis bifurcate. Lower lip (Fig. 7K): inner plates absent. Maxilla 1 (Figs 7G, H): inner plate with 17 plumose setae; outer plate with 11 serrated spines; article 2 of left palp with 7 pointed spines accompanied by 3 stiff setae; article 2 of right palp with 6 blade-like spines accompanied by 1 plumose seta. Maxilla 2 (Fig. 7F): inner plate with oblique row of 25 plumose setae on inner face; outer plate with long apical setae. Maxilliped (Fig. 7M): inner plate with

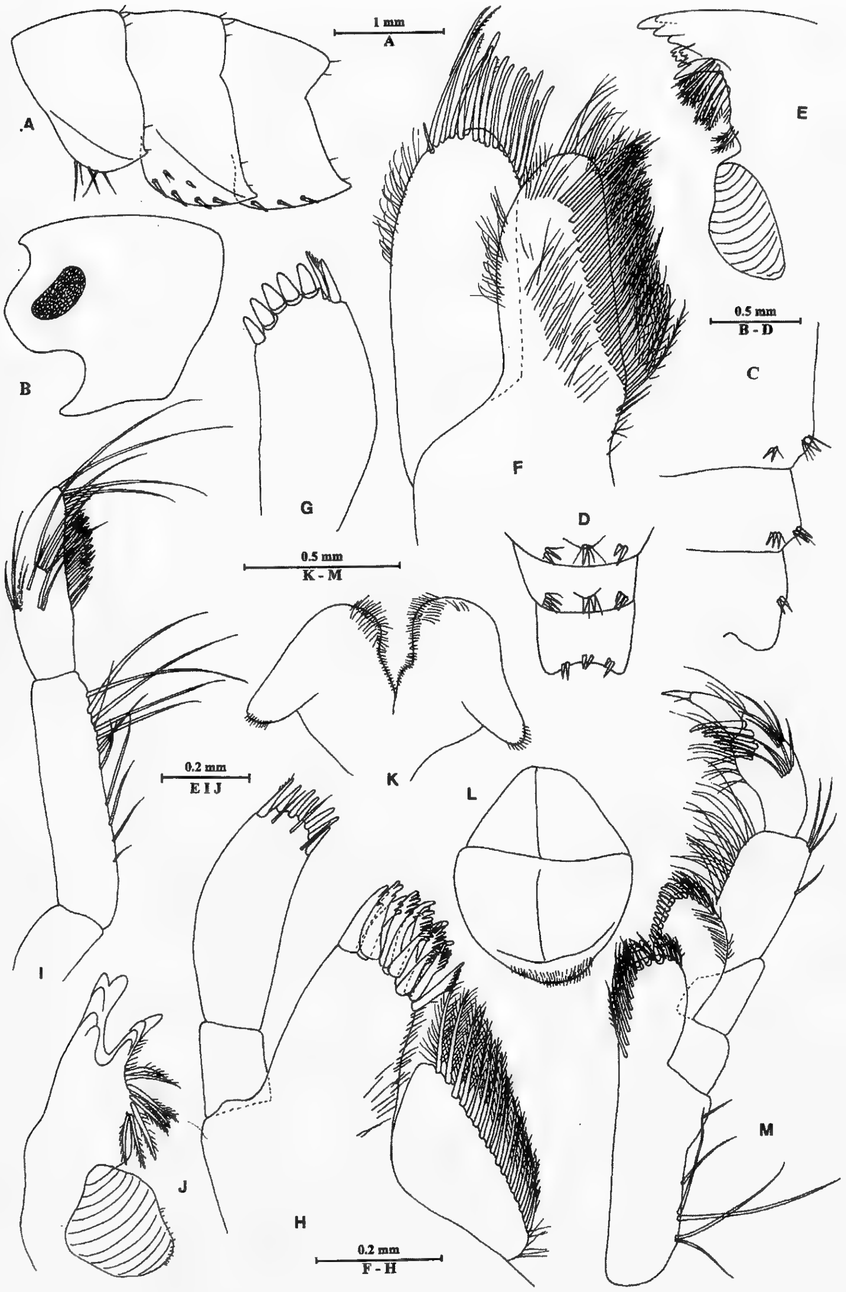

FIG. 7

Gammarus ninglangensis sp. n., holotype, male. A, epimeral plates; B, head; C, urosomites 1-3 (lateral view of dorsal part); D, urosomites 1-3 (dorsal view); E, incisor of right mandible; F, maxilla 2; G, palp of right maxilla 1; H, left maxilla 1; I, palp of left mandible; J, incisor of left mandible; K, lower lip; L, upper lip; M, maxilliped.

apical spines; outer plate expanded, with 10 slender spines on medial margin and 5 apical pectinate setae; article 3 of palp with numerous setae, article 4 cuspidate.

Coxal plates 1-3 subrectangular (Figs 8A, D, E), ventral margins with minute setae; coxal plate 4 with posterior excavation (Fig. 9A), longer than wide; coxal plates 5 and 6 (Figs 9B, C): anterior lobes small; coxal plate 7 (Fig. 9D) with 2 setae on anterior margin.

Gnathopod 1 (Figs 8A, B): basis with long setae along anterior and posterior margins, bearing 3 spinulate setae distally; carpus triangular, length about 73% that of propodus; propodus pyriform, palm oblique, bearing 1 medial spine anteriorly, and 12 spines on posterior margin and 4 spines on inner face; dactylus relatively short, with 1 seta on outer margin. Gnathopod 2 (Figs 8C, D), basis similar to that of gnathopod 1, length of carpus about 66% that of propodus; propodus subrectangular, palm truncate, bearing 1 spine anteriorly, and 7 spines on posterior corner; dactylus with 1 seta on outer margin, nail short.

Pereopod 3 (Figs 8E, F) a little longer than pereopod 4 (Figs 9A, E), both pereopods 3 and 4 with long straight setae on posterior margins accompanied by short spines; dactyli stout, bearing 1 seta on outer margins and 2 stiff setae at joints of nails, nails about 50% of corresponding dactyli length.

Pereopods 6 and 7 longer than pereopod 5 (Figs 9B-D, F-H). Bases of pereopods 5-7 relatively narrow and elongate, bearing 3-4 short spines and several long setae on anterior margins, posterior margins with a few short setae; merus and carpus with 2-3 groups of 2-3 spines along anterior and posterior margins; propodus with 4 groups of 3 spines on anterior margins; dactyli with 1 seta on outer margins and 2 spines at hinges of nails, nails short.

Coxal gills of pereopods 2-7 sac-like, coxal gill 7 smallest.

Epimeral plates 1-3 (Fig. 7A) posterior corners progressively acuminate, bearing 5-6 small setae on dorsal margins and 1-2 setae on posterior margins. Epimeral plate 1 with 5 long setae on anterior corner; plate 2 ventrally with 4 marginal spines and 2 submarginal spines; plate 3 with 3 spines on ventral margin. Pleopods 1-3 (Figs 10E-G): peduncles with some setae, and 2 retinaculae accompanied by 2 setae; both rami bearing 18 articles, fringed with plumose setae.

Urosomites 1-3 slightly humped (Figs 7C, D), bearing 3 clusters of spines dorsally. Uropod 1 (Fig. 10C): peduncle bearing 1 basofacial spine, with 1-1-1-2 spines on outer margin and 1 spine on medio-distal corner; outer ramus with 2 spines and 1 spine on outer and inner margins, respectively; inner ramus with 2 spines and 1 spine on outer and inner margins, respectively. Uropod 2 (Fig. 10D): peduncle with 3 spines and 1 spine on outer and inner margins, respectively; both rami with 1-2 marginal spines. Uropod 3 (Fig. 10H): peduncle with several dorsal setae and 5 distal spines; inner ramus about 81% length of outer ramus, with 2 spines on inner margin and 1 distal spine; outer ramus with 1 article, bearing 3 marginal and 4 distal spines; both rami densely armed with plumose setae.

Telson (Fig. 11A) longer than wide, deeply cleft, each lobe with 2 distal spines accompanied by several setae, and with 2 medial setae.

Description of female: Body length 7.5 mm. Antenna 1: peduncular articles 1-3 with length ratios of 1.0 : 0.61 : 0.41, flagellum with 18 articles, most of them with

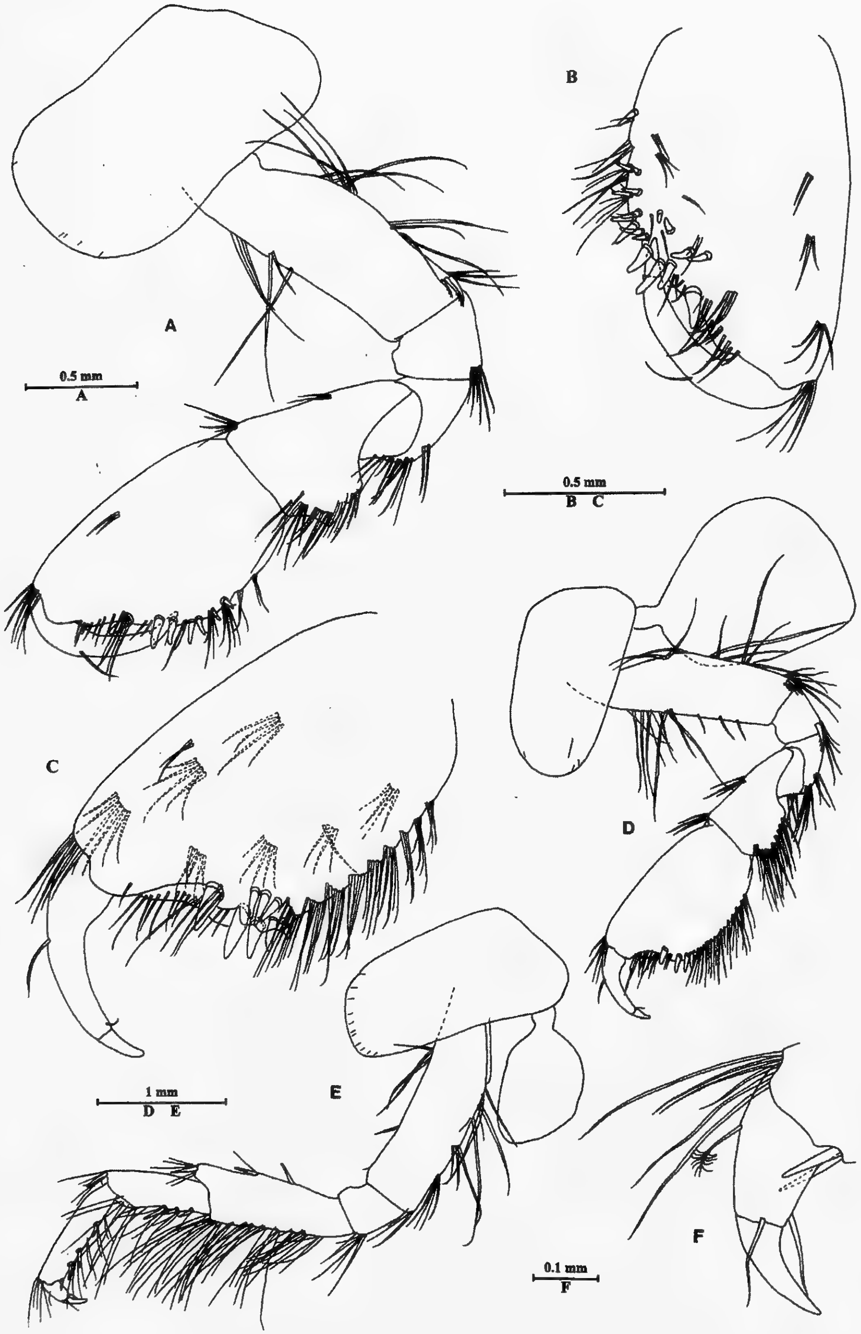

FIG. 8

Gammarus ninglangensis sp. n., holotype, male. A, gnathopod 1; B, propodus of gnathopod 1; C, propodus of gnathopod 2; D, gnathopod 2; E, pereopod 3; F, dactylus of pereopod 3.

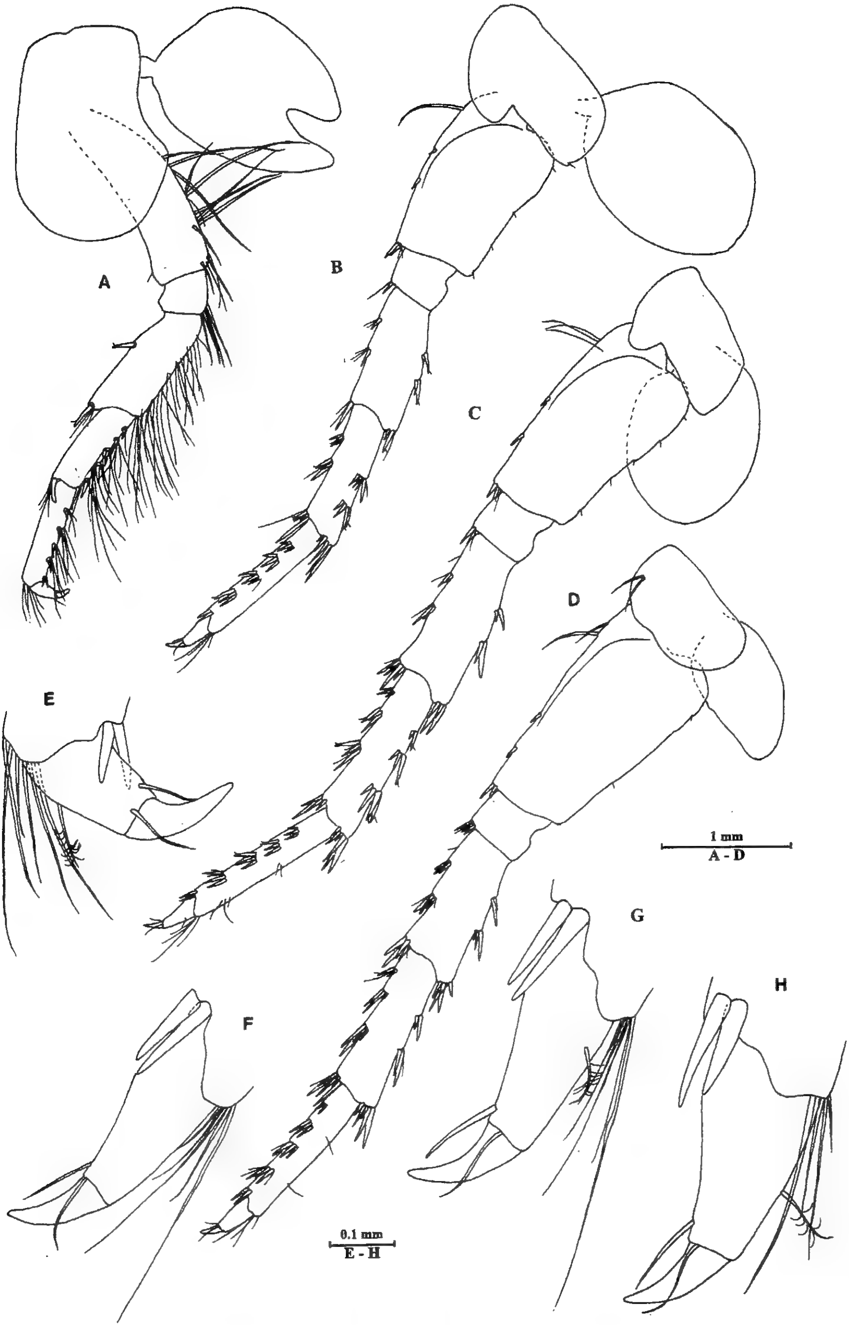

FIG. 9

Gammarus ninglangensis sp. n., holotype, male. A, pereopod 4; B, pereopod 5; C, pereopod 6; D, pereopod 7; E, dactylus of pereopod 4; F, dactylus of pereopod 5; G, dactylus of pereopod 6; H, dactylus of pereopod 7.

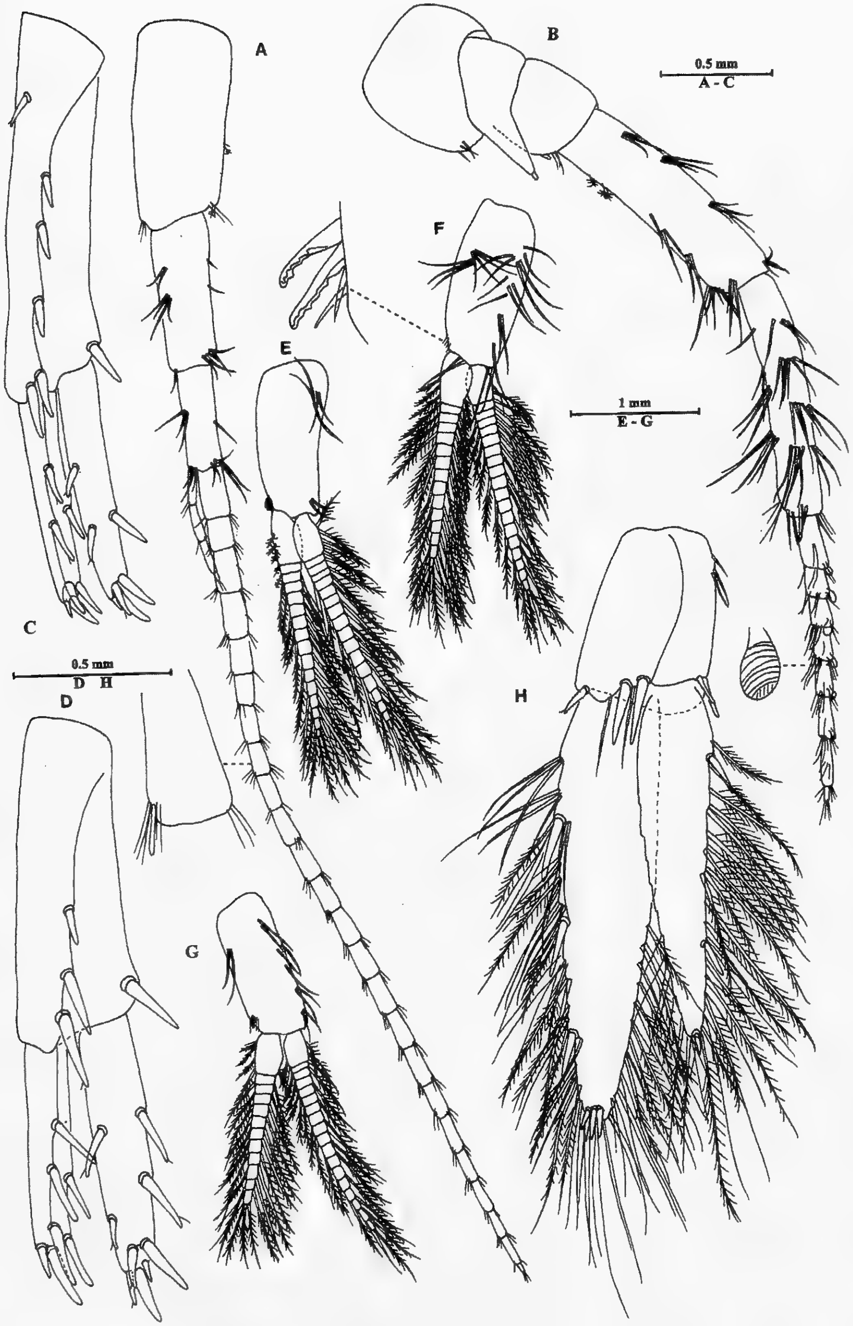

FIG. 10

Gammarus ninglangensis sp. n., holotype, male. A, antenna 1; B, antenna 2; C, uropod 1; D, uropod 2; E, pleopod 1; F, pleopod 2; G, pleopod 3; H, uropod 3.

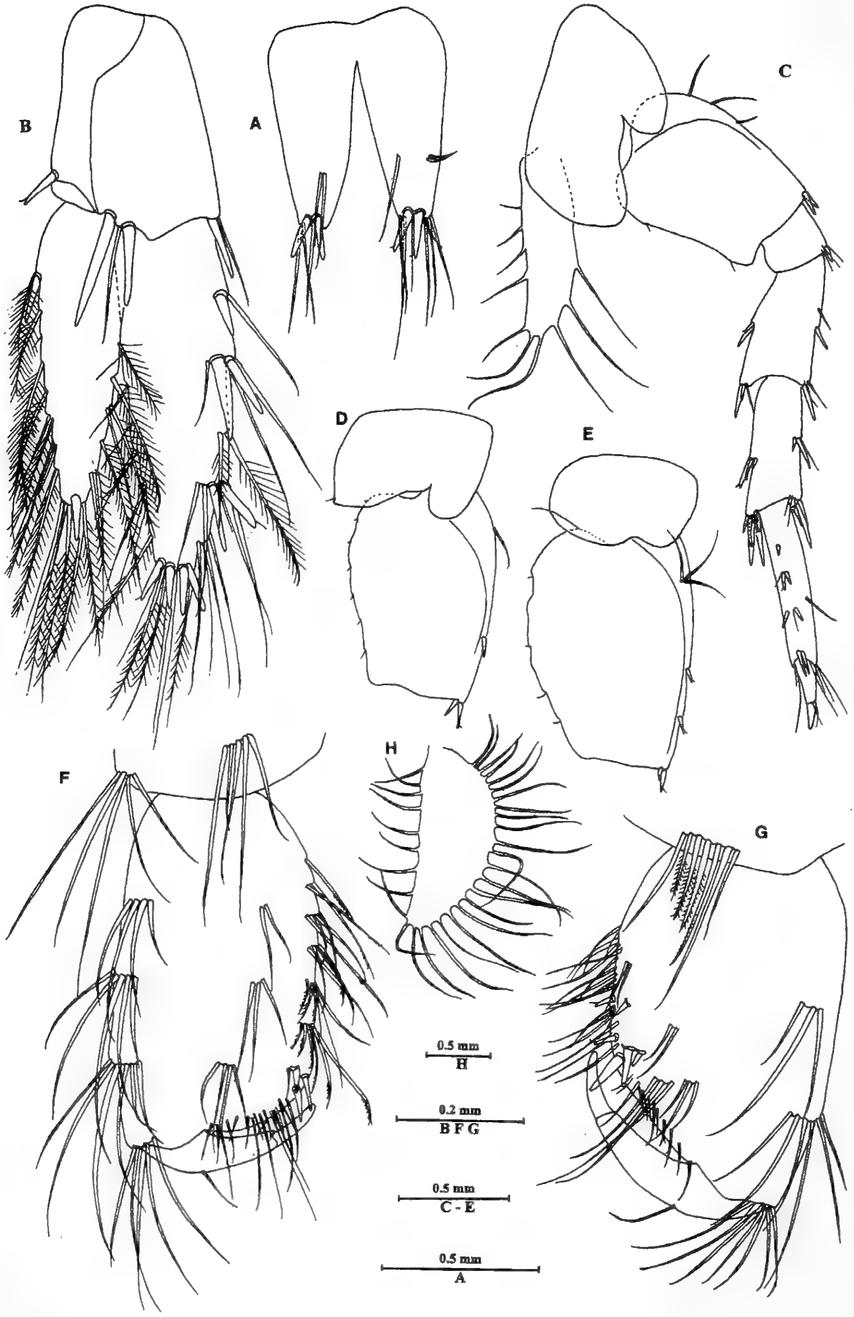

FIG. 11

Gammarus ninglangensis sp. n., male: A, female: B – H. A, telson; B, uropod 3; C, pereopod 5; D, basis of pereopod 6; E, basis of pereopod 7; F, propodus of gnathopod 2; G, propodus of gnathopod 1; H, oostegite of gnathopod 2.

aesthetascs; accessory flagellum with 3 articles, article 3 very short. Antenna 2: peduncular article 4 about as long as article 5, both with 2 groups of marginal setae; flagellum with 7 articles, calceoli absent.

Gnathopod 1 (Fig. 11G), carpus a little shorter than propodus; propodus not as oblique as that of male, with 6 spines on posterior corner; dactylus with 1 seta on outer margin. Gnathopod 2 (Fig. 11F), carpus parallel-sided; propodus subrectangular, with 3 groups of long setae on dorsal margin, palm transverse, with 3 spines on posterior corner.

Pereopods 3-4 similar to those of male.

Bases of pereopods 5-7 more expanded than in male (Figs 11C-E).

Oostegites of pereopod 2-5 elongated (Figs 11C, H), with numerous long marginal setae.

Uropod 3 stout (Fig. 11B): length of inner ramus about 88% of outer ramus, outer ramus with 1 article, bearing 1-2-2 marginal and 4 distal spines; both rami densely fringed with plumose setae.

Telson cleft, longer than wide, similar to that of male.

Remarks: *Gammarus ninglangensis* sp. n. is clearly distinguished from *G. curvativus* sp. n. by the following characters: gnathopods 1 and 2 only with straight setae, bases of pereopods 5-7 narrow and elongated, and inner ramus of uropod 3 reaching about 81% of outer ramus in length. Moreover, the outer ramus of uropod 3 possesses 1 article in *G. ninglangensis* sp. n., and both rami are densely armed with plumose setae.

G. curvativus sp. n. and *G. ninglangensis* sp. n. apparently are able to coexist in the same man-made environment, i.e. in fishponds.

Barnard and Dai (1988) redescribed *G. lacustris* Sars, 1863 based on material from Lijiang (26.8°N, 100.2°E), Yunnan Province, not far from the type locality of *G. ninglangensis* sp. n.. These two species are similar in the shape of gnathopods 1 and 2, the armature of pereopods 3-7, and the length ratio between inner ramus and article 1 of outer ramus. However, *G. lacustris* has acute posterodistal angles of epimeral plates 2 and 3 (slightly pointed in *G. ninglangensis*), and the distinct presence of a 2-articulated outer ramus of uropod 3.

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Le blaireau (*Meles meles* L.) dans le Jura suisse: succès de capture, paramètres démographiques et ectoparasites

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The badger (*Meles meles* L.) in the Swiss Jura: trapping success, demographic parameters and ectoparasites. - We studied two badger (*Meles meles* L.) populations in western Switzerland between 1993 and 1996. Trapping success was low and probably related to population densities. Metal cages proved to be efficient in trapping cubs, whereas only snares were adapted to catch adult badgers. As in other areas, badger weight was higher in males than in females, and showed an autumnal peak. Almost 70% of the animals were infested with ticks (*Ixodes* spp.), but loads were generally low. Studied populations consisted of 34% cubs and 66% adults/subadults. The observed sex ratio was slightly but non significantly biased towards females. Road-traffic was the main mortality factor in adults.

Key-words: Badger - *Meles meles* - trapping success - body weight - ectoparasites - age structure - sex ratio - road mortality.

INTRODUCTION

Le blaireau (*Meles meles* L. 1758, Carnivora: Mustelidae) est répandu dans une grande partie de la région paléarctique (Griffiths & Thomas, 1993). Sa vaste distribution géographique et sa capacité à s'accommoder à toute une série de situations environnementales différentes ont amené de nombreux auteurs à s'intéresser à lui. Ainsi, durant les trente dernières années, plusieurs études ont été consacrées à sa physiologie, à son écologie comportementale, à sa dynamique des populations et à ses pathologies (revue *in* Vink, 2001).

S'il est vrai qu'il existe actuellement une littérature extrêmement abondante sur cette espèce, il n'en demeure pas moins que la plupart de ces publications concerne les populations britanniques présentant de surcroît des densités très élevées. En Suisse, le blaireau n'a fait l'objet que de quelques recherches. On citera les travaux de Lüps sur la morphométrie (Lüps, 1983, 1984) et sur les variations apparaissant au niveau de la dentition (Lüps, 1986, 1990), ainsi que les recherches de Graf et Wandeler sur le cycle sexuel des animaux et sur la structure d'âge des populations (Graf & Wandeler, 1982a, 1982b; Wandeler & Graf, 1982). Des études sur le régime alimentaire et/ou sur la

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typologie et la distribution des terriers ont été effectuées aussi bien sur le Plateau (Lüps *et al.*, 1987; Roper & Lüps, 1995; Good *et al.*, 2001) que dans le Jura (Weber & Aubry, 1994). Il n'existe d'autre part qu'un seul travail de recherche abordant d'une manière globale l'écologie d'une population de blaireaux (Graf, 1988; Graf *et al.*, 1996). Une autre étude de ce genre est en train de s'achever dans la Broye vaudoise et fribourgeoise (Do Linh San, 2002a, 2002b).

Le présent article traite des caractéristiques démographiques de deux populations de faible densité étudiées entre 1993 et 1996 dans le cadre d'un travail de thèse portant sur l'éco-éthologie du blaireau dans le Jura suisse (Ferrari, 1997). Nous détaillons également les techniques de piégeage utilisées et discutons du succès de capture obtenu, deux points très rarement abordés dans la littérature et pourtant déterminants dans des études axées sur le suivi télémétrique des blaireaux ou sur la technique dite de «capture-marquage-recapture».

TERRAINS D'ÉTUDE

La majorité des données a été récoltée dans le canton de Neuchâtel, dans la région de Saint-Blaise, de Cressier et du canal de la Thielle (abrégé ci-dessous BCT; 47°02' N, 7°00' E). La zone d'étude (26 km^2) s'étend de 430 m à 1180 m d'altitude. Elle est dominée par la forêt (hêtraies, chênaies; 46%) et par les terres exploitées à des fins agricoles (blé, maïs; 40%). Les constructions humaines (agglomérations, routes, complexes industriels), trois carrières et un terrain de golf complètent la structure paysagère de l'aire d'étude (14% au total).

Des données supplémentaires ont également été prelévées dans une zone de 30 km^2 située à 15 km à l'est de la ville de La Chaux-de-Fonds, dans la région de La Chaux d'Abel (47°09' N, 6°56' E; canton de Berne). Les altitudes sont comprises entre 900 et 1288 m. Le paysage au relief vallonné se compose d'une mosaïque de prés/pâturages (51.5%), de pâturages boisés (25%) et d'îlots forestiers de taille variable dominés par l'épicéa *Picea abies* (20%). Les constructions humaines (routes, fermes, villages) ne constituent que 3% de la surface totale et les champs cultivés (céréales) sont quasiment absents (0.5%).

MATÉRIEL ET MÉTHODES

PIÉGEAGES

Nous avons utilisé plusieurs techniques de piégeage. Deux types de pièges, les cages en grillage métallique et les collets à arrêtoir, ont été employés tout au long de l'étude vu les résultats positifs dont ils ont fait preuve. D'autres types de trappes, tels que les pièges à palette (Victor Fox Soft Catch, Woodstream Co, Lititz PA, USA), ont fait l'objet d'essais temporaires et ont rapidement été abandonnés du fait de leur inefficacité.

Les cages ont été posées près des terriers et des latrines, ou le long des pistes régulièrement empruntées par les blaireaux (Pigozzi, 1988). Nous les avons camouflées avec des branches et des feuilles ou cachées dans les buissons. Le fond était recouvert de terre, feuilles ou autres matériaux trouvés dans les alentours. Nous avons veillé à déplacer le moins possible les cages ainsi posées dans le terrain. Chaque session de piégeage commençait par une semaine de pré-appâtage, durant laquelle la porte des cages était ouverte et bloquée. Les pièges étaient contrôlés chaque jour et l'appât renouvelé si nécessaire. Différents types d'appâts ont fait l'objet d'essais tout au long de l'étude. En plus des cacahuètes (Harris & Cresswell, 1987), nous avons essayé un mélange de mélasse et cacahuètes, des têtes de poulet, des restes de poisson, des fruits ou encore du maïs. Lors des sessions de piégeage *sensu stricto*, les cages restaient ouvertes et amorcées pendant une semaine et étaient contrôlées tous les matins de très bonne heure.

Les collets ont été posés sur les pistes régulièrement utilisées par les blaireaux (Cheeseman & Mallinson, 1980), à 20-50 m des terriers ou à proximité des latrines. Nous avons évité les sites habituellement fréquentés par des chiens ou des promeneurs, et les endroits où un éventuel animal capturé aurait pu se blesser (pentes raides, clôtures en fil de fer barbelé). Les sessions de piégeage se sont déroulées en moyenne sur 5 jours consécutifs, les collets étant relevés très tôt le matin.

EXAMEN ET MANIPULATION DES ANIMAUX CAPTURÉS ET DES CADAVRES

Les blaireaux piégés ont été immobilisés pendant 15-20 minutes grâce à une injection intramusculaire d'hydrochloride de kétamine (Kétalar, Parke-Davis, Warner-Lambert AG, Baar, Suisse; Beck, 1976). Les adultes ont été pesés au degré de précision de ±0.5 kg et les blaireautins de ±0.1 kg. Nous avons estimé l'âge des animaux par examen de l'usure des dents (Hancox, 1988) et n'avons retenu que les trois classes d'âge proposées par Harris & Cresswell (1987), soit jeunes (0+), subadultes (1+) et adultes (> 2 ans). Les ectoparasites (tiques, mallophages) ont été récoltés et conservés dans des tubes en verre.

Les blaireaux trouvés morts dans les deux terrains d'étude et dans leurs alentours ont fait l'objet de la même série d'examens que les animaux capturés.

ANALYSE DES DONNÉES

La plupart de nos données a été traitée de manière saisonnière. L'année a été subdivisée en saisons météorologiques: hiver (décembre, janvier, février), printemps (mars, avril, mai), été (juin, juillet, août) et automne (septembre, octobre, novembre).

Pour le traitement statistique des données, nous avons utilisé le U de Mann-Whitney pour comparer deux échantillons non-appariés. Le test de Kruskal-Wallis a quant à lui été appliqué pour la comparaison de plusieurs échantillons indépendants. Finalement, le test du chi carré et le chi carré d'ajustement ont été employés pour tester respectivement l'indépendance de deux ou plusieurs distributions observées, et l'indépendance d'une distribution observée par rapport à une distribution théorique.

RÉSULTATS

PIÉGEAGES

De mars 1993 à juin 1996, près de 840 nuits de piégeage (approximativement 7600 unités-pièges) ont été réalisées dans nos deux zones d'études. Celles-ci ont permis 29 captures et recaptures de blaireaux dans le terrain de BCT (124 unités-pièges/prise en moyenne), contre 4 captures dans la région de La Chaux d'Abel (1000 unités-pièges/prise en moyenne). Les captures concernent 14 individus adultes/subadultes et 10 blaireautins, tandis que les recaptures se réfèrent essentiellement aux jeunes individus (Tabl. 1). En effet, si un seul blaireau adulte (M5) a été recapturé tout au long de la présente étude, les reprises de jeunes animaux sont relativement nombreuses.

Le nombre de captures varie significativement en fonction des saisons (χ^2 d'ajustement à une distribution uniforme, d.l.=3, $\chi^2=36.7$, $p<0.001$), le printemps étant de loin la période de l'année la plus favorable à ce genre d'exercice (70% des captures, n=23). Il faut toutefois préciser que, pour des raisons légales, nous avons dû renoncer à tout piégeage durant la saison d'ouverture officielle de la chasse (automne) et que nous avons volontairement évité de piéger lors des périodes de grand froid.

TABLEAU 1. Liste des blaireaux capturés ou recapturés dans les deux terrains d'étude entre 1993 et 1996. P=printemps, E=été, A=automne, H=hiver, m=mâle, f=femelle, j=jeune, s=subadulte, a=adulte, C=capture, RC=recapture, BCT=St.-Blaise-Cressier-Thielle, CA=La Chaux d'Abel.

Date	Saison	Individu	Sexe	Âge	Poids [kg]	Capture/Recapture	Piège	Terrain d'étude
09/07/93	E	-	m	a	11.5	C	Collet	CA
12/08/93	E	M1	m	a	12.0	C	Collet	CA
29/04/94	P	F1	f	j	2.3	C	Cage	BCT
05/05/94	P	M2	m	j	2.8	C	Cage	BCT
10/05/94	P	M2	m	j	-	RC	Cage	BCT
11/05/94	P	M3	m	j	3.0	C	Cage	BCT
11/05/94	P	F1	f	j	-	RC	Cage	BCT
12/05/94	P	M4	m	a	11.0	C	Collet	BCT
25/05/94	P	M2	m	j	-	RC	Cage	BCT
25/05/94	P	M3	m	j	-	RC	Cage	BCT
26/05/94	P	M3	m	j	-	RC	Cage	BCT
27/05/94	P	M2	m	j	3.1	RC	Cage	BCT
14/06/94	E	M2	m	j	3.5	RC	Cage	BCT
16/09/94	A	M5	m	a	15.0	C	Collet	BCT
20/09/94	A	M6	m	j	9.5	C	Collet	BCT
08/02/95	H	M2	m	s	14.0	RC	Collet	BCT
18/03/95	P	M7	m	a	12.0	C	Collet	BCT
18/03/95	P	M8	m	a	14.0	C	Collet	BCT
18/03/95	P	F2	f	s	12.0	C	Collet	BCT
18/03/95	P	F3	f	a	12.0	C	Collet	BCT
18/05/95	P	M9	m	j	2.5	C	Cage	BCT
18/05/95	P	F4	f	j	2.5	C	Cage	BCT
18/05/95	P	F5	f	j	2.5	C	Cage	BCT
30/05/95	P	F6	f	a	11.0	C	Collet	BCT
05/07/95	E	M10	m	a	10.0	C	Collet	BCT
15/08/95	E	M11	m	j	8.0	C	Collet	CA
13/09/95	A	M5	m	a	14.0	RC	Collet	BCT
01/03/96	P	F7	f	a	11.0	C	Collet	BCT
06/03/96	P	F8	f	a	11.0	C	Collet	BCT
16/04/96	P	F9	f	a	8.0	C	Collet	CA
08/05/96	P	F10	f	a	11	C	Cage	BCT
28/05/96	P	F11	f	j	2.5	C	Cage	BCT
18/06/96	E	F12	f	j	3.0	C	Cage	BCT

EFFICACITÉ DES PIÈGES

Les cages en grillage métallique se sont avérées particulièrement efficaces dans le cas des jeunes blaireaux. Posées généralement sur les terriers, à quelques mètres des entrées les plus utilisées, ces trappes ont permis de capturer la totalité des blaireautins marqués à BCT.

Les cages grillagées se sont au contraire révélées inutiles dans le cas de blaireaux subadultes et adultes. L'ensemble de ceux-ci a été pris dans des collets à arrêtoir. La seule exception est la femelle F10, capturée dans une cage à sangliers installée par le Service de la Faune du canton de Neuchâtel.

CADAVRES

Au total, 14 cadavres de blaireaux, provenant du terrain d'étude de BCT (n=6), de celui de La Chaux d'Abel (n=3) ou d'autres régions avoisinantes (littoral neuchâtelois, La Chaux-de-Fonds; n=5), ont été collectés ou reçus tout au long de notre recherche. Il s'agit de 5 mâles adultes, de 6 femelles adultes/subadultes et de 3 jeunes femelles (Tabl. 2). Dans la plupart des cas (79%, n=11), la cause de la mort est le trafic automobile. Un des jeunes animaux, malade et blessé, a été tiré par un agent de police, tandis qu'un blaireautin femelle trouvé en février 1995 à La Chaux d'Abel a probablement été tué par un autre animal (cadavre décapité). Le dernier blaireau - une femelle adulte retrouvée devant un terrier - est vraisemblablement mort de maladie. L'autopsie a en effet montré qu'il ne se nourrissait pas depuis plusieurs jours.

POIDS CORPOREL

L'étude du poids corporel et de ses variations au cours de l'année a été réalisée en regroupant les collectifs des captures et des cadavres (N=35). Deux femelles qui étaient anormalement maigres au moment de leur mort (4.0 et 5.5 kg respectivement), de même qu'une jeune femelle âgée d'approximativement 10 jours (0.2 kg) n'ont pas été inclus dans cette analyse. Les différents blaireaux examinés ont été subdivisés en deux catégories, en fonction de leur âge. Il s'agit des individus adultes/subadultes (n=24) et des jeunes animaux (n=11).

Adultes/subadultes

Le poids moyen des animaux, calculé sur l'ensemble de l'année, s'élève à 12.0 ± 2.1 kg (n=24). Les mâles (12.4 ± 1.6 kg, n=12) se sont avérés plus lourds que les femelles (11.6 ± 2.6 kg, n=12), mais les différences observées ne sont pas significatives (U de Mann-Whitney, N1=12, N2=12, U=57.5, $p>0.05$).

Le poids corporel varie de manière significative au fil des saisons (Kruskal-Wallis, d.l.=3, H=11.11, $p<0.05$, Fig. 1). Il est maximal en automne (14.3 ± 1.2 kg) et décroît durant l'hiver pour atteindre sa valeur minimale au printemps (11.0 ± 2.0 kg). Il est toutefois important de préciser que nous ne disposons que de deux observations relatives à la saison hivernale.

Les blaireaux subadultes/adultes de BCT sont en moyenne plus lourds (12.2 ± 1.7 kg, n=19) que leurs congénères de La Chaux d'Abel (10.3 ± 2.6 kg, n=5). Ces variations ne sont pas significatives à l'échelle annuelle (U de Mann-Whitney, N1=19,

TABLEAU 2. Liste des cadavres de blaireaux récoltés dans les deux terrains d'étude ou dans les régions avoisinantes entre 1993 et 1996. P=printemps, E=été, A=automne, H=hiver, m=mâle, f=femelle, j=jeune, s=subadulte, a=adulte, *I.h.*=*Ixodes hexagonus*, *I.c.*=*Ixodes canisuga*, *I.r.*=*Ixodes ricinus*, mall.=mallophages.

