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SOCIÉTÉ SUISSE DE ZOOLOGIE

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## A new racer of the genus *Platyceps* Blyth from Djibouti (Reptilia: Squamata: Colubrinae)

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**A new racer of the genus *Platyceps* Blyth from Djibouti (Reptilia: Squamata: Colubrinae).** - *Platyceps afarensis* sp. n. is described on the basis of two specimens from Djibouti. The new species is compared with presumed congeneric racers from Eastern Africa. *P. afarensis* is probably most closely related to *P. rhodorachis* auct. The systematics of some East African racers are briefly reviewed.

**Keywords:** *Platyceps afarensis* sp. n. - morphology - systematics - *P. florulentus* group - *P. rhodorachis* - Horn of Africa - Djibouti.

### INTRODUCTION

The racer genus *Platyceps* Blyth, 1860 as understood at the moment of this writing includes, for instance, the *P. najadum* group (*P. collaris*, *P. najadum*, *P. schmidtleri*) from the Balkans to Turkmenistan (Kopet Dag), the Sindian type species *P. ventromaculatus* (Gray, 1834), a species complex from the Himalayas to the Hoggar (Algeria) commonly referred to *P. rhodorachis* (Jan, 1863), Arabian endemics such as *P. elegantissimus* (Günther, 1879) and *P. variabilis* (Boulenger, 1905), and the *P. florulentus* group from Egypt to Cameroon and Tanzania.

Three racer species are reported from the immediate African coast of the southern Red Sea, i.e., *Platyceps largeni* (Schätti, 2001), an endemic of the Dahlak archipelago (Eritrea), *P. taylori* (Parker, 1949) from southern Eritrea to NW Somalia and adjacent areas of Ethiopia, and *P. rhodorachis subniger* (Boettger, 1893) from mainland Eritrea and the Dahlak islands to northern Somalia.

A field trip by the junior author to Djibouti in April 1999 resulted in many amphibian and reptile species formerly not recorded from this country including, for instance, *Platyceps taylori* and *Eirenis africana* (Ineich, 2003). Collecting by French military personnel after this expedition procured further reptile species including two racer specimens that are new and which are described in this paper. They are deposited in the Muséum National d'Histoire Naturelle, Paris (MNHN). Morphological terms and definitions used in the following text are explained in Schätti (1988) and Schätti & Charvet (2003).

*Platyceps afarensis* sp. n. – Afar racer

*Diagnosis.* Dorsal scales in 21 rows on anterior part of trunk and at midbody, 251-258 ventrals in males (females unknown), 143-144 subcaudals, and 19 maxillary teeth.

*Description of holotype* (MNHN 2001.650, adult male: Arta, Djibouti). Head 2.34 times longer than broad. Frontal 2.29 times longer than width across the lateral projections; 1.16 times longer than median suture between parietals.

Loreal elongate, much longer than high, deeper posteriorly. Nine supralabials, fifth and sixth in contact with orbit, seventh and ninth largest. Preocular single. Anterior subocular preventing fourth supralabial from entering the eye. An additional small scale between the subocular, third and fourth supralabial, loreal, and preocular on left side (Fig. 1). Two postoculars. Temporals 1+3 (right) and 2+3. Ten sublabials, the first five in contact with anterior inframaxillary, sixth largest. Anterior pair of inframaxillaries broader and shorter than posterior; the latter slightly separated anteriorly by two rows of small scales and divergent posteriorly (three rows of elongate scales).

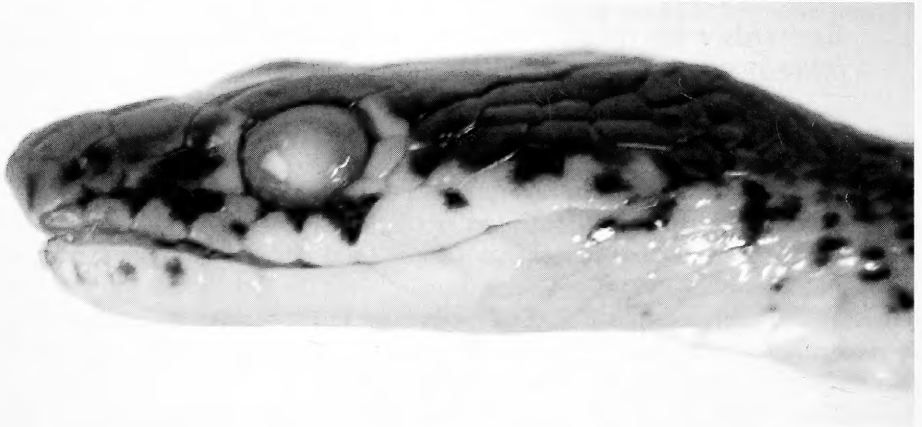


FIG. 1

*Platyceps afarensis* sp. n. Lateral head view of holotype (MNHN 2001.650).

Two preventrals, 251 ventrals; anal scute divided, 144 paired subcaudals. Dorsal scales with paired apical pits; in 21 rows on anterior part of trunk (counted at 20<sup>th</sup> ventral) and at midbody, 13 in front of vent. Bilateral reduction of dorsal scale rows at ventral 144 involving eighth and ninth (left) and ninth and tenth row (right), 153 (third and fourth and second and third, respectively), 177 (sixth and seventh), and between ventrals 225 and 246 (sixth and seventh row, scalation partly damaged). Total length 1035 (740 + 295) mm.

Pileus (in formalin) dark; supralabials, preocular, and postoculars mostly light; chin uniformly light. Scales on neck and first third of body dark anteriorly, with a fine yellowish-white medial line and light posterior lateral edges. Venter possibly yellowish, with dots; darker dorsal coloration extending to lateral edges of ventrals.

Left maxillary with 17 subsodont teeth, followed by a diastema and two larger teeth (last set off laterad). Basis of hemipenis smooth, followed by fine spines (apical ornamentation unknown).

*Variation in paratype* (MNHN 2001.651, subadult: Arta, Djibouti). Supralabials, preocular, anterior subocular, postoculars, sublabials, inframaxillary scales, and maxillary dentition as in holotype but with a presubocular on both sides. Temporals 2+3; an additional scale between the anterior temporals, the lower postocular, and the sixth and seventh supralabial. 258 ventrals, 143 subcaudals. Dorsals in 21 rows at the 20<sup>th</sup> ventral and midbody, and 15 in front of anal scute; reduction at ventral 153 (rows 8-10=9), 157-158 (3+4=3), and 186-188 (7+8=7). Total length 437 (320+117) mm. Dorsal coloration brownish (in formaline), venter pearly iridescent.

*Derivatio nominis*. The species is named after the Afar tribe of Djibouti and adjacent regions.

*Distribution*. Both specimens were collected by personnel of the 'CECAP' military site at Arta (11°31'N 42°51'E, approx. 705 m a.s.l.) in 1999 and 2000. The distribution of, and precise ecological information on, *Platyceps afarensis* pend further investigation.

The Arta area comprises three main botanical associations (steppe profiles). *Rhigozum somalense*, *Acacia tortilis*, *A. horrida*, and *Balanites rotundifolia* grow along wadis. This vegetation type is characterized by the reduced herbaceous strata due to the arid climat. The arbustive steppe with up to 2 m high *Rhigozum somalense* and *Caesalpinia erianthera* (herbaceous strata sometimes absent) is predominant along hillsides south of Arta, roughly from Ouhea to the Bara depression. The herbaceous steppe (mainly *Cymbopogon schoenanthus*) is found in valleys.

## COMPARISON

*Platyceps afarensis* clearly differs in external morphological features from congeneric species recorded from the area under consideration including *P. florulentus* auct. which has not yet been collected from Djibouti proper.

*Platyceps rhodorachis subniger* (see Systematic Remarks) has 19 dorsal scale rows along the anterior part of the body, 208-228 ventrals, and 112-132 subcaudals (Parker, 1949; Schätti, unpubl.). This racer occurs in the Afar area (e.g., MNHN 2001.649 and 2001.652-653) and sympatry with *P. afarensis* is likely.

Midbody dorsal scale counts of 21-23 are characteristic for *Platyceps f. florulentus* and *P. taylori*. However, these species have distinctly fewer ventrals and subcaudals than *P. afarensis*, up to ca. 230 and 105 or less, respectively, in the former and less than 200 and 100, respectively, in Taylor's racer (Schätti, 1988).

Populations of *Platyceps r. rhodorachis* auct. from Egypt to south-eastern Algeria (Hoggar, Tibesti) and Nubia attain ventral and subcaudals counts similar to those recorded for the new species, i.e., 245-262 and 136-154, respectively (Boulenger, 1893; Anderson, 1898; Kramer & Schnurrenberger, 1963). However, this taxon has only 19 dorsal scale rows along the anterior part of the trunk and at midbody, and there is a geographical gap including most of Sudan as well as Ethiopia and Eritrea separating *P. rhodorachis* auct. from the Afar racer (Schätti & McCarthy, 2004).

Racer species mentioned above except *Platyceps r. rhodorachis* auct. differ from *P. afarensis* in maxillary dentition, viz., 16 or fewer teeth versus 19 in the new species. Morphological difference is even more pronounced between *P. afarensis* and *P. b. brevis* from Somalia with 158-183 ventrals, 80-95 subcaudals, usually 17-19 dorsal scale rows at midbody (rarely 21 in southern populations), and 14 or fewer maxillary teeth (Schätti & Charvet, 2003).

## SYSTEMATIC REMARKS

*Platyceps rhodorachis subniger* (Boettger, 1893) may be specifically different from northern African *P. rhodorachis* auct. (Schätti, 1989; in prep.). The latter populations belong to a new species (Schätti & McCarthy, 2004).