Date	Saison	Lieu	Sexe	Âge	Poids [kg]	Ectoparasites	Cause du décès
13/04/94	P	La Chaux-de-Fonds	f	s	5.5	Pas contrôlé	Trafic automobile
20/09/94	A	Cornaux	m	a	13.0	Aucun	Trafic automobile
03/10/94	A	Golf de Voëns	f	a	15.0	*I.h.*, *I.c.*, *I.r.*, mall.	Trafic automobile
19/10/94	A	Lignières	f	a	16.0	Aucun	Trafic automobile
28/02/95	H	Terrier de la Puce	f	j	0.2	Pas contrôlé	Infanticide (?)
25/05/95	P	Usine Juracime	m	a	13.0	*I.r.*, mall.	Trafic automobile
29/08/95	E	Château Jeanjaquet	f	j	10.0	Aucun	Trafic automobile
23/02/96	H	Areuse	m	a	11.0	*I.h.*, mall.	Trafic automobile
16/04/96	P	Gorgier	f	a	12.0	*I.h*, *I.r.*, mall.	Trafic automobile
17/04/96	P	Chaumont	m	a	10.0	*I.h.*, mall.	Trafic automobile
25/04/96	P	Combe à la Biche	f	a	7.0	Pas contrôlé	Inconnue
04/06/96	E	Autoroute (Cornaux)	m	a	12.0	*I.h.*	Trafic automobile
06/09/96	A	Le Landeron	f	j	4.0	*I.h.*, mall.	Tirée (blessée et malade)
01/10/96	A	Renan	f	a	13.0	Pas contrôlé	Trafic automobile (F9)

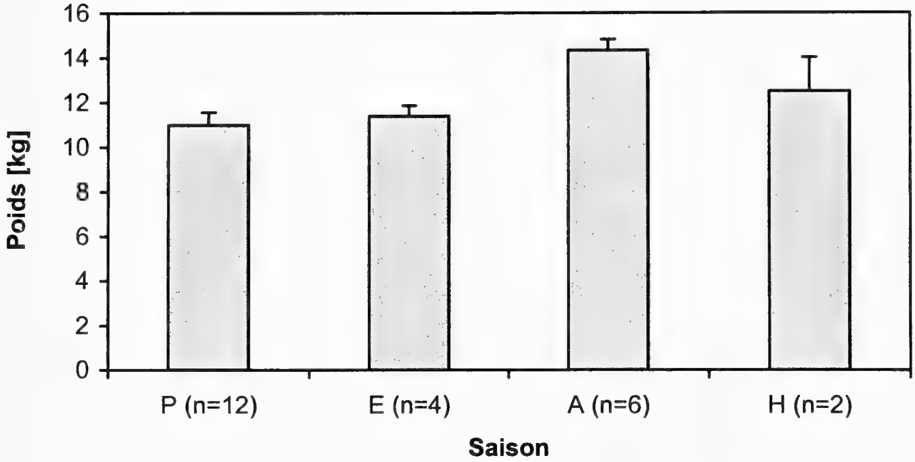

FIG. 1

Evolution saisonnière du poids corporel moyen chez les blaireaux dans le Jura suisse. P=printemps, E=été, A=automne, H=hiver, n=nombre de cas saisonniers.

N2=5, U=28, p>0.05), tandis qu'une différence statistique a été trouvée durant le printemps (U de Mann-Whitney, N1=10, N2=2, U=0, p<0.05). La faiblesse de nos échantillons empêche toute comparaison régionale dans le cas des autres saisons.

Jeunes

En avril-mai, lors des premières émergences, les blaireautins âgés de 8-10 semaines pèsent en moyenne 2.6 ± 0.2 kg (n=8). Leur poids augmente ensuite rapidement durant l'été et se situe en moyenne autour des 9 kg en août-septembre (9.2 ± 1.0 kg, n=3). Nos données ne permettent malheureusement aucune comparaison intersexuelle fiable.

ECTOPARASITES

Vingt-deux blaireaux, tous provenant de BCT et d'autres régions du littoral neuchâtelois, ont été contrôlés pour d'éventuels ectoparasites au cours de notre recherche, ce qui nous a permis de récolter 130 tiques. *Ixodes hexagonus* (n=118, 90.8% du total) est de loin l'espèce la plus fréquente, tandis que *I. canisuga* (n=6) et *I. ricinus* (n=6) sont nettement plus rares. La plupart de ces tiques sont des nymphes (n=95, 73.1%) et des femelles adultes (n=34), un seul mâle adulte (*I. hexagonus*) ayant été récolté sur les blaireaux examinés.

Les taux d'infestation observés sur l'ensemble de l'année (68.2%, n=15) et au niveau saisonnier (printemps: 66.7%, été: 66.7%, automne: 66.7%) sont considérablement élevés. Aucune valeur n'a pu être calculée pour la saison hivernale en raison de la petitesse de notre échantillon (n=1).

Les charges parasitaires sont généralement faibles, de l'ordre de 2 à 5 tiques par blaireau. Bien que la plupart des infestations soient le fait d'une seule espèce (n=12), quelques cas d'infestations mixtes ont également été relevés (n=3), impliquant 2, voire 3 espèces de tiques.

Signalons en plus la présence de 9 cas d'infestations par *Trichodectes melis* (Mallophages), ce qui représente un taux d'infestation de 40.9%.

STRUCTURE D'ÂGE ET SEX RATIO

Le tableau 3 présente les proportions relatives de jeunes (0+), de subadultes (1+) et d'adultes (> 2 ans) au sein des différents collectifs étudiés (captures et cadavres). Les blaireautins constituent approximativement la moitié du nombre total d'animaux capturés (42%), leur proportion étant au contraire nettement plus faible parmi les cadavres (21%). Les variations observées dans ces deux catégories ne sont toutefois pas significatives (χ^2, d.l.=2, p>0.05).

TABLEAU 3. Proportions relatives des différentes classes d'âge observées dans les deux populations de blaireaux étudiées; n=nombre de blaireaux examinés.

Collectif	n	Jeunes [%]	Subadultes [%]	Adultes [%]
Captures	24	42	8	50
Cadavres	14	22	7	71
Total	**38**	**34**	**8**	**58**

Dans tous les échantillons pris en considération (en fonction du collectif d'origine ou de l'âge des animaux), la proportion de femelles est supérieure à celle de mâles (Tabl. 4). Précisons toutefois qu'aucune des différences observées n'est significative (χ^2 d'ajustement à une distribution théorique, d.l.=1, p>0.05) et que, par conséquent, la sex ratio ne s'éloigne pas d'une valeur théorique de 1:1 dans chacun des cas étudiés.

TABLEAU 4. Distribution des mâles et des femelles de blaireaux en fonction des collectifs d'origine et des classes d'âge. Les données se réfèrent aux animaux capturés et aux cadavres récoltés dans le Jura suisse entre 1993 et 1996; Pf=proportion des femelles.

Collectif	Mâles	Femelles	Total	Pf	Sex ratio
Captures	11	13	24	0.54	1 : 1.2
Cadavres	5	9	14	0.64	1 : 1.8
Total	**16**	**22**	**38**	**0.58**	**1 : 1.4**
Jeunes	5	8	13	0.62	1 : 1.6
Adultes/subadultes	11	14	25	0.56	1 : 1.3

DISCUSSION

PIÉGEAGES

Comme l'évoquaient Pigozzi (1988), Cheeseman *et al.* (1993) et Rodriguez *et al.* (1996), le succès de capture dépend dans une large mesure de la densité de population. Cheeseman *et al.* (1988), par exemple, qui ont étudié pendant 9 ans une population à très haute densité dans le Gloucestershire (sud-ouest de l'Angleterre, 26.3 ind/km^2), signalent plus de 930 captures/recaptures de blaireaux. A l'inverse Rodriguez *et al.* (1996) n'ont pu capturer que 6 individus pendant 3 ans de piégeages intensifs à Doñana (Espagne), cette région présentant une densité de population parmi les plus faibles d'Europe (0.4 ind/km^2).

Les résultats obtenus au cours de notre recherche s'insèrent parfaitement dans ce schéma général. Le nombre d'animaux capturés à BCT (n=29; densité de population: 3 ind./km^2, Ferrari, 1997) correspond à ceux relevés dans d'autres régions à densité de population moyenne ou faible à moyenne (Kruuk, 1978: 23 captures en 3 ans; Cresswell & Harris, 1988: 69 captures en 6 ans; Shepherdson *et al.*, 1990: 25 captures en 3 ans; O'Corry-Crowe *et al.*, 1993: 35 captures en 2 ans; Seiler *et al.*, 1995: 21 captures en 2 ans; Do Linh San, 2002b: 16 captures en 3 ans). De même, le petit nombre de blaireaux piégés à La Chaux d'Abel (n=4; densité de population: 0.9 ind./km^2, Ferrari, 1997) coïncide remarquablement avec les résultats obtenus par Rodriguez *et al.* (1996).

EFFICACITÉ DES PIÈGES

De nombreux auteurs ont souligné l'efficacité des cages en grillage métallique pour la capture des blaireaux. En Ecosse, Parish & Kruuk (1982) annoncent un bilan de 5 unités-pièges par capture, cette valeur étant seulement légèrement plus élevée (7 unités-pièges par capture) dans le comté de Cork, en Irlande (Sleeman & Mulcahy, 1993). Da Silva *et al.* (1994) en vont même jusqu'à affirmer que l'utilisation massive de ces cages permet de marquer la totalité des individus d'une population en 2 ans, même en présence de très hautes densités de blaireaux. Il est en outre important de souligner le fait que les cages grillagées ont donné des résultats positifs tant avec les jeunes que dans le cas des blaireaux adultes (Kruuk, 1978; Cheeseman *et al.*, 1987; Pigozzi, 1988).

Nos résultats indiquent clairement que les cages ne sont pas toujours le meilleur outil pour capturer des blaireaux. Ce type de piège n'a donné des résultats satisfaisants que dans le cas des tout jeunes blaireautins, plus enclins au jeu et moins expérimentés que les animaux âgés. Il est intéressant de relever que d'autres auteurs suisses ont également constaté l'inefficacité des cages pour la capture des adultes (Graf, 1988; Do Linh San, 2002b; K. Hindenlang, comm. pers.). Plusieurs raisons peuvent être évoquées pour expliquer ce phénomène, mais une certaine méfiance face à tout nouvel objet rencontré dans un environnement familier (néophobie) semble être le facteur principal. Dans le terrain d'étude de La Chaux d'Abel une telle méfiance à l'égard des pièges a été relevée également chez d'autres carnivores comme la martre *Martes martes* (Marchesi, 1989), la fouine *Martes foina* (Lachat Feller, 1993) et le renard *Vulpes vulpes* (Meia, 1994).

Tous les blaireaux adultes/subadultes capturés au cours de notre étude l'ont été grâce aux collets à arrêtoir. L'utilisation de ces pièges nécessite la présence de coulées étroites (15-20 cm) et bordées d'une végétation abondante, ainsi que de sols fermes permettant l'amarrage des collets (Cheeseman & Mallinson, 1980). Si ces conditions étaient souvent remplies dans les forêts caducifoliées du terrain d'étude de plaine, le contraire vaut dans le cas des pessières de La Chaux d'Abel, caractérisées par des sols relativement meubles et par un sous-bois presque inexistant. Les difficultés pratiques liées à l'utilisation des collets, couplées à la faible densité de blaireaux, sont à notre avis les causes principales du faible succès de piégeage obtenu dans le terrain d'étude de montagne.

CAUSES DE MORTALITÉ

Les causes de mortalité varient en fonction de l'âge des blaireaux. Les jeunes meurent principalement à cause de facteurs naturels (Neal & Cheeseman, 1996; Do Linh San, 2002c), alors que la plupart des décès chez les adultes dépend de facteurs d'origine humaine. Ainsi, le trafic automobile constitue la principale cause de mortalité des blaireaux dans de nombreux pays d'Europe (Lankester *et al.*, 1991; van der Zee *et al.*, 1992; Griffiths, 1993; Sleeman & Mulcahy, 1993; Wiertz, 1993). Au Danemark, par exemple, plus de 3'600 blaireaux (10-15% de la population) meurent chaque année à cause de voitures (Aaris-Sørensen, 1995), tandis que Neal & Cheeseman (1996) estiment à 37'500 le nombre annuel de blaireaux tués sur les routes de Grande-Bretagne. Le trafic ferroviaire est également responsable de nombreux décès (Neal, 1986; Graf, 1995).

Les résultats obtenus dans le cadre de notre recherche ne diffèrent pas significativement par rapport à ce qui a été montré ailleurs en Europe. Tant à La Chaux d'Abel que dans le terrain d'étude de plaine, le trafic automobile semble être la principale cause de mortalité. La disparité dans le nombre de cadavres collectés sur le littoral neuchâtelois et dans les hautes terres jurassiennes dépend, selon toute vraisemblance, de la différence entre les densités de population observées.

POIDS CORPOREL

Les poids corporels relevés dans le cadre de notre étude correspondent tout à fait avec les valeurs observées dans d'autres contrées d'Europe centrale, comme l'Allemagne (Stubbe, 1980: 12 kg), la France (Henry, 1984: 11 kg) et le Plateau suisse (Lüps, 1984: 11.7 kg). De plus, conformément à ce qui a été montré par de nombreux auteurs (revues *in* Erlinge, 1986; Henry *et al.*, 1988; Lüps & Wandeler, 1993), les mâles sont plus lourds que les femelles. Le poids des blaireaux subit également d'importantes variations saisonnières. Il est maximal en automne et décroît progressivement durant l'hiver pour atteindre sa valeur minimale au printemps. De telles fluctuations saisonnières ont été constatées dans d'autres études (Kruuk & Parish, 1983; Lüps, 1984; Neal & Cheeseman, 1991 *inter alies*).

Dans notre recherche, le poids corporel des blaireaux ne montre pas de variations régionales au niveau annuel. Toutefois, les animaux de La Chaux d'Abel sont significativement plus légers que leurs congénères de plaine durant le printemps.

Ceci dépend, selon toute vraisemblance, des différences climatiques observées entre les deux terrains d'étude. Selon Neal & Cheeseman (1996) en effet, la perte de poids durant la première partie de l'année varie en fonction de la rigueur de l'hiver. Dans les régions caractérisées par des hivers longs et froids (comme le terrain de La Chaux d'Abel) les blaireaux ne se nourrissent pratiquement pas durant cette saison et dépendent dans une très large mesure des réserves adipeuses accumulées durant l'automne. Par conséquent, les animaux vivant sous de telles conditions climatiques sont très amaigris au printemps.

Comme c'est le cas pour d'autres espèces de carnivores qui sont inactives durant la gestation (Ours noir *Ursus americanus*, Blaireau américain *Taxidea taxus*), les nouveau-nés des blaireaux sont très petits à la naissance (Gittleman & Oftedal, 1987; Woodroffe & Macdonald, 1995). En Grande-Bretagne, leur poids varie de 75 à 132 g en fonction du nombre d'individus composant la portée (Neal & Cheeseman, 1996). Le poids des blaireautins augmente ensuite rapidement et ceux-ci pèsent généralement entre 2 et 3 kg lors des premières émergences aux mois d'avril et de mai. Sur le Plateau suisse, Lüps (1983) signale un poids moyen de 2.3 kg, cette valeur correspondant parfaitement à celle que nous avons relevée (2.6 ± 0.2 kg). De même, le poids moyen observé dans le Jura suisse en août-septembre (9.2 ± 1.0 kg) coïncide avec les valeurs relevées par Cheeseman *et al.* (1993) dans le Gloucestershire (8.2 kg) et par Lüps (1983) dans le canton de Berne (9 kg).

ECTOPARASITES

Sur l'ensemble de leur aire de répartition, les blaireaux sont infestés par un vaste spectre de parasites externes (Thompson, 1961; Aubert & Beaucournu, 1976; Stubbe, 1989). En Europe occidentale les principaux d'entre eux sont *Trichodectes melis* (Mallophages), *Paraceras melis* (Siphonaptères), et les tiques du genre *Ixodes* spp. (Hancox, 1980; Butler & Roper, 1996). Les taux d'infestation sont généralement élevés (Neal & Cheeseman, 1996). Dans la région d'Oxford, par exemple, 80% des blaireaux sont infestés par des mallophages et 40% le sont par des tiques (Hancox, 1980). La situation relevée à BCT et sur le littoral neuchâtelois ne diffère pas de manière substantielle par rapport à celle observée dans d'autres pays d'Europe. Dans notre terrain d'étude aussi, les taux d'infestation sont très importants. Il est toutefois intéressant de relever que, contrairement à ce qui a été montré par Hancox (1980), les tiques semblent être les parasites les plus fréquents.

Comme l'ont fait remarquer plusieurs auteurs (revue *in* Neal & Cheeseman, 1996), *Ixodes hexagonus*, *I. canisuga* et *I. ricinus* sont les espèces de tiques qui parasitent le plus souvent les blaireaux. Dans la plupart des cas, les infestations sont le fait d'individus immatures (larves et nymphes) et de femelles adultes, les mâles adultes étant généralement rares ou absents (Hancox, 1980). Nos résultats correspondent tout à fait avec ce qui a été montré par ces auteurs. Toutes les tiques collectées appartiennent aux 3 espèces mentionnées plus haut. En outre, des 130 individus récoltés, un seul était un mâle adulte. *Ixodes hexagonus* est de loin l'espèce la plus fréquente chez nos animaux (91% du total), tandis que *I. canisuga* et *I. ricinus* sont relativement rares. Le comportement et l'écologie des blaireaux, au regard de l'habitat usuel de ces tiques, expliquent dans une large mesure ces différences. *I. hexagonus*, espèce endophile, vit en effet de préférence à l'intérieur des terriers et des galeries d'autres animaux (Marchesi, 1989; Lachat Feller, 1993), tandis que *I. ricinus*, exophile, vit plutôt en surface. La faible incidence de l'autre espèce endophile, *I. canisuga*, est par contre plus difficile à expliquer. Il se pourrait, toutefois, que les blaireaux ne soient pas des hôtes idéaux pour cette tique, comme c'est le cas pour d'autres mustélidés comme la fouine et la martre (Gilot & Aubert, 1985). Le faible nombre d'infestations mixtes observées à BCT s'accorde bien avec les observations de Toutoungi *et al.* (1991), selon qui ce type d'infestation est rare chez les mustélidés.

De manière générale, les charges parasitaires sont faibles (Hancox, 1980; Neal, 1986). Dans le Sussex, Butler & Roper (1996) estiment à 3.6 le nombre moyen de tiques par blaireau, cette valeur étant très proche de celle relevée dans notre terrain d'étude (2 à 5 tiques/individu). Dans certains cas, cependant, des animaux affaiblis par des maladies ou des blessures peuvent être infestés par un grand nombre de parasites externes (Neal & Cheeseman, 1996). Ce phénomène a été observé à BCT aussi. Deux des blaireaux examinés présentaient en effet un nombre de tiques extrêmement élevé (respectivement 35 et 38 tiques).

STRUCTURE D'ÂGE

Il existe passablement de données sur la structure d'âge des populations de blaireaux. Stubbe (1989), par exemple, signale une proportion de 34% de jeunes en Allemagne, cette valeur s'élevant à 26% en Suède et à 28.5% en Angleterre. Graf & Wandeler (1982a), quant à eux, trouvent 139 blaireautins (20%) dans un échantillon de 702 cadavres provenant de Suisse.

Dans notre étude, la proportion de jeunes varie en fonction des collectifs étudiés. Les blaireautins constituent ainsi 21% des cadavres examinés, tandis qu'ils représentent 42% des individus capturés. Selon Henry *et al.* (1988), les individus adultes et subadultes sont généralement plus affectés par la mortalité routière que les jeunes animaux. A l'inverse, comme nous l'avons vu plus haut, les blaireautins sont globalement plus faciles à capturer que les animaux âgés. Compte tenu de ces considérations, la structure d'âge déterminée en regroupant les deux collectifs (animaux piégés et cadavres) semble être celle qui caractérise au mieux les populations jurasiennes. La proportion de jeunes observée dans ces conditions (34%) s'accorde bien avec la valeur moyenne de 25 à 35% calculée pour l'ensemble du continent européen (Anderson & Trewhella, 1985).

SEX RATIO

Chez les blaireaux, la proportion de mâles et de femelles est généralement équivalente, aussi bien à la naissance (Harris & Cresswell, 1987; Page *et al.*, 1994) que chez les animaux adultes (Kruuk & Parish, 1987; Stubbe, 1989; Macdonald & Newman, 2002). Toutefois, dans les populations denses et fortement territoriales, les femelles adultes sont souvent surnuméraires par rapport aux mâles de même âge (Pritchard *et al.*, 1986; Evans *et al.*, 1989; Sleeman & Mulcahy, 1993; Rogers *et al.*, 1997). Ce déséquilibre s'explique par le fait que les mâles, plus impliqués que les femelles dans la défense des territoires sociaux (Cheeseman *et al.*, 1988; Brown *et al.*, 1992; Roper & Lüps, 1993; Roper *et al.*, 1993), sont soumis à une mortalité plus sévère. Plusieurs d'entre eux meurent à cause des blessures occasionnées par les agressions de congénères ou sont heurtés par des véhicules lors des déplacements visant à patrouiller les frontières territoriales (Skinner *et al.*, 1991; Cheeseman *et al.*, 1993).

La sex ratio déterminée dans le Jura suisse semble s'inscrire à mi-chemin entre ces deux situations extrêmes. En effet, bien que les résultats obtenus ne se démarquent pas significativement d'un rapport de 1:1, il semblerait que le nombre de femelles soit supérieur au nombre de mâles à la naissance (1.6 femelle pour 1 mâle), alors que cette différence tend à s'estomper à l'âge adulte (1.3 femelle pour 1 mâle). Il est toutefois important de souligner que la petitesse des échantillons liée aux aléas de l'échantillonnage nous empêche de généraliser le patron observé.

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REVUE SUISSE DE ZOOLOGIE 110 (3): 581-589; septembre 2003

Bryconamericus pyahu sp. n. (Characiformes, Characidae), a new species from the río Iguazú basin, in Argentina

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***Bryconamericus pyahu* sp. n. (Characiformes, Characidae), a new species from the río Iguazú basin, in Argentina.** - A new species of the genus *Bryconamericus* is described from río Iguazú basin in Misiones, Argentina. *Bryconamericus pyahu* sp. n. is distinguished from all other species by the following combination of characters: low body depth (28.0-34.5 in % of SL); premaxillary teeth of the inner series with 3 to 5 cusps; aligned 3 premaxillary teeth of the outer row tricuspidate, and 3-5 maxillary teeth with 1 to 3 cusps. Also, the new species has 18-20 branched anal-fin rays, large black subcircular humeral spot, wide black lateral band, and 37-39 perforated scales on the lateral line. The new species was collected in the arroyo Tateto, headwaters of the río San Antonio, Iguazú basin.

Key-words: Characiformes - Characidae - *Bryconamericus* - Argentina - Misiones - Iguazú basin.

INTRODUCTION

The genus *Bryconamericus* in Argentina includes 9 species reported from the basins of the ríos Paraguay, Paraná, Uruguay, and Río de la Plata; it is present also in endorrheic basins of central and western Argentina and Atlantic drainages in the south of Buenos Aires Province (Miquelarena & Aquino, 1995; Casciotta *et al*., 1999; Braga, 2000; Azpelicueta & Almirón, 2001; Casciotta *et al*., 2002). The río Iguazú basin is the only one in which the genus *Bryconamericus* was not known.

The río Iguazú, one tributary of the río Paraná, runs from the East to the West through 1,320 km. The last 115 km flow between Argentina and Brasil and have an amazing drop 78 m high with numerous falls, known as Cataratas del Iguazú (Severi & Cordeiro, 1994). These falls have been an effective fish-fauna barrier since its origin in the Oligocene-Miocene.

The aim of this paper is to describe a new species of *Bryconamericus* found in one stream, tributary of the río Iguazú.

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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). Vertebrae count includes those corresponding to the Weberian apparatus and also the complex centrum as one element.

The specimens examined belong to Asociación Ictiológica, La Plata, Argentina (AI); Fundación Miguel Lillo, Tucumán, Argentina (FML); Muséum d'histoire naturelle, Genève, Switzerland (MHNG); Facultad de Ciencias Naturales y Museo, La Plata, Argentina (MLP); Staatliches Museum für Tierkunde, Dresden, Germany (MTD F).

COMPARATIVE MATERIAL EXAMINED

Bryconamericus agna Azpelicueta & Almirón, 2001: FML 3700, holotype, 61.5 mm SL, Argentina, Misiones, arroyo Tabay, Paraná basin. MHNG 2611.46, 4 ex., 54.3-60.0 mm SL, collecting data as holotype. *Bryconamericus iheringii* (Boulenger, 1887): MLP 9073, 110 ex., 39.9-44.3 mm SL, Argentina, Buenos Aires, Sierra de la Ventana. MLP 9103, 15 ex., 34.8-49.2 mm SL, 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 mennii* Miquelarena *et al.*, 2002: AI 102, 3 ex., 43.0-55.9 mm SL, Argentina, Misiones, arroyo Cuñapirú. *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* Casciotta *et al.*, 2002: MLP 9568, holotype, 51.5 mm SL, Argentina, Misiones, Uruguay basin, arroyo Once Vueltas. *Hypobrycon poi* Almirón *et al.*, 2001: MLP 9573, 50.5 mm SL, Argentina, Misiones, Uruguay basin, arroyo Once Vueltas.

RESULTS

Bryconamericus pyahu sp. n. Figs 1-5, Table 1

Holotype. AI 101, 50.6 mm SL, Argentina, Misiones, arroyo Tateto (25° 47' 12.8" S - 53° 58' 12.9" W), Iguazú basin. Coll. J. Casciotta, A. Almirón & M. de las M. Azpelicueta, February 2002.

Paratypes. MHNG 2639.48, 10 ex., 45.5-52.3 mm SL, Argentina, Misiones, arroyo Tateto (25° 47' 12.8" S - 53° 58' 12.9" W), Iguazú basin. Coll. A. Almirón, J. Casciotta & M. de las M. Azpelicueta, February 2002. MTD F 27048-27051, 4 ex., 47.0-50.9 mm SL, same data as type locality. Coll. J. Casciotta & A. Almirón, February 2001.

Diagnosis. *Bryconamericus pyahu* is distinguished from other species of the genus by the following combination of characters: low body (28.0-34.5 % of SL); premaxillary teeth of the inner series slender with 3 to 5 cusps; premaxillary teeth of the outer row 3, aligned, tricuspidate, and 3-5 maxillary teeth, conic to tricuspidate. Also, the new species has 18-20 branched anal-fin rays, males without hooks on fins; lateral series with 37-39 perforated scales, large black subcircular humeral spot, and wide black lateral band.

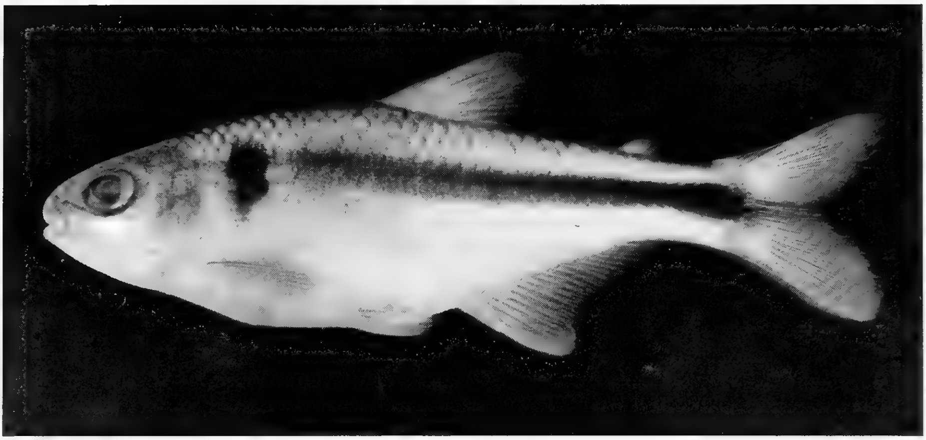

FIG. 1
Bryconamericus pyahu sp. n., holotype, AI 101, 50.6 mm SL.

Description. Morphometrics of holotype and 14 paratypes are presented in table 1. Body elongate and laterally compressed (Fig. 1). Greatest body depth approximately at dorsal-fin origin. Dorsal profile of body slightly convex from upper lip to dorsal-fin origin, almost straight and slanted ventrally from dorsal-fin base to caudal peduncle. Ventral profile of body sligthly convex from mouth to branchiostegal area, straight from this last point to anal-fin origin. Ventral profile straight from anal-fin origin to caudal peduncle. Dorsal and ventral profiles of caudal peduncle straight.

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. Usually, tip of pectoral fin not reaching pelvic-fin origin. Tip of pelvic fin in adults 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.

Anal fin with iii-iv,18-20 rays (3 ex.= 18, 7 ex.= 19, 5 ex.= 20), males without hooks on rays. Many specimens with last unbranched and first five branched rays forming an anterior lobe, independently from sex.

Pectoral fin with i,11-12 rays (5 ex.= 11, 10 ex.= 12), posterior pectoral-fin margin rounded.

Pelvic fin with i,7 rays, males without hooks on it.

Caudal fin with 1 unbranched and 9 branched principal rays on upper lobe; 1 unbranched and 8 branched principal rays on lower lobe. Lower caudal lobe scarcely longer and more rounded.

Dorsal profile of head straight, concave over supraoccipital spine. 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 short, lateral process long, wide, and laminar. Maxilla with 3-5 teeth, bearing 1-3 cusps (Fig. 2); in one specimen (C&S) maxilla with 6 teeth on one side. Premaxilla with as-

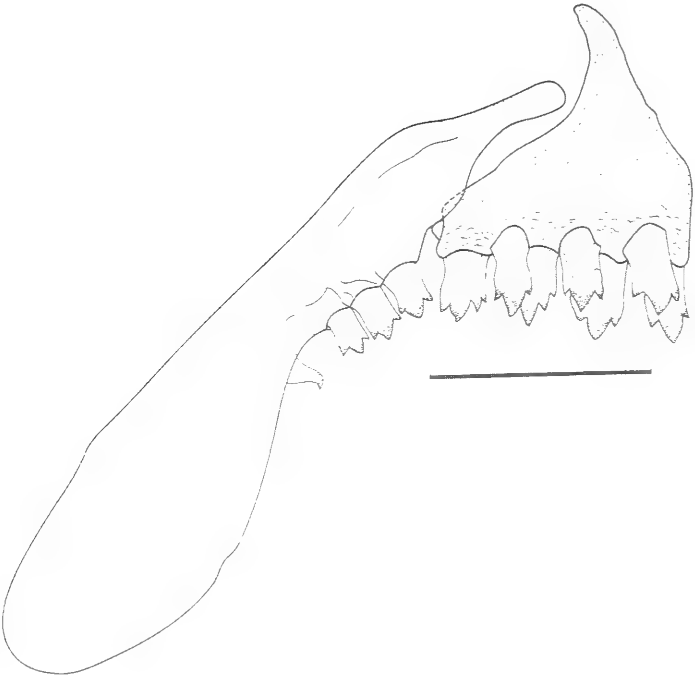

FIG. 2

Bryconamericus pyahu sp. n., external view of right maxilla and premaxilla. Scale bar = 1 mm.

cending process short, bearing 2 series of teeth, with stronger median cusp (Fig. 2). Outer series with 3 aligned teeth, all tricuspidate (1 ex. with 4 teeth). Inner series of premaxillary teeth consisting of 4 teeth (1 ex. with 5 teeth on both sides), with 3 to 5 cusps; symphysial tooth narrower. Dentary bearing 8-10 teeth decreasing in size anteroposteriorly, most of them tricuspidate, although last ones conic (Fig. 3).

Eye longer than snout. Postero-ventral edge of third infraorbital not in contact, but very closed, with sensory tube of preopercle.

Scales cycloid. Lateral series with 37-39 perforated scales (1 ex.= 37, 8 ex.= 38, 6 ex.= 39). Five scales between dorsal-fin origin and lateral line, 3.5-4 scales between lateral line and pelvic-fin origin. Fourteen scales around caudal peduncle. Eleven to fourteen scales forming a regular median series between supraoccipital process and dorsal-fin origin in most specimens. Seven to ten scales in one row, covering proximal portion of the anal-fin rays.

In four cleared and stained specimens, gill-rakers on first branchial arch 4-5 + 9. Caudal fin with 11-13 dorsal and 10-12 ventral procurrent rays. Vertebrae counts 37-38. Dorsal fin with 9 pterygiophores, placed between neural spines of vertebrae 11 or 12 and 18; anal fin with 20-21 pterygiophores, placed between hemal spines of vertebrae 17-18 and 28. Ten or 12 pairs of ribs.

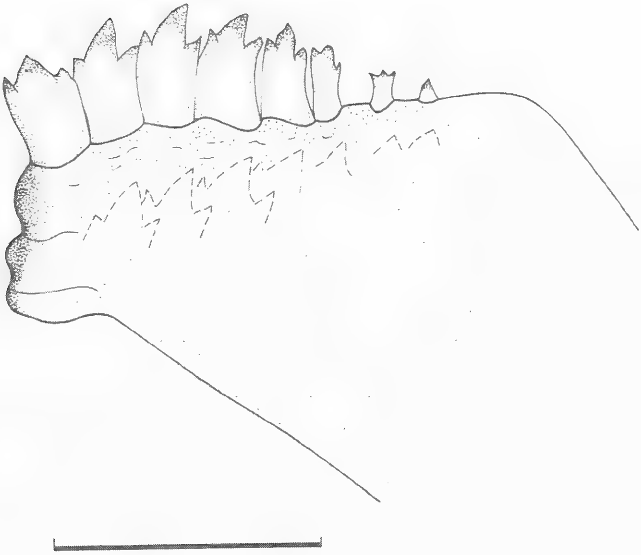

FIG. 3

Bryconamericus pyahu sp. n., medial view of right dentary. Scale bar = 1 mm.

Colouration in alcohol preserved specimens: Ground color pale yellow, with upper area of flanks slightly darker; margin of scales over lateral band with dark chromatophores forming a reticular pattern, in most specimens. Lower half of flanks with small isolated chromatophores, some of them concentrated over anal fin and other ones following myosepta. Dorsum of head with gray chromatophores, also placed on snout with low density. Scattered chromatophores on maxilla and lower jaw. Ventral region of head and vent whitish. A large subcircular black humeral spot, placed on or behind second scale of longitudinal series. A wide dark lateral band extended on middle flank, 1 or 2 scales deep, and continuing onto a caudal spot. 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. First unbranched dorsal-fin ray completely covered with dark chromatophores. Anal fin with chromatophores on distal portion of membranes and along anterior ray margins. Adipose with very few small scattered chromatophores. Caudal fin with chromatophores, especially concentrated on ray margins and close to distal edges. Pectoral fins with dark chromatophores concentrated on ray margins, pelvic fins with very few chromatophores.

Etymology. The specific name *pyahu* is a guaraní word meaning new.

Distribution. This species is only known from arroyo Tateto, a tributary of the arroyo Deseado which flows into the río San Antonio. This river is the most important affluent of the Iguazú basin, in Argentina (Fig. 4).

The arroyo Tateto has rapids and pools, with clear flowing water. The depth of the stream was variable from 40 cm to 2 m, and the bottom is composed of mud, sand, and mostly stones. Some areas have scarce submerged vegetation. The temperature of the water near surface was 26 °C.

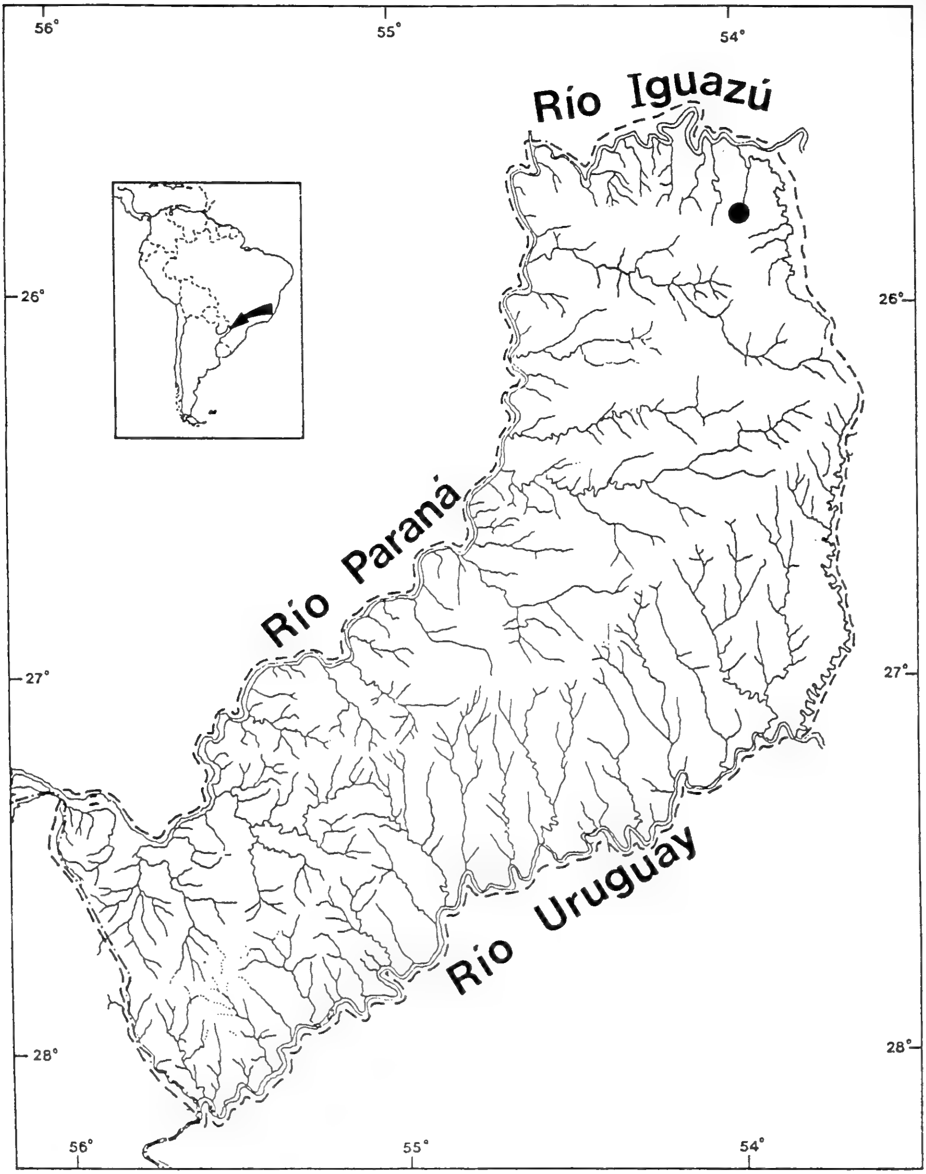

FIG. 4
Map showing the type locality of *B. pyahu* sp. n., Argentina, Misiones, Iguazú basin, arroyo Tateto.

DISCUSSION

Among species of the genus *Bryconamericus* cited in the streams and rivers of Southeastern Brazil and the Río de la Plata basin, the following species have lower number of branched anal-fin rays than *B. pyahu* (18-20): *Bryconamericus eigenmanni*

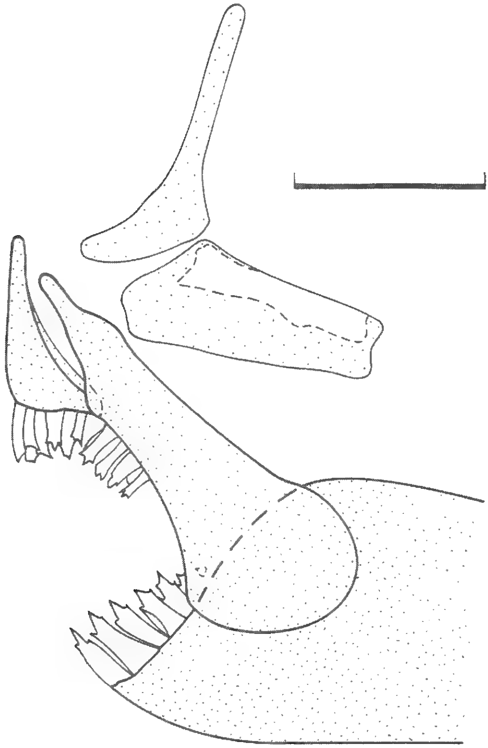

FIG. 5

Bryconamericus pyahu sp. n., outlines of upper and lower jaw, showing the shape of the bones. Scale bar = 1 mm.

Everman & Kendall, 1906 (15-17), *B. iheringii* (15-17), *B. rubropictus* (Berg, 1901) (13-17), and *B. thomasi* (10-17). *Bryconamericus sylvicola* has high number of branched anal-fin rays (22-25 vs. 18-20).

Other species with the same number of branched anal-fin rays that *B. pyahu* are *B. agna*, *B. exodon* (*B. stramineus* a junior synonym of *B. exodon*?), *B. lambari*, *B. mennii*, and *B. uporas*.

Bryconamericus pyahu differs from *B. exodon* in having an aligned outer row of premaxillary teeth, a subcircular humeral spot, and deeper body (28.0-34.5 vs. 22.9-26.8 % in SL). The wide dark lateral band present in *B. pyahu* distinguishes this species from *B. lambari*, but a similar band occurs in *B. agna*. *Bryconamericus pyahu* differs from *B. agna* in having lower body (28.0-34.5 vs. 34.1-39.8 % in SL), longer caudal peduncle length (14.7-18.3 vs. 12.9-14.6 % in SL), and higher number of dentary teeth (8-10 vs. 6-7).

Among all species examined, *B. pyahu* looks like *B. uporas* from the río Uruguay basin. Counts and measurements are very similar in both species, and also in *B. mennii*. However, the shape of dentary, maxillary, and premaxillary teeth are very

TABLE 1. Morphometrics of the holotype and 14 paratypes of *Bryconamericus pyahu* sp. n. Standard length is expressed in mm. SD: standard deviation.

	Holotype	Range	mean	SD
Standard length	50.6	45.5-52.3		
Percentage of SL				
Body depth	32.6	28.0-34.5	30.4	1.82
Head length	26.7	25.1-28.1	26.9	0.85
Predorsal length	50.6	50.0-53.8	52.0	1.18
Preventral length	44.9	44.5-50.0	47.4	1.58
Preanal length	61.5	58.9-63.9	61.6	1.69
Dorsal-fin base	14.4	12.0-14.7	13.4	0.88
Anal-fin base	26.9	25.2-29.1	27.2	1.23
Pelvic-fin length	14.0	13.7-15.1	14.4	0.48
Pectoral-fin length	20.4	19.9-22.6	21.0	0.78
Caudal peduncle depth	12.1	10.5-12.2	11.3	0.54
Caudal peduncle length	15.2	14.7-18.3	16.2	0.97
Distance between pectoral and pelvic fin origins	22.1	20.7-24.9	22.8	1.13
Distance between pelvic and anal fin origins	17.8	14.5-18.4	16.2	1.22
Percentage of head length				
Interorbital width	26.7	25.0-29.2	27.1	1.46
Head depth	81.5	74.2-83.6	80.3	2.41
Orbital diameter	31.1	30.4-38.6	34.2	3.00
Snout length	27.4	22.9-27.9	24.9	1.57
Premaxillary+maxillary length	34.1	30.5-36.7	33.5	1.61
Maxillary length	23.0	23.0-27.2	25.0	1.19

different in *B. uporas* (Casciotta *et al.*, 2002, figures 2-5). There are tricuspidate teeth in maxilla and the outer premaxillary series of *B. pyahu* whereas teeth are pentacuspidate in the same bones of *B. uporas*. Also, the teeth of the inner premaxillary series of *B. pyahu* are tricuspidate to pentacuspidate whereas they are heptacuspidate in *B. uporas*. The dentary of *B. pyahu* bears tricuspidate to conic teeth which are tricuspidate to pentacuspidate in *B. uporas*.

The ascending maxillary process of *B. pyahu* is shorter than that of *B. uporas* and *B. mennii*. The anterior portion of the lateral maxillary process is deeper than that of *B. uporas* and *B. mennii*. In *B. pyahu*, the deeper anterior portion of the maxilla scarcely covers the posterior edge of the premaxilla (Figs. 2, 5). The shape and position of the maxilla seems an intermediate state between *B. uporas* and *Hypobrycon poi* (Almirón *et al.*, 2001).

In comparison with *B. mennii*, *B. pyahu* has shorter premaxillary ascending process (vs. long), three tricuspidate premaxillary teeth in the outer row aligned and with similar length (vs. 4-5 teeth, irregularly placed, and two of them longer). Also the dentary teeth decrease in size anteroposteriorly; most of the teeth have three cusps and the last ones are conic (vs. four large teeth followed by several smaller teeth, pentacuspidate to tricuspidate).

Bryconamericus pyahu is the first species of the genus described from the río Iguazú basin. This new taxon belongs to the group of species with restricted distribution (Casciotta *et al.*, 2002), being present in one stream of the río San Antonio, in Misiones Province, Argentina.

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Types of Flatidae. XXIV. Type designations and taxonomic notes on species in the Natural History Museum of Geneva (Homoptera, Auchenorrhyncha, Fulgoroidea)

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Types of Flatidae. XXIV. Type designations and taxonomic notes on species in the Natural History Museum of Geneva (Homoptera, Auchenorrhyncha, Fulgoroidea). - Type specimens of 8 species named by Melichar were examined. Valid status for 4 holotypes, 2 lectotypes and 3 paralectotypes was determined. Taxonomic data were integrated with records on syntypes deposited elsewhere. New synonymy: *Ormenis conformis* Melichar, a junior synonym of *Ketumala bisecta* (Kirby). New combinations: *Ormenis chloris* Melichar = *Flatormenis chloris* (Melichar); *Ormenis conflicta* Melichar = *Anaya conflicta* (Melichar); *Ormenis debilis* Melichar = *Anormenis debilis* (Melichar).

Key-words: Flatidae - type specimens - Melichar - taxonomic notes.

INTRODUCTION

In his revisional monograph of the family Flatidae, Melichar (1901, 1902) recorded the Natural History Museum of Geneva [Genf] as depository for 20 species of Flatidae, including 11 species described as new.

Five of the Melichar types examined on loan from the Natural History Museum of Geneva had a standarized label with accession number 600/## and locality data transcribed from the original label also affixed to the pin. Melichar's original handwritten determination label was found on 3 specimens labeled otherwise, but in agreement with publication data. They are considered here to be valid syntypes.

Most of the types are females. If available, a male specimen associated with a female was used for dissection and illustration of genitalia. Such specimens bear my blue plesiotype label. This term has no status under nomenclatural rules, but the label identifies the specimen in relation to published data, and enables accurate examination by a future worker.

I also examined syntypes of several species in the Natural History Museum of Geneva that were distributed by Melichar to other museums or retained in his personal collection. Codens sensu Arnett *et al.* (1993) are used to specify the museums, as follows:

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BPBM	Bernice P. Bishop Museum, J. Linsley Gressitt Center for Research in Entomology, Honolulu, HI, 96817 USA.
DEIC	Deutsches Entomologisches Institut, Eberswalde, Germany.
HNHM	Hungarian Natural History Museum, Budapest, Hungary.
MHNG	Muséum d'histoire naturelle, CH-1211 Geneva 6, Switzerland.
MMBC	Moravian Land Museum, Department of Entomology, Brno, Czech Republic.
NHMW	Naturhistorisches Museum, Zool. Abt., Vienna, Austria.
USNM	US National Museum of Natural Hisory, Washigton, DC, USA.
ZMUC	Zoological Museum, University of Copenhagen, Denmark.

Morphometric measurements are recorded in mm according to the following format: Length: overall; v (vertex); f (frons); p (pronotum); m (mesonotum); t (tegmen); pcl (postclaval sutural margin). Width: v (vertex); f (frons); t (tegmen). The spine formula gives sequence of metatibial lateral spine(s): metatibial apical spines: metatarsal I basal spines.

CATALOGUE

Types are arranged by species name in alphabetical sequence. Each name and generic combination is associated with reference to original publication, along with currently valid status of the name in the 1957 Catalogue of Metcalf, unless a new combination is proposed here.

albomaculata, *Dascalia*, Melichar, 1902: 150, pl. 7, fig. 4, habitus illustration in lateral view; *Leptodascalia*, Metcalf, 1957: 450.

MHNG: Paralectotype ♀, 600/53, Amer. merid., coll. Jurine, det. Melichar; here designated.

ZMUC: Lectotype ♂, Bahia, designated by Medler (1994: 98).

Measurements: Lectotype ♂, Paralectotype ♀ - Length: overall 11.25, 12.5; v 0.25, 0.33; f 1.29, 1.66; p 0.42, 0.50; m 2.49, 2.82; t 8.80, 10.79; pcl 3.32, 3.49. Width: v 1.29, 1.41; f 1.58, 1.74; t 4.32, 4.48. Hind leg spine formula: 2:6:7, 2:(?:? hidden). Measurements show the female larger than the male in all parameters.

Taxonomic note: In the original description Melichar cited syntypes from Brazil: Espirito Santo and Bahia [States !] in Breddin's collection, and MHNG, HNHM and ZMUC. The syntype ♂ from Bahia, at ZMUC was designated lectotype and genitalia illustrated by Medler (1994: 98, Fig. 1). The syntype in the Breddin collection at DEIC is a ♀ labeled from Bahia. The syntype recorded as deposited at HNHM was not found by Medler (1993b: 38).

breviceps, *Carthaeomorpha*, Melichar, 1902: 34; Metcalf, 1957: 229.

MHNG: Paralectotype ♀, 600/77, Bresil: Bahia, L.F. Pictet, here designated.

Measurements: Paralectotype ♀ - Length: overall 14.0; v 0.50; f 1.83; p 0.66; m 3.32; t 11.92; pcl 3.32. Width: v 1.33; f 1.99; t 6.64. Hind leg spine formula: 2:6:8.

Taxonomic note: In his original description Melichar cited ♂ and ♀ syntypes, "Bahia Brasilien", one each in NHMW and MHNG. Medler (1993a: 435) designated a lectotype ♀ labeled "Lacerda Brasilien", Signoret Collection, det. Melichar, NHMW. The sex of the syntype at MNHG was erroneously recorded as ♂, and the specimen lacks a det. Melichar label. However, my designation as paralectotype ♀ is considered to be valid. No ♂ from Brazil was available for measurements and illustration of genitalia.

chloris, *Ormenis*, Melichar, 1902: 89, pl. IV, fig. 18. *Anormenis*, Metcalf, 1957: 303. *Flatormenis chloris* (Melichar), **comb. n.**

MHNG: Holotype (abdomen and thorax missing, tegmina detached), 600/81, Etats Unis: Tenesse (sic!), det. Melichar.

My illustration of the holotype tegmen (Fig. 3) compares favorably with tegmen illustrated by O'Brien (1985, Fig. 6), but accentuates apical venation. A ♂ from Arlfarm, Rosslyn, Virginia, and a ♀ from Montgomery Co., Virginia, USNM, were selected for measurements. The genitalia of the Arlfarm ♂ correspond to genitalia illustrated by O'Brien (1985, Fig. 8).

Measurements: Holotype (partial): Frons: length 0.83, width, 1.16; tegmen: length 6.31, pcl 1.99; width 3.32.

Measurements (complete): ♂, ♀, Virginia, USA - Length: overall 9.0, 10.0; v 0.17, 0.21; f 1.00, 1.08; p 0.42, 0.50; m 1.99, 2.16; t 8.30, 9.13; pcl 2.32, 2.82. Width: v 1.16, 1.33; f 1.45, 1.49; t 3.82, 4.32. Hind leg spine formula: 2:7:8, 2:7:8.

Taxonomic note: O'Brien (1985: 660, Figs 4-8) reported on the holotype and illustrated head, tegmen and genitalia. My research on *Flatormenis* Melichar in Central America, Mexico and Southwestern USA revealed that all known species of the genus have similar genitalia pattern as that of the O'Brien plesiotype of *chloris* from St. Tamany Parish, Louisiana.

conflicta, *Ormenis*, Melichar, 1902: 83; *Melicharia lactifera*, Metcalf, 1957: 329. *Anaya conflicta* (Melichar), **comb. n.**

MHNG: Holotype ♀, Trincomalia, A. Humbert, 216, det. *Ormenis proxima* Mel.

The tegmen illustration (Fig. 4) shows both angles evenly rounded and a linear arrangement of apical veins interrupted by a continuous line of subapical crossveins. The species may be recognized by uniformly white tegmina, distinctive pattern of apical veins, oblique crease extending from claval apex, and 5-6 small teeth on valvulae III.

Measurements: Holotype ♀ - Length: overall 9.0; v 0.46; f 1.16; p 0.50; m 2.16; t 7.97; pcl 1.99. Width: v 0.83; f 1.08; t 4.15. Hind leg spine formula: 2:6:8.

Taxonomic note: Melichar (1903: 90) listed specimens of *O. conflicta* from Trincomalee, Matala, Paradna, and Puttalam. The record from Trincomalee [Trincolmalia] is probably the holotype cited by Melichar in original description. The holotype of *conflicta* remained unrecognized under the attached label names "*Ormenis proxima*" det. Melichar, and "*Ormenis conformata*", both in error. However, *O. conflicta* and *O. proxima* are related species belonging in the genus *Anaya* Distant.

Melichar (1923: 70) and Metcalf (1957: 323) listed *O. conflicta* as a junior synonym of *Melicharia lactifera* (Walker), also in error.

conformata, *Ormenis*, Melichar, 1902: 87; *Anormenis*, Metcalf, 1957: 303.

MHNG: Lectotype ♂, Rosario, det. Melichar, here designated.

Head and tegmen are illustrated in Figs 2a, 2b, 2c. The genital capsule was partially crushed and unsuitable for illustration.

Measurements: Lectotype ♂ - Length: overall 7.5; v 0.25; f 0.83; p 0.33; m 1.49; t 6.31; pcl 1.99. Width: v 0.83; f 1.00; t 2.99. Hind leg spine formula: 2:7:8.

Taxonomic note: Melichar cited "Amerika" as provenance for *O. conformata* and did not record a depository for ♂ and ♀ syntypes. The specimen from "Rosario, det, Melichar" is considered a valid syntype. The specific locality of "Rosario" is unknown. This name is found in various American localities: e.g., Argentina, Brazil, Chile, Mexico, Paraguay, Uruguay and Venezuela. Although *O. conformata* and *O. perpusilla* appeared to Melichar similar in form and size, diagnostic characters differ, and the two species are not congeneric.

conformis, *Ormenis*, Melichar, 1902: 73; *Melormenis*, Metcalf, 1957: 332; *Ketumala bisecta* Kirby, 1891: 152, Fig. 5, **syn. n**.

MHNG: Holotype ♂, 600/53, Trincomalie, Ceylan, A. Humbert, 104, det. Melichar.

Genitalia of the holotype are illustrated in Fig. 6. Characters are indistinguishable from numerous specimens from Ceylon that I have determined as *Ketumala bisecta* (Kirby).

Measurements: Holotype ♂ - Length: overall 7.0; v 0.33; f 0.83; p 0.50; m 1.16; t 5.64; pcl 1.16. Width: v 0.83; f 1.08; t 2.66. Hind leg spine formula: 2:7:7.

Taxonomic note: The provenance of the holotype is Sri Lanka [Ceylon] not "Nordamerika" cited by Melichar in error. Melichar considered the species very similar to his *O. fuscata* from Ceylon.

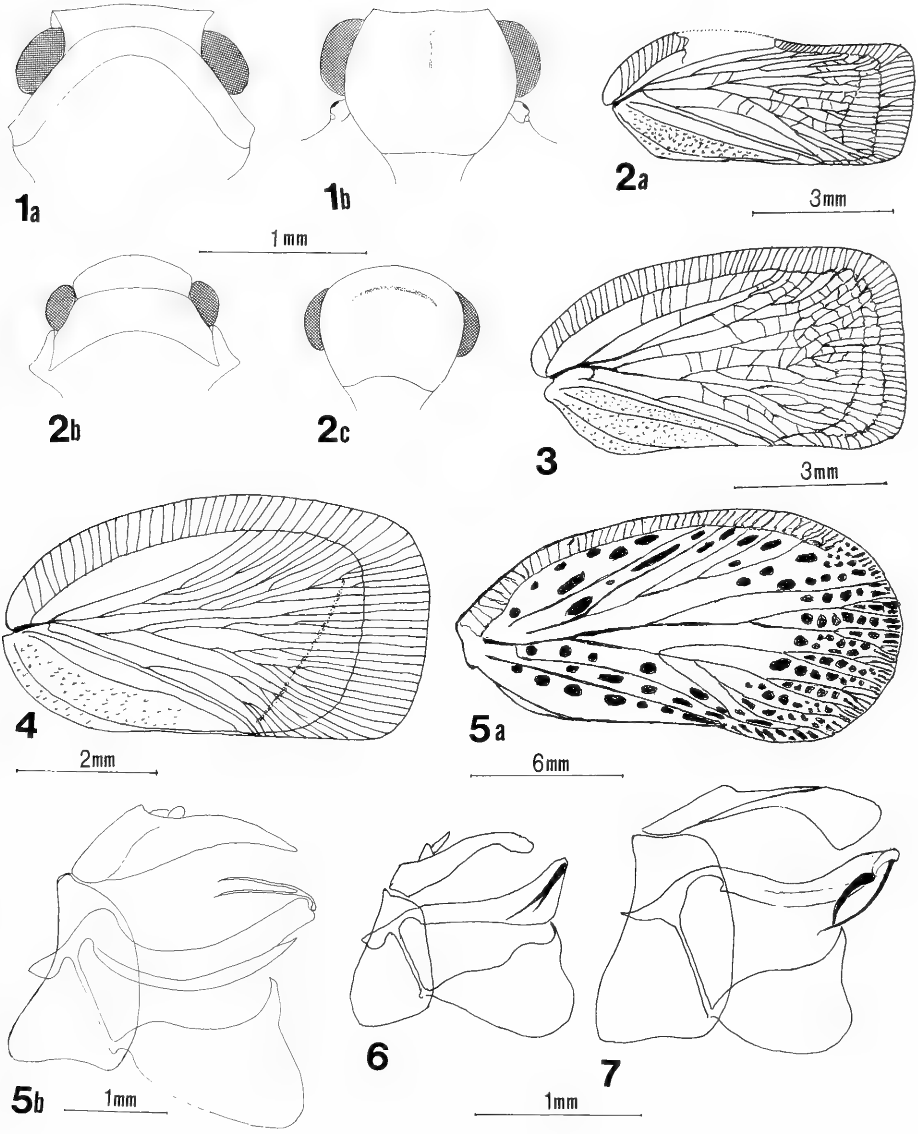
debilis, *Ormenis*, Melichar, 1902: 87; *Hansenia*, Metcalf, 1957: 280; *Anormenis debilis* (Melichar), **comb. n**.

MHNG: Holotype ♀, Cordilleren, 2000 m. (no other data), Head and genitalia are illustrated in Figs 1a, 1b, 7.

BPBM: Plesiotype ♂, Panama: Cerro Azul, Sendero.

Measurements: Plesiotype ♂, holotype ♀ - Length: overall 7.0, 7.0; v 0.17, 0.17; f 0.83, 0.83; p 0.33, 0.33; m 1.49, 1.49; t 6.47, 6.97; pcl 1.83, 1.99. Width: v 0.83, 0.83; f 1.04, 1.08; t 3.32, 3.15. Hind leg spine formula: 2:6:7, 2:6:7.

Taxonomic note: The provenance "Cordilleren" is not a precise locality, but applies in general to the range of Andes mountains extending in Colombia, Bolivia and Peru. The holotype belongs to a complex of *Anormenis* species in Central and South America that is easily recognized by a dark spot on the apex of antennal segment II, as shown in Fig. 1b.



FIGS 1-7

Ormenis debilis Melichar, Fig. 1a, head, 1b, frons, 7, male genitalia. *Ormenis conformata* Melichar, Fig. 2a, tegmen, 2b, head, 2c, frons. *Ormenis chloris* Melichar, Fig. 3, tegmen. *Ormenis conflicta* Melichar, Fig. 4, tegmen. *Poekilloptera pantherina*, Fig. 5a, tegmen, 5b, male genitalia. *Ormenis conformis*, Fig. 6, male genitalia.

fuscata, *Ormenis*, Melichar, 1902: 73; *Seliza nigropunctata* Kirby, Metcalf, 1957: 408.

MHNG: Type material not found.

MMBC: Lectotype ♀, Ceylon, *fuscata* det. Melichar.

Taxonomic note: Melichar (1903: 89) listed the species from Patipolla. Distant, 1906:443, and 1916:124, queried *O. fuscata* as junior synonym of *S. nigropunctata* Kirby. Melichar, 1923:89, and Metcalf, 1957: 408, catalogued the synonymy as valid.

pantherina, *Poekilloptera suturata*, Melichar 1901: 239; *Poekilloptera fritillaria* var. *pantherina*, Metcalf, 1957: 83.

MHNG: Lectotype ♀, paralectotype ♀, Brazil: Amazones, Sto Paulo d'Olivenca, M. de Mathan, coll. Autran, var. *pantherina* det. Melichar, here designated.

BPBM: Plesiotype ♂, Brasil: Distrito Federal, 8 km W of Planaltina, 3.xi.1993, coll. G.M. Nishida.

Measurements: Plesiotype ♂, lectotype ♀. Length: overall 17.0, 20.0; v 0.83, 0.66; f 1.49, 1.66; p 0.83, 0.66; m 2.49, 3.49; t 15.27, 17.60; pcl 2.32, 2.49. Width: v 1.33, 1.33; f 1.66, 1.66; t 8.63, 9.96. Spine formula: 1:7:7, 1:6:4.

Taxonomic note: The diagnosis of var. *pantherina* in original publication by Melichar (1901: 239) was "Die schwarze Zeichnung der Zellen geht bis zum Apicalrande (Museum in Genf)." The tegmen illustration of the plesiotype (Fig. 5a) shows black markings extending to the apical margin. The genitalia of the plesiotype ♂ are illustrated in Fig. 5b.

Melichar's brief diagnosis gave no label information on two syntypes at MHNG and 3 at MMBC, each ♀, and with the same locality, collector and det. Melichar labels. My lectotype and paralectotype designations apply to specimens at MHNG.

propria, *Dascalia*, Melichar, 1902: 146; *Paradascalia*, Metcalf, 1957: 448.

MNHG: Holotype ♀, Sudamerika, original citation by Melichar. Type material was not found.

proxima, *Ormenis*, Melichar, 1902: 83; *Anaya proxima* (Melichar), Metcalf, 1957: 441. MHNG: Type material was not found.

NHMW: Holotype ♀ of *proxima*, Ceylon, (*Anaya*) designated by Medler 1987: 536.

Taxonomic note: A ♂ unambiguously belonging to *proxima* has not been available for genitalia study.

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A taxonomic study of the genus *Agathidium* (Coleoptera: Leiodidae) from Korea, Part I

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A taxonomic study of the genus *Agathidium* (Coleoptera: Leiodidae) from Korea, Part I. - A taxonomic study of the genus *Agathidium* from Korea is presented. Nine species including five new species (*Agathidium muryeongi* sp. n., *A. bockshini* sp. n., *A. leesunshini* sp. n., *A. odaesanense* sp. n., and *A. choi* sp. n.) are recognized, two of which are reported as new to Korea (*Agathidium cribratum* Portevin and *A. multitodum* Hoshina). A key for the Korean species of the two subgenera, *Cyphoceble* and *Neoceble*, of the genus *Agathidium* and illustrations of diagnostic features are provided.

Key-words: *Agathidium* - Leiodidae - Coleoptera - new species - new records - Korea.

INTRODUCTION

The genus *Agathidium* Panzer, 1797 belongs to the tribe Agathidiini of the family Leiodidae. The pioneer work on the Korean *Agathidium* was made by J. Hlisnikovsky, who described *Agathidium* (*Neoceble*) *curticorne* from Pu-ry-ong (northern Korea) in 1964. Later, Angelini (1992) recorded *Agathidium mequignoni* Roubal, and described three new *Agathidium* species. Also, Angelini (1995) reported *Agathidium subcostatum* Portevin from Korea. As a result, six species of *Agathidium* have hitherto been known to occur in Korea.

In the course of our field works in 1998-2001, many beetles including *Agathidium* were collected from Korea by the flight intercept trap (FIT), the beating method, sifting litters, and so on. Our careful examinations revealed that these specimens contained five new species of the subgenus *Cyphoceble* and *Neoceble* of the genus *Agathidium* and two species newly recorded from Korea. Therefore, we revise here the subgenera *Cyphoceble* and *Neoceble* with descriptions of five new species under the names, *Agathidium* (*Cyphoceble*) *muryeongi* sp. n., *A.* (*C.*) *bockshini* sp. n., *A.* (*Neoceble*) *leesunshini* sp. n., *A.* (*N.*) *odaesanense* sp. n., and *A.* (*N.*) *choi* sp. n. in this paper (part I), and will treat other subgenera of the genus *Agathidium* in part II. The measurement method in the present paper was followed to Angelini & De Marzo (1981).

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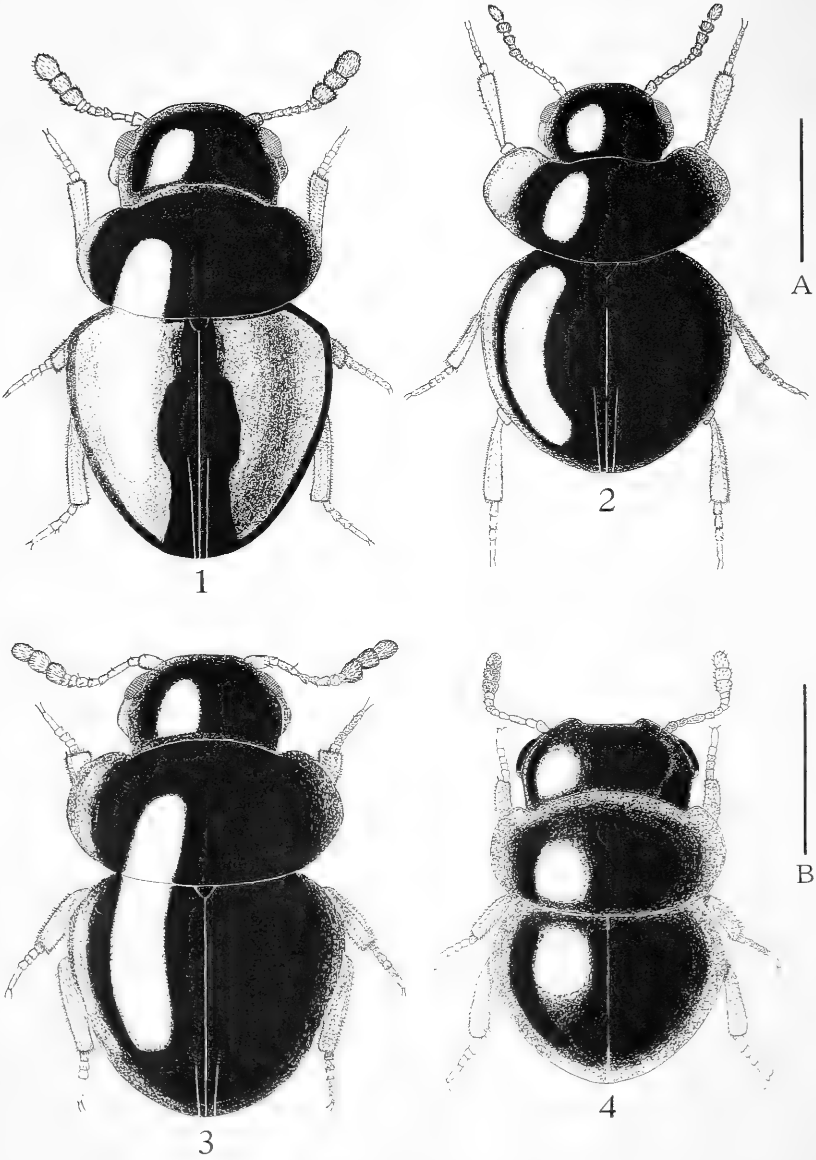


FIGS 1-4

Habitus, dorsal view. 1, *Agathidium* (*Cyphoceble*) *muryeongi* sp. n.; 2, *A.* (*C.*) *subcostatum* Portevin; 3, *A.* (*C.*) *bockshini* sp. n.; 4, *A.* (*Neoceble*) *leesunshini* sp. n.. Scale A: 1 mm for Fig. 1 and 1.5 mm for Fig. 2. Scale B: 1 mm for Figs 3-4.

The holotypes and most of paratypes of five new species and all materials of known species described or revised in the present paper are deposited in Chungnam National University Insect Collection (CNUIC, Daejeon). Only two male paratypes of *Agathidium* (*Neoceble*) *choi* sp. n. are preserved in the collection of a senior author.

TAXONOMIC TREATMENT

KEY TO SPECIES OF THE SUBGENUS *CYPHOCEBLE* THOMSON, 1859 IN KOREA

See Angelini (1995) for a key to the subgenera of the genus *Agathidium*

1 Dorsum clearly bicolorous (Fig. 1); aedeagus relatively thick (Fig. 45) . . . . *Agathidium* (*Cyphoceble*) *muryeongi* sp. n.

\- Dorsum almost concolorous (Figs 2 & 3); aedeagus relatively slender (Figs 46-47) 2

2 Body length 3.5-5.0 mm; dorsum punctate densely (Fig. 10); hind wings present . . . . *A.* (*C.*) *subcostatum* Portevin

\- Body length 2.8-2.9 mm; dorsum punctate very sparsely (Fig. 11); hind wings absent . . . . *A.* (*C.*) *bockshini* sp. n.

Agathidium* (*Cyphoceble*) *muryeongi Hoshina & Park sp. n.
Figs 1, 9, 17, 22, 23, 30, 31, 37, 45, 53, 61

Type series. Holotype: ♂, Sangwonsa, Mt. Odaesan, Jinbu-myeon, Pyeongchang-gun, Gangwon Prov., 22. viii.-20. x. 2000, K.-J. Ahn leg. (FIT) (CNUIC). Paratypes: 1 ♂, 1 ♀, Chongmyolbongung, Mt. Odaesan, Jinbu-myeon, Pyeongchang-gun, Gangwon Prov., 7-9. x. 1999, U.-S. Hwnag & M.-S. Kim leg. (FIT); 1 ♀, Sangwonsa, Mt. Odaesan, Jinbu-myeon, Pyeongchang-gun, Gangwon Prov., 15. ix. 2001, S.-J. Park leg.; 1 ♀, Sangwonsa, Mt. Odaesan, Jinbu-myeon, Pyeongchang-gun, Gangwon Prov., 15. ix.-14. xi. 2001, K.-J. Ahn & C.-W. Shin leg. (FIT).

Distribution. Korea.

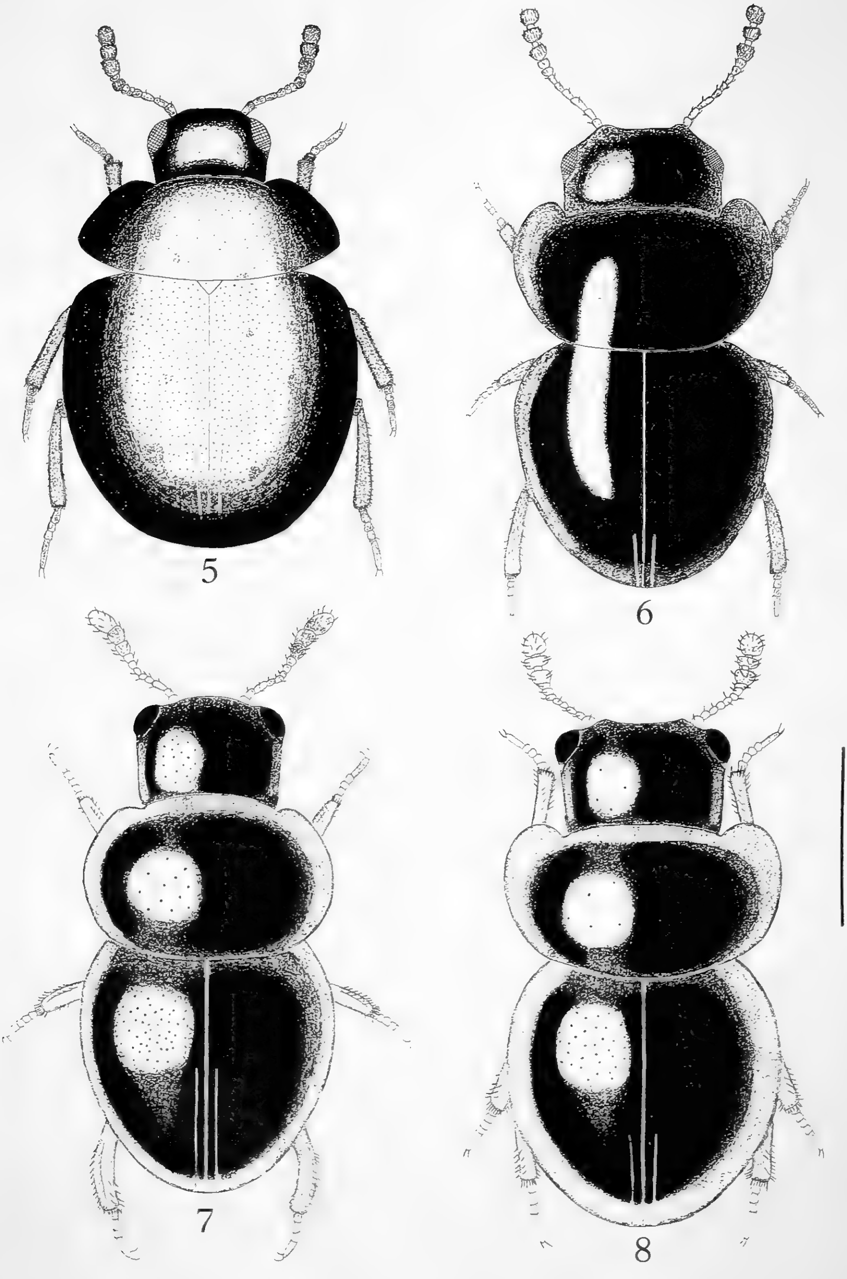
Description. Measurement of holotype. Body length: 3.4 mm. Pronotum: length 0.86 mm, width 1.8 mm, height 1.0 mm. Elytra: length 1.9 mm, width 1.9 mm, height 1.2 mm.

Coloration. Dorsum less shining, almost bicolorous; head black; pronotum black with reddish brown margins; elytra dark-orange with black stripes (Figs 1 & 17); mesosternum light brown; metasternum and venter dark brown; legs dark brown; antennomeres 1-8 reddish brown; 9-10 and basal two-fifths of 11 dark brown; apical two-fifths of 11 light brown.

Body about 1.8 times as long as wide (Fig. 1), convex in general (Fig. 17).

Head widest at tempora (Figs 22 & 23), about 1.5 times as wide as long, punctate minutely and densely (Fig. 9), microreticulate strongly; length and width of head about 0.79 times as long as and about 0.65 times as wide as those of pronotum, respectively (Fig. 1); eyes oval, located at about apical one-third of lateral margins; clypeal line shallow; male left mandible larger than right one (Figs 22 & 23), and sharply or moderately curved apically in lateral view (Figs 30 & 31); both mandibles of almost same size in female; antennomeres 1-4 and 11 longer than wide; the others wider than long (Fig. 37); antennomere 3 about 1.4 times as long as 2, and shorter than 4 plus 5; length and width of antennomere 9 about 2.3 times as long as and about 1.5 times as wide as those of 8, respectively; antennomere 9 a little longer than 10; antennomere 11 oval.

Pronotum widest at about basal two-fifths of lateral margins (Fig. 1), about 1.9 times as wide as long, punctate and microreticulate as head (Fig. 9); length and width about 0.46 times as long as and slightly narrower than those of elytra, respectively (Fig. 1).



Figs 5-8

Habitus, dorsal view. 5, *Agathidium* (*Neoceble*) *cribratum* Portevin; 6, *A.* (*N.*) *odaesanense* sp. n.; 7, *A.* (*N.*) *curticorne* Hlisnikovsky; 8, *A.* (*N.*) *choi* sp. n.. Scale: 1 mm for Figs 5-8.

Elytra widest at about basal one-seventh of lateral margins, almost as wide as long (Fig. 1), punctate more sparsely than head and pronotum (Fig. 9), not microreticulate; sutural stria distinct, and present at about apical three-eighths of elytra.

Mesosternum with a complete lateral line and a thin median carina; metasternum without femoral lines.

Tarsal formula 5-5-4 in male, 5-4-4 in female.

Hind wings normal.

Male. Aedeagus (Figs 45 & 53) thick and short in general; the median lobe curved sharply at middle in lateral view; parameres curved as the median lobe in lateral view, straight at sides, and bluntly pointed apically in ventral view.

Female. Spermatheca curved sharply at two points in general (Fig. 61).

Body length 3.2-3.4 mm.

Remarks. A. (*C.*) *muryeongi* sp. n. can be distinguished from the other Korean *Cyphoceble* species by having a bicolorous dorsum (Fig. 1). This new species is similar to *A.* (*C.*) *besucheti* Hlisnikovsky, 1972, in appearance, but is distinguished from the latter by having a dorsum less shining, and head and pronotum microreticulate strongly, in compare with *A.* (*C.*) *besucheti* that has a shining dorsum, and head and pronotum not microreticulate. Moreover, *A.* (*C.*) *muryeongi* sp. n. is also similar to *A.* (*C.*) *annulatum* Hisamatsu, 1957, but the elytra have black stripes on the elytral suture and along the lateral margins (Fig. 1). In contrast, *A.* (*C.*) *annulatum* has the elytra with two black patches separated from the elytral suture.

Etymology. The specific name is derived from Mu ryeong Wang (462-523), a great king of ancient Korean Kingdom, Baeck Jae.

Agathidium* (*Cyphoceble*) *subcostatum Portevin, 1905
Figs 2, 10, 38, 46, 54, 62

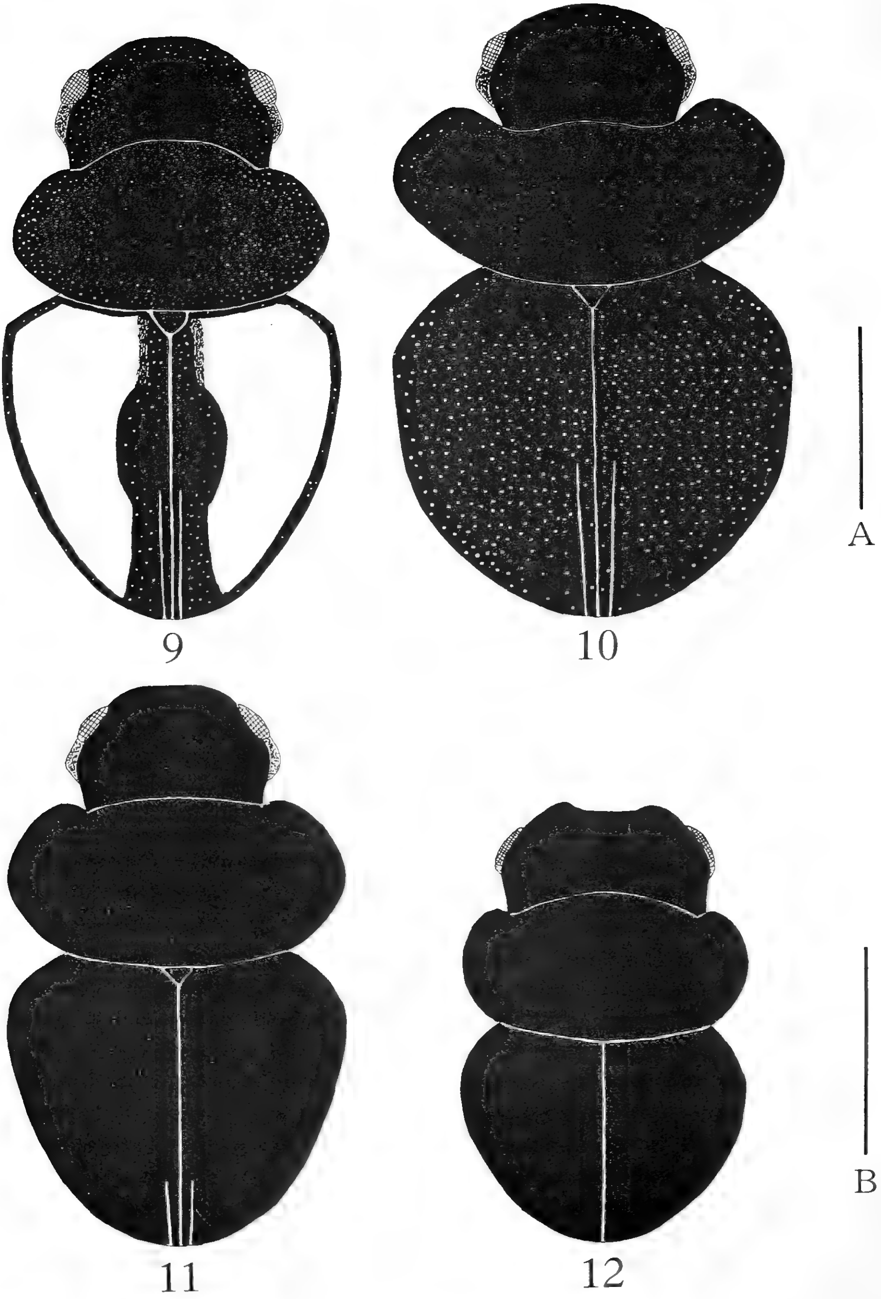
Agathidium subcostatum Portevin, 1905: 420 (Japan: Honshu).
Agathidium (*Cyphoceble*) *subcostatum*: Hatch, 1929: 80; Hoshina & Maruyama, 2001: 157.
See Angelini (1995), Hoshina (1999a), and Hoshina & Maruyama (2001) for other synonymy and references.

Specimens examined. 1 ♂, 1 ♀, Sangwonsa, Mt. Odaesan, Jinbu-myeon, Pyeongchang-gun, Gangwon Prov., 21. iv.-18. v. 2002, S.-J. Park & C.-W. Shin leg. (FIT).

Distribution. Korea and Japan.