The mainly Afrotropical *Platyceps florulentus* group is considered to be composed of *P. brevis* (Boulenger, 1895), *P. florulentus* (Geoffroy Saint-Hilaire, 1827), *P. largeni* (Schätti, 2001), *P. messanai* (Schätti & Lanza, 1989), *P. somalicus* (Boulenger, 1896), *P. taylori* (Parker, 1949), and a yet undescribed species from Ethiopia (Schätti, 2001; Schätti & Utiger, 2001; Schätti & Charvet, 2003). This cluster is quite heterogeneous as to external morphological characters. *P. somalicus*, only known from the female holotype (Audo Mts., Ethiopia), has solely 15 longitudinal dorsal scale rows at midbody and eight supralabials. *P. florulentus perreti* (Schätti, 1988) from Nigeria and Cameroon with 25 dorsals at midbody and nine supralabials probably deserves species status (Schätti & Utiger, 2001: 922). Supposed plesiomorphic character states (see below) of eastern African racers (*P. brevis*, *P. messanai*, *P. somalicus*) and their presumed close relationship to the *P. florulentus* group (Schätti & Charvet, 2003) require re-evaluation as briefly notified by Schätti & Monsch (2004).

A high degree of fragmentation of lateral head scales and other features (e.g., heterogeneous paraventral scale rows) as found in *Spalerosophis* spp. and the monotypic insular endemic *Hemerophis socotrae* (Günther, 1881) may be plesiomorphic conditions. This hypothesis is supported by certain character states of *Coluber* [sensu lato] *zebrinus* Broadley & Schätti, 1999 from Namibia, the terminal taxon of an early evolutionary lineage among Old World racers with nine supralabials, 21 dorsal scale rows, as well as comparatively high maxillary tooth counts (19).

Based on a relatively high number of lateral head scales, ventrals, dorsal scale rows at midbody, and maxillary teeth, *Platyceps afarensis* may be a primitive racer taxon. Additional specimens and further investigations including more characters and molecular data are necessary to establish the phylogenetic relationships of the Afar racer. In spite of the number of dorsal scale rows (21), we are inclined to consider the new species most closely related to *P. rhodorachis* auct. on the basis of overall morphology.

## ACKNOWLEDGEMENTS

Dr Bertrand Lafrance (Djibouti) provided help to obtain the specimens described in this paper. Aurélien Mirallès (Paris) took the photograph of the holotype.



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## Saharo-Arabian racers of the *Platyceps rhodorachis* complex – description of a new species (Reptilia: Squamata: Colubrinae)

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**Saharo-Arabian racers of the *Platyceps rhodorachis* complex – description of a new species (Reptilia: Squamata: Colubrinae).** - *Platyceps saharicus* sp. n. is described from northern Africa and the Near East (Sinai to western Jordan). This species is morphologically distinct from *P. rhodorachis* (Jan) and a yet unassigned taxon of the *rhodorachis* complex. The latter is sympatric with the Sahara racer in Israel, Jordan, and Palestine.

**Keywords:** *Platyceps saharicus* sp. n. - *P. rhodorachis* - *Platyceps* sp. *incertae sedis* - distribution - systematics.

### INTRODUCTION

*Platyceps rhodorachis* (Jan, 1863) was described from Shiraz, Iran. The taxon, as understood today, is a wide-ranging species complex comprising populations from the Hoggar (Ahaggar) and Tassili in southeast Algeria and from Somalia to the “Western Himalayas” (Boulenger, 1893). Populations from the Horn of Africa, originally described as *Zamenis ladacensis subnigra* Boettger, 1893, are commonly considered a subspecies of Jan’s cliff racer.

As far as the Near East is concerned, records of *Platyceps rhodorachis* auct. are lacking for most of Iraq, northern Saudi Arabia (with the exception of the extreme northwestern corner), and eastern Jordan (e.g., Parker, 1949; Gasperetti, 1988: Fig. 28; Disi *et al.*, 2001). There is reason to assume that this gap reflects the absence of Jan’s cliff racer from the interior of the northern Arabian Peninsula rather than lack of collecting activity. Farther west, *P. rhodorachis* auct. is documented from Jordan, Palestine, Israel, Egypt, and on the basis of scattered records from Chad, Libya, and Algeria (e.g., Angel & Lhote, 1938; Kramer & Schnurrenberger, 1963; Mertens, 1969).

It has long been known that *Platyceps rhodorachis* auct. is highly variable in external morphology, and particularly ventral scales (e.g., Anderson, 1895). Anderson (1898), for instance, noted the highest counts in specimens from Egypt, stating that their “lowest number of ventrals [...] is greater than the maximum number from any other localities, with the exception of Midian and the Sinaitic Peninsula”. Soon after, Steindachner (1900) reported considerable variation of ventral and subcaudal scales in

specimens from Lower Egypt and the northern Red Sea (Shadwan Island). Based on the material deposited in the former British Museum (Natural History), Parker (1949: 31) concluded that “there are indications of the possible existence of distinguishable local races [of *rhodorachis* auct.], e.g., in Egypt”.

Werner (1988: 367) distinguished two “*Coluber rhodorachis* *ssp.*” [sic] that “are morphologically distinct [and] well defined geographically, occupying northern vs. southern parts of the Israeli range” (“Perry in MS”). More recently, El-Oran *et al.* (1994) reported significant variation in ventral scales among Jordan populations.

This paper intends to improve our understanding of the *Platyceps rhodorachis* complex, and is a further step towards a revision of this complicated racer group (see Schätti & Ienech, 2004). Within the scope of this contribution, we re-evaluate northern African and Near East populations commonly referred to Jan’s cliff racer and present a preliminary assessment of western Arabian taxa currently identified as *P. rhodorachis* auct.

## MATERIAL AND METHODS

This study is based on 74 individuals including 38 specimens of the new species and 22 Iranian *Platyceps rhodorachis* (Appendix). The material is deposited in the following institutions: The Natural History Museum (formerly British Museum [Natural History]), London (BMNH), Field Museum of Natural History, Chicago (FMNH), Museum of Comparative Zoology, Harvard University, Cambridge (MCZ), Muséum d’histoire naturelle, Genève (MHNG), Muséum National d’Histoire Naturelle, Paris (MNHN), Museo Zoologico dell’Università [‘La Specola’], Firenze (MZUF), Naturhistorisches Museum, Basel (NHMB), Naturhistorisches Museum, Wien (NMW), Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt/Main (SMF), Zoological Museum, University of Tel-Aviv (TAU), and Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn (ZFMK). Further acronyms used in the text are CAS (California Academy of Sciences, San Francisco), HJ (Zoological Museum, Hebrew University, Jerusalem), JUM (Jordan University Museum, Department of Biological Sciences, Amman), MCC (Museo Civico di Storia Naturale, Carmagnola), MUM (Mutah University Museum of Natural History, Jordan), MZUT (Museo Zoologico dell’Università, Torino), and ZISP (Zoological Institute, Russian Academy of Sciences, St. Petersburg).

Morphological terms are explained in Schätti (1988). Numbers in parentheses indicate intraspecific variation. The tail / body length ratio was calculated for adult specimens only. Cephalic measurements were ascertained with a calliper. The head length is in a straight line from the anterior tip of the rostral to the posterior border of the median suture of the parietals. The head width equals the distance between the lateral edge of the supraoculars at the middle of the eye. The frontal length is along the midline from the anterior tip to the posterior border, and its width equals the maximum distance between the lateral projections. The internasal, prefrontal, and parietal length was measured along their respective median suture. The distance from the nostril to the eye is the shortest span from the posterior border of the external nose opening to the orbit.

Scale formulae give the number of longitudinal dorsal scale rows (dsr) at the 15<sup>th</sup> ventral, midbody, and five ventrals in front of the anal scute. The reduction pattern on the posterior portion of the trunk is expressed in terms of ventrals and as a percentage of their total number (%ven), based on the average of the right and left side counts. Maxillary teeth were examined on the right hand side only. The length of the hemipenis *in situ* (position of the apex) and the insertion of the retractor muscle have been ascertained in terms of subcaudals and are also given in percent of the total number of subcaudals (%sub).

The synonyms do not lay claim to be complete but contain most references presenting new material or good illustrations. Accession numbers are usually cited only at the first mention of a specimen, and where the material was examined by the authors; holdings mentioned by other authors are given in brackets. Coordinates are from the Gazetteers of the U.S. Board on Geographic Names or the GEONET database (<http://earth-info.nima.mil>), the pertinent literature (Gasperetti, 1988: Jabal As-Sinfa, Sawawin [see footnote 1]; Harrison & Bates, 1991: Tureibe Plain), file entries of scientific collections (TAU: Tubas, Vaset), and information by staff members (TAU 7059, 11230).

## RESULTS

### *Platyceps saharicus* sp. n. – Sahara racer

*Coluber florulentus* Geoffroy Saint-Hilaire, 1827 [partim]. - Rüppell, 1845: 308 (“Aegypten”: SMF 18217, see Boettger, 1898).

*Zamenis ventrimaculatus* [sic] (Gray, 1834). - Günther, 1878: 398 (“Midian”: BMNH 77.6.1. 7-8).

?“*Zamenis*” sp. - Hart, 1891: 25 (“Wâdy Hessi” [“Jebel Herteh”], see Remarks).

*Zamenis rhodorhachis* [sic] [partim]. - Boulenger, 1893: [381, 383] 399 (“Egypt”, Beni Hassan, “Tel-el-Amarna”: BMNH 97.10.28.544-545, 1963.993); Anderson, 1898: 252 [270], Tb. [unnumbered], Pl. 35 [BMNH 97.10.28.544] (same material including Tor).

*Zamenis rhodorhachis* [sic] var. *ladacensis* Anderson, 1871. - Boettger, 1898: 44 (“Tor, Arabien”).