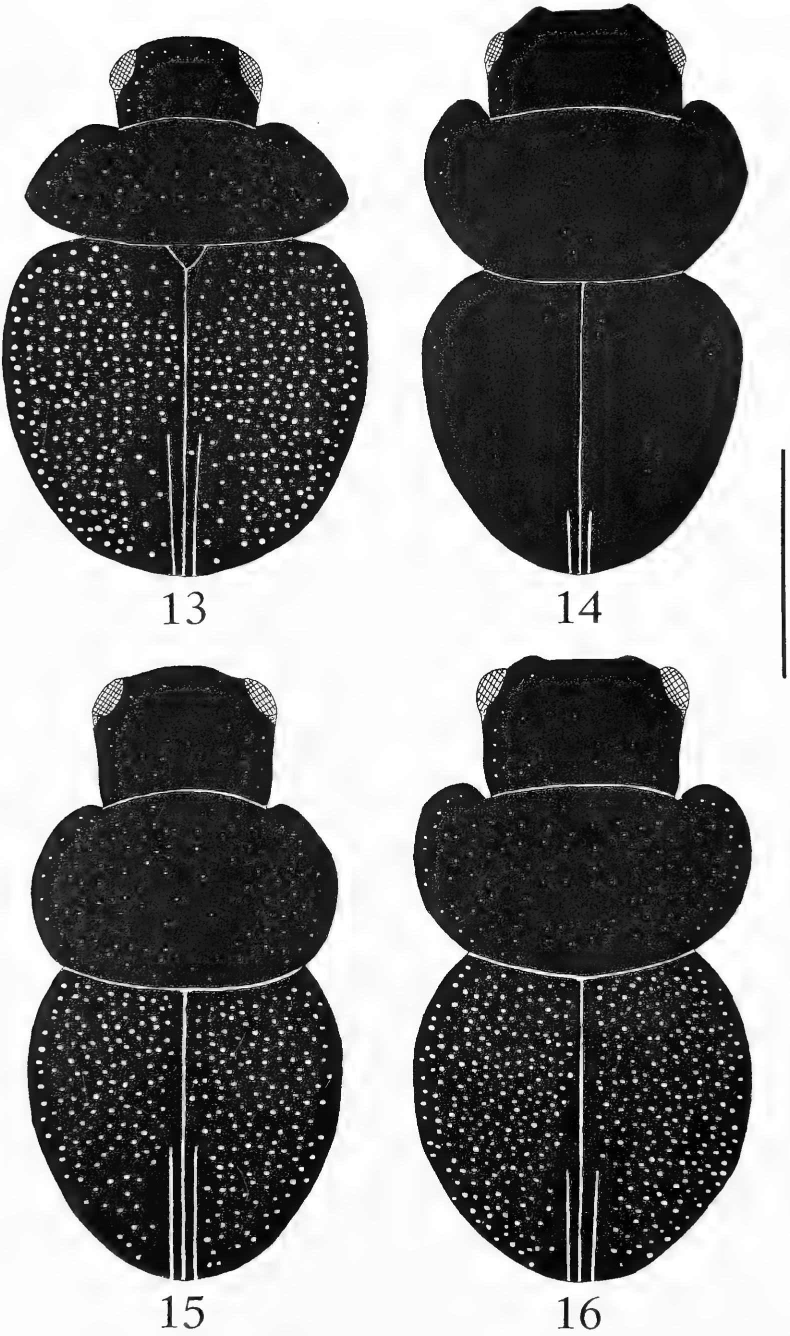
Diagnosis. Coloration. Dorsum brown to dark brown and almost concolorous; antennomeres 1-6 and 11 brown, the others dark brown; legs dark brown.

Body about 1.5 times as long as wide (Fig. 2); head widest at tempora, and microreticulate; punctures of head minutely and densely (Fig. 10); clypeal line shallow; left mandibles almost as large as or a little larger than right in both sexes; antennomeres 3 about 2.3 times as long as 2 (Fig. 38); antennomere 11 slender; pronotum microreticulate as head; punctures of pronotum as those of head (Fig. 10); elytra not microreticulate; punctures of elytra stronger and denser than those of head and pronotum (Fig. 10); sutural stria distinct and its length varying among specimens, about from one-third to the half of length of elytra; hind wings normal; tarsal formula 5-5-4 in male, 4-4-4 in female; aedeagus as shown in Figs 46 & 54; spermatheca as shown in Fig. 62.



Figs 9-12

Punctures of dorsum. 9, *Agathidium* (*Cyphoceble*) *muryeongi* sp. n.; 10, *A.* (*C.*) *subcostatum* Portevin; 11, *A.* (*C.*) *bockshini* sp. n.; 12, *A.* (*Neoceble*) *leesunshini* sp. n.. Scale A: 1 mm for Fig. 9 and 1.2 mm for Fig. 10. Scale B: 1 mm for Figs 11-12.



FIGS 13-16

Punctures of dorsum. 13, *Agathidium* (*Neoceble*) *cribratum* Portevin; 14, *A.* (*N.*) *odaesanense* sp. n.; 15, *A.* (*N.*) *curticorne* Hlisnikovsky; 16, *A.* (*N.*) *choi* sp. n.. Scale: 1 mm for Figs 13-16.

Body length: 3.5-5.0 mm.

Remarks. Agathidium (*Cyphoceble*) *subcostatum* Portevin has been known to be distributed in Korea (Angelini, 1995). We succeeded in recording this species again in the present study. This species can be distinguished easily from *A.* (*C.*) *bockshini* sp. n. by having dense punctures on dorsum (Fig. 10) and normal hind wings.

Agathidium (Cyphoceble) bockshini Hoshina & Park sp. n.
Figs 3, 11, 18, 24, 39, 47, 55, 63

Type series. Holotype: ♂, Sangwonsa, Mt. Odaesan, Jinbu-myeon, Pyeongchang-gun, Gangwon Prov., 15. ix. 2001, S.-J. Park & C.-W. Shin leg. by sifting the litter layers (CNUIC). Paratypes: 1 ♂, 2 ♀, same data as holotype; 1 ♀, Sangwonsa, Mt. Odaesan, Jinbu-myeon, Pyeongchang-gun, Gangwon Prov., 4. iv. 2001, S.-J. Park leg. (by sifting the litter layers).

Distribution. Korea.

Description. Measurement of holotype. Body length: 2.8 mm. Pronotum: length 0.82 mm, width 1.7 mm, height 0.90 mm. Elytra: length 1.6 mm, width 1.7 mm, height 1.0 mm.

Coloration. Dorsum shining, almost concolorous, reddish brown; pronotum with light brown margins; mesosternum and venter reddish brown; metasternum reddish brown or dark brown; legs brown; antennomere 1 brown or reddish brown; 2-8 and 11 light brown; 9-10 brown.

Body about 1.7 times as long as wide (Fig. 3), less convex in general (Fig. 18).

Head widest at tempora (Fig. 24), about 1.7 times as wide as long, punctate minutely and very sparsely (Fig. 11), microreticulate weakly; length and width of head about 0.74 times as long as and about 0.64 times as wide as those of pronotum, respectively (Fig. 3); eyes a little slender, located at about apical one-third of lateral margins; clypeal line indistinct; both mandibles almost of the same size in both sexes; antennomeres 1-5 and 11 longer than wide; the others wider than long (Fig. 39); antennomere 3 about 2.0 times as long as 2, and longer than 4 plus 5; length and width of antennomere 9 segment about 2.4 times as long as and about 1.2 times as wide as those of 8, respectively; antennomere 9 almost as large as 10; antennomere 11 segment slender.

Pronotum widest at about basal one-third of lateral margins (Fig. 3), about 2.0 times as wide as long, punctate and microreticulate as head (Fig. 11); length and width about 0.58 times as long as and almost as wide as those of elytra, respectively (Fig. 3).

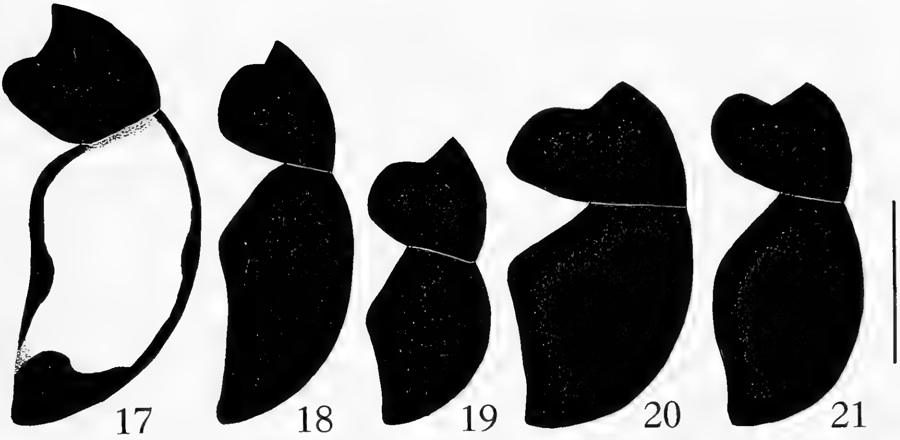
Elytra widest at about basal one-sixth of lateral margins, about 1.2 times as long as wide (Fig. 3), punctate and microreticulate as head and pronotum; sutural stria shallow and its length varying among specimens, about from one-fourth to three-eighths of length of elytra.

Mesosternum with complete lateral line and without median carinae; metasternum without femoral lines.

Tarsal formula 5-5-4 in male, 4-4-4 in female.

Hind wings absent.

Male. Aedeagus (Figs 47 & 55) slender in general; the median lobe curved spirally near the base in lateral view; parameres curved in an arc, shorter than the median lobe in lateral view, straight at sides, and bluntly pointed apically in ventral view.



FIGS 17-21

Bodies, lateral view. 17, *Agathidium* (*Cyphoceble*) *muryeongi* sp. n.; 18, *A.* (*C.*) *bockshini* sp. n.; 19, *A.* (*Neoceble*) *leesunshini* sp. n.; 20, *A.* (*N.*) *odaesanense* sp. n.; 21, *A.* (*N.*) *choi* sp. n.. Scale: 1 mm for Figs 17-21.

Female. Spermatheca slender and curved weakly (Fig. 63).

Body length 2.8-2.9 mm.

Remarks. The present new species is related to Japanese two flightless species described by Hoshina (1999b), *A.* (*C.*) *hayashii* and *A.* (*C.*) *yoshidai*, but the dorsum color is reddish brown and the median lobe of the aedeagus is curved spirally near the base in lateral view (Fig. 47), whereas in *A.* (*C.*) *hayashii*, the dorsum color is light brown to brown and the median lobe is almost straight near the base. Moreover, *A.* (*C.*) *bockshini* has no hind wings, in comparison with *A.* (*C.*) *yoshidai* that has hind wings which are vestigial and about one-fifth of length of elytra.

Etymology. The specific name is dedicated to a great general of the ancient Korean kingdom Baeck Jae, Gwee-Sil Bock-Shin (?-663).

KEY TO SPECIES OF THE SUBGENUS *NEOCEBLE* GOZIS, 1886 IN KOREA

1 Elytra without sutural stria (Fig. 4); hind wings absent
. . . . *Agathidium* (*Neoceble*) *leesunshini* sp. n.
\- Elytra with sutural stria (Figs 5-8); hind wings present 2
2 Head and pronotum microreticulate 3
\- Head and pronotum not microreticulate 4
3 Dorsum punctate densely (Fig. 13); antennomere 7 larger than 8 (Fig. 41); clypeal line distinct; elytra a little wider than pronotum (Fig. 5)
. . . . *A.* (*N.*) *cribratum* Portevin
\- Dorsum punctate sparsely (Fig. 14); antennomere 7 almost as large as 8 (Fig. 42); clypeal line indistinct; elytra almost as wide as pronotum (Fig. 6) . . . . *A.* (*N.*) *odaesanense* sp. n.
4 Male left mandible sometimes with a long horn extending to the lateral side; antennomere 3 about 1.8 times as long as 2 . *A.* (*N.*) *multitodum* Hoshina

- Antennomere 3 about 1.5 times or less as long as 2 (Figs. 43-44) 5

5 Antennomere 3 about 1.5 times as long as 2; 11 relatively slender (Fig. 43); aedeagus of male relatively sharply curved in lateral view (Fig. 51) . . . . *A.* (*N.*) *curticorne* Hlisnikovsky

- Antennomere 3 about 1.2 times as long as second; 11 segment relatively robust (Fig. 44); aedeagus of male relatively weakly curved in lateral view. (Fig. 52) . . . . *A.* (*N.*) *choi* sp. n.

CANARIENSE GROUP

Agathidium* (*Neoceble*) *leesunshini Hoshina & Park sp. n.
Figs 4, 12, 19, 25, 32, 40, 48, 56

Type series. Holotype: ♂, Mt. Odaesan, Pyeongchang-gun, Gangwon Prov., 7-9. vii. 1998, K.-J. Ahn leg. (CNUIC). Paratype: 1 ♂, Mt. Odaesan, Pyeongchang-gun, Gangwon Prov., 21. iv. 2002, S.-J. Park leg.

Distribution. Korea.

Description. Measurement of holotype: Body length 2.2 mm. Pronotum: length 0.80 mm, width 1.3 mm, height 0.64 mm. Elytra: length 1.2 mm, width 1.3 mm, height 0.70 mm.

Coloration. Dorsum shining, almost concolorous, brown in general; meso-metasterna and venter a little lighter in color than dorsum; legs brown with tarsi a little lighter in color than in other parts of legs; antennomeres 1-8 light brown, 9-10 and basal half of 11 brown, apical half of 11 light brown to brown.

Body about 1.7 times as long as wide (Fig. 4), convex in general (Fig. 19).

Head widest at eyes and tempora (Fig. 25), about 1.7 times as wide as long, almost impunctate (Fig. 12), not microreticulate; length and width of head about 0.77 times as long as and about 0.76 times as wide as those of pronotum, respectively (Fig. 4); eyes slender, located at about apical two-fifths of lateral margins; clypeal line indistinct; left mandible of holotype clearly larger than right one and with a tip curved sharply and posteriorly (Figs 25 & 32); left mandible of paratype a little larger than right, and simply curved apically; antennomeres 1-5 and 11 longer than wide; the others wider than long (Fig. 40); antennomere 3 about 1.5 times as long as 2, and almost as long as 4 plus 5; length and width of antennomere 9 about 2.0 times as long as and about 1.9 times as wide as those of 8, respectively; antennomere 9 almost as large as 10; antennomere 11 oval.

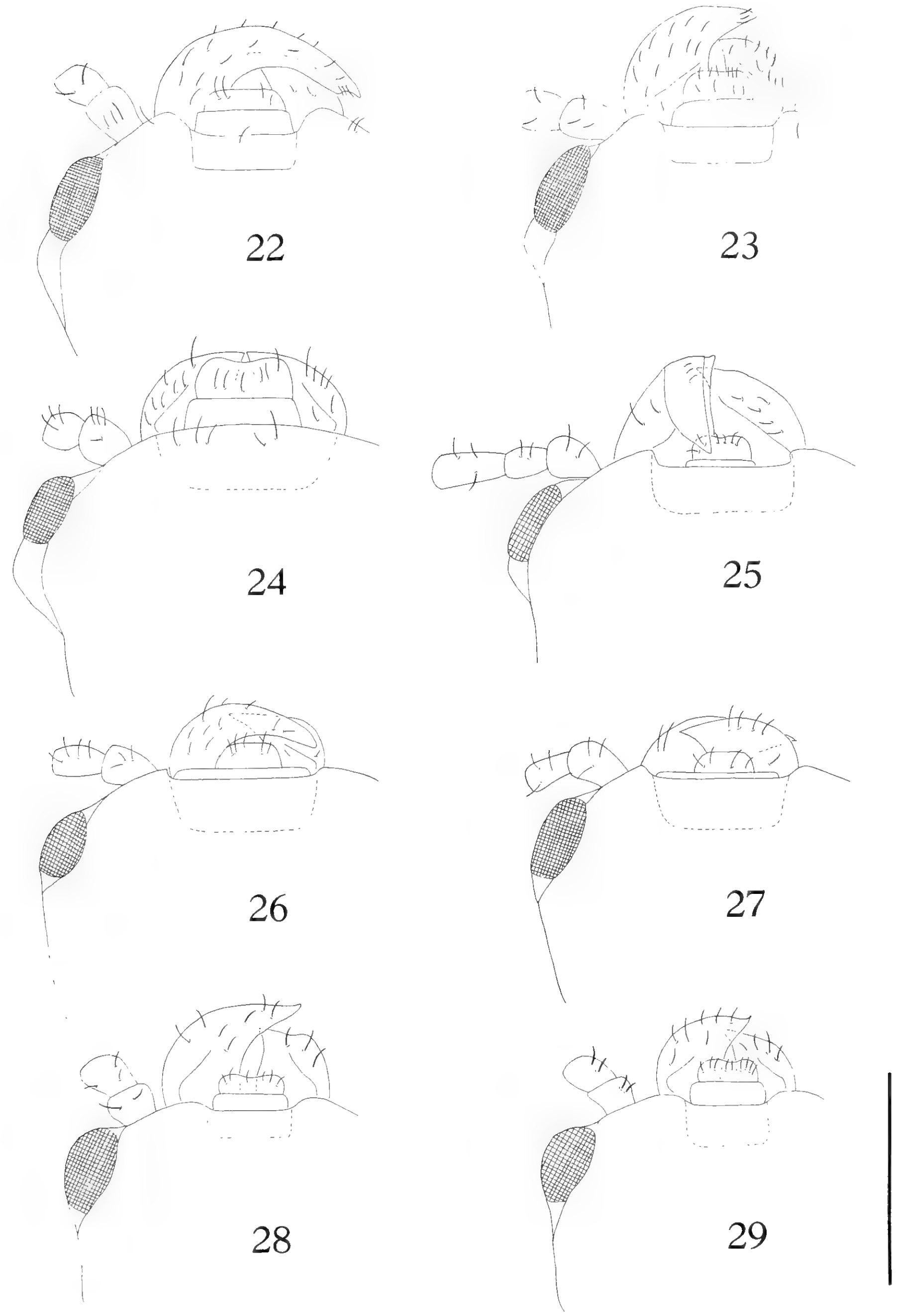
Pronotum widest at about middle of lateral margins, about 1.6 times as wide as long, almost impunctate (Fig. 12), not microreticulate; length and width of pronotum about 0.67 times as long as and almost as wide as those of elytra, respectively (Fig. 4).

Elytra widest at about basal one-third of lateral margins, almost 1.1 times as wide as long (Fig. 4), almost impunctate (Fig. 12), not microreticulate; sutural stria absent.

Mesosternum with a incomplete lateral line and a distinct median carina; metasternum without femoral lines.

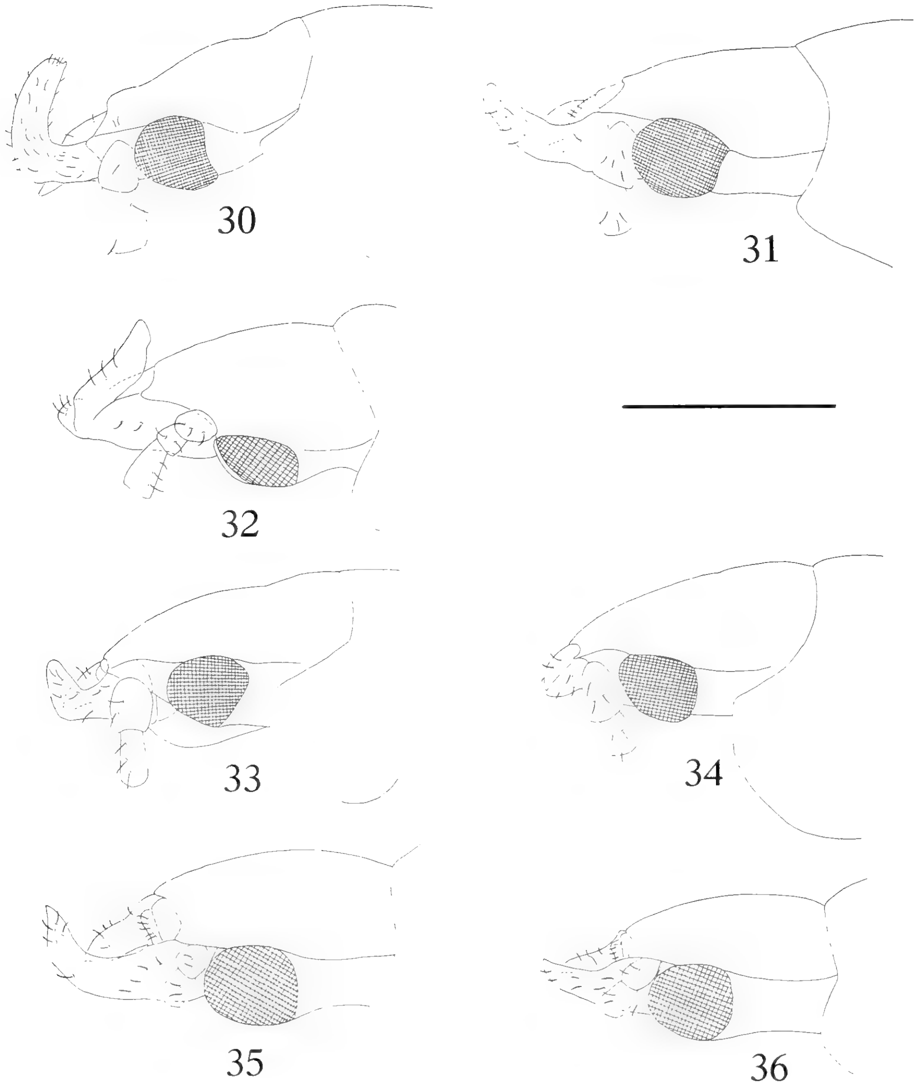
Tarsal formula 5-5-4 in male, unknown in female.

Hind wings absent.



FIGS 22-29

Male heads, dorsal view. 22-23, *Agathidium* (*Cyphoceble*) *muryeongi* sp. n.; 24, *A.* (*C.*) *bockshini* sp. n.; 25, *A.* (*Neoceble*) *leesunshini* sp. n.; 26-27, *A.* (*N.*) *odaesanense* sp. n.; 28-29, *A.* (*N.*) *choi* sp. n.. Scale: 0.7 mm for Figs 22-23 and 0.5 mm for Figs 24-29.



FIGS 30-36

Male heads, lateral view. 30-31, *Agathidium* (*Cyphoceble*) *muryeongi* sp. n.; 32, *A.* (*Neoceble*) *leesunshini* sp. n.; 33-34, *A.* (*N.*) *odaesanense* sp. n.; 35-36, *A.* (*N.*) *choi* sp. n.. Scale: 0.7 mm for Figs 30-31 and 0.5 mm for Figs 32-36.

Male. Aedeagus (Figs 48 & 56) thick in general; the median lobe curved sharply at middle in lateral view, protuberant apically in ventral view; parameres slender, shorter than the median lobe, curved in an arc, round apically in lateral view, straight at sides, curved inwardly and expanded near apex in ventral view.

Female. Unknown.

Body length 2.0-2.2 mm.

Remarks. Agathidium (*Neoceble*) *leesunshini* sp. n. can be distinguished easily from other five Korean species of the subgenus *Neoceble* by having the dorsum almost impunctate and no hind wings. Moreover, this new species is similar to *A.* (*N.*) *omogoense* Angelini et De Marzo, 1990, but the apex of the median lobe of aedeagus is protuberant in ventral view (Fig. 56). In contrast, *A.* (*N.*) *omogoense* has the median lobe of aedeagus with almost straight apical margin.

Etymology. The specific name is derived from a Korean national hero, admiral Lee Sun-Shin (1545-1598).

VARIANS GROUP

Agathidium* (*Neoceble*) *cribratum Portevin, 1905

Figs 5, 13, 41, 49, 57, 64

Agathidium cribratum Portevin, 1905: 419 (Japan: Honshu).
Agathidium (*Neoceble*) *cribratum*: Portevin, 1914: 229; Hoshina, 2000: 78.
See Angelini (1995) and Hoshina (2000) for other synonymy and references.

Specimens examined. 1 ♂, Sangwonsa, Mt. Odaesan, Jinbu-myeon, Pyeongchang-gun, Gangwon Prov., 4. vi-22. vi. 2001, K.-J. Ahn *et al.* leg. (FIT); 1 ♀ Sangwonsa, Mt. Odaesan, Jinbu-myeon, Pyeongchang-gun, Gangwon Prov., 30. iv.-4. vi. 2001, K.-J. Ahn *et al.* leg. (FIT); 1 ♀, Sangwonsa, Mt. Odaesan, Jinbu-myeon, Pyeongchang-gun, Gangwon Prov., 4. vi 2001, S.-J. Park leg. (by sifting the litter layers).

Distribution. Korea and Japan.

Diagnosis. Coloration. Dorsum almost concolorous, usually black, rarely brown; pronotum with reddish brown margins; antennomeres 1-6 light brown; antennomeres 7, 9-10 and basal two-fifths of 11 black; 8 dark brown; apical three-fifths of 11 brown.

Body about 1.6 times as long as wide (Fig. 5). Head widest at eyes, and microreticulate strongly or weakly; punctures of head minutely and densely (Fig. 13); clypeal line deep and distinct; both mandibles of almost same size in both sexes: antennomere 3 about 1.3 times as long as 2 (Fig. 41); antennomere 7 much larger than 8; antennomere 11 oval; pronotum a little narrower than elytra (Fig. 5), and microreticulate as head; punctures of pronotum as those of head (Fig. 13); elytra not microreticulate; punctures of elytra denser and larger than those of head and pronotum (Fig. 13); sutural stria distinct and its length varying among specimens, about from one-third to two-fifths of length of elytra; hind wings normal; tarsal formula 5-5-4 in male, 5-4-4 in female; aedeagus as shown in Figs 49 & 57; spermatheca as shown in Fig. 64.

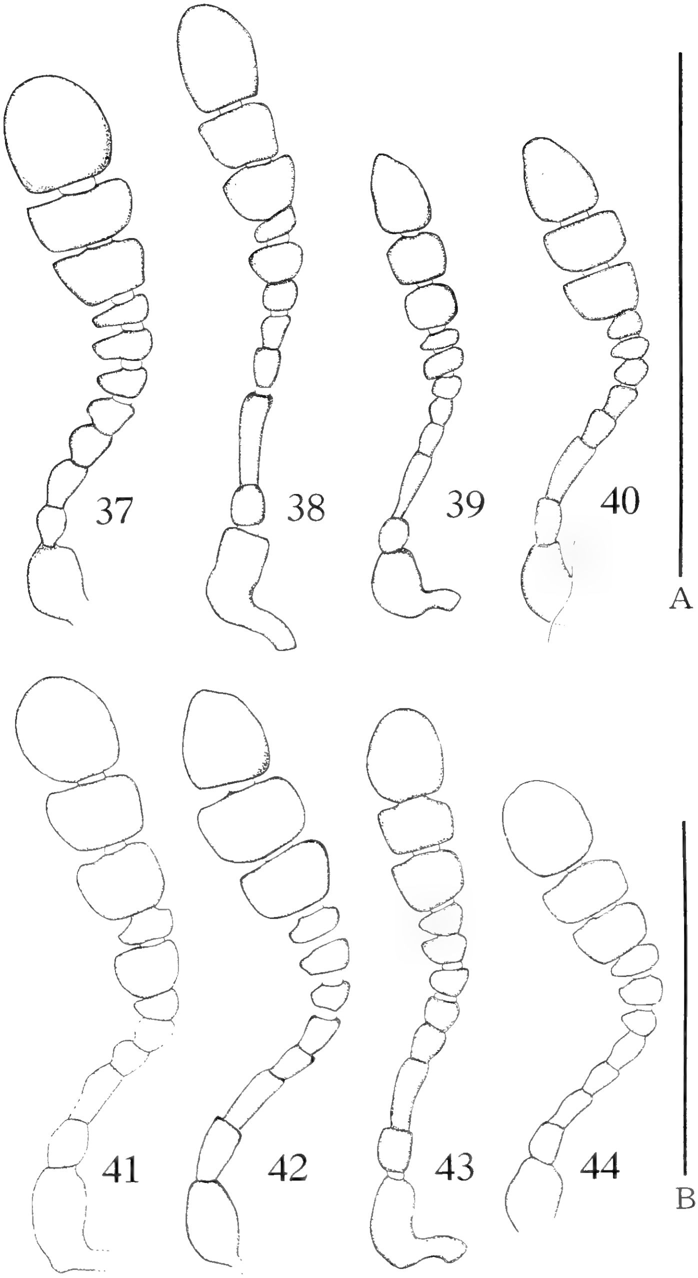
Body length 2.4-3.4 mm.

Remarks. This species was collected for the first time from Korea, being previously known from only Japan. It can be distinguished easily from the other four Korean species of *Neoceble* by having the elytra a little wider than pronotum (Fig. 5) and the antennae with antennomere 7 clearly larger than 8 (Fig. 41).

Agathidium* (*Neoceble*) *odaesanense Hoshina & Park sp. n.

Figs 6, 14, 20, 26, 27, 33, 34, 42, 50, 58, 65

Type series. Holotype: ♂, Sangwonsa, Mt. Odaesan, Jinbu-myeon, Pyeongchang-gun, Gangwon Prov., 22. vii. 2000, M.-H. Kim leg. by the beating (CNUIC). Paratype: 1 ♂, same data



FIGS 37-44

Antennae. 37, *Agathidium* (*Cyphoceble*) *muryeongi* sp. n.; 38, *A.* (*C.*) *subcostatum* Portevin; 39, *A.* (*C.*) *bockshini* sp. n.; 40, *A.* (*Neoceble*) *leesunshini* sp. n.; 41, *A.* (*N.*) *cribratum* Portevin; 42, *A.* (*N.*) *odaesanense* sp. n.; 43, *A.* (*N.*) *curticorne* Hlisnikovsky; 44, *A.* (*N.*) *choi* sp. n.. Scale A: 1 mm for Figs 37 & 39 and 1.2 mm for Fig. 38. Scale B: 0.5 mm for Figs 40-44.

as holotype; 1 ♀, Unduryeong, Kyebangsan, Nae-myeon, Hongcheon-gun, Gangwon Prov., 24. viii. 2000, M.-H. Kim leg. (by the beating); 1 ♀, Sangwonsa, Mt. Odaesan, Jinbu-myeon, Pyeongchang-gun, Gangwon Prov., 16. viii.-15. ix. 2001, S.-J. Park & C.-W. Shin leg. (FIT).

Distribution. Korea.

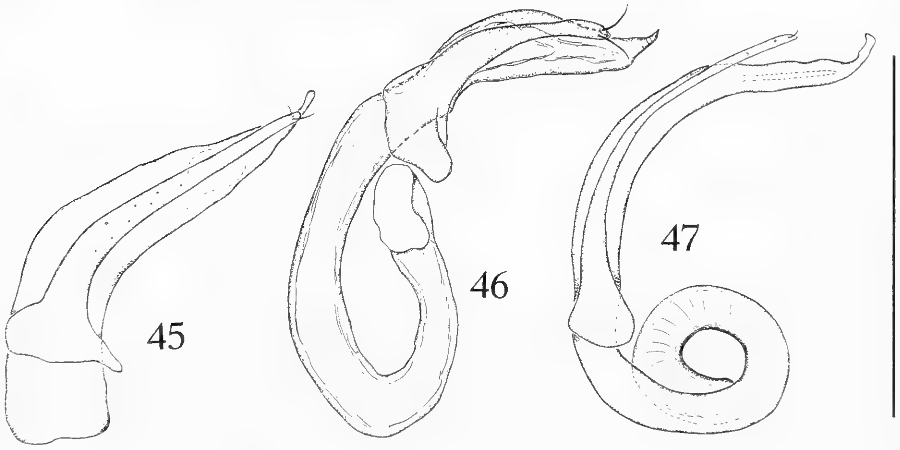
Description. Measurement of holotype. Body length: 2.6 mm. Pronotum: length 0.84 mm, width 1.5 mm, height 0.92 mm. Elytra: length 1.5 mm, width 1.5 mm, height 0.96 mm.

Coloration. Dorsum shining, almost concolorous, dark brown; pronotum with reddish brown margins; mesosternum and venter brown; metasternum dark brown; legs brown; antennomeres 1-8 and 11 brown; 9-10 dark brown; basal two-fifths of 11 darker than 1-8.

Body about 1.7 times as long as wide (Fig. 6), convex in general (Fig. 20).

Head widest at eyes (Figs 26 & 27), about 1.7 times as wide as long, punctate minutely and sparsely (Fig. 14), microreticulate very weakly; length and width of head about 0.66 times as long as and about 0.61 times as wide as those of pronotum, respectively (Fig. 6); eyes oval, located at about apical two-fifths of lateral margins; clypeal line indistinct; male left mandible larger than or almost as large as right one (Figs 26 & 27), and sharply curved apically or straight in lateral view (Figs 33 & 34); both mandibles almost of the same size in female; antennomeres 1-5 and 11 longer than wide; the others wider than long (Fig. 42); antennomere 3 about 1.2 times as long as 2, and almost as long as 4 plus 5; length and width of antennomere 9 about 2.4 times as long as and about 1.7 times as wide as those of 8, respectively; antennomere 9 as large as 10; antennomere 11 oval.

Pronotum widest at about apical two-fifths of lateral margins, about 1.8 times as wide as long, punctate and microreticulate as head (Fig. 14); length and width about 0.55 times as long as and almost as wide as those of elytra, respectively (Fig. 6).



FIGS 45-47

Aedeagi, lateral view. 45, *Agathidium* (*Cyphoceble*) *muryeongi* sp. n.; 46, *A.* (*C.*) *subcostatum* Portevin; 47, *A.* (*C.*) *bockshini* sp. n.. Scale: 0.7 mm for Fig. 45 and 1 mm for Figs 46-47.

Elytra widest at about basal one-fourth of lateral margins, almost as wide as long (Fig. 6), punctate as head and pronotum (Fig. 14), not microreticulate; sutural stria shallow, and present at about apical two-ninths of elytra.

Mesosternum with a complete lateral line and without median carinae; metasternum without femoral lines.

Tarsal formula 5-5-4 in male, 4-4-4 in female.

Hind wings normal.

Male. Aedeagus (Figs 50 & 58) slender in general; the median lobe curved feebly at about basal one-third, pointed sharply at the apex in lateral view, triangular simply along apical margins in ventral view; parameres curved as the median lobe in lateral view, straight at sides, and bluntly pointed apically in ventral view.

Female. Spermatheca bent simply at one point (Fig. 65).

Body length 2.5-2.8 mm.

Remarks. The present species is similar to *Agathidium* (*Neoceble*) *varians* Beck, 1817 in appearance, but is separated by having the dorsum almost concolorous, in compare with *A.* (*N.*) *varians* that has the bicolorous dorsum. Moreover, *A.* (*N.*) *odaesanense* sp. n. is also similar to *A.* (*N.*) *aeneum* Angelini & De Marzo, 1990, but is distinguished by having the dorsum very sparsely punctate. In contrast, *A.* (*N.*) *aeneum* has the dorsum densely and minutely punctate.

Etymology. The specific name is derived from the type locality, Mt. Odaesan.

NIGRIPENNE GROUP

Agathidium* (*Neoceble*) *multitodum Hoshina, 2000

Agathidium (*Neoceble*) *multitodum* Hoshina, 2000: 71 (Japan: Kyushu).

Specimens examined. [Japanese specimens] Holotype, ♂, Mt. Kurodake, Oita Pref., Kyushu, 19. vi. 1996, H. Hoshina leg. (preserved in the collection of Kyushu University, Fukuoka) [Korean specimens] 2 ♂, 1 ♀, Mt. Baekamsan, Waya-ri, Naechon-myeon, Hongcheon, Gangwon Prov., 25. v. -21. vi. 2002, K.-J. Ahn *et al.* leg. (FIT).

Distribution. Korea and Japan.

Diagnosis. See Hoshina (2000).

Remarks. This species was collected for the first time from Korea, and can be distinguished easily from the other five Korean species of *Neoceble* by sometimes having a long horn on the male left mandibles.

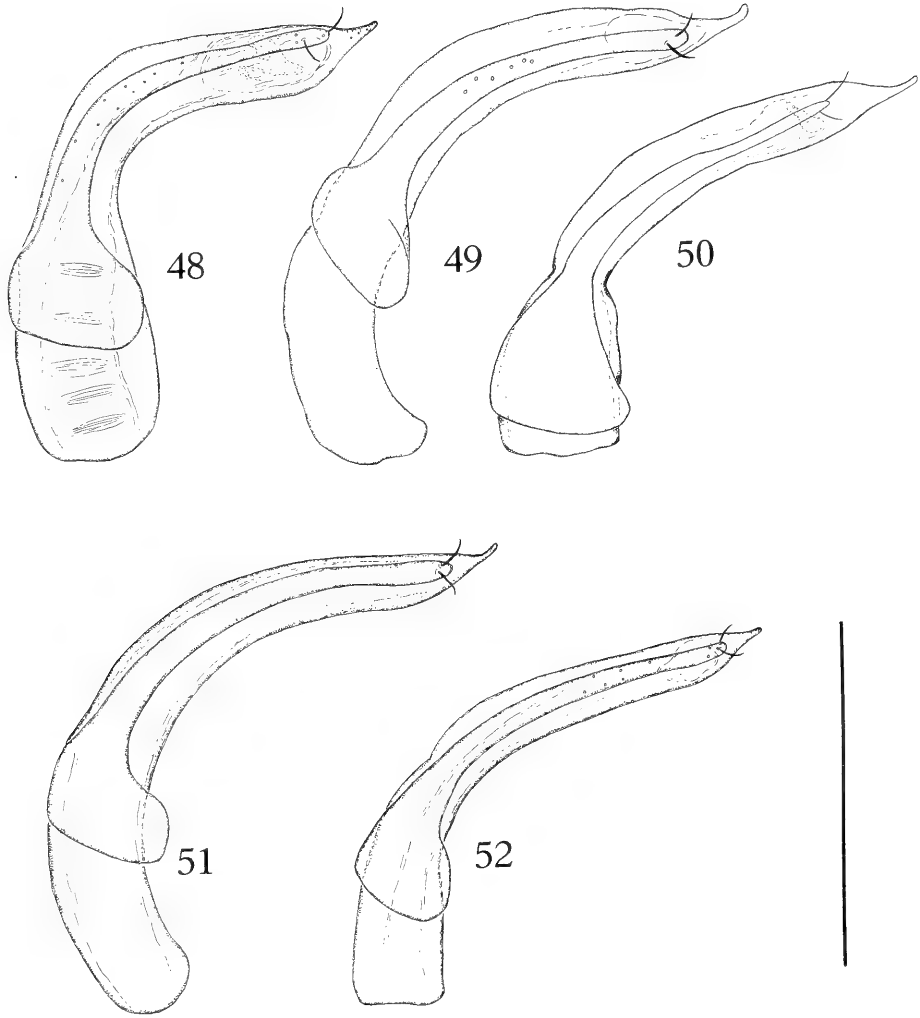
Agathidium* (*Neoceble*) *curticorne Hlisnikovsky, 1964
Figs 7, 15, 43, 51, 59

Agathidium (*Neoceble*) *curticorne* Hlisnikovsky, 1964: 49 (Korea); Lafer, 1989: 327; Angelini, 1992: 431; Angelini, 1995: 141.

Specimens examined. Holotype, ♂, Pu-ry-ong, Korea (preserved in the Natural History Museum, Prague).

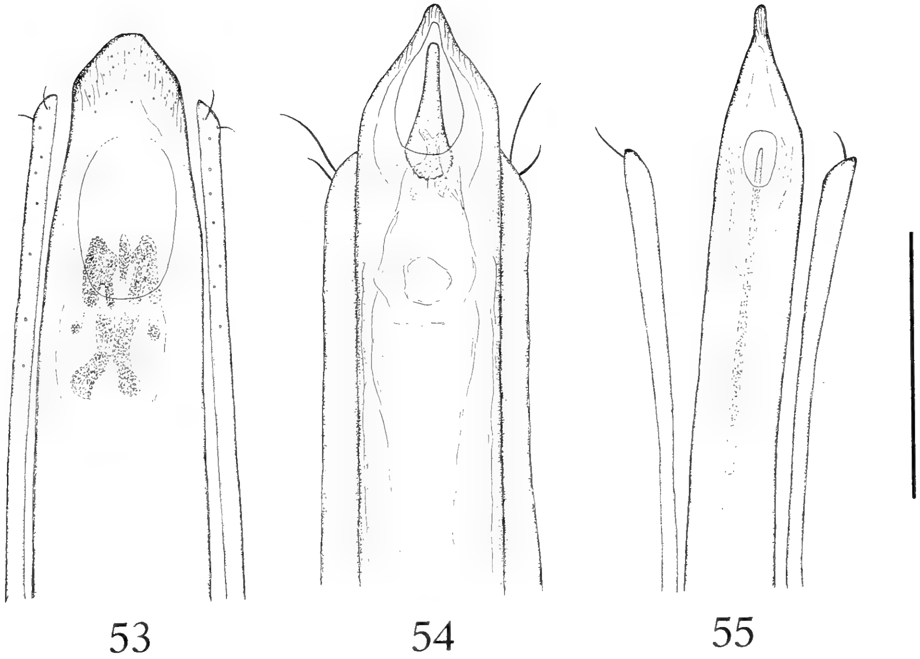
Distribution. Korea.

Diagnosis. Coloration. Dorsum almost concolorous, brown to reddish brown in general; antennomeres 1-8 reddish brown; 9-10 brown, basal two-fifths of 11 light brown to brown; apical three-fifths of 11 light brown; legs reddish brown.



FIGS 48-52
Aedeagi, lateral view. 48, *Agathidium* (*Neoceble*) *leesunshini* sp. n.; 49, *A.* (*N.*) *cribratum* Portevin; 50, *A.* (*N.*) *odaesanense* sp. n.; 51, *A.* (*N.*) *curticorne* Hlisnikovsky; 52, *A.* (*N.*) *choi* sp. n.. Scale: 0.5 mm for Figs 48-52.

Body about 1.9 times as long as wide (Fig. 7); head widest at eyes, punctate minutely (Fig. 15), not microreticulate; clypeal line shallow; both mandibles almost of the same size; antennomere 3 about 1.5 times as long as 2 (Fig. 43); antennomere 11 a little slender; pronotum not microreticulate; punctures of pronotum as those of head (Fig. 15); elytra not microreticulate; punctures of elytra stronger and denser than those of head and pronotum (Fig. 15); sutural stria distinct and present at about apical five-twelfths of elytra; hind wings normal; tarsal formula 5-5-4 in male, unknown in female; aedeagus as shown in Figs 51 & 59.