*Zamenis rhodorhachis* [sic] [partim]. - Steindachner, 1900: 334 (“Insel Shadwan” [Jazirat Shakir]: NMW 25444.9).

*Zamenis rhodorhachis* [sic]. - Barbour, 1914: 88 (“Wady Feiran”: MCZ 9856).

*Coluber rhodorachis*. - Flower, 1933: [808] 809 (Wadi “Firan” [Feiran], Wadi Abu “Ghusum”); Scortecci, 1935: 193 (Ain Murr: MZUF 659); Angel & Lhote, 1938: 366 (Djanet [Tassili]: MNHN 1936.105).

*Coluber rhodorhachis* [sic]. - Schmidt & Marx, 1956: 29 (“Wadi el Sheikh” [ash-Shaykh]: FMNH 72108-10 [72109 now in ZISP]).

*Coluber r. rhodorachis* [partim]. - Kramer & Schnurrenberger, 1963: 501 (“Ybbi Bou [...] Tibesti”: BMNH 1958.1.3.93).

*Coluber r. rhodorhachis* [sic]. - Marx, 1968: 31, map 23 (“St. Catherine’s Monastery area [ $\pm$  5000 ft.], Wadi el Sheikh”; “Helwan, Wadi Hof” [Hulwan, Wadi Hawf]: incl. FMNH 153044).

*Coluber r. ladacensis* [partim]. - Mertens, 1969: 60 (“Hoggar-Berge”: SMF 62785).

*Coluber r. rhodorhachis* [sic]. - Werner, 1971: 244, Pl. 6A-B (Petra; “southern Cisjordan”: BMNH 1965.805, FMNH 74405, see Type specimens); Werner, 1973: 24, 41 [map] (see Distribution).

*Coluber rhodorhachis* [sic]. - Branch, 1980: 343, Tb. 2, Pl. 2 [“Saudi Arabia”, BMNH 1978.927, see footnote 1] (karyotype, secondary constriction).

?*Coluber r. rhodorhachis* [sic] [partim]. - Disi *et al.*, 1988: [43] 45 (see Remarks).

*Coluber r. rhodorhachis* [sic] [partim]. - Gasperetti, 1988: [215] 219 [405, 446], Figs 28 [map] and 30, Pls 5 [BMNH 1978.927] and 6 ["Jabal as Sinfa", BMNH 1979.708] (see Remarks and footnote 4) <sup>1)</sup>.

*Coluber rhodorachis* ssp. [1]. - Werner, 1988: 367, Tb. 3 (Israel, see Discussion).

*Coluber rhodorachis* [partim]. - Leviton *et al.*, 1992: 92, Pl. 15C ["Jabal as Sinfa, near Wadi Sawawin", BMNH 1978.927] (see footnote 1).

*Coluber r. rhodorachis* [partim]. - El-Oran *et al.*, 1994: 361, 366, Tb. 3 (Aqaba [MUM 366-67], see Remarks).

?*Coluber rhodorhachis* [sic]. - Sindaco *et al.*, 1995: 396, Pl. 1.4 (Wadi "Ramm" [MCC R635], see Remarks and footnote 3).

*Coluber r. rhodorhachis* [sic] [partim?]. - Saleh, 1997: [140] 143, map, Pl. 81 (Lower Egypt and Sinai, see Fig. 2).

?*Coluber rhodorachis* [partim]. - Disi *et al.*, 2001: 265, map [unnumbered], Figs 188 [Wadi "Ramm"] and 189 [Petra] (see Remarks and footnote 3).

*Platyceps rhodorachis* [complex]. - Schätti & McCarthy, 2001: 81, 88 (discussion).

*Type specimens.* Holotype - FMNH 72108 (EGYPT: "St. Catherine's Monastery area, Wadi el Sheikh", ♂; coll. Harry Hoogstraal, 14 May 1953). Paratypes - ALGERIA: MNHN 1936.105 (Djanet, 24°34'N 9°29'E, juv. ♀); SMF 62785 ("Hoggar-Berge, Sahara", ♂). CHAD: BMNH 1958.1.3.93 (Yebbi-Bou, 20°58'N 18°04'E, ♀). EGYPT: BMNH 97.10.28.544 (Beni Hassan, 30°54'N 31°40'E, juv. ♂), 97.10.28.545 (Tell El-Amarna, 27°39'N 30°54'E, juv. ♀), 1963.993 ("Egypt", ♀); FMNH 72110 ("St. Catherine's Monastery area, Wadi el Sheikh", ♀), 153044 ("Helwan, Wadi Hof" [Hulwan, Wadi Hawf], ca. 29°52'N 31°19'E, sex unknown [damaged]); MCZ 9856 (Wadi Feiran [Sinai], ca. 28°42'N 33°19'E, ♂); MHNG 2443.32 ("Upper Egypt", ♂); NMW 25444.8 ("Arabische Wüste bei Cairo" [leg. Fischer, 1880], juv. ♀), 25444.9 ("Shadwan" Island [Jazirat Shakir], 27°30'N 33°59'E, ♂), 25444.10 ("Aegypten" ["alte Sammlung"], ♂); SMF 18217 ("Tor, Arabien" [Sinai], 28°14'N 33°36'E, ♂); TAU 8004 (St. Catherine's Monastery area [Sinai], ca. 28°31'N 33°57'E, ♀), 8187 ("Vaset" [Sinai], ca. 29°02' 34°35'E, ♂); ZFMK 50270 ("Nag Hammadi (Nil-Ostufer)", 26°03'N 32°14'E, ♀), 50271 ("Qiseib, Rotes Meer", 29°24'N 32°28'E [Bir Qisayb], sex unknown [subad.]). ISRAEL: MHNG 1358.100 ("Negev", ♀); TAU 1662 (En Yotvata, 29°53'N 35°03'E, ♀), 4430 (Tureibe, ca. 31°05'N 35°06'E, ♀), 11488 (Nahal "Nikrot" [Neqarot], ca. 30°35'N 34°59'E, ♂). JORDAN: BMNH 1965.805 (Petra, 30°19'N 35°29'E, ♀); MHNG 2555.15-18 (Petra, ♂-♂, juveniles). LIBYA: MZUF 659 (Ain Murr, 22°17'N 24°45'E, sex unknown [subad.]). PALESTINE: FMNH 74405 ("South Dead Sea" [file entry], ♀, formerly HUI-R 3211 ["southern Cisjordan": Werner, 1971]). SAUDI ARABIA: BMNH 77.6.1.7 ("Midian", ♀), 1978.927 and 1979.708 (Sawawin, 27°57'N 35°47'E, ♂-♂, see footnote 1). SUDAN: ZFMK 23156 ("Nubien", juv.).

*Further material.* EGYPT: SMF 32307 ("Kairo" [leg. "v. Hoff"], juv.). ISRAEL: MHNG 2555.20 (Mizpe Ramon, 30°36'N 34°48'E, juv.). SAUDI ARABIA: BMNH 77.6.1.8 ("Midian", ♀; body fragmentary), 1979.709 (Jabal as-Sinfa, ♀; head and tail damaged, see footnote 1).

*Derivatio nominis.* The species is named after the Sahara desert, its main distribution range.

*Description of holotype* (FMNH 72108, ♂). Rostral distinctly broader than high. Internasals and prefrontals about the same length along the median suture. Frontal 1.45 times longer than broad, ca. 1.5 times longer than internasals and prefrontals, as long as parietals. Posterior border of parietals straight but somewhat indented towards the median suture. Head 2.25 times longer than maximum distance between outer border of supraoculars. Distance from the nostril to the eye nearly equals the length of the internasals and prefrontals. Loreal oblong and longer than high,

<sup>1)</sup> BMNH 1978.927 (leg. J. Gasperetti) and 1979.708 (coll. J. Forster, pres. J. Gasperetti) are registered as from "Sawawin", and BMNH 1979.709 from "Jabal As-Sinfa, ca. 500 m" (coll. J. Forster, pres. J. Gasperetti). They were all collected in the same area at approx. 27°57'N 35°47'E.

situated on 2<sup>nd</sup> (anterior portion) and 3<sup>rd</sup> supralabial. Preocular single, contacting frontal. A single anterior subocular on the right side, left with a somewhat smaller pre-subocular on the 3<sup>rd</sup> and 4<sup>th</sup> supralabial. Nine supralabials, 5<sup>th</sup> and 6<sup>th</sup> in contact with eye, 7<sup>th</sup> largest. Two postoculars and anterior and posterior temporals. Ten sublabials, first four in contact with the anterior inframaxillary, 6<sup>th</sup> largest. Anterior chin shields slightly broader and shorter than posterior pair which is separated by two small scales anteriorly and 4-5 rows of scales posteriorly. Gulars in 4 oblique rows.

Ventrals 250 (penultimate is a half-scale); anal scute divided; 144 paired sub-caudals. Dorsals with 2 apical pits, in 19-19-11 rows at the 15<sup>th</sup> ventral, midbody, and in front of the vent. First reduction involving row 7+8 (right) and 6+7 (left) at ventrals 135 and 134 (54%ven), respectively, 2<sup>nd</sup> (rows 3+4) at 142 (57%ven), 3<sup>rd</sup> (6+7) at 157-158 (63%ven); reduction to 11 dsr involving row 3+4 at ventral 212 (right, 85%ven) and 4+5 between ventrals 198-209 (left, 84%ven: irregular, including para-vertebral fluctuations). Length ca. 1270 (ca. 905 + 365) mm.

Light greyish above. Dark pigmentation at the posterior edge of the loreal, a distinct streak from the lower posterior edge of the eye to the 7<sup>th</sup> supralabial, a large dark spot on the anterior temporals; parietals obscurely marbled. Neck and anterior part of trunk transversely banded; light interspaces narrower than crossbars; their lateral portion sometimes separated and alternating with median series of bands. Lateral edges of ventrals darkened (spotted anteriorly).

Maxillary with 13 subisodont teeth followed by two enlarged postdiastemal teeth. Hemipenis spinose throughout.

*Variation.* Rostral 1.58-1.85 times broader than high. Internasals about the same length as, or slightly shorter than, prefrontals. Frontal 1.24-1.48 times longer than broad, 1.20-1.51 times longer than internasals and prefrontals, 0.78-1.0 times as long as parietals. Posterior border of parietals straight, forming an obtuse angle, or somewhat indented at the median suture. Head 2.15-2.46 times longer than broad.

Distance from the nostril to the eye equals 0.83-0.96 times the length of the internasals and prefrontals. Loreal usually longer than, or as long as, high, situated on the 2<sup>nd</sup> (posterior portion) and 3<sup>rd</sup> supralabial. Preocular single, with a nick on the anterior border in BMNH 77.6.1.7, 1965.805, and 1978.927; in contact with frontal. Usually a single anterior subocular; absent in BMNH 97.10.28.545 (Anderson, 1898); FMNH 74405 (left), MCZ 9856 (right), SMF 62785 (both sides), and TAU 8004 (left) with a presubocular. Nine supralabials (8 on right side of ZFMK 23156, 10 in BMNH 1963.993 [8<sup>th</sup> vertically divided] and on right side of NMW 25444.8), 5<sup>th</sup> and 6<sup>th</sup> (4<sup>th</sup> to 6<sup>th</sup> in BMNH 97.10.28.545) in contact with eye. Normally 2 postoculars (3 in ZFMK 23156); upper coalesced with supraocular in ZFMK 50271, lower fused with 6<sup>th</sup> supralabial in NMW 25444.8. Two anterior and 2 or 3 generally smaller posterior temporals; lower scale in first row usually distinctly larger than upper (especially so in SMF 62785 and ZFMK 23156). Upper anterior temporal vertically divided in FMNH 153044, MHNG 2555.15, and MNHN 1936.105 (left). With an additional small scale between the lower anterior temporal, the lower postocular, and the supralabials in BMNH 1963.993 (left), FMNH 74405 (right) and MZUF 659. BMNH 1963.993 has the parietals laterally distinctly constricted at the anterior level of the 2<sup>nd</sup> row of tem-

porals. An enlarged elongate scale along the lateral border of the parietals in TAU 4430, and at the posterior edge in TAU 8187.

Usually 10 (11 on right side of TAU 8187) sublabials, the four (and anterior part of 5th in BMNH 97.10.28.544, 1963.993, MCZ 9856, TAU 11488, and ZFMK 23156) anterior in contact with first inframaxillary, 6<sup>th</sup> (7<sup>th</sup>) largest. Anterior chin shields broader and shorter than posterior pair; the latter anteriorly separated by 1-2 (rarely 3) rows of scales (sometimes very small) and usually 3-5 posteriorly. Gulars in 4 (5) oblique rows between the posterior chin shields and the first ventral.

Ventrals 238-264 (♂♂ 238-258, ♀♀ 239-264); anal scute divided; 134-149 (♂♂ 136-144, ♀♀ 134-149) paired subcaudals; sum of ventrals and subcaudals 374-405 (375-402, 374-405, respectively)<sup>2)</sup>. Populations from northern Africa, Sinai, Jazirat Shakir, and NW Saudi Arabia have more ventral scales and a higher sum of ventrals and subcaudals than those from Israel, Jordan, and Palestine.

According to Boulenger (1893), the Beni Hassan specimen (BMNH 97.10.28.544: 628 + 244 mm) is a halfgrown with 262 ventrals (256 and damaged portion). This count is also found in Anderson (1898) who reported the individual to be a female.

Dorsals with paired apical pits, in 19-19-13, 19-19-11, or 19-19-11/13 rows. First reduction at ventrals 126 (Jazirat Shakir, 50%ven) and 133-151 (52-61%ven), 2<sup>nd</sup> 138-158 (56-62%ven), 3<sup>rd</sup> 160-200 (62-78%ven); occasional 4<sup>th</sup> reduction to 11 dsr 186-237 (76-96%ven). First and 2<sup>nd</sup> fusion involving rows 2-4 or 6-9 (10), 3<sup>rd</sup> 5-8, and 4<sup>th</sup> (optional) rows 2-4 or 5-7.

Longest specimens over 1410 (1010 + 400) mm in males (TAU 8187) and approx. 1380 (ca. 1000 + 380) mm in females (ZFMK 50270); snout-vent length of BMNH 1963.993 (♀) ca. 1100 mm (tail truncated). Specimens with a total length exceeding one meter are also reported, for instance, by Flower (1933). Tail/body ratio in adults 0.38-0.41 (♂♂, ♀♀).

Greyish, light brown, or olive brown above. Pileus with obscure markings (Fig. 1) and temporal region often darkened. Neck with alternating or coalesced dark transverse bars; light interspaces often mottled with fine black dots. Dorsum with a series of ventrolateral bars, transversely banded throughout, or barred and chequered. Crossbars normally distinctly narrower than, or as wide as, light interspaces; much wider in, for instance, BMNH 1965.805 (Werner, 1971: Pl. 6A). In adults, the dorsal colour pattern is usually faded on the last quarter of the body and tail. Lateral edges of ventrals darkened or with blackish spots, sometimes with an obscure pattern along their borders. "Color variations include bright salmon red individuals" according to Saleh (1997).

Maxillary usually with 15-17 teeth (18 in FMNH 74405), last two separated by a diastema from the subisodont anterior series. Hemipenis subcylindrical, apex (*in situ*)

<sup>2)</sup> Parker (1949: footnote 2) remarked "that the very high subcaudal count of 154 for a specimen from Egypt [BMNH 97.10.28.545], first reported by Anderson (1898, p. 253) and repeated by others, is a typographical error for 145." This lapsus for the Tell El-Amarna specimen was published for the first time in the species section of Boulenger (1893: 399) but the correct count (145) is given in the generic table (p. 381). Further printing errors in the pertinent literature include, for instance, the ventral count of BMNH 1958.1.3.93 (245 instead of 254) in Kramer & Schnurrenberger (1963).



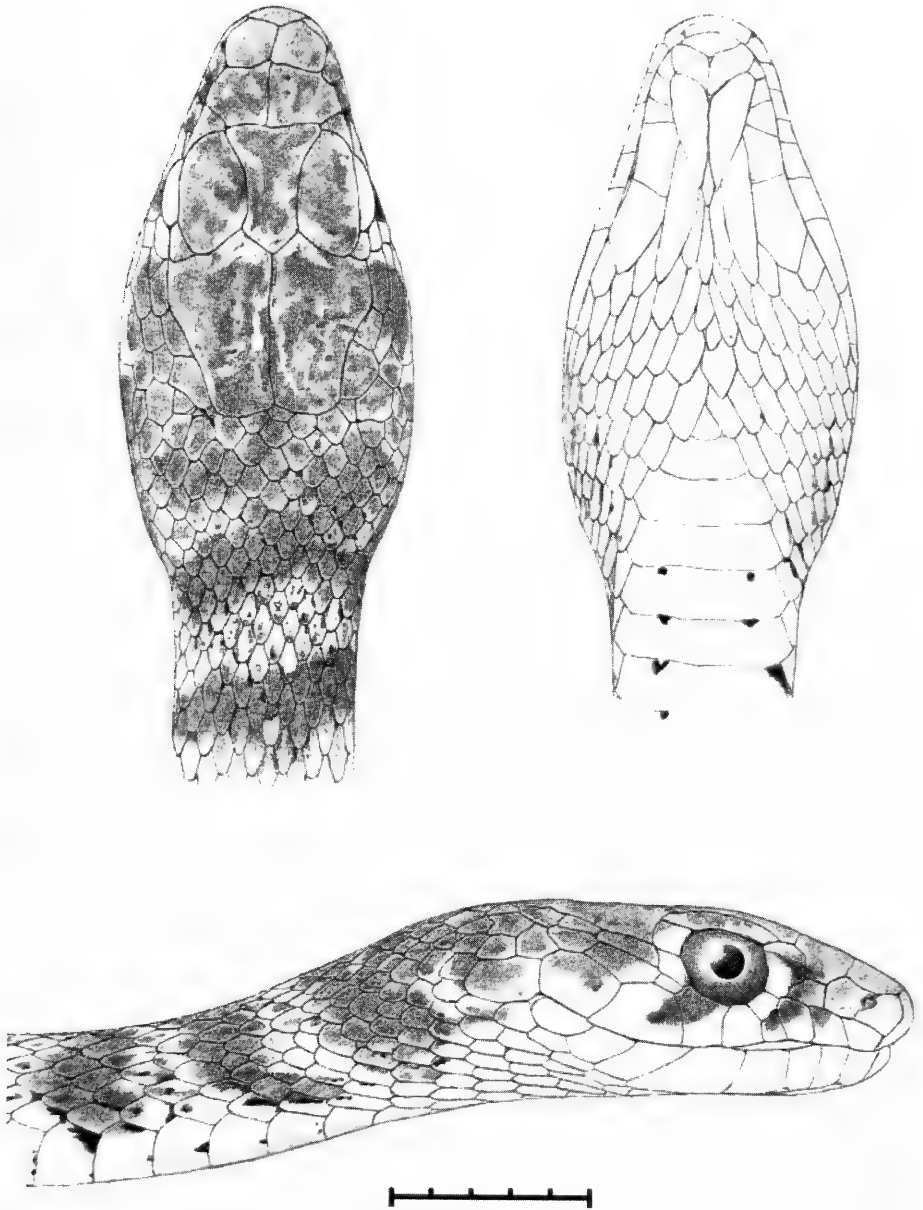


FIG. 1

*Platyceps saharicus* (BMNH 1958.1.3.93): dorsal, ventral, and lateral view of head and neck. Scale line 10 mm. Drawings by Edward Wade.

at 7<sup>th</sup> subcaudal (5%sub), distinct spines to 4<sup>th</sup> subcaudal (3%sub); *Musculus retractor penis magnus* inserting at 26<sup>th</sup> subcaudal (18%sub) (NMW 25449.9).