FIGS 53-55

Aedeagi, ventral view. 53, *Agathidium* (*Cyphoceble*) *muryeongi* sp. n.; 54, *A.* (*C.*) *subcostatum* Portevin; 55, *A.* (*C.*) *bockshini* sp. n.. Scale: 0.25 mm for Figs 53-55.

Body length: 2.6 mm.

Remarks. This species was described by Hlisnikovsky (1964) and no specimens have been collected since then.

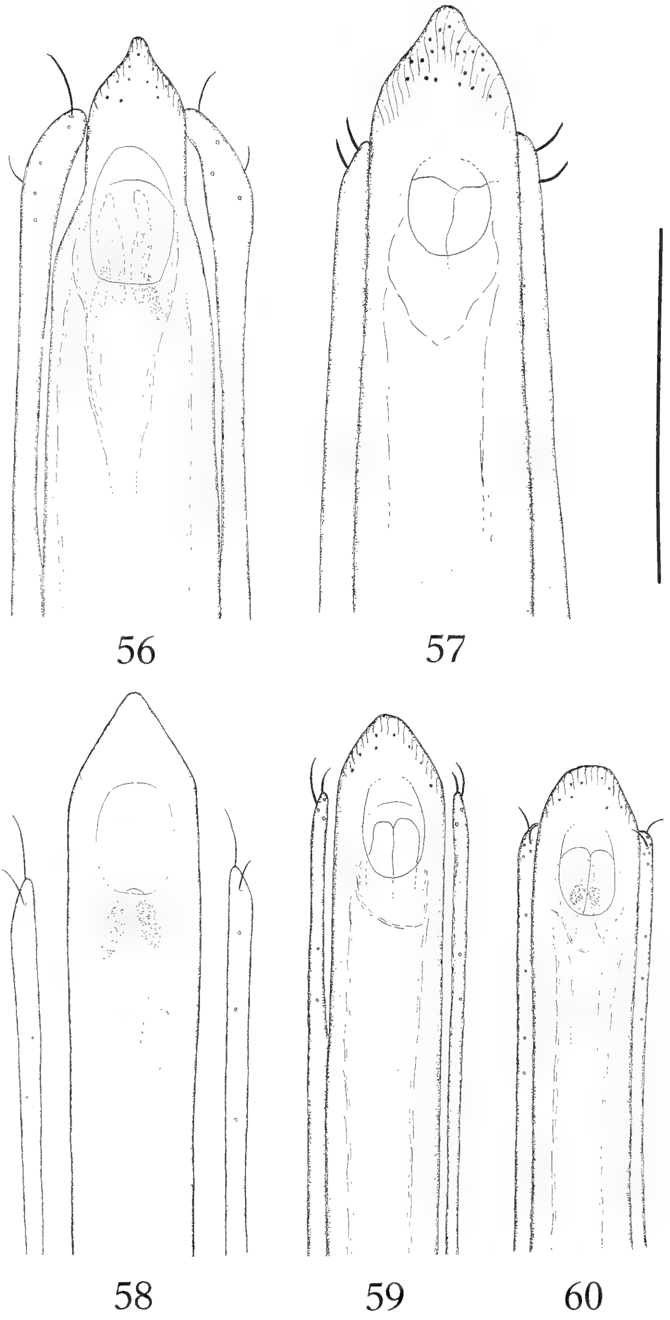
Agathidium* (*Neoceble*) *choi Hoshina & Park sp. n.
Figs 8, 16, 21, 28, 29, 35, 36, 44, 52, 60, 66

Type series. Holotype: ♂, Geumsubong, Mt. Gyeryongsan, Chungnam Prov., 23. vi. 2000, H. Hoshina & M. Maruyama leg. by the beating. (CNUIC). Paratypes: 4 ♂, same data as holotype (2♂ preserved in the collection of a senior author); 1 ♂, 1 ♀, Sangwonsa, Mt. Odaesan, Jinbu-myeon, Pyeongchang-gun, Gangwon Prov., 4. vi-22. vi. 2001, K.-J. Ahn *et al.* leg. (FIT); 1 ♂, Sangwonsa, Mt. Odaesan, Jinbu-myeon, Pyeongchang-gun, Gangwon Prov., 16. viii.-15. ix. 2001, S.-J. Park & C.-W. Shin leg. (FIT); 1 ♂, Mt. Sambangsan, Pyeongchang-eup, Pyeongchang-gun, Gangwon Prov., 13. vii. 2001, S.-J. Park & C.-W. Shin leg. (by the beating).

Distribution. Korea.

Description. Measurement of holotype: Body length 2.6 mm. Pronotum: length 0.84 mm, width 1.4 mm, height 0.84 mm. Elytra: length 1.4 mm, width 1.4 mm, height 1.0 mm.

Coloration. Head and pronotum brown or reddish brown; elytra dark brown; mesosternum brown; metasternum and venter dark brown; fore and mid coxae brown,



FIGS 56-60

Aedeagi, ventral view. 56, *Agathidium* (*Neoceble*) *leesunshini* sp. n.; 57, *A.* (*N.*) *cribratum* Portevin; 58, *A.* (*N.*) *odaesanense* sp. n.; 59, *A.* (*N.*) *curticorne* Hlisnikovsky; 60, *A.* (*N.*) *choi* sp. n.. Scale: 0.5 mm for Figs 56-60.

fore and mid trochanters brown or reddish brown; fore and mid femora brown; other parts of legs reddish brown; antennomere 1 brown, 2-8 light brown, antennomeres 9-10 and basal two-fifths of 11 dark brown, apical three-fifths of 11 a little lighter in color than the basal part.

Body about 1.8 times as long as wide (Fig. 8), convex in general (Fig. 16).

Head widest at eyes (Figs 28 & 29), about 1.5 times as wide as long, punctate minutely (Fig. 16), not microreticulate; length and width of head about 0.71 times as long as and about 0.65 times as wide as those of pronotum, respectively (Fig. 8); eyes oval, located at about apical one-fourth of lateral margins; clypeal line shallow; male left mandible larger than right one (Figs 28 & 29), and sharply or feebly curved apically in lateral view (Figs 35 & 36); both mandibles almost of the same size in female; antennomeres 1-5 and 11 longer than wide; the others wider than long (Fig. 44); antennomere 3 segment about 1.2 times as long as 2, and shorter than 4 plus 5; length and width of antennomere 9 about 1.8 times as long as and about 1.5 times as wide as those of 8, respectively; antennomere 9 narrower than 10; antennomere 11 robust.

Pronotum widest at about apical two-fifths of lateral margins, about 1.7 times as wide as long, punctate minutely (Fig. 16), not microreticulate; length and width of pronotum about 0.58 times as long as and almost as wide as those of elytra, respectively (Fig. 8).

Elytra widest at about basal from one-third to two fifths of lateral margins, almost as wide as long (Fig. 8), not microreticulate; punctures of elytra clearly denser than those of head and pronotum (Fig. 16); sutural stria shallow, present at about apical one-third of elytra.

Mesosternum with a complete lateral line and a distinct median carina; metasternum without femoral lines.

Hind wings normal.

Tarsal formula 5-5-4 in male, 4-4-4 in female.

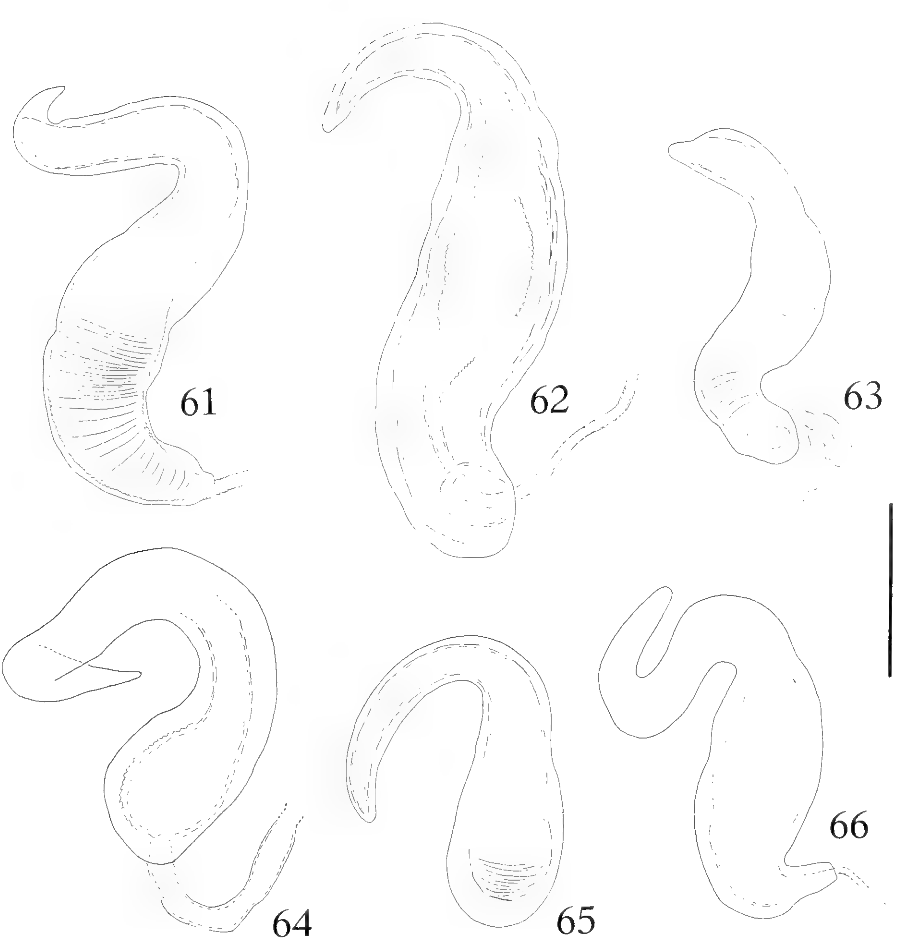
Male. Aedeagus (Figs 52 & 60) slender in general; the median lobe curved simply and weakly in lateral view, almost straight at apical margins in ventral view; parameres slender, shorter than the median lobe, curved in an arc, round apically in lateral view, straight at sides in ventral view.

Female. Spermatheca curved sharply at two points in general (Fig. 66).

Body length 2.5-2.7 mm.

Remarks. Agathidium (*Neoceble*) *cho*i sp. n. is similar to *A.* (*N.*) *aeneum* Angelini et De Marzo, 1990 in appearance, but is distinguished by a pronotum not microreticulate, in comparison with *A.* (*N.*) *aeneum* which has a pronotum clearly microreticulate. This new species is also similar to *A.* (*N.*) *confusum* Brisout, 1863, but the median lobe of the aedeagus is curved simply and weakly in lateral view (Fig. 52). In contrast, *A.* (*N.*) *confusum* has the median lobe which is relatively sharply curved. Moreover, this new species is similar to in appearance to *A.* (*N.*) *curticorne* Hlisnikovsky (see a key for the differences between these two species).

Etymology. The specific name is dedicated to Korean Coleopterogist, Dr. Young Bok Cho.



FIGS 61-66

Spermathecae. 61, *Agathidium* (*Cyphoceble*) *muryeongi* sp. n.; 62, *A.* (*C.*) *subcostatum* Portevin; 63, *A.* (*C.*) *bockshini* sp. n.; 64, *A.* (*Neoceble*) *cribratum* Portevin; 65, *A.* (*N.*) *odaesanense* sp. n.; 66, *A.* (*N.*) *choi* sp. n.. Scale: 0.1 mm for Figs 61-66.

ACKNOWLEDGEMENTS

We wish to express our sincere gratitude to Profs Jun-ichi Aoki (Yokohama National University, Japan) and Young Bok Cho (Hannam University, Korea), and Mr Fernando Angelini (Italy) for their continuous guidances. We also owe thanks to Dr Josef Jelinek (The Natural History Museum, Prague) who kindly provided us with the opportunity to examine a type specimen. We are deeply indebted to Mr Munetoshi Maruyama (Hokkaido University, Japan) and all students of Department of Biology, Chungnam National University for their kind help in offering or lending valuable specimens for this study.

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REVUE SUISSE DE ZOOLOGIE 110 (3): 621-660; septembre 2003

Gyrophaenini della Cina (Coleoptera, Staphylinidae) *

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Gyrophaenini from China (Coleoptera, Staphylinidae). - A revision of Chinese species of *Gyrophaena* and *Brachida*, and the description of two new species of *Encephalus* are presented. In *Gyrophaena,* 24 new species are added to the 18 species already described. *G. quadrifida* is a mixture of two species, necessiting the selection of a lectotype and the description of *G. gulmargensis* sp. n. from Kashmir. In *Brachida* one new species is described, so that now 4 species are known from China. All new species are described, illustrated and compared with related species. A separate key for males and females to the Chinese species of *Gyrophaena* is presented, as well as a key to the 4 species of *Brachida.*

Key-words: Coleoptera - Staphylinidae - Aleocharinae - Gyrophaenini - taxonomy - China.

INTRODUZIONE

La tribù Gyrophaenini Kraatz, 1856, comprende i generi *Gyrophaena* Mannerheim, 1831, *Encephalus* Curtis, 1829 e *Brachida* Mulsant & Rey, 1871, le cui specie sono fungicole, sia come larve, sia come adulti, e i generi *Sternotropa* Cameron, 1920, *Pseudoligota* Cameron, 1920 e *Adelarthra* Cameron, 1920, le cui specie sono fungicole, fitodetriticole e succicole. Questi generi sono caratterizzati essenzialmente dalla presenza sull'apice delle lacinia, il lobo interno della maxilla, di un largo pettine di corte spine accompagnato da molte spine addizionali, pure corte. Per questo carattere unico nella sottofamiglia Aleocharinae e per la forma esterna, i generi *Gyrophaena, Encephalus* e *Brachida,* nel presente lavoro non sono inclusi in una sottotribù degli Homalotini Heer, 1839. Infatti Ashe (1984) colloca *Gyrophaena, Encephalus* e *Brachida,* come sottotribù Gyrophaenina, nella tribù Homalotini. Ma gli unici caratteri sopra elencati giustificano secondo me il livello di tribù e i generi sono perciò posti nella tribù Gyrophaenini Kraatz, 1856.

Le prime specie cinesi del genere *Gyrophaena* Mannerheim, 1831, sono state descritte da Bernhauer (1938). Esse, in numero di cinque, provengono dalla Manciuria, cioè dalla Cina settentrionale. Dei territori della Cina centrale e meridionale non erano note specie fino a quando, recentemente (Pace, 1998, 1999), grazie alla ricerche del Dr. Aleš Smetana di Ottawa e di Guillaume de Rougemont di Londra, vennero descritte di quest'area geografica tredici nuove specie. Successive ricerche di detti colleghi, di

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* 179° Contributo alla conoscenza delle Aleocharinae.
Manoscritto accettato il 14.01.2003

Michael Schülke di Berlino, di Marc Tronquet di Molitg Les Bains (Francia) e dell'inglese J. Fellew, permettono di aggiungere alle ventidue specie note dei Gyrophaenini della Cina, ulteriori ventisette nuove, con una del Kashmir rinvenuta in una serie tipica di Cameron. Esse sono qui di seguito descritte e illustrate.

Gli olotipi delle nuove specie sono conservati nel Museo di Storia Naturale di Ginevra (MHNG), nel Museo di Storia Naturale dell'Università Humboldt di Berlino (NHMB), nel Museo Regionale di Scienze Naturali di Torino (MRSNT) e nel Museo di Storia Naturale di Londra (NHML). Paratipi si conservano nei medesimi Istituti, in collezione A. Smetana di Ottawa, M. Schülke di Berlino e in collezione M. Tronquet di Molitg Les Bains (Francia).

METODO

È noto che le tradizionali suddivisioni del genere *Gyrophaena* in sottogeneri sono basate su caratteri unicamente esterni dell'esoscheletro. Grazie all'esame dell'edeago risulta che molte specie, evidentemente tra loro affini o simili per la forma di quest'organo, seguendo i caratteri tradizionali stabiliti per le suddivisioni sottogeneriche, vengono a porsi sparpagliate in sottogeneri differenti. È questo il caso di *G. zhouzhiensis* n. sp. qui descritta, e specie affini, collocabili in *Gyrophaena (Gyrophaena)* e *G. anguinea* n. sp., pure qui descritta, che si collocherebbe in *Gyrophaena (Agaricophaena* Reitter, 1909). L'appendice preapicale del lobo mediano dell'edeago informa che le due specie sono tra loro affini, nonostante i caratteri esterni così notevolmente differenti, da condurre a due attribuzioni sottogeneriche differenti con i caratteri esterni. Per questo motivo, nel presente lavoro non compaiono attribuzioni sottogeneriche, in attesa di una revisione del genere a livello mondiale, fondata essenzialmente sulla forma dell'edeago.

L'accostamento delle nuove specie tra loro, nel presente lavoro, è un tentativo effettuato in base alla forma dell'edeago e della spermateca, anche se, in base ai caratteri esterni, sarebbe stato d'obbligo collocare più specie in altra posizione. Ciò nel tentativo di porre le singole specie in ordinamento naturale. Ma molte specie cinesi non sono ancora note, pertanto mancano gli «anelli di congiunzione» che potrebbero rendere più chiari i vari passaggi evoluzionistici da specie a specie.

ELENCO DELLE SPECIE NOTE

Gyrophaena facilis Pace, 1998

Gyrophaena facilis Pace, 1998: 171

1 ♂, Sichuan, Gongga Shan, Hailuogou, above camp 3, 3000 m, 6.VII.1996, leg A. Smetana.

DISTRIBUZIONE. Già nota di Sichuan, Gongga Shan.

Gyrophaena gonggana Pace, 1998

Gyrophaena gonggana Pace, 1998: 171

2 es., Sichuan, Gongga Shan, Hailuogou, above camp 3, 3000 m, 6.VII.1996, leg A. Smetana.

DISTRIBUZIONE. Già nota di Sichuan, Gongga Shan.

Gyrophaena thoracica Cameron, 1939

Gyrophaena thoracica Cameron, 1939: 113

58 es., Sichuan, Gongga Shan, above camp 3, 3000 m, 6.VII.1996, leg A. Smetana; 39 es., W Sichuan, 20 Km N Sabdé, 3200 m, 13.VII.1998, leg A. Smetana.

DISTRIBUZIONE. India, Nepal. Nuova per la Cina (serie tipica esaminata).

Gyrophaena facilis Pace, 1998

Gyrophaena facilis Pace, 1998: 171

1 ♂, Sichuan, Gongga Shan, Hailuogou, above camp 3, 3000 m, 6.VII.1996, leg A. Smetana; 1 ♂, Shaanxi, Qin Ling Shan, autoroute Km 93 S of Zhouzhi, 108 Km SW Xian, mountain forest, 1-2.IX.1995, leg. M. Schülke; 8 es., Shaanxi, Qin Ling Shan, Hua Shan, Mt. N Valley, 1200-1400 m, 118 Km E Xian, 18-20.VIII.1995, leg. M. Schülke.

DISTRIBUZIONE. Già nota della Cina: Sichuan, Gongga Shan.

Gyrophaena chinensis Pace, 1998

Gyrophaena chinensis Pace, 1998: 173

14 es., Shaanxi, Qin Ling Shan, autoroute Km 93 S of Zhouzhi, 108 Km SW Xian, mountain forest, 1-2.IX.1995, leg. M. Schülke; 1 es., Shaanxi, Qin Ling Shan, Hua Shan, Mt. N Valley, 1200-1400 m, 118 Km E Xian, 18-20.VIII.1995, leg. M. Schülke.

DISTRIBUZIONE. Già nota del Ganshu: Xilong Shan.

Gyrophaena vidua Pace, 1998

Gyrophaena vidua Pace 1998: 173

37 es., Shaanxi, Qin Ling Shan, autoroute Km 93 S of Zhouzhi, 108 Km SW Xian, mountain forest, 1-2.IX.1995, leg. M. Schülke.

DISTRIBUZIONE. Già nota del Ganshu: Xilong Shan.

DESCRIZIONE DELLE NUOVE SPECIE

Gyrophaena xianensis sp. n. Figg. 1-5

Holotypus ♂, China, Shaanxi, Qin Ling Shan, autoroute Km 93 S of Zhouzhi, 108 Km SW Xian, mountain forest, sifted, 1650 m, 1-2.IX.1995, leg. M. Schülke (NHMB).
Paratypi: 1 ♂ e 1 ♀, stessa provenienza.

DESCRIZIONE. Lungh. 2,6 mm. Corpo lucido e rossiccio con metà posteriore delle elitre e uroterghi liberi quarto e base del quinto bruni; antenne brune con i tre antennomeri basali giallo-rossicci; zampe gialle. La punteggiatura del capo e del pronoto è forte, assente ai lati del pronoto, quella delle elitre è netta, irregolarmente distribuita e assente al margine e all'angolo posteriore esterno. La reticolazione del capo e del pronoto è estremamente superficiale, quella delle elitre è assente e quella dell'addome è netta. Il primo urotergo libero presenta una bozza mediana su cui non vi sono granuli, presenti ai suoi lati. Edeago figg. 2-3, spermateca fig. 4, sesto urotergo libero del ♂ fig. 5.

ETIMOLOGIA. La nuova specie prende nome dalla città di Xian.

COMPARAZIONI. Per la forma dell'edeago, la nuova specie si mostra affine a *G. gregaria* Cameron, 1939, dell'India settentrionale (serie tipica esaminata conservata al *Museum of Natural History* di Londra, collezione Cameron. Si compone di 1 ♂ così etichettato: Ghum distr., Tiger Hill, 8500-10.000 ft., V-VI.1931, Dr. Cameron, *G. gre-*

garia Cam., TYPE in rosso; 1 ♂ e 1 ♀, Manggo, V-31, Dr Cameron; 1 ♂, Ghum distr. V-VI.31, Dr Cameron. Lectotypus non scelto perché l'esemplare indicato in rosso come TYPE corrisponde all'holotypus, in base a quanto indicatomi da un *referee* di altri Musei). Se ne distingue per i caratteri dati nella seguente chiave.

1 Punteggiatura del capo fitta, quella del pronoto quasi indistinta, tranne quattro punti; addome privo di reticolazione; i due tubercoli mediani allungati davanti al margine posteriore del quinto urotergo libero del ♂, paralleli; tra i due lobi laterali del sesto urotergo libero del ♂, ve ne sono due mediani lunghi e due corti; edeago debolmente ricurvo al lato ventrale. Lungh. 1,9 mm. India: Ghum distr. . . . . *G. gregaria* Cameron

\- Punteggiatura del capo rada, quella del pronoto forte; addome nettamente reticolato; i due tubercoli mediani allungati davanti al margine posteriore del quinto urotergo libero del ♂, convergenti all'indietro; tra i due lobi laterali del sesto urotergo libero del ♂, ve ne sono due cortissimi mediani; edeago fortemente ricurvo al lato ventrale. Lungh. 2,6 mm. Cina: Shaanxi . . . . *G. xianensis* sp. n.

Gyrophaena simplicitatis sp. n. Figg. 6-9

Holotypus ♂, China, Shaanxi, Qin Ling Shan, autoroute Km 93 S of Zhouzhi, 108 Km SW Xian, 1650 m, 1-2.IX.1995, leg. M. Schülke (NHMB).

Descrizione. Lungh. 2,1 mm. Corpo lucido e bruno; antenne giallo-brune con i tre antennomeri basali gialli; zampe gialle. Punteggiatura del capo e del pronoto forte, quella delle elitre è fine. La reticolazione del capo è assente, quella del pronoto è molto superficiale sul disco e assente ai lati, quella delle elitre è distinta e quella dell'addome è nettissima. Edeago figg. 7-8, sesto urotergo libero del ♂ fig. 9.

Etimologia. Il nome della nuova specie deriva dalla forma semplice dell'armatura interna dell'edeago.

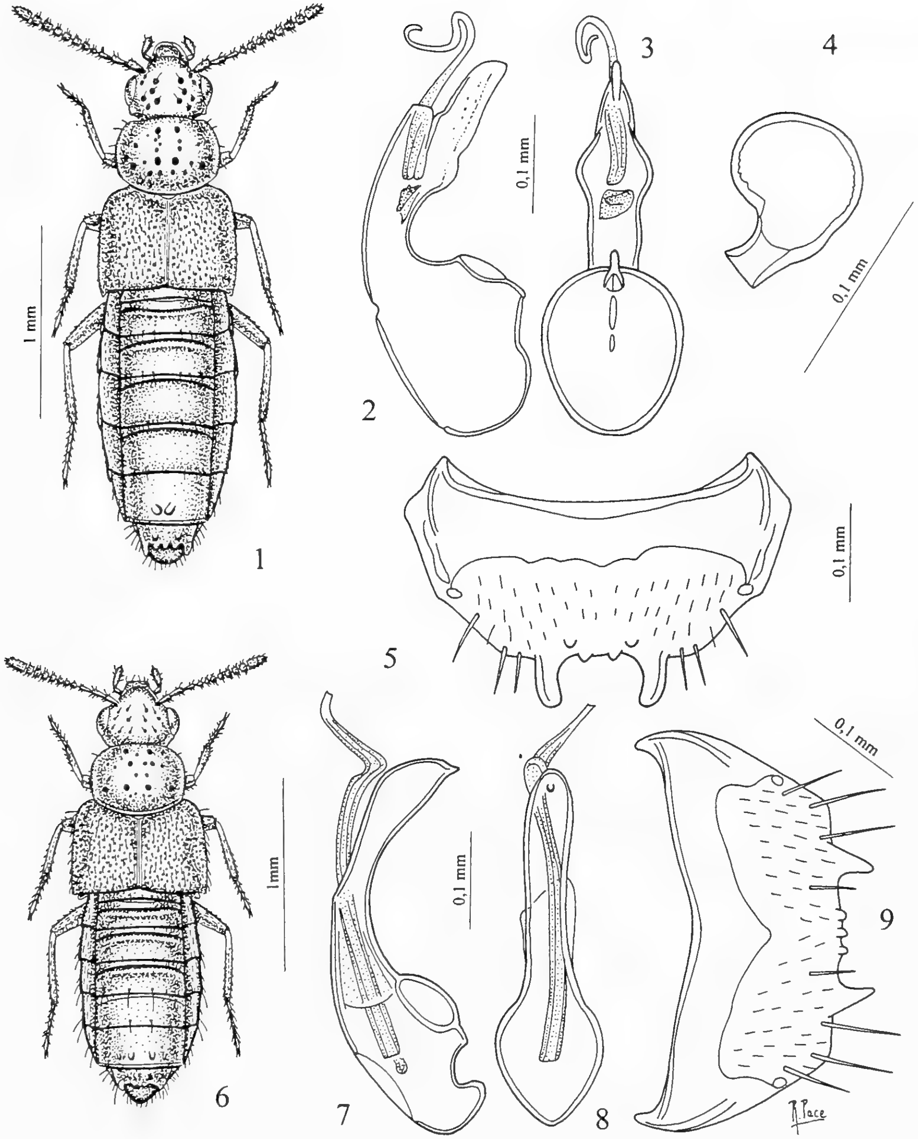
Comparazioni. La nuova specie, per la forma dell'edeago, è tassonomicamente vicina a *G. gregaria* Cameron, 1939, dell'India settentrionale (serie tipica esaminata). Se ne distingue per i caratteri dati nella seguente chiave.

1 Pronoto più trasverso, con punteggiatura quasi indistinta al di fuori di quattro punti robusti; reticolazione dell'addome superficiale; edeago nettamente bisinuato al lato ventrale; armatura interna dello stesso angolosa due volte e arcuata all'apice. Lungh. 1,9 mm. India: Ghum distr. . . . . *G. gregaria* Cameron

\- Pronoto meno trasverso, con punteggiatura netta al di fuori di sei punti robusti; reticolazione dell'addome nettissima; edeago indistintamente bisinuato al lato ventrale; armatura interna dello stesso angolosa una sola volta e rettilinea nella regione preapicale. Lungh. 2,1 mm. Shaanxi. . . . . *G. simplicitatis* sp. n.

Gyrophaena discoidea sp. n. Figg. 10-13

Holotypus ♂, China, Shaanxi, Qin Ling Shan, Hua Shan, S-top, 1950-2000 m, forest, sifted, 19.VIII.1995, leg. M. Schülke (NHMB).
Paratypi: 2 ♀♀, stessa provenienza.



FIGG. 1-9
Habitus, edeago in visione laterale e ventrale, spermateca e sesto urotergo libero del ♂. 1-5: *Gyrophaena xianensis* sp. n.; 6-9: *Gyrophaena simplicitatis* sp. n.

DESCRIZIONE. Lungh. 2,6 mm. Corpo lucido e bruno-rossiccio con capo bruno e margine posteriore degli uriti liberi primo, secondo e terzo rossicci; antenne interamente gialle; zampe dello stesso colore. La punteggiatura del capo e del pronoto è forte, assente ai lati del pronoto. Le elitre sono coperte di granulosità superficiale. La reticolazione del capo, delle elitre e dell'addome è distinta, quella del pronoto è assente. Edeago figg. 11-12, sesto urotergo libero del ♂ fig. 13, spermateca indistinta.

ETIMOLOGIA. Il nome della nuova specie deriva dalla forma di disco della parte apicale dell'edeago, se visto ventralmente.

COMPARAZIONI. Per la forma dell'edeago la specie più simile sembra essere affine a *G. narendra* Pace, 1989, del Nepal. Le due specie si distinguono come segue.

1 Penultimi antennomeri trasversi; reticolazione del capo estremamente superficiale; punteggiatura delle elitre forte e composta di punti confluenti tra loro; i due tubercoli posteriori mediani del quinto urotergo libero del ♂ più corti delle carene laterali; parte apicale dell'edeago, in visione ventrale, ovale allungato; spermateca presente. Lungh. 1,9 mm. Nepal .... *G. narendra* Pace

\- Reticolazione del capo distinta al di fuori del disco e in avanti; penultimi antennomeri più lunghi che larghi; elitre coperte di granulosità superficiale; i due tubercoli posteriori mediani del quinto urotergo libero del ♂ molto più robusti dei laterali; parte apicale dell'edeago, in visione ventrale, circolare; spermateca indistinta. Lungh. 2,6 mm. Shaanxi .... *G. discoidea* sp. n.

Gyrophaena nobilis sp. n. Figg. 14-16

Holotypus ♀, China, Sichuan, Gongga Shan, Hailuogou, Lake above camp 2, 2750 m, 4.VII.1998, 39°35N/102°OOE, leg. A. Smetana, 1998 China Expedition J. Farkač, D. Král, J. Schneider & A. Smetana (MHNG).

DESCRIZIONE. Lungh. 3,8 mm. Corpo lucido e bruno, con elitre giallo-brune e lati destro e sinistro del pronoto, uriti liberi primo e secondo, paratergiti del terzo e pigidio, giallo-rossicci. Punteggiatura del capo e del pronoto forti. Al di fuori di alcuni punti forti alla base e lungo la sutura delle elitre, la punteggiatura delle elitre è molto superficiale: due distinti punti si trovano agli angoli posteriori esterni delle stesse elitre. La punteggiatura superficiale dei due uriti basali è assente sulla linea longitudinale mediana. Il quarto urotergo libero è coperto di strie longitudinali. I quattro tubercoli del quinto urotergo libero della ♀ sono posti lontano dal margine posteriore dello stesso quinto urotergo libero. Su tutto il corpo non è presente reticolazione.

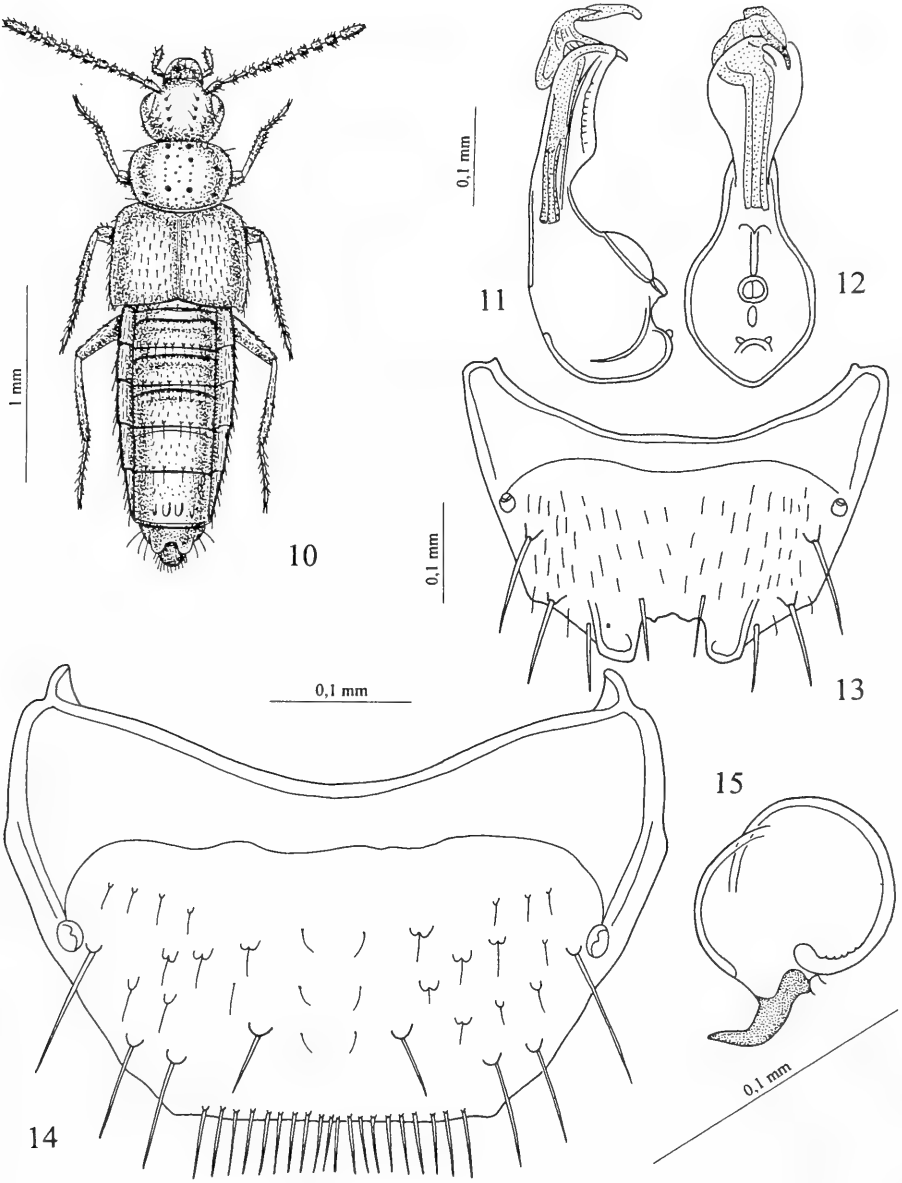
ETIMOLOGIA. La nuova specie prende nome di «nobile» a motivo del suo habitus distinto, raro come la nobiltà.

COMPARAZIONI. La grande taglia corporea, i caratteri unici degli uroterghi (Fig. 14) e la fortemente sclerificata parte prossimale della spermateca (Fig. 15) rendono la nuova specie inconfondibile da quelle note.

Gyrophaena erosa sp. n. Figg. 17-19

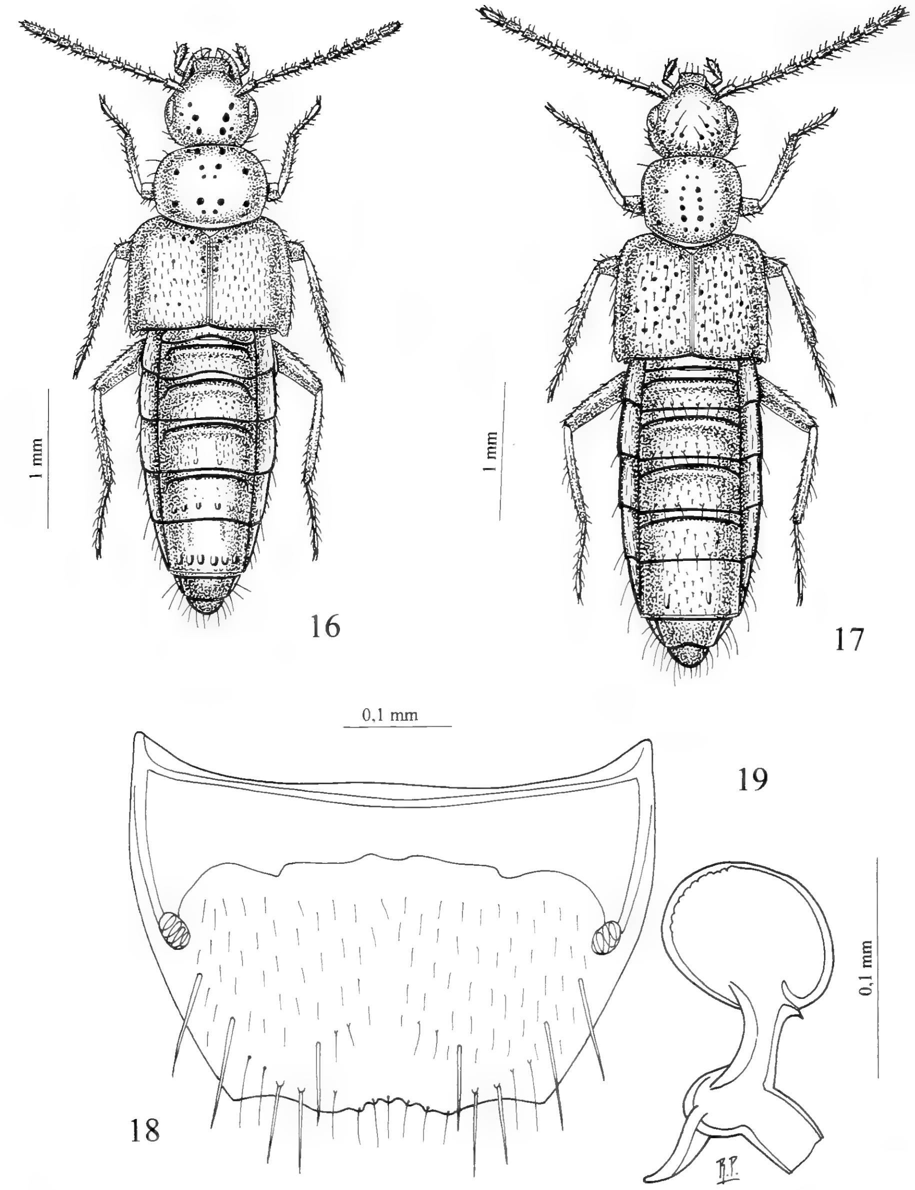
Holotypus ♀, China, W Sichuan, 20 Km N Sabdé, 3200 m, 29°35N/102°23E, 14.VII.1998, leg. A. Smetana, 1998 China Expedition J. Farkač, D. Král, J. Schneider & A. Smetana, (MHNG).

DESCRIZIONE. Lungh. 4,1 mm. Corpo lucido e bruno, con lati destro e sinistro del pronoto, omeri e uriti liberi primo, secondo e terzo, bruno-rossicci; antenne e zampe giallo-rossicce. La punteggiatura del capo e del pronoto è forte, quella delle



FIGG. 10-15
Habitus, edeago in visione laterale e ventrale, sesto urotergo libero del ♂ (13) e della ♀ (14) e spermateca. 10-13: *Gyrophaena discoidea* sp. n.; 14-15: *Gyrophaena nobilis* sp. n.

elitre è di due tipi: tra punti grandi sono frammisti punti fini. La reticolazione del capo e del pronoto è estremamente superficiale sul disco e assente ai lati, quella delle elitre e dell'addome è assente. Sesto urotergo libero della ♀ fig. 18, spermateca fig. 19.



Figg. 16-19

Habitus, sesto urotergo libero della ♀ e spermateca. 16: *Gyrophaena nobilis* sp. n.; 17-19: *Gyrophaena erosa* sp. n.

Etimologia. La nuova specie prende nome dal fatto che il margine posteriore del sesto urotergo libero è smarginato a metà in modo tale da apparire come «eroso o rosicchiato».

COMPARAZIONI. Per la lunghezza delle antenne, la taglia corporea e altri caratteri, la nuova specie sembra sistematicamente vicina a *G. gonggana* Pace, 1998, pure della Cina. Se ne distingue per i caratteri dati nella seguente chiave.

1 Antenne giallo-brune con base gialla; occhi più lunghi delle tempie; pronoto nettamente trasverso; elitre uniformemente bruno-rossicce. Lungh. 3,7 mm. Sichuan .... *G. gonggana* Pace

\- Antenne interamente giallo-rossicce; occhi più corti delle tempie; pronoto appena trasverso; elitre brune con omeri bruno-rossicci. Lungh. 4,1 mm. Sichuan .... *G. erosa* sp. n.

Gyrophaena permixta sp. n. Figg. 20-23

Holotypus ♂, China, Gongga Shan, Hailuogou, above camp 3, 3000 m, 6.VII.1996, 29°35N/102°00E, leg. A. Smetana, J. Farkač and P. Kabátek (MHNG).

DESCRIZIONE. Lungh. 2,7 mm. Corpo lucido e giallo-rossiccio, con capo e quarto urite libero bruni; antenne brune con i tre antennomeri basali di un giallo sporco; zampe gialle. La punteggiatura del capo e del pronoto è profonda, quella delle elitre è fitta e distinta. La reticolazione del capo è presente solo sul disco dove è estremamente superficiale, quella del pronoto e delle elitre è svanita e assente ai lati delle elitre. L'addome è coperto di reticolazione netta. Edeago figg. 21-22, sesto urotergo libero del ♂ fig. 23.

ETIMOLOGIA. La nuova specie mostra alcuni caratteri che sembrano presi da altre specie affini, per cui il suo nome significa «molto mista».

COMPARAZIONI. L'edeago della nuova specie presenta un'appendice preapicale dorsale e non è fortemente dilatato ventralmente, in visione ventrale. Per questi caratteri mostra sicura affinità con *G. difficilis* Cameron, 1939, (olotipo ♂, conservato nel Museo di Londra, esaminato: esso ha i lobi del margine posteriore del sesto urotergo amputati, perciò non citati nella seguente chiave per confronto). Se ne distingue come segue.

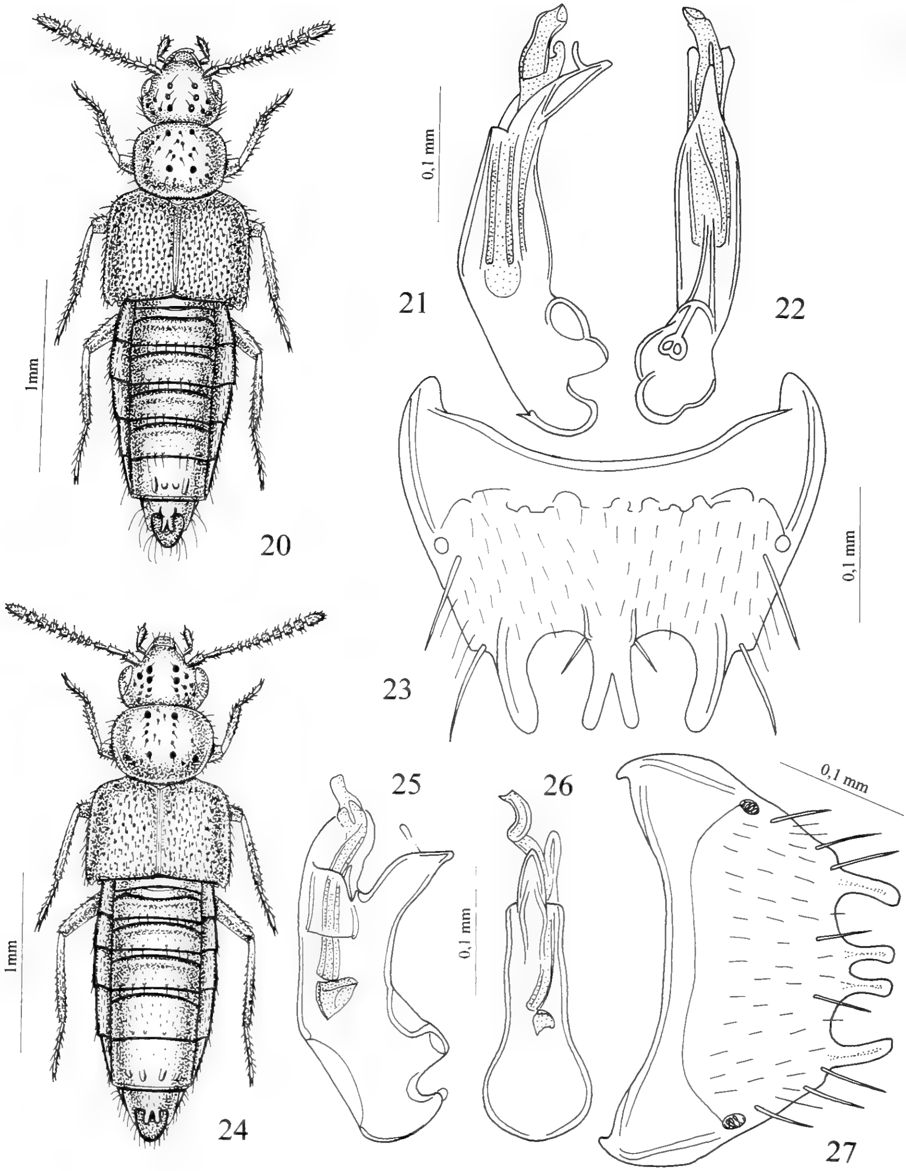
1 Reticolazione del capo distinta; quarto antennomero poco differente in grandezza dall'immediatamente successivo e appena trasverso; occhi più lunghi delle tempie; reticolazione delle elitre netta; appendice preapicale dorsale dell'edeago assai lunga, descrivente un'ampia C; edeago fortemente arcuato al lato ventrale. Lungh. 1,7 mm. India settentrionale .... *G. difficilis* Cameron.

\- Reticolazione del capo assente, tranne sul disco dove è estremamente superficiale; quarto antennomero molto più piccolo dall'immediatamente successivo e fortemente trasverso; occhi più corti delle tempie; reticolazione delle elitre superficiale; appendice preapicale dorsale dell'edeago corta e appena ricurva; edeago debolmente arcuato al lato ventrale. Lungh. 2,7 mm. Gongga Shan .... *G. permixta* sp. n.

Gyrophaena zhouzhiensis sp. n. Figg. 24-27

Holotypus ♂, China, Shaanxi, Qin Ling Shan, autoroute Km 93 S of Zhouzhi, 108 Km SW Xian, 1-2.IX.1995, leg. M. Schülke (NHMB).

Paratypus: 1 ♂, stessa provenienza.



FIGG. 20-27

Habitus, edeago in visione laterale e ventrale e sesto urotergo libero del ♂. 20-23: *Gyrophaena permixta* sp. n.; 24-27: *Gyrophaena zhouzhiensis* sp. n.

DESCRIZIONE. Lungh. 2,7 mm. Corpo lucido e giallo-rossiccio, con capo, elitre e quarto urite libero bruni; antenne brune con i tre antennomeri basali gialli; zampe gialle. La punteggiatura del capo e del pronoto è profonda, quella delle elitre è fine e irregolarmente distribuita. La reticolazione del capo è assente, quella del pronoto è estremamente superficiale e quella dell'addome è netta, tranne sul quinto urotergo libero del ♂ dove è quasi vigorosa. Edeago figg 25-26, sesto urotergo libero del ♂ fig. 27.

ETIMOLOGIA. La nuova specie prende nome dalla città cinese di Zhouzhi, nelle cui vicinanze si trova la sua località tipica.

COMPARAZIONI. La nuova specie, per i caratteri esterni e quelli dell'edeago, sembra affine a *G. smetanaiella* Pace, 1989, del Nepal. Infatti entrambe le specie presentano una corta appendice preapicale dorsale dell'edeago e forte punteggiatura del capo e del pronoto (debole punteggiatura nelle altre specie di questo gruppo di *G. difficilis* Cameron). La nuova specie si distingue per i caratteri dati nella seguente chiave.

1 Undicesimo antennomero lungo quasi quanto i tre antennomeri precedenti riuniti; quarto antennomero lungo quanto largo; punteggiatura del capo e del pronoto assai rada; pronoto trasverso; secondo urotergo libero del ♂ con due pliche mediane; sesto urotergo libero del ♂ con un largo lobo mediano al margine posteriore; parte apicale dell'edeago, in visione ventrale, assai asimmetrica e larga. Lungh. 2,9 mm. Nepal .... *G. smetanaiella* Pace

\- Undicesimo antennomero lungo quanto i due antennomeri precedenti riuniti; quarto antennomero trasverso; punteggiatura del capo e del pronoto meno rada; pronoto meno trasverso; secondo urotergo libero del ♂ senza pliche mediane; sesto urotergo libero del ♂ con due stretti e lunghi lobi mediani al margine posteriore; parte apicale dell'edeago, in visione ventrale, simmetrica e stretta. Lungh. 2,7 mm. Shaanxi .... *G. zhouzhiensis* sp. n.

Gyrophaena gulmargensis sp. n. Figg. 28-31

Holotypus ♂, Kashmir, Gulmarg, 8,000-9,000 ft., VI-VII.1931, leg. Dr. Cameron (NHML). Esemplare considerato sintipo di *G. quadrifida* Cameron, ma precedentemente determinato da Cameron come *G. transita* sp. n., type, il cui cartellino è stato annullato dallo stesso Cameron con due barre diagonali. *G. transita* sp. n. non è mai stata descritta. Il lectotypus ♂, nella presente designazione, porta i seguenti cartellini: Kashmir, Gulmarg, 8,000-9,000 ft., VI-VII.1931, Dr. Cameron; *G. quadrifida* Cam., TYPE in rosso. I paralectotypi, sono 3 ♂♂ e 6 ♀♀, stessa provenienza del lectotypus, ma senza la scritta TYPE in rosso. L'edeago di *G. quadrifida* è assai caratteristico per avere, in visione laterale, una lunga e stretta appendice apicale e, in visione ventrale l'apice a forma di triangolo isoscele a base larga. Il sesto urotergo libero del ♂ è come lo descrive Cameron (1939). La spermateca ha bulbo distale sferico e corpo mediano assai largo. Mi riservo di pubblicare il disegno di questi organi in un futuro lavoro, comprendente anche l'edeago e la spermateca delle specie himalaiane e indiane descritte da Cameron.

DESCRIZIONE. Lungh. 1,8 mm. Corpo lucido e rossiccio, con elitre e addome, tranne il margine posteriore degli uroterghi, bruno rossicci; antenne brune con i tre antennomeri basali gialli; zampe giallo-rossicce. La punteggiatura del capo è netta e profonda, quella del pronoto, al di fuori di quattro punti forti, è addensata sulla fascia mediana e ai lati, sicché tra queste due aree si trova una fascia longitudinale senza punteggiatura. Le elitre sono coperte di punteggiatura fine e irregolarmente distribuita. La reticolazione del capo e del pronoto è assente, quella delle elitre è superficiale e quella dell'addome distinta. Edeago figg. 29-30, sesto urotergo libero del ♂ fig. 31.

ETIMOLOGIA. La nuova specie prende nome dalla sua località tipica Gulmarg.

COMPARAZIONI. L'esemplare appartenente a questa nuova specie, come sopra accennato, era determinato da Cameron come *G. quadrifida* Cameron, 1939, pure del Kashmir, perché i caratteri esterni delle due specie quasi coincidono. L'esame della serie tipica mi ha permesso di notare la grande differenza di forma dell'edeago tra le due specie, anche se appartenenti entrambe al medesimo gruppo di *G. difficilis* Cameron, 1939. La nuova specie, in base alla forma dell'edeago è sicuramente più affine a *G. pujana* Pace, 1989, del Nepal, che a *G. quadrifida*. Le due specie affini si distinguono per i caratteri dati nella seguente chiave.

1 Pronoto meno trasverso, con rapporto larghezza/lunghezza pari a 1,31; reticolazione delle elitre netta; parte apicale dell'edeago lunga, sia in visione laterale, sia in quella ventrale, sicché la parte apicale ha forma di triangolo isoscele, con altezza pari una volta e un terzo della base. Lungh. 2,0 mm. Nepal . . . . *G. pujana* Pace

\- Pronoto più trasverso, con rapporto larghezza/lunghezza pari a 1,40; reticolazione delle elitre superficiale; parte apicale dell'edeago corta, sia in visione laterale, sia in quella ventrale, sicché la parte apicale ha forma di triangolo rettangolo, la cui altezza è appena più lunga della base. Lungh. 1,8 mm. Kashmir . . . . *G. gulmargensis* sp. n.

Gyrophaena anguinea sp. n. Figg. 32-35

Holotypus ♂, China, Sichuan, Gongga Shan, Hailuogou, above camp 3, 3000 m, 6.VII.1996, 29°35N/102°00E, leg. A. Smetana, J. Farkač and P. Kabátek (MHNG).

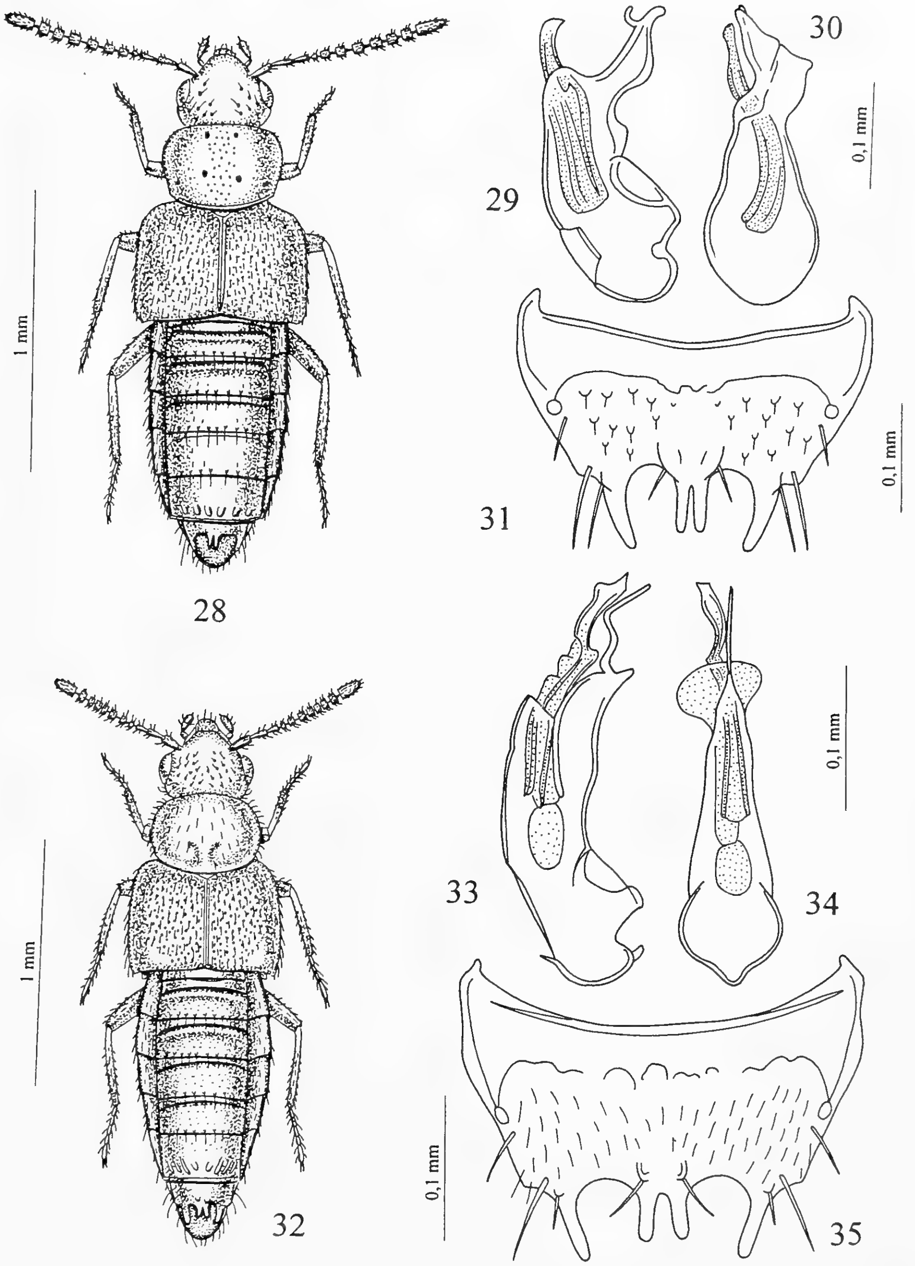
DESCRIZIONE. Lungh. 2,1 mm. Corpo lucido e bruno-rossiccio, con capo, elitre e addome bruni; antenne brune con i tre antennomeri basali di un giallo sporco; zampe gialle. La punteggiatura del capo è poco profonda, quella del pronoto è poco distinta e quella delle elitre è fine, profonda e assente all'angolo posteriore esterno delle stesse elitre. La reticolazione del capo e del pronoto è distinta, quella delle elitre e dell'addome netta. Edeago figg. 33-34, sesto urotergo libero del ♂ fig. 35.

ETIMOLOGIA. La nuova specie prende nome di «attinente al serpente» per la forma serpeggiante dell'appendice preapicale dorsale dell'edeago.

COMPARAZIONI. La nuova specie per i caratteri dell'edeago, tra cui la sua lunghissima appendice preapicale dorsale, può essere affine a *G. quadrifida* Cameron, 1939, del Kashmir (serie tipica esaminata), che presenta simile lunga appendice. Le due specie si distinguono per i seguenti caratteri.

1 Penultimi antennomeri debolmente trasversi; occhi ridotti, molto più corti delle tempie; pronoto senza solchi mediani basali; reticolazione delle elitre estremamente superficiale; appendice preapicale dorsale dell'edeago rettilinea; parte preapicale dell'edeago, in visione ventrale, larga e a lati paralleli. Lungh. 2,1 mm. Kashmir e Nepal . . . . . . *G. quadrifida* Cameron

\- Penultimi antennomeri fortemente trasversi; occhi molto sviluppati, più lunghi delle tempie; pronoto con due solchi mediani basali; reticolazione delle elitre netta; appendice preapicale dorsale dell'edeago bisinuosa; parte preapicale dell'edeago, in visione ventrale, stretta e a lati convergenti verso l'apice dello stesso edeago. Lungh. 2,1 mm. Sichuan . . . . *G. anguinea* sp. n.



FIGG. 28-35

Habitus, edeago in visione laterale e ventrale e sesto urotergo libero del ♂. 28-31: *Gyrophaena gulmargensis* sp. n., del Kashmir; 32-35: *Gyrophaena anguinea* sp. n.

Gyrophaena schuelkei sp. n. Figg. 36-40

Holotypus ♂, China, Shaanxi, Qin Ling Shan, autoroute Km 93, S of Zhouzhi, 108 Km SW Xian, mountain forest, sifted, 1650 m, leg. M. Schülke (NHMB).

Paratypi: 18 es., stessa provenienza.

DESCRIZIONE. Lungh. 2,7 mm. Corpo lucido e bruno, con base delle elitre e addome di un giallo sporco, tranne il quarto urite libero e la base del quinto che sono bruni; antenne giallo-brune con i tre antennomeri basali gialli; zampe gialle. La punteggiatura del capo e del pronoto è forte. Le elitre sono coperte di fine granulosità. Il capo è depresso presso gli occhi. Sul corpo non si osserva reticolazione. Il secondo urotergo libero del ♂ presenta due pliche mediane basali. Il quinto urotergo libero del ♂ mostra a ciascun lato un solco basale ricurvo. Edeago figg. 37-38, spermateca fig. 39, sesto urotergo libero del ♂ fig. 40.

ETIMOLOGIA. La nuova specie è dedicata al suo raccoglitore Michael Schülke, noto studioso di Staphylinidae di Berlino.

COMPARAZIONI. Per alcuni caratteri esterni (pliche sul secondo urotergo libero del ♂, antenne lunghe, pronoto fortemente punteggiato) e dell'edeago (corta appendice preapicale dorsale, parte preapicale dello stesso organo larga e presenza di flagello filiforme), la nuova specie è sicuramente affine a *G. gonggana* Pace, 1989, pure della Cina (Sichuan). Se ne distingue per i caratteri dati nella seguente chiave.

1 Decimo antennomero più lungo che largo; presso il margine posteriore del quinto urotergo libero del ♂ si trova un tubercolo mediano depresso, affiancato da deboli granuli; sesto urotergo libero del ♂ con minuscolo dente mediano affiancato da un largo lobo; regione preapicale dell'edeago bruscamente e fortemente dilatata simmetricamente. Lungh. 3,7 mm. Sichuan . . . . *G. gonggana* Pace

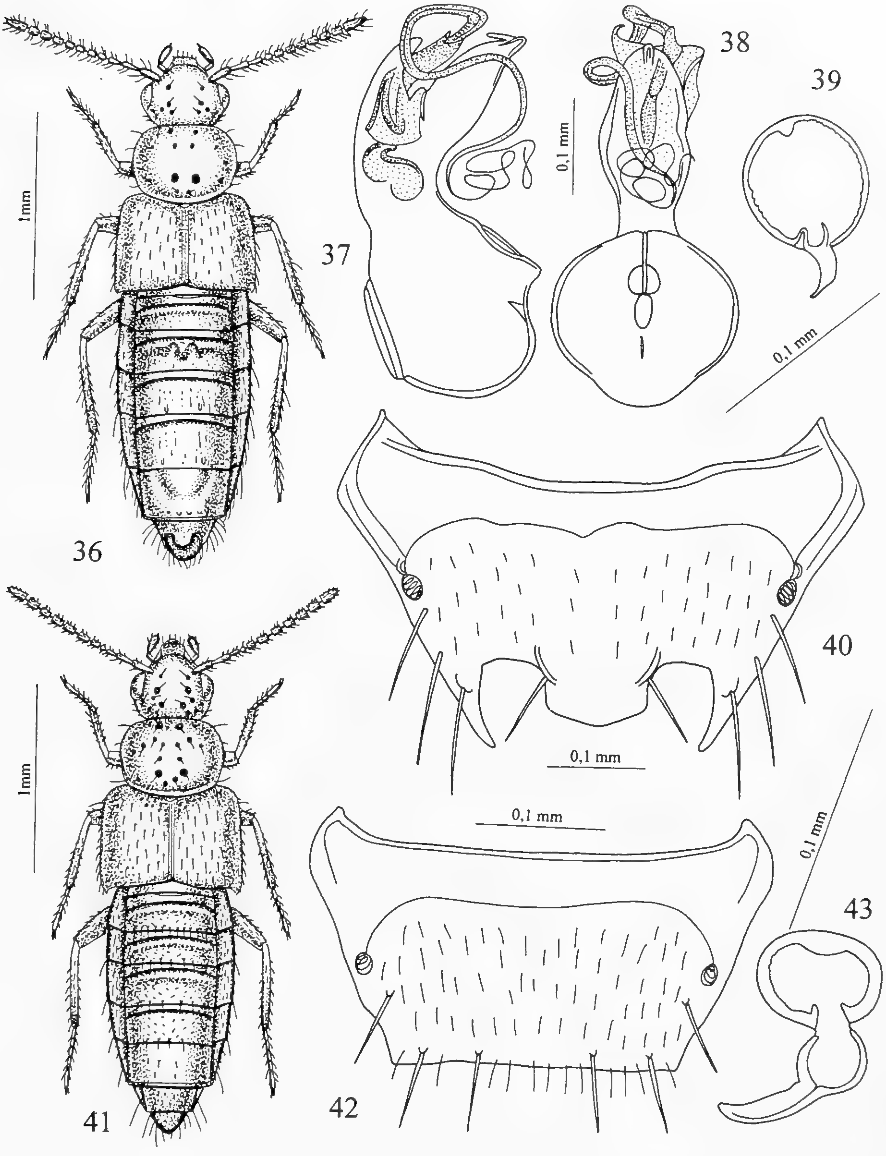
\- Decimo antennomero lungo quanto largo; presso il margine posteriore del quinto urotergo libero del ♂ si trovano circa otto granuli allineati trasversalmente; sesto urotergo libero del ♂ con un largo lobo mediano tra due lunghe spine laterali; regione preapicale dell'edeago appena dilatata e asimmetrica. Lungh. 2,7 mm. Shaanxi . . . . *G. schuelkei* sp. n.

Gyrophaena speculicollis sp. n. Figg. 41-43

Holotypus ♀, China, Yunnan, Kunming, Western Hills, 1800 m, 25°04N/102°41E, 24.VII.1996, leg. A. Smetana, J. Farkac and P. Kabátek (MHNG).

DESCRIZIONE. Lungh. 2,6 mm. Corpo lucidissimo e giallo-rossiccio, con capo e uriti liberi quarto e quinto bruno-rossicci ed elitre brune, tranne la base che è giallo-bruna; antenne giallo-rossicce con i tre antennomeri basali gialli; zampe gialle. La punteggiatura del capo e del pronoto è profonda e forte, quella delle elitre distintamente presente solo alla loro base: sul resto della loro superficie è finissima e ai lati superficiale. La reticolazione del capo e del pronoto è assente, quella delle elitre è superficiale, quella dei tre uriti basali estremamente superficiale e quella degli urti liberi quarto e quinto è netta, composta di maglie lievemente trasverse. Sesto urotergo libero della ♀ fig. 42.

ETIMOLOGIA. La nuova specie prende nome «pronoto a specchio», appunto perché questa sua parte corporea è lucidissima e liscia, tanto da potersi specchiare su essa, se fosse a maggiore dimensione.



FIGG. 36-43

Habitus, edeago in visione laterale e ventrale, spermateca, sesto urotergo libero del ♂ (40) e della ♀ (42). 36-40: *Gyrophaena schuelkei* sp. n.; 41-43: *Gyrophaena speculicollis* sp. n.

COMPARAZIONI. La spermateca (Fig. 43) della nuova specie è ben caratterizzata dall'avere il bulbo prossimale ben conformato. Questa porzione in molte specie del genere *Gyrophaena* è nettamente ridotta o assente. L'unica specie nota che mostra una spermateca vagamente simile a quella della nuova specie è *G. tactilis* Pace, 2001, del Borneo, che però presenta antenne corte (lunghe in *speculicollis* sp. n.).

Gyrophaena qingchengensis sp. n. Figg. 44-47

Holotypus ♂, China, Sichuan, Qingcheng Shan, Rückseite, 650-700 m, 18.V.1997, leg. M. Schülke (NHMB).

Descrizione. Lungh. 2,2 mm. Corpo lucido e bruno, con base dell'addome rossiccia; antenne brune con i tre antennomeri basali gialli; zampe gialle. La punteggiatura del capo è superficiale, quella del pronoto, al di fuori dei quattro forti punti in rettangolo, è distinta. Le elitre sono coperte di granulosità poco saliente. La reticolazione del capo è molto svanita, quella del pronoto e delle elitre è superficiale e quella dell'addome è distinta, ma sugli uroterghi liberi quinto e sesto è netta. Edeago figg. 45-46, sesto urotergo libero del ♂ fig. 47.

Etimologia. La nuova specie prende nome dal Monte Qingcheng, sua località tipica.

Comparazioni. In base alla forma dell'edeago, la nuova specie può essere sistematicamente vicina a *G. mansueta* Pace, 1989, del Nepal. Se ne distingue per i caratteri dati nella seguente chiave.

1 Punteggiatura del capo netta; pronoto poco trasverso; edeago ampiamente ricurvo al lato ventrale, con due angoli molto ottusi sul profilo ventrale; in visione ventrale, apice dell'edeago poco lungo. Lungh. 1,8 mm. Nepal . . . . *G. mansueta* Pace

\- Punteggiatura del capo superficiale; pronoto molto trasverso; edeago strettamente ricurvo al lato ventrale, con un angolo quasi retto sul profilo ventrale; in visione ventrale, apice dell'edeago molto lungo. Lungh. 2,2 mm. Sichuan . . . . *G. qingchengensis* sp. n.

Gyrophaena flagellans sp. n. Figg. 48-52

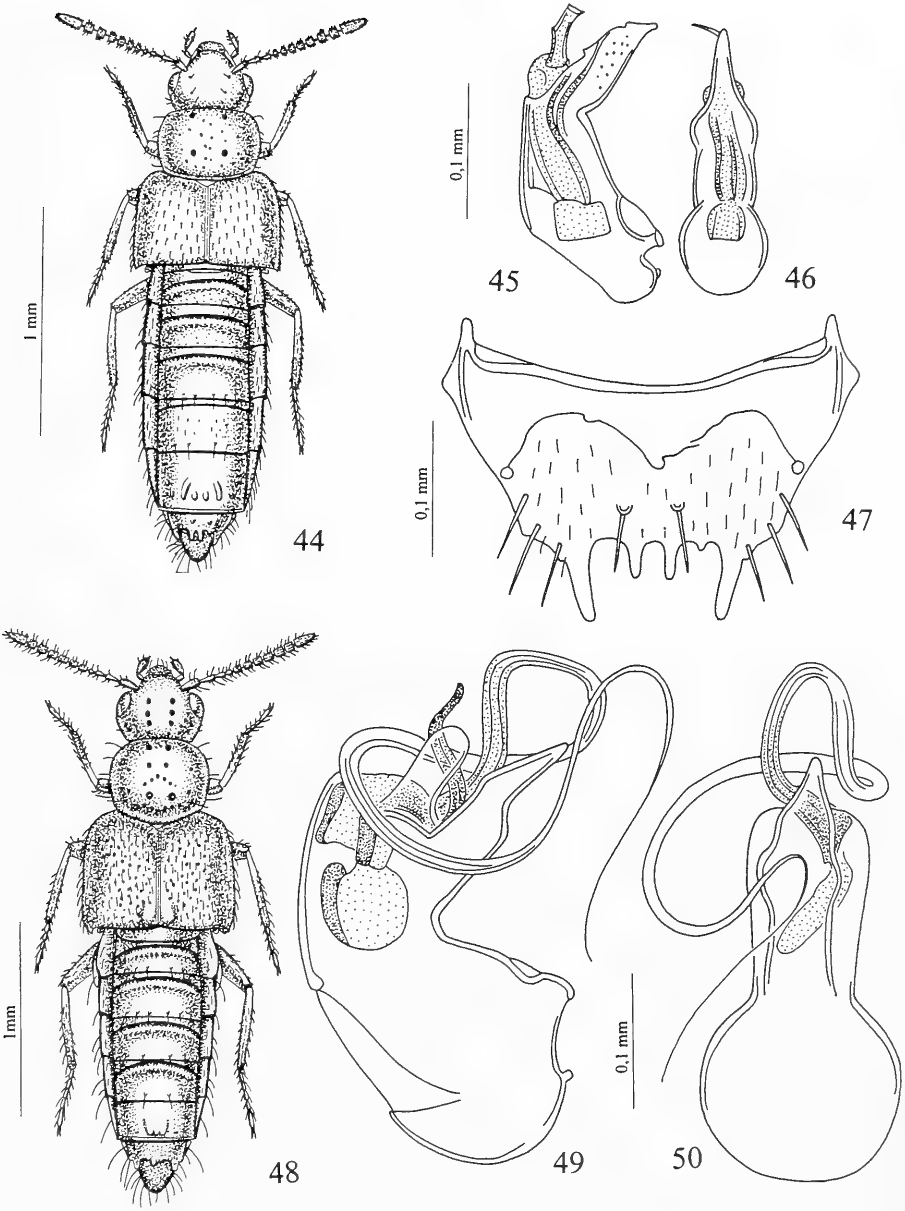
Holotypus ♂, China, Sichuan, Gongga Shan, Hailuogou, for. above camp 2, 2800 m, 29°35N/102°00E, 5.VIII.1998, leg. A. Smetana, J. Farkač and P. Kabátek (MHNG).

Paratypi: 2 ♀♀ stessa provenienza; 13 es., China, Sichuan, Gongga Shan, Hailuogou, for. above camp 3, 3000 m, 6.VII.1996, leg. A. Smetana.

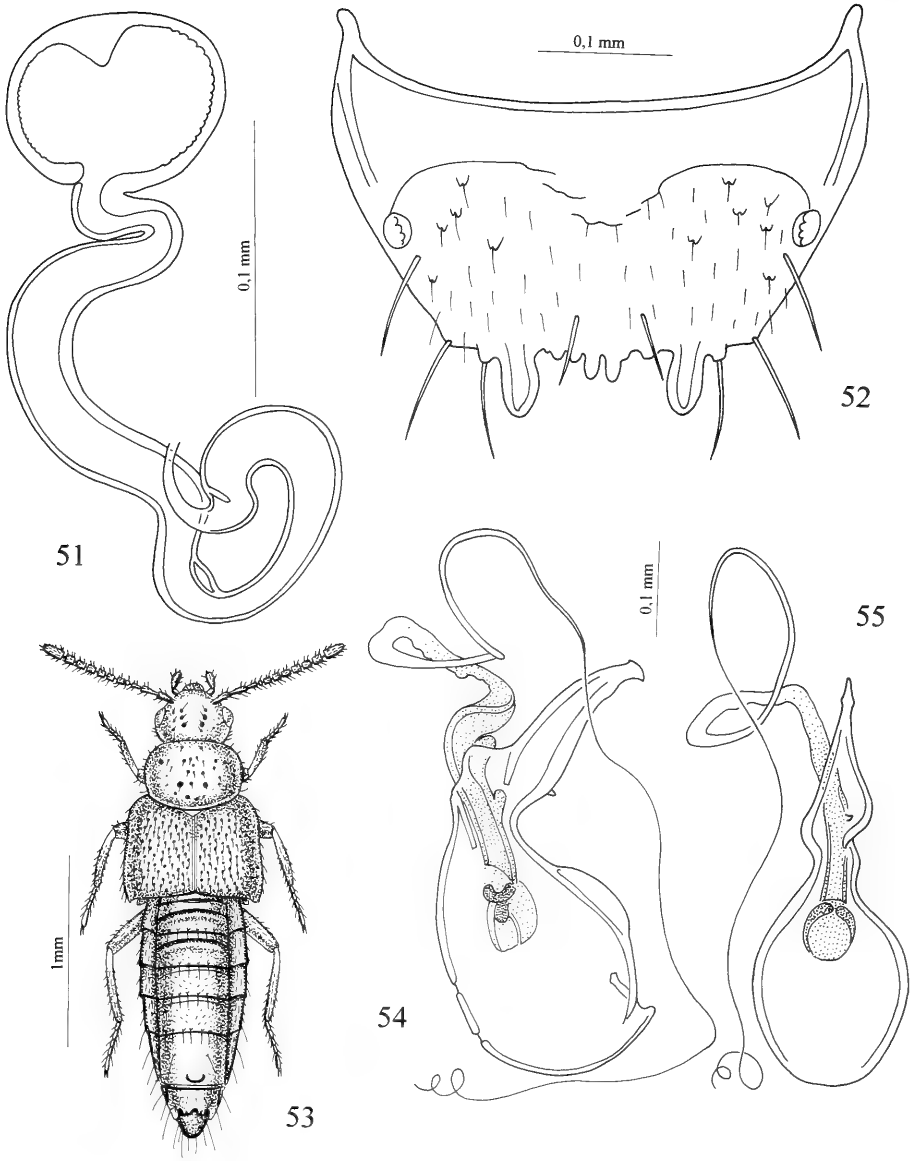
Descrizione. Lungh. 2,7 mm. Corpo lucido e bruno-rossiccio, con capo e uriti liberi quarto e quinto bruni; antenne brune con i tre antennomeri basali giallo-bruni, zampe gialle. La punteggiatura del capo e del pronoto è forte, quella delle elitre è evidente in una fascia che partendo dall'omero termina all'angolo posteriore interno dove si trova una bozza, nel ♂. La reticolazione del capo è distinta sul disco, ma sul resto della superficie è assente. La reticolazione del pronoto è superficiale e quella dell'addome è distinta, ma sul quinto urotergo libero è assente. Edeago fig. 49-50, spermateca fig. 51, sesto urotergo libero del ♂ fig. 52.

Etimologia. La nuova specie prende nome di «flagellante» a motivo della lunghezza del flagello del suo edeago.

Comparazioni. La nuova specie presenta il pronoto poco trasverso e flagello dell'edeago libero. Questi caratteri si riscontrano anche in *G. thoracica* Cameron, 1939, dell'India settentrionale. Le due specie si distinguono come segue.



FIGG. 44-50
Habitus, edeago in visione laterale e ventrale e sesto urotergo libero del ♂. 44-47: *Gyrophaena qingchengensis* sp. n.; 48-50: *Gyrophaena flagellans* sp. n.



FIGG. 51-55
Spermateca, sesto urotergo libero del ♂, habitus ed edeago in visione laterale e ventrale. 51-52: *Gyrophaena flagellans* sp. n.; 53-55: *Gyrophaena perflagellans* sp. n.

1 Decimo antennomero più lungo che largo; elitre del ♂ senza bozza all'angolo posteriore interno; edeago assai poco ricurvo al lato ventrale; flagello sporgente dall'orifizio apicale dell'edeago, corto e descrivente una spira. Lungh. 2,7 mm. India settentrionale . . . . *G. thoracica* Cameron

\- Decimo antennomero trasverso; elitre del ♂ con una bozza all'angolo posteriore interno; edeago profondamente ricurvo al lato ventrale; flagèllo sporgente dall'orifizio apicale dell'edeago, lunghissimo e descrivente tre spire. Lungh. 2,7 mm. Sichuan .... *G. flagellans* sp. n.

Gyrophaena perflagellans sp. n. Figg. 53-57

Holotypus ♂, China, Sichuan, Gongga Shan, Hailuogou for., Camp 2, 2800 m, 25°35N/102°00E, 5.VIII.1998. leg. A. Smetana, J. Farkač and P. Kabátek (MHNG). leg. A Smetana (MHNG).

Paratypi: 6 es., stessa provenienza.

Descrizione. Lungh.2,2 mm. Corpo lucido e bruno-rossiccio, con capo, quarto urite e base del quinto bruni; antenne giallo-rossicce con i tre antennomeri basali gialli; zampe gialle. La punteggiatura del capo e del pronoto è robusta, quella delle elitre è distinta. La reticolazione discale del capo e del pronoto è superficiale, assente sul resto della superficie dei due, quella delle elitre e dell'addome è distinta, a maglie trasverse sull'addome e netta sul quinto urotergo libero che nel ♂ presenta un tubercolo mediano posteriore largo e debole. Edeago figg. 54-55, spermateca fig. 56, sesto urotergo libero del ♂ fig. 57.

Etimologia. Il nome della nuova specie significa «molto flagellante» a motivo della presenza di un lunghissimo flagello dell'edeago.

Comparazioni. A motivo della forma dell'edeago, come pure per i caratteri esterni, la nuova specie è probabilmente tassonomicamente vicina a *G. metaxifera* Pace, 1989, del Nepal. Le due specie si distinguono per i caratteri dati nella seguente chiave.

1 Decimo antennomero trasverso; punteggiatura del capo debole; quinto urotergo libero del ♂ con quattro carene presso il margine posteriore; edeago largamente arcuato al lato ventrale e senza spina ventrale. Lungh. 2,0 mm. Nepal .... *G. metaxifera* Pace

\- Decimo antennomero lungo quanto largo; punteggiatura del capo forte; quinto urotergo libero del ♂ con un debole e largo tubercolo mediano presso il margine posteriore; edeago strettamente arcuato al lato ventrale e con spina ventrale. Lungh. 2,2 mm. Sichuan .... *G. perflagellans* sp. n.

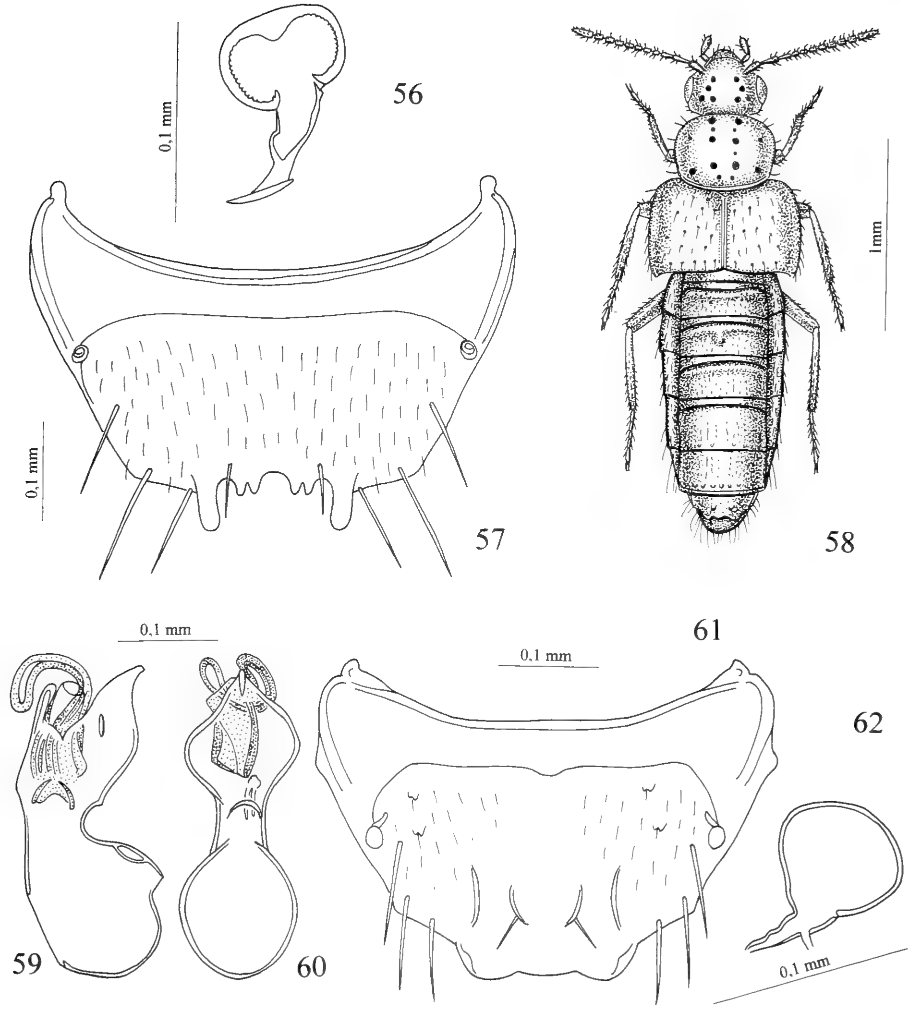
Gyrophaena shaanxiensis sp. n. Figg. 58-62

Holotypus ♂, China, Shaanxi, Qin Ling Shan, autoroute Km 93 S of Zhouzhi, 108 Km SW Xian, mountain forest, sifted, 1650 m, 1-2.IX.1995, leg. M. Schülke (NHMB).

Paratypi: 8 es., stessa provenienza.

Descrizione. Lungh. 2,6 mm. Corpo lucido e bruno-rossiccio, con base delle elitre e lati dell'addome di un giallo sporco e metà posteriore delle elitre, quarto urite libero e base del quinto bruni; antenne brune con i quattro antennomeri basali gialli; zampe gialle. La punteggiatura del capo e del pronoto è profonda e forte, quella delle elitre è netta, ma molto rada in avanti. Una reticolazione è visibile solo alla base degli uroterghi liberi terzo e quarto. Edeago figg. 59-60, sesto urotergo libero del ♂ fig. 61, spermateca fig. 62.