**Distribution and Ecology.** The Sahara racer is distributed from SE Algeria to Nubia (Sudan), SW Jordan, and NW Saudi Arabia (see Discussion). In the western part of the range, *Platyceps saharicus* appears to be locally restricted as evidenced by the scattered records from Egypt to Algeria (Fig. 2). The northernmost record is FMNH 74405 from the West Bank, Palestine ("southern Cisjordan", Werner, 1971).

The species is documented from the Ahaggar ("Hoggar", SMF 62785), Tassili, and Tibesti mountains in SE Algeria and Chad, SE Libya (Ain Murr), the Nubian region in Sudan, and Egypt (see Synonymy). In the latter country, the Sahara racer was "obtained on the margin of the desert" at Beni Hassan, east of the Nile delta, and Tell El-Amarna (Anderson, 1898) in Upper Egypt, near Nag Hammadi (ZFMK 50270), in

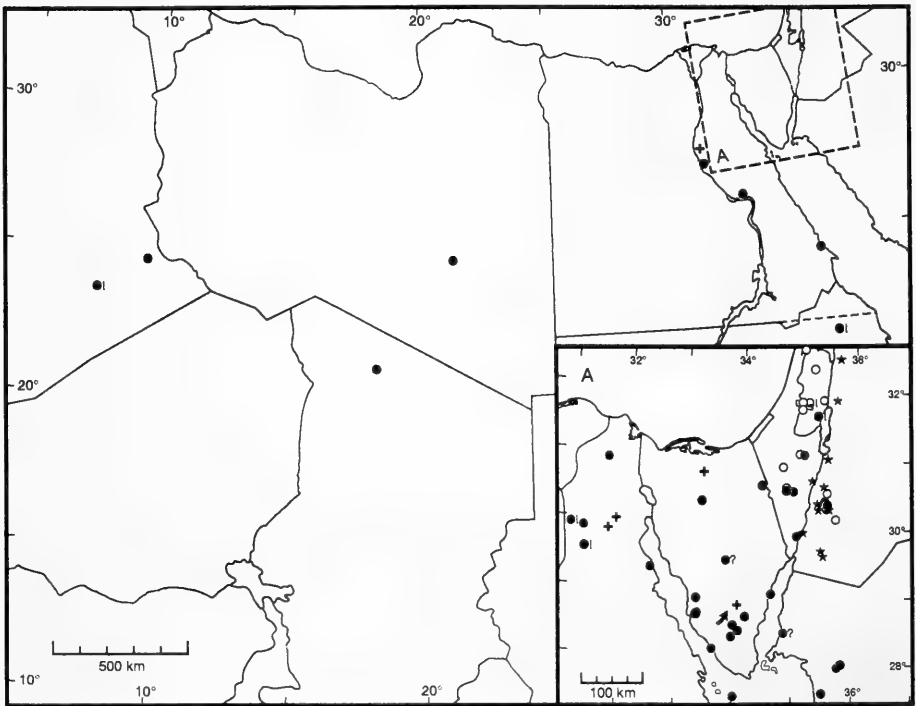


FIG. 2

Distribution of *Platyceps saharicus* (●) and *Platyceps* sp. (○) in northern Africa and northwestern Arabia based on the examined material except BMNH 64.8.23.108 ("Dead Sea") and NMW 25444.3-7 (see Discussion), and on literature records including six unspecified localities from Sinai mapped in Werner (1973) tentatively referred to *P. saharicus* (see text). The approximate type locality of *P. saharicus* is indicated by an arrow (↗). Crosses (+) mark five localities of *P. rhodorachis* auct. from Lower Egypt and Sinai mapped in Saleh (1997). Question marks denote Hart's (1891) specimen from the Tih Plateau ("Jebel Herteh", approximate position) and "JG 70658" (Gasperetti, 1988) from Jabal Tayran (28°25'N 34°50'E) provisionally assigned to *P. saharicus* (see Discussion and footnote 4). An exclamation mark indicates approximate locations, and stars (★) denote Jordan records and observations of unknown identity mentioned by Disi *et al.* (1988), Amr *et al.* (1994), and El-Oran *et al.* (1994).

the Cairo area, as well as along the Red Sea coast, i.e., in Wadi Abu Ghusun (24°27'N 35°12'E; Flower, 1933), "Qiseib" (ZFMK 50271), and on Jazirat Shakir (NMW 25444.9).

Werner (1973) mapped eight localities in Sinai including TAU 8004 (St. Catherine's Monastery area) and 8187 ("Vaset"). These records of "*Coluber r. rhodorachis*" are herewith tentatively assigned to the Sahara racer (see Discussion and Fig. 2).

Werner (1988: 372) might be wrong that "the record of *Coluber ventromaculatus* from Sinai, quoted by Gasperetti (1974) could conceivably have been based on a *C. rhodorachis* with ventrolateral black dots [...]." The citation refers to Hart's (1891) "*Zamenis ventrimaculatus*" [sic] from Wadi Zalaqah determined by Günther (1891). This specimen is probably *Platyceps rogersi* (Anderson, 1893) (Schätti, in prep.).

Flower (1933) collected a specimen "upstream perennial water in Wadi Firan [Feiran], south Sinai at or over 2000 ft." (> 650 m). According to Marx (1968), the type locality in Wadi ash-Shaykh near St. Catherine's Monastery is at ca. 1'500 m above sea level. The holotype and a paratype (FMNH 72110) were collected "among rocks on hillside", and the former had an "*Eumeces* lizard in stomach" (file entry).

*Platyceps saharicus* is sympatric with the species discussed below in the Negev, Palestine (West Bank), and southwestern Jordan (Fig. 2). In the latter country, *P. rhodorachis* auct. "has been reported only from the dry parts [...] in an altitudinal range of -410 [sic] to 1160 m" (Disi *et al.*, 2001). It cannot be excluded that both taxa occur in NW Saudi Arabia (see Discussion).

*Remarks.* Various Near East literature records cannot be assigned with certainty to either species dealt with in this paper due to the lack of individual diagnostic data, i.e., ventral and subcaudal counts or any morphological features at all <sup>3)</sup>. This is, for instance, the case with "a sand-coloured snake about 4 feet long" from the "Jebel Herteh" area in Sinai (Tih Plateau) reported by Hart (1891) and Gasperetti's (1988: Fig. 28, no. 39) record ("CAS JG 70658") from Jabal Tayran (28°25'N 34°50'E) in extreme NW Saudi Arabia (see Discussion and Fig. 2).

Based on material in the JUM collection (not examined), Disi *et al.* (1988) recorded *Platyceps rhodorachis* auct. from "Khanzerah" (Khinzirah, 32°28'N 35°42'E), Wadi Fidan (ca. 30°40'N 35°22'E), "Ghore Al-Wast" (unlocated), "Ghore Nimreen" (Ghor Nimrin, 31°54'N 35°37'E), and "Rahmeh" (Rahmah, 29°55'N 35°08'E). Ventral and subcaudal data are 230-238 and 113-154 (120-154 in their determination key), respectively. We strongly suppose that the maximum value for subcaudals is from literature (see footnote 2). The ventral counts (probably including 'pre-ventrals') suggest that these specimens, or at least the majority, are *Platyceps* sp. *incertae sedis*.

Apart from two individuals belonging to the species discussed below, El-Oran *et al.* (1994) reported MUM 14 collected at "El-Naqah (Wadi Araba)" (31°02'N 35°29'E) which is not listed in their table. MUM 83 from "El-Disah (Wadi Rum)" (Ad-Disah, 29°37'N 35°33'E, maybe the one "killed during late afternoon near a pool", Amr *et al.*, 1994) is without ventral and subcaudal counts (total length 1370 mm,

<sup>3)</sup> At the moment of this writing, we are not aware of clear-cut differences in coloration between *Platyceps saharicus* and *Platyceps* sp. This issue requires further investigation.

tail/body ratio 0.38). The identity of this material as well as observations “near Petra and El-Disah” (“seen during daytime”) remains open to question. This also applies to MCC R635 from Wadi “Ramm” (Rum, ca. 29°41'N 35°27'E) figured in Sindaco *et al.* (1995) and records quoted in Disi *et al.* (2001) including Wadi Musa (30°22'N 35°25'E) and “the lower Jordan Valley” which are probably based on Amr *et al.* (1994: JUM 372, see the following taxon) and El-Oran *et al.* (1994).

*Platyceps sp. incertae sedis*

*Zamenis ventrimaculatus* [sic] (Gray, 1834). - Günther, 1865: 489 (“Dead Sea”: BMNH 64.8.23.108); Tristram, 1884: 143 (“Found round the Dead Sea”, same specimen).

*Zamenis rhodorhachis* [sic] [partim]. - Steindachner, 1900: 334 (“Umgebung von Cairo”: NMW 25444.3-7, see Discussion).

*Coluber rhodorachis* ssp. [2]. - Werner, 1988: 367, Tb. 3 (Israel, see Discussion).

*Coluber r. rhodorhachis* [sic] [partim?]. - Disi *et al.*, 1988: [43] 45 (see Remarks under *P. saharicus*); Amr *et al.*, 1994: 45 (see Remarks).

*Coluber r. rhodorachis* [partim]. - El-Oran *et al.*, 1994: 361, 366, Fig. 1 [map], Tb. 3 (Ash-Shawbak [30°32'N 35°34'E, MUM 72], Ma'an [30°12'N 35°44'E, MUM 371]).