Etimologia. La nuova specie prende nome dallo Shaanxi, dove è stata raccolta.



FIGG. 56-62

Spermateca, sesto urotergo libero del ♂, habitus ed edeago in visione laterale e ventrale. 56-57: *Gyrophaena perflagellans* sp. n.; 58-62: *Gyrophaena shaanxiensis* sp. n.

COMPARAZIONI. In base alla forma dell'edeago, la nuova specie si colloca sistematicamente vicino a *G. nepalensis* Pace, 1985, del Nepal e si distingue da essa per i caratteri della seguente chiave.

1 Decimo antennomero trasverso; occhi ridotti, più corti delle tempie; punteggiatura del pronoto superficiale, tranne quattro punti grandi; quinto urotergo libero del ♂ coperto di reticolazione netta; margine posteriore del sesto urotergo libero del ♂ con quattro stretti lobi, di cui i mediani corti; edeago debolmente dilatato nella regione preapicale. Lungh. 2,0 mm. Nepal . . . . *G. nepalensis* Pace

- Decimo antennomero più lungo che largo; occhi più lunghi delle tempie; punteggiatura del pronoto forte; quinto urotergo libero del ♂ senza reticolazione; margine posteriore del sesto urotergo libero del ♂ con tre lobi larghissimi; edeago fortemente dilatato nella regione preapicale. Lungh. 2,6 mm. Shaanxi .... *G. shaanxiensis* sp. n.

Gyrophaena daxuemontis sp. n. Figg. 63-66

Holotypus ♂, China, W Sichuan, Daxue Shan, W Kangding, 2700-2800 m, leg. M. Schülke (NHMB).

DESCRIZIONE. Lungh. 2,2 mm. Corpo lucido e giallo-rossiccio, con capo, metà posteriore delle elitre e quarto urite libero bruno-rossicci; antenne brune con i tre antennomeri basali gialli; zampe giallo-rossicce. La punteggiatura dell'avancorpo è netta. La reticolazione del capo e del pronoto è estremamente superficiale, quella delle elitre è assente e quella dell'addome è netta solo alla base degli uroterghi e assente al margine posteriore di ciascuno. Una plica mediana sta presso il solco basale del primo urotergo libero. Edeago figg. 64-65, sesto urotergo libero del ♂ fig. 66.

ETIMOLOGIA. La nuova specie prende nome dal Monte Daxue (Daxue Shan), sua località tipica.

COMPARAZIONI. L'edeago della nova specie è simile a quello di *G. gregaria* Cameron, 1939, dell'India settentrionale, ma, in visione ventrale, la sua parte apicale è asimmetrica e stretta (larga e simmetrica in *gregaria*) e in visione laterale è accentuatamente bisinuata (lievemente bisinuata in *gregaria*).

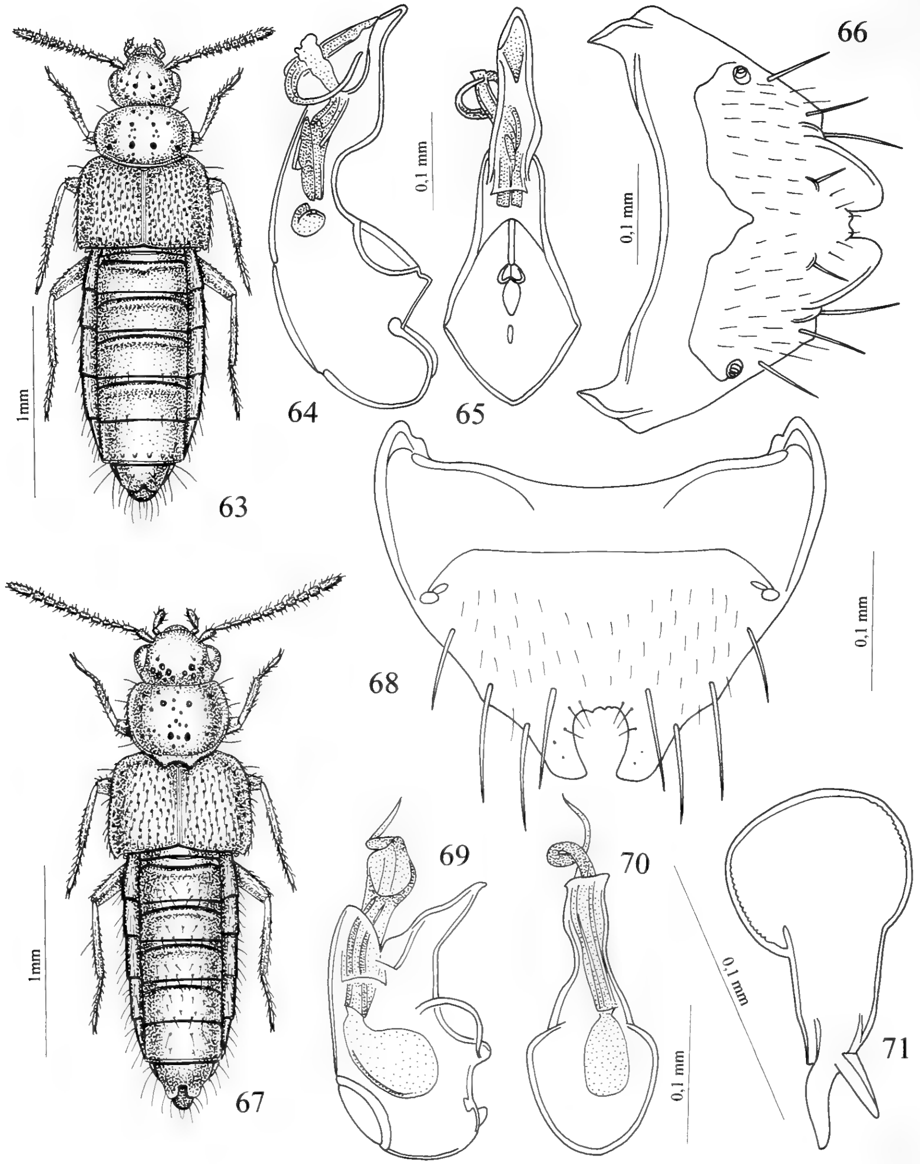
Gyrophaena bilimbisublata sp. n. Figg. 67-71

Holotypus ♂, China, Sichuan, Moxi, 29°13N/102°10E, 1600 m, 2.VII.1998, leg. A. Smetana, J. Farkač and P. Kabátek (MHNG).
Paratypi: 11 es., stessa provenienza.

DESCRIZIONE. Lungh.2,5 mm. Corpo lucido e rossiccio, con capo, terzo posteriore delle elitre e quarto urotergo libero bruni; antenne nero-brune con primo antennomero basale bruno e i due contigui gialli; zampe gialle. La punteggiatura del capo è composta di punti enormi sul vertice e di punti ridotti ai lati, entrambi profondi e netti come quelli delle elitre. Il pronoto presenta quattro forti punti in rettangolo al di fuori dei quali la punteggiatura è superficiale. La reticolazione del capo, del pronoto e delle elitre è molto superficiale, quella dell'addome è estremamente svanita e poco visibile: solo alla base di ciascun urotergo si nota una reticolazione superficiale. I lobi del margine posteriore del sesto urotergo libero del ♂ sono ricurvi verso il lato dorsale. Sesto urotergo libero del ♂ fig. 68, edeago figg. 69-70, spermateca fig. 71.

ETIMOLOGIA. Il nome della nuova specie significa «due estremità sollevate» a motivo della presenza di due lobi sollevati del margine posteriore del sesto urotergo libero del ♂.

COMPARAZIONI. L'edeago della nuova specie è molto simile a quello di *G. gratella* Cameron, 1939 (serie tipica, conservata al NHML, esaminata) dell'India settentrionale. Le due specie si distinguono per i caratteri della seguente chiave.



FIGG. 63-71

Habitus, edeago in visione laterale e ventrale, sesto urotergo libero del ♂ e spermateca. 63-66: *Gyrophaena daxuemontis* sp. n.; 67-71: *Gyrophaena bilimbisublata* sp. n.

1 Decimo antennomero trasverso; punteggiatura del capo composta di punti né enormi, né ridotti; margine posteriore del sesto urotergo libero del ♂ con quattro denti; in visione ventrale, apice dell'edeago a forma ogivale simmetrica. Lungh. 1,7 mm. India settentrionale . . . . . *G. gratella* Cameron

- Decimo antennomero lungo quanto largo; punteggiatura del capo composta di punti enormi; margine posteriore del sesto urotergo libero del ♂ con due grandi lobi ricurvi verso il lato dorsale; in visione ventrale, apice dell'edeago tronco e asimmetrico. Lungh. 2,5 mm. Sichuan .... *G. bilimbisublata* sp. n.

Gyrophaena ancilla sp. n. Figg. 72-75

Holotypus ♂, China, Yunnan, Kunming, Western Hills, 1800 m, 25°04N/102°41E, 24.VII.1996, leg. A. Smetana, J. Farkač and P. Kabátek (MHNG).

Descrizione. Lungh. 1,9 mm. Corpo lucido e rossiccio, con capo, elitre tranne la base e uriti liberi terzo, quarto e quinto bruni, base dell'addome giallo-rossiccia; antenne brune con i tre antennomeri basali di un giallo sporco; zampe gialle. La punteggiatura del capo è forte e assente sulla fascia mediana, quella del pronoto è profonda e quella delle elitre è distinta. La reticolazione del capo è superficiale, quella delle elitre è distinta e quella dell'addome è estremamente svanita, tranne sui due uroterghi basali dove è assente. Edeago figg. 73-74, sesto urotergo libero del ♂ fig. 75.

Etimologia. Il nome della nuova specie significa «serva».

Comparazioni. La forma dell'edeago della nuova specie è simile a quella di *G. gratella* Cameron, 1939, dell'India, ma quest'organo ha apice molto sottile. Altri caratteri differenziali sono compresi nella seguente chiave.

1 Occhi più lunghi delle tempie; pronoto meno trasverso, con rapporto larghezza/lunghezza pari a 1,35; spine mediane del margine posteriore del sesto urotergo libero del ♂ parallele; edeago poco arcuato al lato ventrale; parte preapicale della lama sternale dello stesso organo, poco dilatata. Lungh. 1,7 mm. India settentrionale .... *G. gratella* Cameron

- Occhi ridotti, molto più corti delle tempie; pronoto più trasverso, con rapporto larghezza/lunghezza pari a 1,42; spine mediane del margine posteriore del sesto urotergo libero del ♂ convergenti all'indietro; edeago molto arcuato al lato ventrale con parte preapicale della lama sternale dello stesso organo, accentuatamente dilatata. Lungh. 1,9 mm. Yunnan .... *G. ancilla* sp. n.

Gyrophaena zhagaensis sp. n. Figg. 76-80

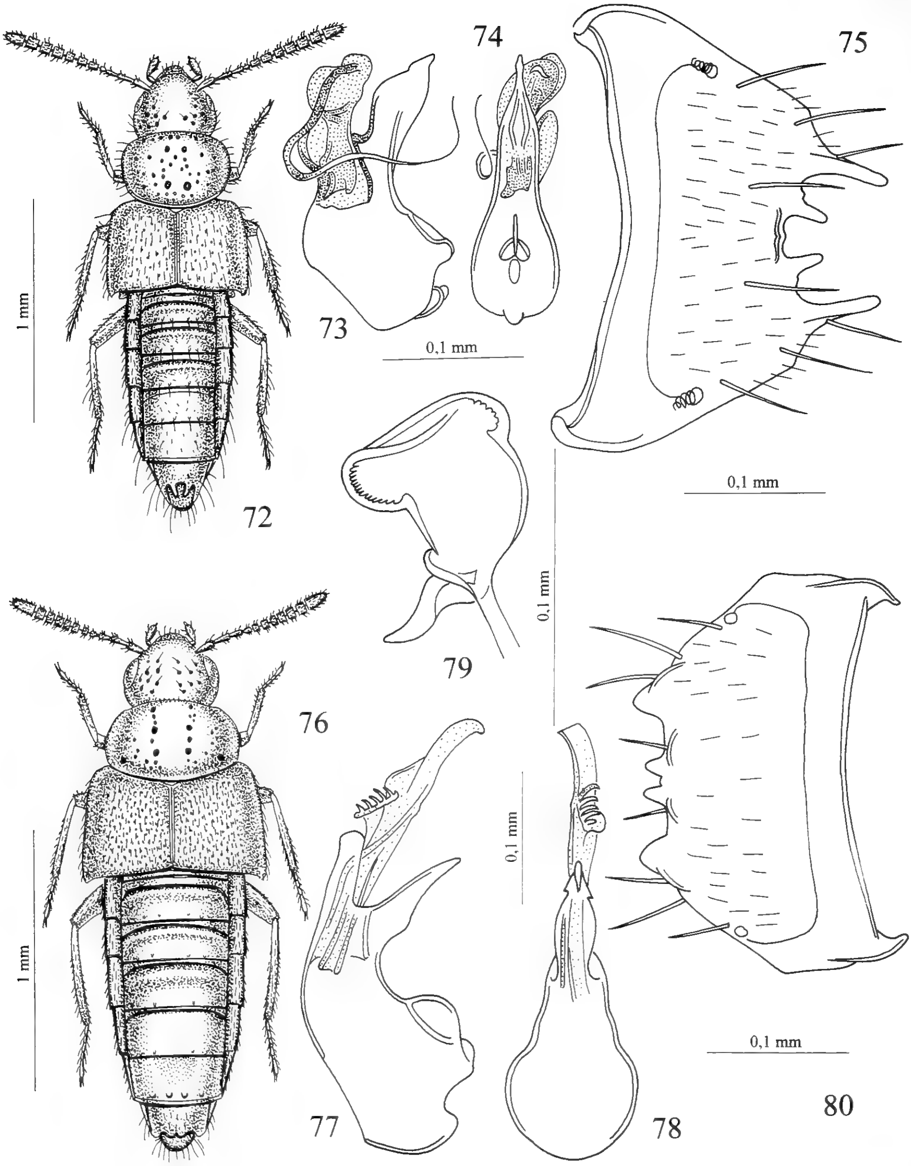
Holotypus ♂, Chine, Sichuan, Songpan, 3050 m, Zhaga Fall, 5.VIII.1994, leg. M. Tronquet (MRSN).

Paratypi: 1 ♀ stessa provenienza; 1 ♂, Shaanxi, Qin Ling Shan, autoroute 93 Km S of Zhoushi, 1-2.IX.1996, leg. M. Schülke.

Descrizione. Lungh. 1,9 mm. Corpo lucido e giallo-bruno con uriti liberi quarto e quinto bruni; antenne brune con i tre antennomeri basali gialli; zampe gialle. La punteggiatura del capo e del pronoto è profonda, quella delle elitre è distinta. La reticolazione del capo è presente solo sulla fascia longitudinale mediana dove è distinta, quella del pronoto e dell'addome è netta e quella delle elitre è distinta. Edeago figg. 77-78, sesto urotergo libero del ♂ fig. 80, spermateca fig. 79.

Etimologia. La nuova specie prende nome dalla sua località tipica Zhaga Fall.

Comparazioni. La nuova specie presenta il pronoto più ristretto in avanti che all'indietro. Una specie con tale carattere, con addome nettamente reticolato e con



FIGG. 72-80

Habitus, edeago in visione laterale e ventrale, sesto urotergo libero del ♂ e spermateca. 72-75: *Gyrophaena ancilla* sp. n.; 76-80: *Gyrophaena zhagaensis* sp. n.

edeago di struttura simile a quello della nuova specie, è *G. narendra* Pace, 1989, del Nepal. Le due specie sono separabili per i caratteri dati nella seguente chiave.

1 Pronoto meno trasverso, con rapporto larghezza/lunghezza pari a 1,42; elitre fortemente punteggiate; edeago poco profondamente arcuato al lato ventrale, con larghissima gibbosità preapicale ventrale; apice dell'edeago, in visione ventrale, acuto e semplice. Lungh. 1,9 mm. Nepal .... *G. narendra* Pace

\- Pronoto più trasverso, con rapporto larghezza/lunghezza pari a 1,65; punteggiatura delle elitre distinta; edeago profondamente arcuato al lato ventrale, senza larghissima gibbosità preapicale ventrale, ma solo con angolo ottuso smussato; apice dell'edeago, in visione ventrale, a punta di freccia. Lungh. 1,9 mm. Sichuan .... *G. zhagaensis* sp. n.

Gyrophaena opacicollis sp. n. Figg. 81-83

Holotypus ♀, China, Sichuan, Gongga Shan, Hailuogou, for. above camp 2, 2800 m, 27°49N/102°00E, 5.VII.1998, leg. A. Smetana, J. Farkač and P. Kabátek, (MHNG).

Descrizione. Lungh. 1,8 mm. Corpo debolmente lucido e bruno, con margine posteriore degli uroterghi primo libero a quinto, rossiccio; antenne brune con i tre antennomeri basali giallo-rossicci; zampe gialle. La punteggiatura del capo e del pronoto è rada e distinta. Le elitre sono coperte di granulosità saliente solo all'angolo posteriore esterno, sul resto della superficie la granulosità è indistinta. La reticolazione del capo e del pronoto è nettissima, quella delle elitre è evidente, composta di maglie ampie e robuste, quella dell'addome è evidente, vigorosa sul quinto urotergo libero della ♀. Spermateca fig. 82, sesto urotergo libero della ♀ fig. 83.

Etimologia. Il nome della nuova specie significa «pronoto opaco».

Comparazioni. La nuova specie presenta reticolazione evidente su tutto il corpo, pronoto più stretto in avanti che all'indietro e granuli delle elitre confinate all'angolo posteriore esterno. Per la somma di questi caratteri finora non è nota alcuna specie orientale.

Gyrophaena secreta sp. n. Figg. 84-86

Holotypus ♀, China, N Yunnan, Xue Shan, nr. Zhongdian, 3900 m, 25.VI.1996, 27°49N/99°34E, leg. A. Smetana, 1998 China Expedition J. Farkač, D. Král, J. Schneider & A. Smetana, (MHNG).

Descrizione. Lungh. 2,2 mm. Corpo lucido e rossiccio, con metà posteriore delle elitre e quarto urite libero bruni e con i tre uriti basali giallo-rossicci; antenne giallo-rossicce con i tre antennomeri basali gialli; zampe gialle. La punteggiatura del capo è poco profonda, quella del pronoto molto superficiale e quella delle elitre è svanita. La reticolazione del capo è estremamente superficiale, quella del pronoto è assente, quella delle elitre è svanita, quella dei tre uriti basali è distinta e quella dei restanti uriti è quasi vigorosa. Spermateca fig. 85, sesto urotergo libero della ♀ fig. 86.

Etimologia. La nuova specie è chiamata «segreta» perché resta nascosta sotto le apparenze di *G. chinensis* se non si esaminano attentamente i caratteri differenziali esterni e la forma della spermateca.

Comparazioni. A motivo della forma della spermateca e per vari caratteri esterni, la nuova specie è sicuramente affine a *G. chinensis* Pace, 1998. Le due specie si distinguono con la seguente chiave.

1 Uriti liberi quarto e quinto privi di reticolazione; bulbo distale della spermateca molto sviluppato, con diametro tre volte più lungo della larghezza della parte mediana della stessa spermateca; parte prossimale della stessa, lunghissima. Lungh. 2,6 mm. Gansu . . . . *G. chinensis* Pace

\- Uriti liberi quarto e quinto con reticolazione quasi vigorosa; bulbo distale della spermateca poco sviluppato, con diametro poco più lungo della larghezza della parte mediana della stessa spermateca; parte prossimale della stessa, larghissima. Lungh. 2,2 mm. Yunnan . . . . . *G. secreta* sp. n.

Gyrophaena monospina sp. n. Figg. 87-90

Holotypus ♂, China, Sichuan, Gongga Shan, Hailuogou, lake. above camp 2, 2750 m, 4.VII.1998, leg. A. Smetana, 1998 China Expedition J. Farkač, D. Král, J. Schneider & A. Smetana, (MHNG).

Paratypus: 1 ♂, China, Sichuan, Gongga Shan, Hailuogou, for. above camp 3, 3200 m, 7.VII.1996, leg. A. Smetana.

DESCRIZIONE. Lungh. 2,5 mm. Corpo lucido e bruno-gialliccio, con capo bruno; antenne gialle sfumate di giallo-bruno verso l'estremià distale; zampe gialle. La punteggiatura del capo è superficiale, quella del pronoto è estremamente svanita. Le elitre sono coperte di granulosità evanescente. La reticolazione del capo e delle elitre è molto superficiale, quella del pronoto è assente, quella dei due uroterghi basali è svanita, quella degli uroterghi liberi terzo e quarto è nettissima e il quinto libero ha reticolazione solo alla base dove è estremamente superficiale. Edeago figg. 88-89, sesto urotergo libero del ♂ fig. 90.

ETIMOLOGIA. Il nome della nuova specie significa «una sola spina», quella ventrale dell'edeago.

COMPARAZIONI. Per la forma dell'edeago e del margine posteriore del sesto urotergo libero del ♂, la nuova specie si pone sistematicamente vicino a *G. beijingensis* Pace, 1998, pure della Cina (Pechino). I principali caratteri differenziali sono i seguenti.

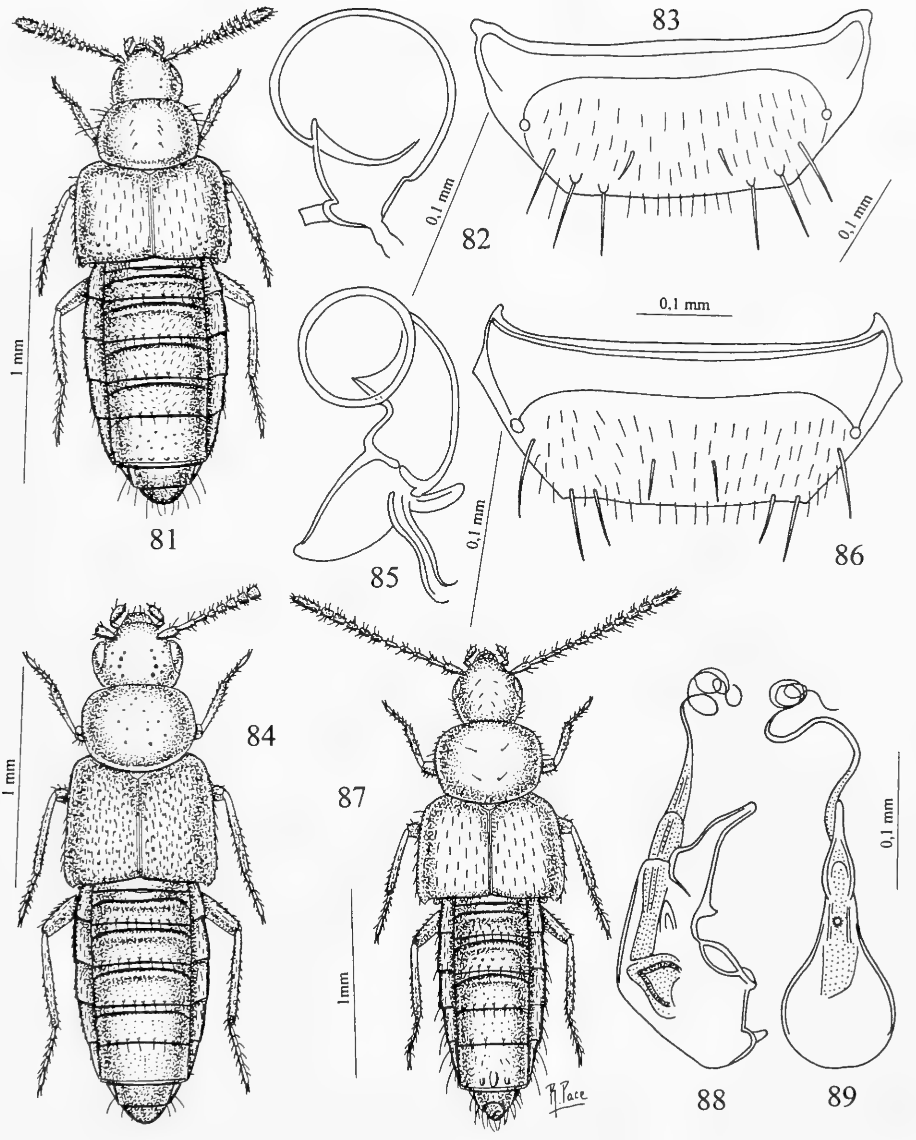
1 Decimo antennomero trasverso; punteggiatura del capo e del pronoto profonda e forte; quinto urotergo libero del ♂ coperto di reticolazione netta, privo di tubercoli o carene; edeago senza spina ventrale e non dilatato nella regione preapicale, in visione ventrale. Lungh. 1,8 mm. Pechino . . . . *G. beijingensis* Pace

\- Decimo antennomero più lungo che largo; punteggiatura del capo e del pronoto estremamente superficiale; quinto urotergo libero del ♂ senza reticolazione, tranne alla base e con tre tubercoli; edeago con spina ventrale e dilatato nella regione preapicale, in visione ventrale. Lungh. 2,5 mm. Sichuan . . . . *G. monospina* sp. n.

Gyrophaena sentiens sp. n. Figg. 91-94

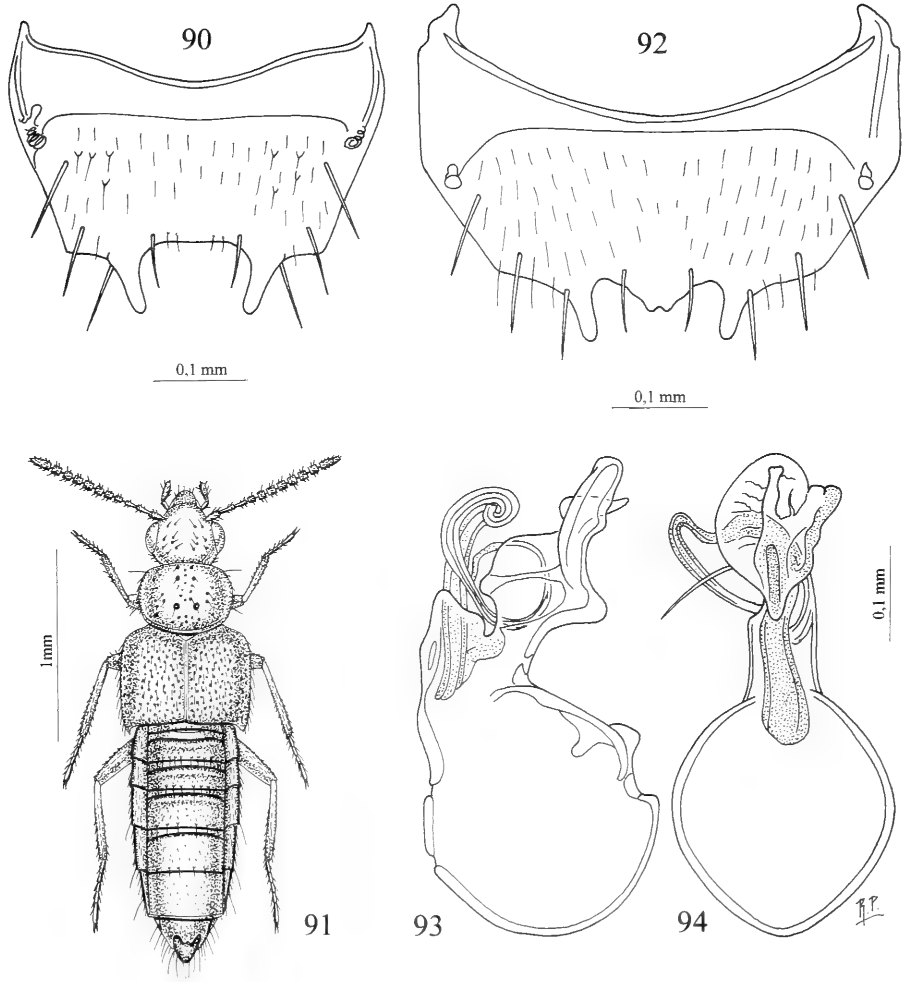
Holotypus ♂, China, Shaanxi, Qin Ling Shan, autoroute Km 93, S of Zhouzhi, 108 Km SW Xian, 1-2.IX.1995, leg. M. Schülke (NHMB).

DESCRIZIONE. Lungh. 2,3 mm. Corpo lucido e bruno-rossiccio, con addome rossiccio; antenne giallo-brune con i tre antennomeri basali gialli; zampe gialle. La



FIGG. 81-89
Habitus, spermateca, sesto urotergo libero della ♀ ed edeago in visione laterale e ventrale. 81-83: *Gyrophaena opacicollis* sp. n.; 84-86: *Gyrophaena secreta* sp. n.; 87-89: *Gyrophaena monospina* sp. n.

punteggiatura dell'avancorpo è distinta. La reticolazione del capo è presente solo sul disco e in avanti ed è superficiale, quella del pronoto è pure solo sul disco ed è estremamente svanita come quella delle elitre e dell'addome. Sesto urotergo libero del ♂ fig. 92, edeago figg. 93-94.



FIGG. 90-94
Sesto urotergo libero del ♂, habitus ed edeago in visione laterale e ventrale. 90: *Gyrophaena monospina* sp. n.; 91-94: *Gyrophaena sentiens* sp. n.

ETIMOLOGIA. L'apice dell'edeago della nuova specie presenta numerosi canali sensorii. Da essi la nuova specie prende nome di «colei che sente».

COMPARAZIONI. L'edeago della nuova specie è asimmetrico nella regione apicale, come quello di *G. immatura* Kraatz, 1859 (serie tipica esaminata), dello Sri Lanka. Le due specie si distinguono per i caratteri della seguente chiave.

1 Quinto urotergo libero del ♂ con reticolazione assai netta; edeago senza gibbosità ventrale e con apice sottile. Lungh. 1,7 mm. Sri Lanka .... *G. immatura* Kraatz

\- Quinto urotergo libero del ♂ con reticolazione estremamente superficiale; edeago con grande gibbosità ventrale e con apice largo in visione laterale e larghissimo in quella ventrale. Lungh. 2,3 mm. Shaanxi .... *G. sentiens* sp. n.

Gyrophaena cervicornis sp. n. Figg. 95-99

Holotypus ♂, China, Shaanxi, Qin Ling Shan, autoroute Km 93, S of Zhouzhi, 108 Km SW Xian, mountain forest, sifted, 1650 m, 1-2.IX.1995, leg. M. Schülke (NHMB).

Paratypi: 10 es., stessa provenienza.

Descrizione. Lungh. 2,2 mm. Corpo lucido e bruno, con pronoto, base delle elitre e margine posteriore degli uroterghi liberi primo, secondo, terzo e quinto, giallo-bruni; antenne nere con i tre antennomeri basali gialli; zampe gialle. La punteggiatura del capo e del pronoto è netta, quella delle elitre è superficiale. La reticolazione del capo e del pronoto è estremamente superficiale, quella delle elitre e dell'addome è distinta. Edeago figg. 96-97, sesto urotergo libero del ♂ fig. 99, spermateca fig 98.

Etimologia. L'apice dell'edeago della nuova specie, in visione laterale, ha la vaga forma di corna di Cervo. Per questo motivo la nuova specie è chiamata «corna di Cervo».

Comparazioni. L'edeago della nuova specie ha l'apice fortemente flesso al lato ventrale come quello di *G. anguli* Pace, 1999, di Hong Kong. La nuova specie se ne distingue per i caratteri dati nella seguente chiave.

1 Pronoto con punteggiatura assai rada; nell'intervallo tra le due spine laterali del margine posteriore del sesto urotergo libero del ♂, con due lobi; apice dell'edeago semplice. Lungh. 1,7 mm. Hong Kong . *G. anguli* Pace

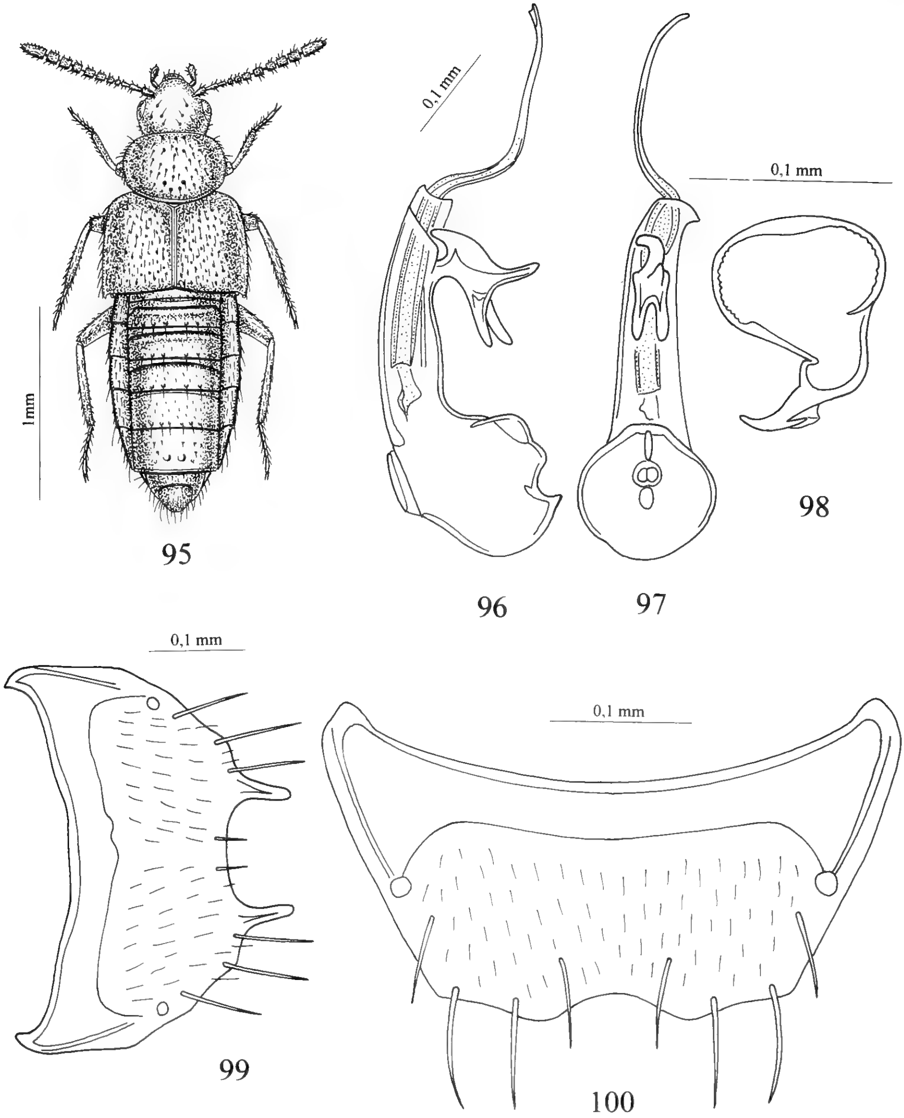
\- Pronoto con punteggiatura fitta; nell'intervallo tra le due spine laterali del margine posteriore del sesto urotergo libero del ♂, senza spine o lobi; apice dell'edeago con tre sporgenze preapicali. Lungh. 2,2 mm. Shaanxi .... *G. cervicornis* sp. n.

Gyrophaena absurdior sp. n. Figg. 100-104

Holotypus ♂, China, Sichuan, Emei Shan, 3000 m, 29°32N/103°21E, 17.VII.1996, leg. A. Smetana, J. Farkač and P. Kabátek, (MHNG).

Paratypi: 1 ♂, stessa provenienza; 1 ♂ e 2 ♀♀ China, Shaanxi, Qin Ling Shan, N mountain, W pass at autoroute Km 70, 47 Km S Xian, sifted, 2300-2500 m, 26-30.VIII.1995, leg. A. Pütz.

Descrizione. Lungh. 2,5 mm. Corpo lucido e rossiccio, con capo, elitre e uriti liberi quarto e quinto bruno-rossicci; antenne bruno-rossicce con i tre antennomeri basali gialli; zampe gialle. La punteggiatura del capo è distinta, assente sul disco, quella del pronoto è superficiale e quella delle elitre è distinta e fine. La reticolazione del capo e del pronoto sta solo sul disco dove è superficiale, quella delle elitre è assente, quella dei tre uroterghi basali è molto svanita, quella dell' urotergo libero quarto è superficiale, ma alla base è nettissima e quella del quinto è assente sulla sua



95 96 97 98 99 100

FIGG. 95-100
Habitus, edeago in visione laterale e ventrale, spermateca e sesto urotergo libero del ♂.95-99: *Gyrophaena cervicornis* sp. n.; 100: *Gyrophaena absurdior* sp. n.

metà posteriore e netta alla sua base. Sesto urotergo libero del ♂ fig. 100, edeago figg. 102-103, spermateca fig. 104.

ETIMOLOGIA. Il nome della nuova specie significa «la più assurda» e si riferisce alla struttura assurda, contraria al buon senso, dell'edeago.

COMPARAZIONI. L'edeago della nuova specie ha caratteri ultraevoluti, riscontrabili solo in alcune specie del Borneo, quali *G. incredibilis* Pace, 2001. Se ne distingue per il pronoto meno trasverso e per le appendici ventrali dell'edeago arrotondate all'apice e non angolose come in *G. incredibilis* .

CHIAVE DEI ♂♂ DELLE SPECIE CINESI DEL GENERE *GYROPHAENA*

1 Pronoto non o appena più stretto in avanti che all'indietro 2
- Pronoto notevolmente più stretto in avanti che all'indietro 30
2 Pronoto con quattro o più punti più forti frammisti a punti minori 3
- Pronoto uniformemente punteggiato, senza punti più forti di altri 26
3 Antenne lunghe, con decimo antennomero più lungo che largo, lungo quanto largo o appena trasverso 4
- Antenne corte, con decimo antennomero chiaramente trasverso 14
4 Decimo antennomero più lungo che largo 5
- Decimo antennomero lungo quanto largo o appena trasverso 6
5 Quarto antennomero trasverso; due tubercoli mediani posteriori sul quinto urotergo libero del ♂. Lungh. 2,6 mm. Shaanxi . . . . . *G. discoidea* sp. n.
- Quarto antennomero più lungo che largo; un solo tubercolo mediano posteriore sul quinto urotergo libero del ♂. Lungh. 3,7 mm. Sichuan . . . . *G. gonggana* Pace
6 Quarto antennomero più lungo che largo 7
- Quarto antennomero trasverso 10
7 Pronoto rossiccio poco trasverso, con rapporto lunghezza/larghezza pari a 1,26; elitre bruno-rossicce. Lungh. 2,5 mm. Sichuan . . . . . *G. absurdior* sp. n.
- Pronoto bruno-rossiccio e nettamente trasverso, con rapporto lunghezza/larghezza pari a 1,31-1,45; elitre brune o brune con base gialliccia . . . 8
8 Elitre uniformemente bruno-rossicce e addome uniformemente rossiccio; secondo urotergo libero senza contrassegni; lobo mediano del margine posteriore del sesto urotergo libero del ♂, inciso all'apice. Lungh. 2,3 mm. Shaanxi . . . . *G. sentiens* sp. n.
- Elitre bicolori e addome con fascia posteriore bruna; secondo urotergo libero con due pliche mediane; lobo mediano del margine posteriore del sesto urotergo libero del ♂, intero 9
9 Al margine posteriore del sesto urotergo libero del ♂ un solo lobo lungo e largo, inquadrato da due spine laterali. Lungh. 2,7 mm. Shaanxi . . . . *G. schuelkei* sp. n.
- Al margine posteriore del sesto urotergo libero del ♂ tre corti lobi e assenza di due spine laterali. Lungh. 2,6 mm. Shaanxi . *G. shaanxiensis* sp. n.
10 Pronoto appena trasverso, con due appendici triangolari al margine posteriore dello stesso; lobi del margine posteriore del sesto urotergo libero del ♂, ricurvi verso il lato dorsale. Lungh. 2,5 mm. Sichuan . . . . *G. bilimbisublata* sp. n.
- Pronoto nettamente trasverso, senza appendici triangolari al margine posteriore dello stesso; lobi del margine posteriore del sesto urotergo libero del ♂, rettilinei 11

11 Elitre unicolori brune o bruno-rossicce; antenne giallo-rossicce o rossicce con base gialla 12

\- Elitre bicolori brune con base gialla o di un giallo sporco; antenne nere o brune con base gialla 13

12 Antenne giallo-rossicce con base gialla; pronoto unicolore; sesto urotergo libero al margine posteriore con quattro piccoli lobi tra i due grandi laterali che sono rettilinei. Lungh. 2,2 mm. Sichuan . . . . *G. perflagellans* sp. n.

\- Antenne rossicce con base gialla; pronoto bruno con margini laterali bruno-rossicci; sesto urotergo libero al margine posteriore con tre corti lobi tra i due grandi laterali che sono ricurvi. Lungh. 2,6 mm. Gansu . . . . *G. chinensis* Pace

13 Base dell'addome giallo-rossiccia; tra i due lunghi lobi laterali del margine posteriore del sesto urotergo libero del ♂ non sono presenti altri lobi o spine. Lungh. 2,2 mm. Shaanxi . . . . *G. cervicornis* sp. n.

\- Base dell'addome bruna e uriti marginati di giallo-bruno; tra i due lunghi lobi laterali del margine posteriore del sesto urotergo libero del ♂ vi sono due stretti e corti lobi. Lungh. 1,9 mm. Yunnan . . . . *G. ancilla* sp. n.