*Coluber rhodorachis*. - Werner, 1988: 156 (“Bab el Wad [31°49'N 35°02'E], western Judean Hills” [HUJ-R 3652]).

?*Coluber rhodorachis* [partim]. - Disi *et al.*, 2001: 265, map [unnumbered], Figs 188-189 (see *P. saharicus*).

*Platyceps rhodorachis* [complex]. - Schätti & McCarthy, 2001: 81, 88 (discussion).

*Material examined.* EGYPT: NMW 25444.3-7 (“Umgebung von Kairo”, ♀, 4 juveniles; 25444.3-6 in poor state). ISRAEL: MHNG 2443.36 (Dimona, 31°04'N 35°02'E, ♂), 2574.90 (Mizpe Ramon, 30°36'N 34°48'E, roadkill); TAU 1324 (Sde Boqer, 30°52'N 34°47'E, ♂), 7059 (“Ya'ar Haqdoshim, Judean Mts.” [pine wood], 31°45'N 35°02'E, ♀), 11230 (“Karmel” [Har Hakarmel (Ridge)], ca. 32°44'N 35°02'E, ♀). PALESTINE: MCZ 119475 (“Judean Desert”, ♂); TAU 9295 (Tubas, 32°19' 35°22'E, ♂), 13674 (Jericho, 31°52'N 35°27'E, ♂). ORIGIN UNCERTAIN: BMNH 64.8.23.108 (“Dead Sea”, ♂).

*Morphology.* Snout rounded; rostral 1.65 times broader than high (one measurement). Frontal 1.37-1.58 times longer than broad, 1.37-1.46 times longer than internasals and prefrontals, 0.90-0.94 times as long as parietals. Head 2.27-2.45 times longer than maximum distance between outer border of supraoculars. Distance from the nostril to the eye equals 0.86-0.92 times the length of the internasals and prefrontals. Preocular single. Anterior subocular usually single (with a presubocular on right side of TAU 7059). Nine supralabials, 5<sup>th</sup> and 6<sup>th</sup> in contact with eye; a posterior subocular on right side of BMNH 64.8.23.108 preventing 6<sup>th</sup> supralabial from entering orbit. Two anterior and 2 or 3 posterior temporals. Usually 10 (11 in TAU 9295) sublabials, the four anterior in contact with first inframaxillary, 6<sup>th</sup> largest. Anterior chin shields broader and usually shorter than posterior pair; the latter anteriorly separated by 2 (1) and posteriorly by 3-4 rows of scales. Gulars in 3-4 oblique rows between the posterior chin shields and the first ventral.

Ventrals 220-232 (♂♂ 221-232, ♀ 226-232, juveniles 220-226); anal scute divided; subcaudals 124-133 (♂♂ 124-130, ♀ 131-133); sum of ventrals and subcaudals 351-365 (351-362 and 357-365, respectively). El-Oran *et al.* (1994) noted lower ventral counts in two specimens from Ash-Shawbak (218) and Ma'an (205). We consider the latter figure as a printing error or based on a misidentified individual; the number of subcaudals (103) of the Ma'an specimen (MUM 371) might be due to a

mutilated tail. Steindachner (1900) reported 136 subcaudals for a specimen from “Kairo”, possibly a counting or printing error.

Dorsals in 19-19-13, 19-19-11, or 19-19-11/13 rows; 17 dsr on anterior part of trunk in MHNG 2443.36, increase to 19 at ventral 53 (23%ven). First reduction at ventrals 123.5-137.5 (54-61%ven), 2<sup>nd</sup> 135-147.5 (59-64%ven) and 161.5 in TAU 9295 (73%ven), 3<sup>rd</sup> 152-179.5 (67-79%ven) and 192 (87%ven), respectively; occasional 4<sup>th</sup> reduction to 11 dsr immediately in front of the anal scute (ventrals 218-227) in TAU 1324 and 9295 (98-99%ven). First reduction usually involving rows 7-9 (4<sup>th</sup> in TAU 7059), 2<sup>nd</sup> 3-5 (5-8 in TAU 9295, 7+8 in TAU 7059), 3<sup>rd</sup> 2-3 (TAU 9295) or 5-9, and 4<sup>th</sup> (optional) rows 2-3 or 6-7.

*Remarks.* Besides MUM 72 and 83 from “Shawbak” (Ash-Shawbak) and “Disah”, respectively, and two observations at Petra and Wadi “Dhana” (Dana, 30°37’N 35°29’E), Amr *et al.* (1994) reported JUM 372 from Wadi Musa. Most probably, the ventral and subcaudal data (218, 127) are from MUM 72. The identity of the remaining specimens remains unresolved (see El-Oran *et al.*, 1994 and Remarks under *Platyceps saharicus*).

## DISCUSSION

Werner (1988: Tb. 3) reported two “*Coluber rhodorachis* ssp.” from the Mediterranean Region of Israel and “Wadi ‘Arava”, respectively, stating that both occur in the “southern deserts”. El-Oran *et al.* (1994) noted that “*Coluber rhodorachis*” auct. “collected from Aqaba have higher ventrals [sic] count (Tb. 3) compared with those collected from Ash-Shawbak and Wadi Arava.” Werner (1998) emphasised the existence of “a similar but distinct species in the Mediterranean region of Israel” as opposed to “*Coluber rhodorachis* (Jan, 1865)” [sic], and that “G. Perry is investigating this question, aiming to find out which of the two, if any, is the true *C. rhodorachis*, and to identify or describe the remaining species.”

Geographically, *Platyceps saharicus* is separated from *P. rhodorachis* Jan, 1863 (*sensu stricto*) by a gap of roughly 1’000 kilometres (Iran, NE Iraq). A comparative sample of Jan’s cliff racer from Iran (22 specimens, see Appendix) reveals significant divergence in ventral scales vis-à-vis *P. saharicus*, i.e., 221-237 (♂♂ 221-237, ♀♀ 224-237) vs. 239-264 in the new species.

In *Platyceps rhodorachis* (s.s.), the subcaudals range from 122-142 (♂♂ 130-142, ♀♀ 122-140), and the sum of ventrals and subcaudals 349-373 (♂♂ 354-373, ♀♀ 349-373) vs. 374-405 in *P. saharicus*. Difference in total scale counts also applies to MCZ 58872 (♂) from Iran (see Appendix) with “broad and close dark crossbands” (Werner, 1971; Haas & Werner, 1969: Pl. 19) and the highest male scale count (235 ventrals, 138 subcaudals) recorded for the *rhodorachis* sample. Apart from ventral scales, *P. saharicus* is distinct from *P. rhodorachis* (s.s.) in lacking the mid-dorsally striped colour morph frequently encountered in the latter species.

The striped dorsal pattern is also absent in *Platyceps* sp. [*incertae sedis*]. This taxon resembles *P. rhodorachis* (s.s.) in its pholidosis but, as in the case of *P. saharicus*, is geographically separated from Jan’s cliff racer.

*Platyceps saharicus* clearly differs from the sympatric taxon of the *P. rhodorachis* complex in ventral and subcaudal counts (see footnote 3). The distribution of these taxa is far from clear. Particularly, the records of *Platyceps* sp. from the vicinity of Cairo ("Umgebung von Kairo", NMW 25444.3-7) reported by Steindachner (1900) require confirmation. So far, this species has not yet been recorded from Sinai (see Distribution of *P. saharicus* and Fig. 2). Based on verified records of the Sahara racer from Sinai and NW Saudi Arabia, the unlocated specimen from "Jebel Herteh" (Hart, 1891) and "CAS JG 70658" (Gasperetti, 1988) from Jabal Tayran (28°25'N 34°50'E) are tentatively referred to *Platyceps saharicus* (see Fig. 2)<sup>4</sup>). However, a southward extension of the known range of *Platyceps* sp. cannot be ruled out at present.

*Platyceps saharicus* probably extends along the coastal region of western Arabia, and it cannot be excluded that the 'high ventral' phenotype from Yemen belongs to this species (in prep.). The distribution pattern of *P. saharicus* as outlined here would show a large degree of congruence with, for instance, the lacertid *Mesalina guttulata* (Lichtenstein, 1823) and the agamid *Pseudotrapelus sinaitus* (Heyden, 1827).

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APPENDIX. Collection numbers of *Platyceps rhodorachis* (Jan, 1863) from Iran (comparative sample): BMNH 91.9.14.16 ("Western Rhughti Hills", N Shapur), 1905.10.14.46 (Ram Hormuz, NE Ahwaz); CAS 86371, 86409, and 86420 (Masjed Soleyman), 86433 (Naftak [M. Soleyman]), 86586 (Chamkureh: Khuzestan), 86624 (Masjed Soleyman); FMNH 141639 (Pol-e-Abginch); MCZ 58872 ("Mohar Biringi", unlocated); MZUT 610 ("Persia meridionale"); NMW 15168.1-4 ("Persien"); SMF 51071 (Birjand); ZFMK 31603, 31666-68, and 31670 (vic. Shiraz); ZISP 13557 ("Central Persia").



**Discovery in the Alps of Provence (France) of a new taxon in the entirely parthenogenetic superspecies *Apatania muliebris* (Trichoptera: Apataniidae)**

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**Discovery in the Alps of Provence (France) of a new taxon in the entirely parthenogenetic superspecies *Apatania muliebris* (Trichoptera).**

- Various aspects of a remarkable complex of parthenogenetic taxa are reviewed, pros and cons being examined concerning their taxonomic status. *Apatania mercantoura* sp. n. is described from alpine wetlands in three localities (2350-2440 m a. s. l.) in the Parc National du Mercantour. This is the first discovery in France of a taxon belonging to this parthenogenetic complex; the known localities are almost at the highest altitudes known for a member of the *A. muliebris* complex, and the new species is possibly the most meridional of all taxa in this complex.