14 Pronoto debolmente trasverso, con rapporto larghezza/lunghezza pari a 1,20-1,25 15

\- Pronoto più trasverso, con rapporto larghezza/lunghezza pari a 1,38-1,66 . . . 18

15 Pronoto giallo-rossiccio; tra i due lobi laterali del margine posteriore del sesto urotergo libero del ♂, sporgono due lobi lunghi quanto i laterali 16

\- Pronoto bruno o bruno-rossiccio; tra i due lobi laterali del margine posteriore del sesto urotergo libero del ♂, ne sporgono tre-cinque corti 17

16 Elitre giallo-rossicce; l'intervallo tra il lobo laterale e quello interno del margine posteriore del sesto urotergo libero del ♂, è oblungo; apice dell'edeago stretto, in visione ventrale. Lungh. 2,7 mm. Hiluogou . . . . *G. permixta* sp. n.

\- Elitre brune; l'intervallo tra il lobo laterale e quello interno del margine posteriore del sesto urotergo libero del ♂ è lungo quanto largo; apice dell'edeago largo, in visione ventrale. Lungh. 2,7 mm. Shaanxi . . . . *G. zhouzhiensis* sp. n.

17 Corpo uniformemente bruno; tra i lobi laterali del margine posteriore del sesto urotergo libero del ♂, si trovano tre corti lobi di forma regolare; edeago semplice, senza lungo flagello. Lungh. 2,1 mm. Shaanxi . . . . *G. simplicitatis* sp. n.

\- Corpo bicolore bruno-rossiccio con capo e fascia addominale posteriore bruni; tra i lobi laterali del margine posteriore del sesto urotergo libero del ♂ si trovano cinque lobi di forma irregolare; edeago complesso, con lungo flagello. Lungh. 2,7 mm. Sichuan . . . . *G. flagellans* sp. n.

18 Angolo posteriore esterno delle elitre con macchia bruna o nera 19

\- Angolo posteriore esterno delle elitre senza macchia 21

19 Quinto urotergo libero del ♂ con una carena mediana posteriore trasversa. Lungh. 1,2-2,0 mm. Manciuria . . . . *G. alexandrovi* Bernhauer

\- Quinto urotergo libero del ♂ con quattro granuli allungati posteriori 20

20 Pronoto bruno marginato di rossiccio e addome giallo-rossiccio fasciato di bruno. Lungh. 1,5 mm. Manciuria . . . . *G. vulnerata* Bernhauer

\- Pronoto uniformemente bruno e addome uniformemente nero. Lungh. 1,3 mm. Manciuria . . . . *G. manchurica* Bernhauer

21 Pronoto ed elitre di un giallo pallido; quinto urotergo libero del ♂ con due acute carene convergenti all'indietro e sesto libero con due spine acute al margine posteriore. Lungh. 1,0-1,2 mm. Manciuria . . . . *G. bicarinella* Bernhauer

\- Pronoto giallo-rossiccio, giallo-bruno, rossiccio, bruno o nero; elitre bicolori o brune; quinto urotergo libero del ♂ senza carene convergenti, sostituite da granuli allungati e più di due 22

22 Elitre bicolori brune o bruno-rossiccie con base gialla o brune con margini laterale e posteriore neri 23

\- Elitre unicolori 25

23 Capo e pronoto neri; elitre brune marginate di nero. Lungh. 1,8 mm. Hong Kong . . . . *G. cicatricosa* Kraatz

\- Capo bruno o bruno rossiccio e pronoto giallo-rossiccio o giallo-bruno 24

24 Sesto urotergo libero del ♂ senza spine o lobi laterali e con due larghi lobi mediani. Lungh. 2,2 mm. Sichuan . . . . *G. daxuemontis* sp. n.

\- Sesto urotergo libero del ♂ con due spine laterali: tra esse sporgono due lobi a base comune. Lungh. 2,2 mm. Hong Kong . . . . *G. vexillifera* Pace

25 Addome uniformemente bruno; tra le due spine laterali del margine posteriore del sesto urotergo libero del ♂ non sono presenti altre spine o lobi. Lungh. 1,8 mm. Pechino . . . . *G. beijingensis* Pace

\- Addome bicolore bruno con base rossiccia; tra i due lunghi lobi laterali del margine posteriore del sesto urotergo libero del ♂ se ne trovano altri due. Lungh. 2,2 mm. Sichuan . . . . *G. qingchengensis* sp. n.

26 Decimo antennomero più lungo che largo 27

\- Decimo antennomero fortemente trasverso 28

27 Quarto antennomero più lungo che largo; tra i due lobi laterali del margine posteriore del sesto urotergo libero del ♂ non sono presenti altri lobi o spine. Lungh. 2,5 mm. Sichuan . . . . *G. monospina* sp n.

\- Quarto antennomero lungo quanto largo; tra i due lobi laterali del margine posteriore del sesto urotergo libero del ♂ sono presenti due lobi più corti dei laterali. Lungh. 1,8 mm. Yunnan . . . . *G. cristifera* Pace

28 Taglia maggiore: 2,1 mm; pronoto trasverso con rapporto larghezza/lunghezza pari a 1,38; quinto urotergo libero del ♂ con granuli e carene salienti. Lungh. 2,1 mm. Sichuan . . . . *G. anguinea* sp. n.

\- Taglia minore: 1,3-1,4 mm; pronoto fortemente trasverso con rapporto larghezza/lunghezza pari a 1,53-1,88; quinto urotergo libero del ♂ semplice o con largo granulo mediano appiattito 29

29 Corpo uniformemente bruno; quinto urotergo libero del ♂ semplice; due brevi lobi al margine posteriore del sesto urotergo libero del ♂.Lungh. 1,4 mm. Jiangsu . . . . *G. cooteri* Pace

\- Avancorpo bruno-rossiccio, addome giallo bruno; quinto urotergo libero del ♂ con largo granulo appiattito. Lungh. 1,3 mm. Hong Kong . . . . *G. lividoides* Pace

30 Decimo antennomero lungo quanto largo 31

\- Decimo antennomero chiaramente trasverso 32

31 Pronoto ed elitre giallo-rossicci; secondo urotergo libero del ♂ con carena mediana. Lungh. 2,2-2,5 mm. Manciuria . . . . *G. kaiseri* Bernhauer

\- Pronoto ed elitre bruni; secondo urotergo libero del ♂ semplice. Lungh. 1,7 mm. Hong Kong . . . . *G. anguli* Pace

32 Pronoto più trasverso, con rapporto larghezza/lunghezza pari a 1,55; lobi laterali del margine posteriore del sesto urotergo libero del ♂, corti e larghi. Lungh. 1,9 mm. Sichuan . . . . *G. zhagaensis* sp. n.

\- Pronoto meno trasverso, con rapporto larghezza/lunghezza pari a 1,36; lobi laterali del margine posteriore del sesto urotergo libero del ♂, lunghi e stretti. Lungh. 2,6 mm. Shaanxi . . . . *G. xianensis* sp. n.

CHIAVE DELLE ♀♀ DELLE SPECIE CINESI DEL GENERE *GYROPHAENA*

1 Pronoto non o appena più stretto in avanti che all'indietro 2

\- Pronoto notevolmente più stretto in avanti che all'indietro 16

2 Pronoto con quattro o più punti più forti frammisti a punti minori 3

\- Pronoto uniformemente punteggiato, senza punti notevolmente più forti di altri 15

3 Antenne lunghe, con decimo antennomero più lungo che largo o lungo quanto largo 4

\- Antenne corte, con decimo antennomero trasverso 13

4 Decimo antennomero più lungo che largo 5

\- Decimo antennomero lungo quanto largo 9

5 Quarto antennomero trasverso; pronoto e base dell'addome giallo-rossicci. Lungh. 2,6 mm. Yunnan . . . . *G. speculicollis* sp. n.

\- Quarto antennomero più lungo che largo o lungo quanto largo; pronoto bruno e addome bruno-rossiccio 6

6 Pronoto appena trasverso, con rapporto larghezza/lunghezza pari a 1,09; elitre brune con omeri bruno rossicci. Lungh. 4,1 mm. Sichuan . *G. erosa* sp. n.

\- Pronoto chiaramente trasverso, con rapporto larghezza/lunghezza pari a 1,30-1,31; elitre bicolori brune con metà basale giallognola o unicolori 7

7 Pronoto bruno marginato lateralmente di giallo-rossiccio; elitre unicolori giallo-brune. Lungh. 3,8 mm. Sichuan . . . . *G. nobilis* sp. n.

\- Pronoto unicolore, non marginato lateralmente di colore; elitre bicolori brune o bruno-rossicce con base giallognola 8

8 Bulbo distale della spermateca senza introflessione apicale. Lungh. 2,6 mm. Shaanxi . . . . *G. shaanxiensis* sp. n.

\- Bulbo distale della spermateca con introflessione apicale. Lungh. 2,7 mm. Shaanxi . . . . *G. schuelkei* sp. n.

9 Pronoto poco trasverso, con rapporto larghezza/lunghezza pari a 1,28-1,36 . . 10

\- Pronoto nettamente trasverso, con rapporto larghezza/lunghezza pari a 1,42-1,52 12

10 Quarto antennomero trasverso; pronoto bruno marginato lateralmente di bruno-rossiccio e più trasverso, con rapporto larghezza/lunghezza pari a 1,38. Lungh. 2,6 mm. Gansu . . . . *G. chinensis* Pace

\- Quarto antennomero lungo quanto largo o più lungo che largo; pronoto unicolore rossiccio e meno trasverso, con rapporto larghezza/lunghezza pari a 1,28-1,31 11

11 Primo antennomero basale nero-bruno e i due contigui gialli; elitre bicolori brune con i due terzi basali rossicci; bulbo distale della spermateca senza introflessione apicale. Lungh. 2,5 mm. Sichuan . . . . *G. bilimbisublata* sp. n.

\- Primi tre antennomeri basali gialli; elitre unicolori bruno-rossicce; bulbo distale della spermateca con introflessione apicale. Lungh. 2,5 mm. Sichuan . . . . *G. absurdior* sp. n.

12 Antenne nere con base gialla; elitre bicolori brune con base giallo-bruna; margine posteriore degli uroterghi giallo-bruno; bulbo distale della spermateca senza evidente introflessione apicale. Lungh. 2,2 mm. Shaanxi . . . . *G. cervicornis* sp. n.

\- Antenne giallo-rossicce con base gialla; elitre unicolori bruno-rossicce; uroterghi unicolori; bulbo distale della spermateca con evidente introflessione apicale. Lungh. 2,2 mm. Sichuan . . . . *G. perflagellans* sp. n.

13 Pronoto poco trasverso, con rapporto larghezza/lunghezza pari a 1,18; taglia corporea ridotta: 1,5 mm; bulbo distale della spermateca assai sviluppato. Yunnan . . . . *G. paula* Pace.

\- Pronoto nettamente trasverso, con rapporto larghezza/lunghezza pari a 1,31-1,66; taglia corporea di 1,8-2,2 mm; bulbo distale della spermateca ridotto 14

14 Capo e pronoto neri; spermateca minuscola. Lungh. 1,8 mm. Hong Kong . . . . *G. cicatricosa* Kraatz

\- Capo e pronoto rossicci; spermateca bene sviluppata. Lungh. 2,2 mm. Yunnan . . . . *G. secreta* sp. n.

15 Elitre bicolori e addome giallo-rossiccio con fascia rossiccia; granulosità del pronoto molto saliente; spermateca minuscola. Lungh. 1,7 mm. Hong Kong . . . . *G. vexillifera* Pace

\- Elitre e addome unicolori bruni; granulosità del pronoto assai superficiale; spermateca enorme in rapporto alla taglia corporea. Lungh. 1,4 mm. Jiangsu . . . . *G. cooteri* Pace

16 Elitre bicolori rossicce con metà posteriore bruna; spermateca minuscola. Lungh. 2,6 mm. Shaanxi . . . . *G. xianensis* sp. n.

\- Elitre unicolori; spermateca grande 17

17 Pronoto poco trasverso, con rapporto larghezza/lunghezza pari a 1,44-1,58 . 18

\- Pronoto molto trasverso, con rapporto larghezza/lunghezza pari a 1,60-1,65 . 20

18 Corpo unicolore bruno-rossiccio; capo fortemente ed estesamente punteggiato. Lungh. 2,7 mm. Gansu . . . . *G. vidua* Pace

- Corpo bicolore o unicolore con margine posteriore degli uriti bruno-rossiccio; capo non fortemente, né estesamente punteggiato 19

19 Corpo unicolore bruno, con margine posteriore degli uroterghi bruno-rossicci; reticolazione del pronoto nettissima; granulosità delle elitre saliente solo all'angolo posteriore esterno. Lungh. 1,8 mm. Sichuan . . . . *G. opacicollis* sp. n.

- Corpo bicolore: avancorpo nero-bruno, addome rossiccio; reticolazione del pronoto assente; granulosità delle elitre fine e uniformemente distribuita. Lungh. 1,5 mm. Hong Kong . . . . *G. herebi* Pace

20 Occhi sporgenti; fascia longitudinale mediana del pronoto senza punteggiatura, strettissima; elitre poco più larghe del pronoto. Lungh. 1,8 mm. Hong Kong . . . . *G. penetrans* Pace

- Occhi non sporgenti; fascia longitudinale mediana del pronoto senza punteggiatura, assai larga; elitre molto più larghe del pronoto. Lungh. 1,9 mm. Sichuan . . . . *G. zhagaensis* sp. n.

Encephalus umbonatus sp. n. Figg. 105-109

Holotypus ♂, China, Sichuan, Gongga Shan, Hailuogou, for. above camp 2, 2800 m, 29°35N/102°00E, 5.VIII.1998, leg. A. Smetana, 1998 China Expedition J. Farkač, D. Král, J. Schneider & A. Smetana, (MHNG).

Paratypi: 1 ♂ e 1 ♀, China, Shaanxi, Qin Ling Shan, autoroute Km 93 S of Zhouzhi, 108 Km SW Xian, mountain forest, sifted, 1650 m, 1-2.IX.1995, leg. A. Pütz.

DESCRIZIONE. Lungh. 2,7 mm. Corpo lucido e rossiccio; antenne rossicce con i tre antennomeri basali giallo-rossicci; zampe gialle. La punteggiatura del capo, pronoto ed elitre profonda. Sul capo tra i punti maggiori si estende una punteggiatura estremamente fine e superficiale. Le elitre presentano una bozza laterale posteriore saliente e una punteggiatura irregolarmente distribuita, assente lungo il margine posteriore e ai lati. L'avancorpo è privo di reticolazione. Una reticolazione netta sta sugli uroterghi liberi primo, quarto e quinto e una reticolazione vigorosa si osserva sulla metà basale degli uroterghi liberi secondo e terzo. Il primo urotergo libero del ♂ ha una plica mediana semiellittica, il secondo presenta due bozze ovali poco salienti. Spermateca fig. 105, edeago figg. 107-108, sesto urotergo libero del ♂ fig. 109.

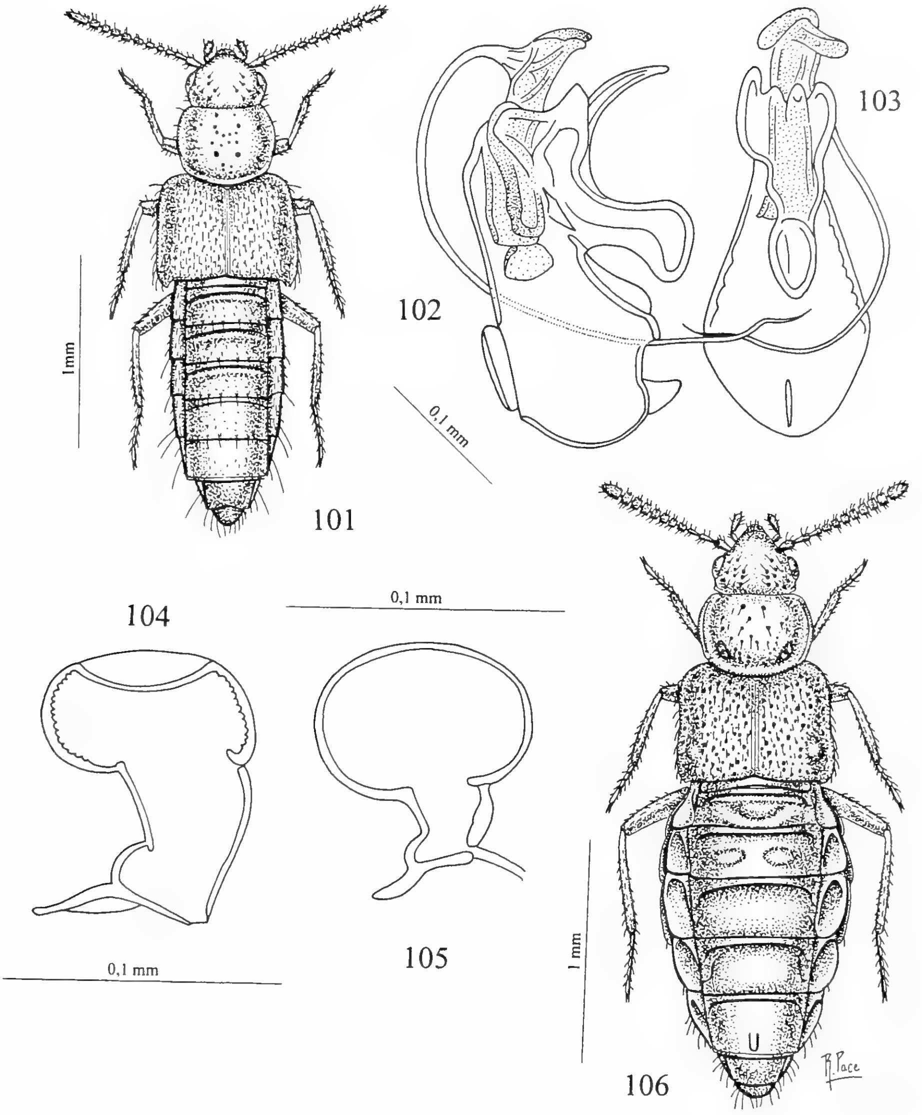
ETIMOLOGIA. La nuova specie prende nome dalla presenza di una bozza delle elitre del ♂, simile al rilievo (umbone) al centro di alcuni tipi di scudo dell'antichità.

COMPARAZIONI. Si veda la chiave data per *E. sinensis* sp. n.

Encephalus sinensis sp. n. Figg. 110-112

Holotypus ♀,China, Shaanxi, Qin Ling Shan, N mountain N pass at autoroute Km 70, 47 Km S Xian, 2300-2500 m, sifted, 1650 m, 26-30.VIII.1995, leg. A. Pütz (NHMB).

DESCRIZIONE. Lungh. 2,7 mm. Corpo lucido e bruno, con capo nero-bruno, pronoto bruno-rossiccio e margine posteriore degli uroterghi liberi primo a terzo e quinto rossicci; antenne giallo-brune con i tre antennomeri basali rossicci; zampe giallo-rossicce. La punteggiatura del capo e del pronoto è forte, quella delle elitre è profonda, irregolarmente distribuita e assente all'angolo posteriore esterno. L'avancorpo è privo di reticolazione. Quella dell'addome è netta. Spermateca fig. 111, sesto urotergo libero della ♀ fig. 112.



FIGG. 101-106
Habitus, edeago in visione laterale e ventrale e spermateca. 101-104: *Gyrophaena absurdior* sp. n.; 105-106: *Encephalus umbonatus* sp. n.

ETIMOLOGIA. Il nome della nuova specie significa «cinese».

COMPARAZIONI. La nuova specie si distingue da *E. chinensis* Pace, 1998 e da *E. umbonatus* sp. n., sopra descritto, per i caratteri dati nella seguente chiave, che non comprende tutte le specie cinesi note.

1 Corpo rossiccio; quarto antennomero lungo quanto largo; pronoto poco trasverso, con rapporto larghezza/lunghezza pari a 1,33. Lungh. 2,7 mm. Sichuan . . . . *E. umbonatus* sp. n.

\- Corpo diversamente colorato; pronoto molto trasverso, con rapporto larghezza/lunghezza pari a 1,52-1,68 2

2 Avancorpo nero; metà posteriore delle elitre coperta di netta reticolazione; punteggiatura delle elitre assente ai lati. Lungh. 2,4 mm. Gansu . . . . *E. chinensis* Pace

\- Capo nero-bruno; pronoto bruno-rossiccio; elitre brune, prive di reticolazione; punteggiatura delle elitre assente all'angolo posteriore esterno. Lungh. 3,0 mm. Shaanxi . . . . *E. sinensis* sp. n.

Brachida guangxiensis sp. n. Figg. 113-114

Holotypus ♀, China, Guanxi Pr., Nong Gang NR. 22.V.1998, leg. J. Fellow (MRSN).
Paratypus: 1 ♀, stessa provenienza.

DESCRIZIONE. Lungh.2,5 mm. Corpo lucidissimo, molto convesso e rossiccio; antenne brune, con i due antennomeri basali e l'undicesimo rossicci; zampe rossicce. La punteggiatura del capo e del pronoto è indistinta. La granulosità delle elitre è saliente, quella degli uroterghi si trova solo alla base di ciascuno, ma il quinto libero è quasi privo di detta granulosità e di fitta pubescenza, sicché appare nudo. Sul corpo non è presente reticolazione. Spermateca fig. 114.

ETIMOLOGIA. La nuova specie prende nome dalla sua località tipica.

COMPARAZIONI. La nuova specie si distingue dalle altre specie della Cina per i caratteri dati nella seguente chiave.

1 Corpo interamente giallo-rossiccio o rossiccio; occhi ridotti, più corti delle tempie 2

\- Corpo giallo-rossiccio con metà posteriore delle elitre bruno-rossiccia; occhi molto sviluppati, più lunghi delle tempie 3

2 Pronoto con due file discali di tre punti ciascuna, convergenti in avanti; quinto urotergo libero con pubescenza fitta come quella dei precedenti uroterghi. Lungh. 2,4 mm. Hong Kong . . . . *B. solifuga* Pace

\- Pronoto senza file di punti discali, ma con una fossetta obliqua a ciascun lato; quinto urotergo libero della ♀ quasi nudo, con alcune rade setole e relativi granuli. Lungh. 2,5 mm. Guangxi . . . . *B. guangxiensis* sp. n.

3 Bulbo distale della spermateca sferico, con introflessione apicale. Lungh. 2,0 mm. Hong Kong . . . . *B. kadooriorum* Pace

4 Bulbo distale della spermateca ovale, senza introflessione apicale. Lungh. 2,1 mm. Hong Kong . . . . *B. hongkongensis* Pace

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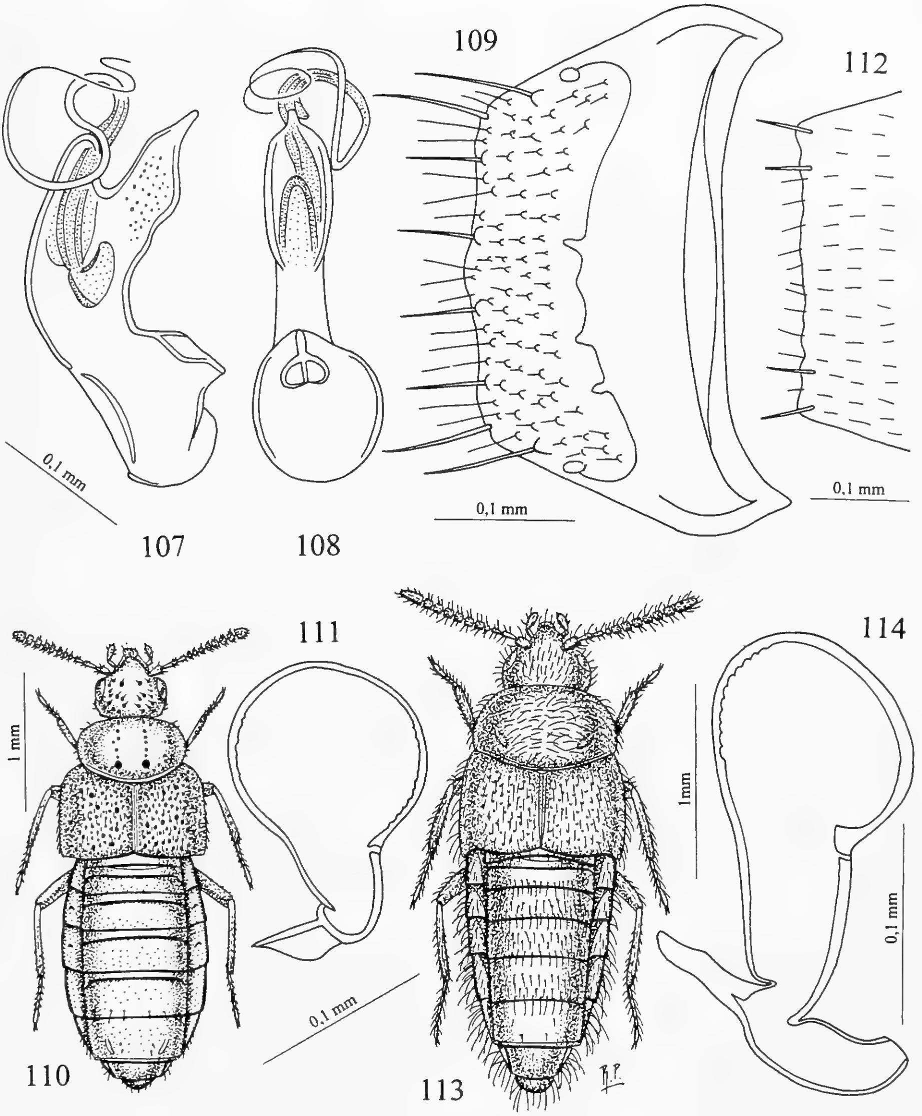

FIGG. 107-114
Edeago in visione laterale e ventrale, sesto urotergo libero del ♂ (109) e della ♀ (112), habitus e spermateca. 107-109: *Encephalus umbonatus* sp. n.; 110-112: *Encephalus sinensis* sp. n.; 113-114: *Brachida guangxiensis* sp. n.

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Distribution of badger setts and latrines in an intensively cultivated landscape

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Distribution of badger setts and latrines in an intensively cultivated landscape. - We made a survey of badger *Meles meles* setts and latrines in a Swiss agricultural area where food resources are over-abundant and suitable den sites potentially rare. Indeed, badger main sett density was the lower ever recorded (0.07/km^2). Setts were located in small remaining woodlands or in the forested slopes surrounding the cultivated area. We discovered 67 latrines, which could be differentiated into two categories: 1) major latrines used for more than 4 months, 2) minor latrines used for only 1 to 4 months. Major latrines, which are generally considered as territorial marks, were located closer to the main setts than the minor ones. This distribution suggests that badger territorial boundaries are not well defined in this cultivated area.

Key-words: Badger - *Meles meles* - main setts - latrines - territoriality - intensive agriculture.

INTRODUCTION

The European badger (*Meles meles* L., 1758) is bound to a great extent to underground burrows dug most of the time by itself. Several setts are usually distributed throughout the territory of one badger clan. They can be classified into two main categories: the main sett and the outliers. Usually characterised by many entrances, the main setts are permanently occupied by badgers and used for reproduction. There is one main sett for every single social group. Outliers are categorised into annex setts and subsidiaries or peripheral setts (Thornton, 1988; Roper, 1992; Lüps & Wandeler, 1993 *inter alies*). Located up to a few hundred meters away from the main sett and connected to it by a well delimited path, the former have fewer entrances than the main sett and are often occupied intermittently by badgers. On the other hand, the subsidiaries can be situated far away from the main sett and are not connected to it by any path. They are rarely used, mostly as resting sites during foraging periods, or as refuges in case of a sudden threat (Butler & Roper, 1994, 1996). A suitable den site should provide a soil which is easy to dig and well drained, a slope to facilitate the evacuation of the excavated material, and vegetal cover to hide the activities close to the sett and to

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sustain the galleries thanks to the roots (Dunwell & Killingley, 1969; Anrys & Libois, 1983; Skinner *et al.*, 1991; O'Corry-Crowe *et al.*, 1993).

Badgers mark their territorial boundaries with their faeces, which are usually deposited in open pits agglomerated in latrines (Kruuk, 1978; Neal, 1986; Roper *et al.*, 1986; Pigozzi, 1989; Roper *et al.*, 1993). Latrines are most of the time situated close to marked landscape limits such as hedgerows, forest edges, roads or streams (Roper *et al.*, 1986; Harris *et al.*, 1994; Martin *et al.*, 1995). There are also latrines spread within the territory but these are usually smaller and used only over a short period (Roper *et al.*, 1993). Roper *et al.* (1986) and O'Corry-Crowe *et al.* (1993) differentiate 2 types of latrines. The «real» latrines or major latrines encompass many pits and are used regularly year-round. «Temporary Defecation Sites» (=TDS) or minor latrines encompass only a few pits, generally 1 or 2, and are used only over a short period. Major latrines are mostly located close to territorial boundaries whereas TDS are often distributed inside the territory and less bound to landscape limits.

Badgers must face two main limiting factors: food availability and the presence of suitable den sites. In modern agricultural landscapes food resources appear to be quite abundant (Stocker & Lüps, 1984; Seiler *et al.*, 1995). On the other hand, most natural structures tend to disappear, slopes are levelled and cover is rare. Thus, favourable sites for the excavation of suitable dens by badgers seem to be limited. Consequently, we tried to determine how badgers could cope with the apparent scarcity of suitable sites for denning in an intensively cultivated area. Further, we investigated to what extent the cultivated fields were encompassed in badger home ranges using the distribution of latrines as these are thought to be territorial marks.

STUDY AREA AND METHODS

The study was carried out in the Val-de-Ruz (41 km^2; Fig. 1), a cultivated valley of the Swiss Jura Mountains, western Switzerland. Altitude ranges from 650 to 800 m. Surrounded by steep wooded slopes, this valley is potentially suitable for intensive agricultural exploitation on over 80% of its surface (Bouzelboudjen *et al.*, 1993). There are only a few small woods remaining within the cultivated area. They, together with some marginal forest patches, account for a surface of 1.8 km^2 representing only 4.4 % of the area.

Badger setts and latrines were searched for systematically in all forests, forest edges, hedgerows and small woods of the cultivated area. Additionally, we also looked for latrines along roads, streams, fences and break of slopes. The utilisation of setts and latrines was then monitored twice every month from June 1994 to May 1995. Each sett was checked for evidences of occupation by badgers (i.e. footprints, hairs at the entrances, traces of scrubbing or faeces), and classified as described in the introduction into main, annex or subsidiary sett. For every latrine we noted the number of pits and, if present, the number of scats.

Despite the absence of dens in the eastern half of the valley we observed regularly badger tracks and individuals. Thus, we decided in mid-winter 1995 to search for burrows in the forests situated on the slopes surrounding the cultivated area, up to altitudes of between 800 and 1000 m depending on the altitude of the bottom of the valley.

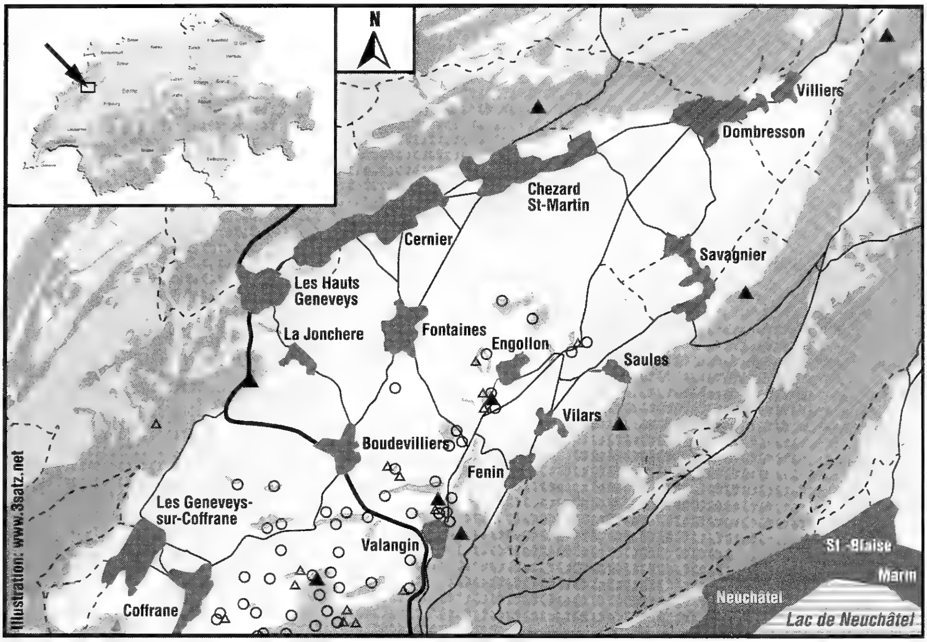

FIG. 1
Distribution of badger setts and latrines in the study area. In black: villages; in grey: woods and forest; in light grey and white (study area): cultivated areas and pastures; black lines: roads; full triangles: main setts; open triangles: outliers; circles: latrines.

The Mann-Whithney U-test was used to test for potential significant differences between main setts and outliers, minor and major latrines, and the distance between latrine type and main sett. Further, we applied a chi square test to determine if the spatial distribution of main setts was different from random.

RESULTS

During the survey, 14 setts, used by badgers, were found within the cultivated area, of which 3 were main ones, 2 annex setts and 9 subsidiaries (proportion main sett to total number of setts: 1:4.1). All setts were located in woodlands (Fig. 1), and 11 of them (78%; all main and annex setts and 6 subsidiaries), were dug in fluvioglacial layers, a highly permeable soil. It has to be noted that only one main sett was situated in a small forest island amid the cultivated area. All others were located in the forests surrounding the valley. Main sett density was 0.07 sett per km^2. The number of entrances was higher in the main setts ($x = 13.7$, SD = ± 6.7) than in the outliers ($x = 2.8$, SD = ± 2.9; Mann-Whithney U-test: $U = 2.471$, $p = 0.0135$). Spatial distribution was statistically different from random (Chi^2 = 20.48, $p < 0.001$).

Six additional main setts and 3 outliers were found in the forested slopes surrounding the cultivated area during the second prospecting in winter (Fig. 1). The small number of outliers is due to the fact that this second search was mainly based on previous knowledge of gamekeepers and not on systematical searching.

As all dens were distributed in the western half of the cultivated valley, the search for latrines was concentrated in this area. None of the 67 latrines we discovered were situated in open fields. Most of them were located at forest edges (45%) or hedgerows (42%), and when situated in woodlands, they were close to streams, paths or break of slopes (Fig. 1).

In our study area 2 types of latrines were recorded. On the one hand, latrines used less than 4 months (41/67 latrines) averaged 6.7 (± 6.7) pits. On the other hand, latrines used more than 4 months averaged 19.1 (± 12.7) pits. The number of pits significantly differed between both groups of latrines (Mann-Whithney U-test: $U = 25$, $p = 0.0076$). Latrines from the latter group, major latrines, were located closer to the main setts (347 m ± 284) than the minor ones (708 m ± 277; Mann-Whithney U-test: $U = -3.358$, $p = 0.0008$). None of the latrines was used for a period longer than 9 months (Fig. 2), and the number of latrines used each month was positively correlated to the number of faeces present (Spearman: $N = 12$, $Rho = 0.816$, $p = 0.0068$)

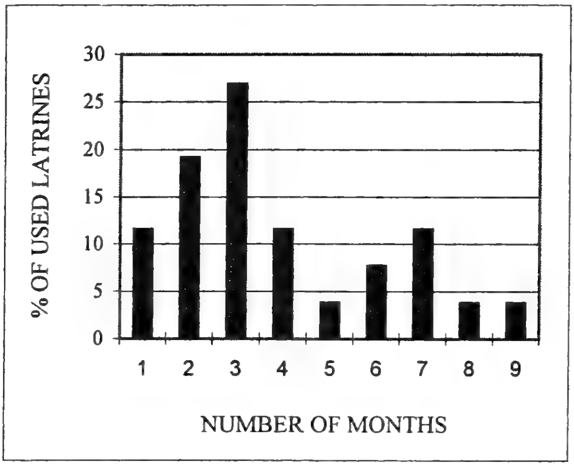

FIG. 2
Proportions of latrines used for a given number of months

DISCUSSION

Main sett density is related to the density of badger clans, as a clan possesses only one main sett (Kruuk, 1978; Neal, 1986). In the Val-de-Ruz, main sett density is 0.07/km^2. This is amongst the smallest density ever observed (Table 1). Apparently, this intensively cultivated area is not a habitat providing suitable den sites. Besides, most main setts of badger clans which home range encompasses the cultivated area, are situated in the forests surrounding the valley. There are only a few setts located in some of the remaining woody islands. In addition, to be suitable, the latter have to provide a slope and a favourable soil. These conditions are absent from the woodlands of the eastern part of the Val-de-Ruz.

TABLE 1. Comparison of main sett densities amongst various studies (bold: results of the present study).

Author(s)	Country	Surface of the study area (km^2)	Number of main setts	Main sett density (km^2)
Butler & Roper, 1996	England	7.75	19	2.45
Cheeseman *et al.*, 1988	England	9	34	3.78
Roper *et al.*, 1986	England	1.3	6	4.61
Roper *et al.*, 1993	England	6.2	15	2.42
Skinner *et al.*, 1991	England	3942	700	0.18
Wilson, 1993	England	1.9	4	2.1
O'Corry-Crowe *et al.*, 1993	Ireland	16	11	0.69
Biancardi & Rinetti, 1999	Italy	180	21	0.12
Marassi & Biancardi, 2002	Italy	58	4	0.07
Pigozzi & Consolati, 1991	Italy	17.5	9	0.50
Kruuk & Parish, 1987	Scotland	12	7	0.58
Do Linh San, 1997	Switzerland	16	6	0.37
Do Linh San, 2002	Switzerland	74	22	0.30
Ferrari, 1997	Switzerland	26	5	0.19
Ferrari, 1997	Switzerland	30	3	0.10
Good *et al.*, 2001	Switzerland	10	35	3.50
Present study	**Switzerland**	**41**	**3**	**0.07**

Regarding the latrines, their distribution and utilisation suggest that boundaries in the cultivated area are not well defined, as most of them are used only over a short period and the important ones are closer to the main setts than the others. This pattern is probably due to the low badger clan density (Cheeseman *et al.*, 1988; Lüps & Wandeler, 1993) or to the absence of neighbouring territories towards the centre of the valley (Kruuk, 1978). As a matter of fact, the spatial distribution of latrines observed in the Val-de-Ruz is different to what has been observed elsewhere (England: Roper *et al.*, 1986; Ireland: O'Corry-Crowe *et al.*, 1993). As far as we know, there are only three studies describing the same pattern of distribution: Graf *et al.* (1996) and Do Linh San (2002) in two Swiss rural areas and Cresswell & Harris (1988) in a British urban habitat. According to the latter, this distribution could be due to the heterogeneity and the unpredictability of food resources in the urban habitat and the authors argue that the same situation could be observed in rural areas with low badger densities. Our study confirms the low badger clan density in a cultivated area, but the cause seems not to lie in the food resource distribution (Fischer, 1997) but rather in the scarcity of potential den sites.

After Pigozzi (1989), the fact that the number of latrines used each month is positively correlated to the number of faeces present would mean that badgers defecate preferentially in the same latrines, the number of which depends on the amount of produced scats and thereafter on the quantity of ingested food. However, in this interpretation, this author does not consider the volume of the faeces and the digestibility of ingested items. Furthermore, several authors have shown that the maximal food consumption takes place in autumn to gain weight before winter (Skoog, 1970; Stocker & Lüps, 1984; Roper, 1994) whereas the number of scats placed in latrines and the number of used latrines is maximal in spring, when territorial marking is most intensive. The positive correlation between these factors is rather linked to this intensity of territorial marking and the rest of the year, scats are less often deposited in latrines.

The role of territorial marking in the European badger is not yet unanimously recognised. After Kruuk (1978) the badger defends its food resources. On the other hand, Roper *et al.* (1986) and Roper & Lüps (1993) argue that the access to mating partners is the defended resource. In a similar way, Doncaster & Woodroffe (1993) and Roper (1993) consider that the defence of the breeding den is actually the proximate cause of territorial behaviour. Stewart *et al.* (1997) propose another explanation of the role of territorial marking which could be additional or an alternative to the "defence" role. They described a «passive range exclusion» hypothesis in which mutual avoidance would create range exclusion. The border latrines would act as information sites to signal resource depletion between 2 groups.

Our observations in the Val-de-Ruz are consistent with the hypothesis that the main sett represents a valuable resource which is surrounded by important marking stations, the more conspicuous latrines. The cultivated area acts as a reservoir with overabundant food supply (Fischer *et al.*, in prep.). Furthermore, the scarcity of suitable den sites does not allow the establishment of a dense population. Consequently, food resources do not need to be defended there like in high badger density areas.

So far, most studies were conducted in high density populations, with many clans, where the defended territory, marked with major latrines, is supposed to match with the home range (Macdonald, 1983). In our study area, where densities are very low, major latrines could also mark the defended territory and the minor ones are likely to be a sign of badger activity outside this defended area, thus indicating that the home range is not similar to the territory. Activity outside the territory limits is likely to be principally bound to foraging. Consequently, food resources are not likely to be the defended resource.

Thus, despite the apparent over-abundance of food resources due to modern cultural habits (Fischer *et al.*, in prep.) badger clan densities are low in the Val-de-Ruz. The absence of suitable den sites in such areas is likely to be the limiting factor (Da Silva *et al.*, 1993; Doncaster & Woodroffe, 1993; Reason *et al.*, 1993; Roper, 1993).

The ecology of the badger is probably quite different between low and high density areas. Unfortunately, these areas with small populations have been mostly disregarded up to now. However, these situations were badgers reach their ecological limits are more likely to give answers to many of the unexplained behavioural traits of this species.

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