**Keywords:** Trichoptera - *Apatania* - parthenogenesis - alpine wetlands - Alps of Provence.

INTRODUCTION

The description by Mc Lachlan (1866-1867, 1876) of *Apatania muliebris* brought to light the existence of a remarkable entirely parthenogenetic (thelytoke) species of caddisflies from a spring habitat – later unfortunately destroyed – in southern England (Sussex). Subsequently a series of taxa considered as belonging to *A. muliebris* were described from various parts of the British Isles, of central and of northern Europe; a list of named taxa is in Barnard & O'Connor (1987); moreover, there are several known populations, possibly distinct, having received a name but not recognizable owing to lack of illustration [an exception: a population from W. Hungary (Nógrádi, 1994)].

In some publications illustrated taxa were wrongly named; for instance, this has been several times the case with “*A. muliebris*” (examples: Mosely, 1939; Nielsen, 1950 a; probably Elliott, 1971; Barnard & O'Connor, 1987; Ivanov & Grigorenko, 1991). The published illustration most correctly representing the genitalia of *A. muliebris* from the type locality is that in Schmid (1954: fig. 70), Burkhardt & Tobias (1982: figs 1-4), or Barnard & O'Connor (1987: fig. 4).

The problem of the status to be assigned to taxa in this parthenogenetic taxa complex has been much discussed, with various results. For some authors (Solem,

1985; Barnard & O'Connor, 1987) they all represent one very variable species; in our opinion, adopting this solution does not take into account all morphological and chorological evidence, "sweeping under the carpet" an exciting problem of taxonomy and biogeography. Nielsen (1969) and Burkhardt & Tobias (1982) argue that one species with several distinct subspecies is involved. Nielsen (1969: 314) admits the difficulty of such an approach; indeed, subspecies are geographic races potentially interbreeding with other ones – something not conceivable in the case of parthenogenetic insects. Solid arguments have been offered by Nielsen (1950 a) and by Schmid (1954) for the status of good species, and in Nielsen's publication we find this excellent observation: "... the parthenogenesis is as effective an isolation as any geographic barrier". For the new taxon described in the present paper we adopt this last solution. Nevertheless, we believe that a more correct one would be to consider *A. muliebris* as a superspecies comprising a series of prospecies; by adopting such an approach, we implicitly recognize (like Schmid, 1954: 35) the probable origin of all taxa in a common parthenogenetic and psychrostenotermic ancestor, as well as the character of Late-Glacial relicts of at least some of the recent offspring populations (Nielsen, 1950 a, 1950 b, 1974). Should be added that in some cases the picture can be obscured by intrapopulation variability (Nielsen, 1950 a, 1969; Solem, 1985; Barnard & O'Connor, 1987); whereas in other cases such variability is described as very slight or practically absent (Burkhardt & Tobias, 1982; present paper).

Clearly, a thorough study of genetic structure could bring much light in this complex case. Unfortunately, this is already too late for several eradicated populations and/or destroyed habitats (Nielsen, 1974: Denmark; Burkhardt & Tobias, 1982: Schlitzter Land; Barnard & O'Connor, 1987: Sussex).

Various aspects have been discussed for this complex of parthenogenetic taxa. There is reliable published information on the – sometimes very dissimilar – life cycles and flight periods (i. a.: Klapalek, 1889; Nielsen, 1942, 1950 a, 1950 b; Elliott, 1971; Solem, 1985; Barnard & O'Connor, 1987). Interesting is the existing evidence on geographic distribution: many localities supporting large and often neighbouring populations in northern Europe; more sporadic distribution in central Europe; and extremely few isolated localities known in the southernmost parts of the general distribution area. In most cases the habitat of the parthenogenetic populations is represented by springs of all types, from lowland to alpine springs, including "wet alpine areas"; almost only in the northernmost localities are springs replaced by streams, some published evidence existing on curiously restricted distribution in some of them.

## DESCRIPTION

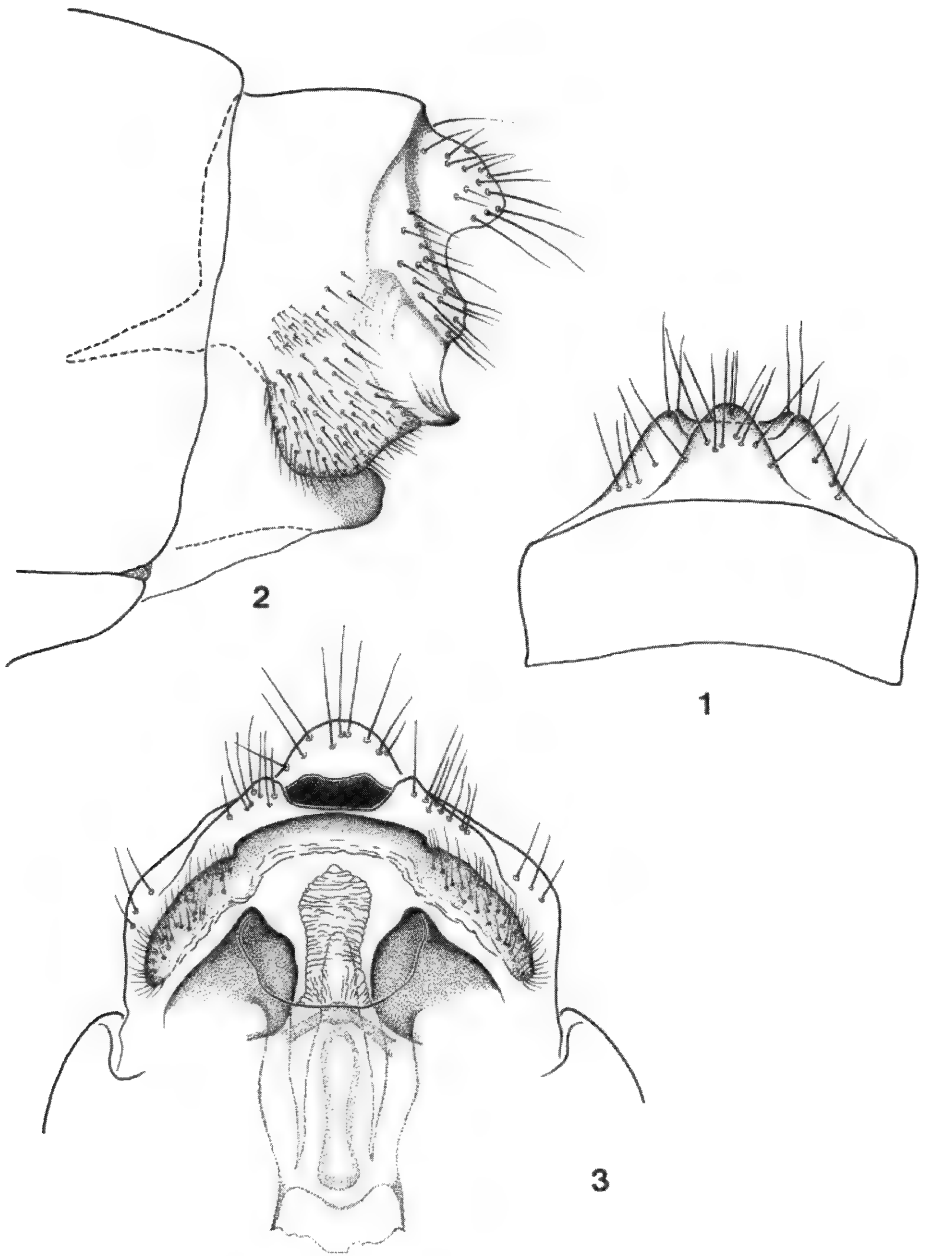
*Apatania mercantoura* sp. n.

Figs 1-6

*Material, localities, habitat*

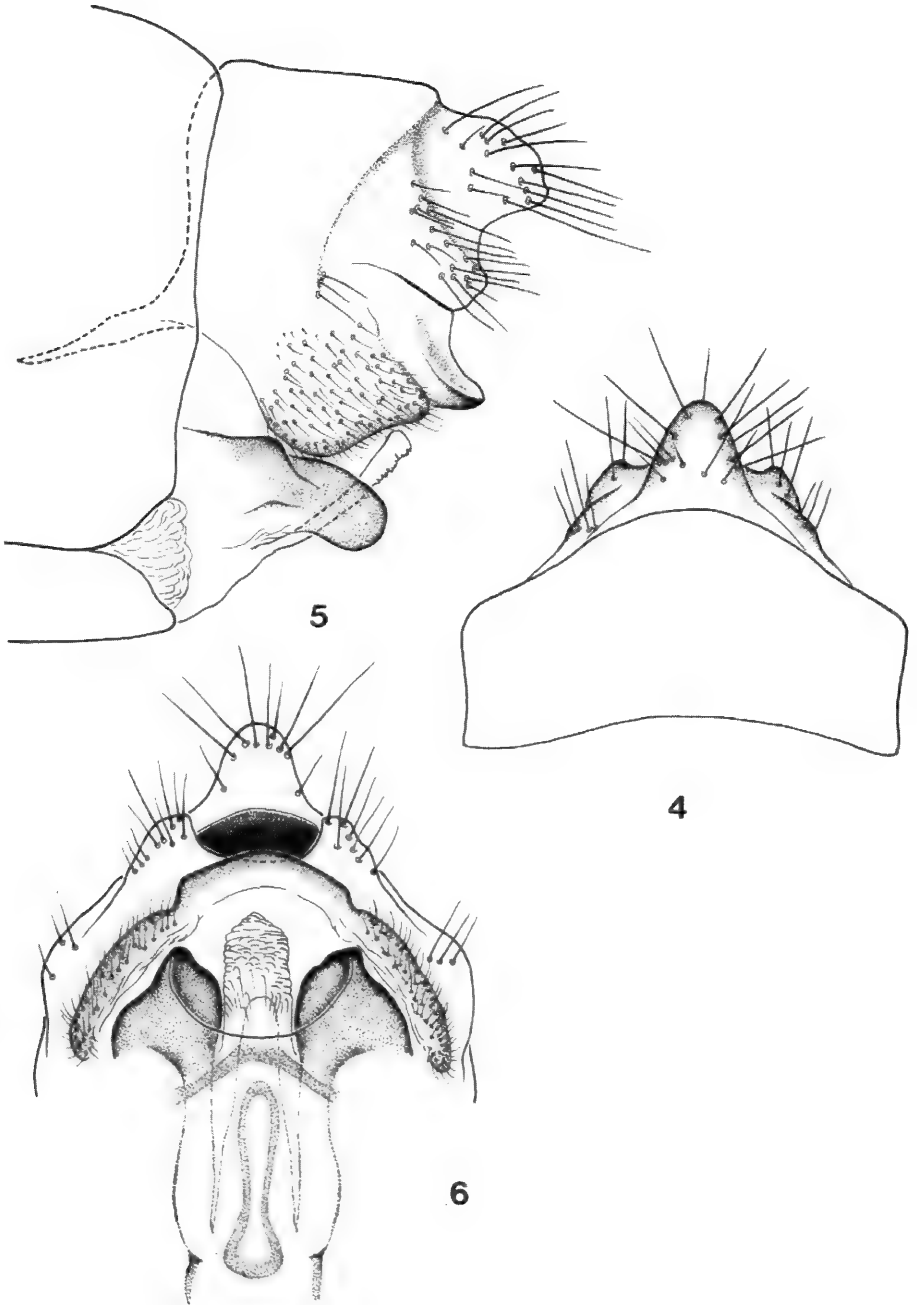
All sampling localities are in the Parc National du Mercantour (France, département Alpes Maritimes and département Alpes de Haute Provence).

1/. Alpine wetland (moorland drained by spring brooks and small streams) in the upper part of Vallon de Restefond, 2415 m a. s. l. (upper course of the Moutière, hydrographic network of the river Ubaye), département Alpes de Haute Provence:



FIGS 1-3

*Apatania mercantoura* sp. n., terminalia, specimen from Vallon de Restefond. 1: dorsal view; 2: lateral view; 3: ventral view.



FIGS 4-6

*Apatania mercantoura* sp. n., terminalia, specimen from Col de la Cayolle. 4: dorsal view; 5: lateral view; 6: ventral view.

5 adult female specimens, 23.VII.2002, coll. M. Derrien (holotype and 4 paratypes); 9 mature female pupae with well developed genitalia, 18 pupae incompletely developed, 5 larvae, 24.VI.2003, coll. M. Derrien & J. Giudicelli.

2/. Alpine wetland, Col de la Cayolle, 2350 m a. s. l. (upper course of the Bachelard, tributary of the river Ubaye), département Alpes de Haute Provence: 1 adult female specimen, 3 mature female pupae with well developed genitalia, 3 larvae, 25.VI.2003, coll. M. Derrien.

3/. Alpine wetland, above Lake Vens, 2440 m a. s. l. (upper part of the Tinée basin), département Alpes Maritimes: 1 mature female pupa with well developed genitalia, 26.VI.2003, coll. M. Derrien.

Holotype (adult female specimen from Restefond) kept in the Zoological Museum Amsterdam. All adult specimens or mature pupae with well developed genitalia mentioned above are designated as paratypes and are deposited either in the Muséum d'histoire naturelle de Genève, or in the Zoological Museum Amsterdam. All specimens are kept in alcohol.

#### *Description of the female*

Forewing length: 7.6 - 8.5 mm.

Proximal spiniform projection of segment IX long. Segment X: dorsal (single) projection massive, well protruding, distal margin slightly variable, but never very slender; in dorsal view it is triangular, devoid of a longitudinal keel, margins converging towards a very blunt apex; this dorsal projection is separated by deep sinuses from the rather well protruding, angular, median projections (bordering the anus); in their turn these median projections are separated by similarly large sinuses from the lower projection ("supragenital plate") which is in lateral view strong, not sharply pointed, reaching almost as far as the dorsal projection (in ventral view: broad, not strongly vaulted, laterally limited by small but distinct loops).

Comparison with all published evidence shows that this is a clearly distinct species; but it would be almost equally meaningless in this case to try to find more similarity with some already described taxon, than to speak of kinship; maybe there is some similarity with *A. scherfi* Burkhardt & Tobias, 1982.

#### *Differential diagnosis*

*A. mercantoura* sp. n. can be distinguished from the various taxa described in the "*A. muliebris* complex" by the following characters of the female genitalia (segment X): dorsal projection massive in lateral view, in dorsal view with very blunt apex and devoid of a longitudinal keel; deep sinuses separating (lateral view) the dorsal projection from the median one, and this last from the strong, not sharply pointed lower projection.

#### *Etymology*

From Parc National du Mercantour (type locality).

#### DISCUSSION

This is the first time that a parthenogenetic *Apatania* is discovered from France. The mention from "France, Rhone Valley" in Ivanov & Grigorenko (1991: 51) is

erroneous and part of a true imbroglio; there is no "specimen from France studied by F. Schmid in 1954": in Schmid (1954: 36) there is a mention of "... Suisse, dans la vallée du Rhône: Chateauneuf ..." (Chateauneuf is in Switzerland between Chamoson and Muveran; N 46° 13', E 7° 20'); moreover, it is clear that when introducing "*Apatania schmidiana* Ivanov et Grigorenko, nomen novum" the authors referred to fig. 70 in Schmid's publication, prepared from a specimen from Mc Lachlan's type locality of *A. muliebris*, a new name being superfluous.

*A. mercantoura* sp. n. is quite possibly the most meridional of all taxa in the *muliebris* complex. The only more meridional one could be *A. theischingerorum* Malicky, 1981, of which only one (female) specimen is known, from a locality in prov. Cuenca, Spain; but morphological evidence, and lack of evidence for parthenogenesis, render this case slightly problematic.

The localities in the Parc National du Mercantour are almost at the highest altitudes known for a member of the *A. muliebris* complex. To the best of our knowledge, only *A. helvetica* Schmid, 1954, has been sampled in some higher localities of the Swiss Alps (from 1800 to 2600 m a. s. l.; Schmid, 1954: 37).

An interesting element of the alpine fauna of southern France, inhabiting, together with other remarkable species, like *Alpopsyche ucenorum* (Mc Lachlan), a peculiar and isolated high mountain freshwater habitat, *A. mercantoura* deserves complete protection as well as a thorough study of the life cycle. The authors intend to do such a study, during which an attempt will be made for finding characters enabling to distinguish the last instar larva of the new species from the small number of already published descriptions of "*A. muliebris*" (*sic* !) larvae.

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**A new genus and species of small characid (Ostariophysi, Characidae) from the upper río Bermejo basin, northwestern Argentina**

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**A new genus and species of small characid (Ostariophysi, Characidae) from the upper río Bermejo basin, northwestern Argentina.** - A new genus and species of small characid is described in this paper. The new genus, *Nans* gen. n., is diagnosed by the combination of: ii,7-8 dorsal-fin rays, 10-15 branched anal-fin rays, 5 teeth in the inner premaxillary row, rotation of the pelvic bone about 90°, rotation of the pelvic fin muscles, pelvic fin curved and forming a complete tube in mature males, incomplete foramen for exit of the olfactory nerve in the lateral ethmoid. Other characters which help in the identification of *Nans* are the large subcircular foramen in the dorsal vomerine lamella which articulates with the mesethmoid, the absence of an extrascapular sensory canal in the posttemporal, and a laterosensory canal in the anguloarticular. The type species, *Nans indefessus* sp. n. was collected in the río Anta Muerta and arroyo Colorado, tributaries of the río Blanco, and in the río Pescado, upper río Bermejo basin, Salta, Argentina.

**Keywords:** Characiformes - Characidae - *Nans* - new genus - río Bermejo basin.

INTRODUCTION

The río Bermejo originates in northwestern Argentina and southern Bolivia, forming the political limit between both countries; it flows into the río Paraguay after 1,450 km. The fishes of the upper río Bermejo basin were almost unknown until few years ago. Fowler (1940) published a list about the ichthyofauna of the río Lipeo, including 14 species, four of them new for science. More recently, Fernández (1999) cited 23 fish species found in the National Park Tariquía, southern Bolivia.

In a recent exploration of some rivers and streams of the upper río Bermejo basin, the first and second authors collected 31 species of fishes (Mirande & Aguilera,

in prep.), including specimens of an unknown species. The possession of several distinctive characters excludes this species from other nominal genera of characids. We describe it as a new genus and a new species.

## MATERIAL AND METHODS

Measurements are straight distances taken with caliper to the nearest 0.1 mm. Measurements are expressed as percentages of SL or the indicated length. Peduncle length was measured from the insertion of the posteriormost anal-fin ray to the hypural joint. Some specimens examined in this study were cleared and counterstained (C&S) following Taylor & Van Dyke (1985). Vertebrae counts include the four vertebrae of the Weberian apparatus and the caudal CP1+U1 as one element. Material is deposited in the following collections: Asociación Ictiológica, La Plata (AI); Facultad de Ciencias Naturales y Museo, La Plata (MLP); Facultad de Ciencias, Sección Genética, Montevideo (MVD-SG); Fundación Miguel Lillo, Tucumán (CI-FML); Museo de Ciencias Naturales de Salta (MCNi), and Museum d'histoire naturelle de Genève, Switzerland (MHNG).

*Comparative material* (SL in mm). *Acrobrycon tarijae*: CI-FML 3270, 1 ex., 66.6 mm, Argentina, Salta, Orán, La Bambú, río Bermejo basin, río Blanco. *Aphyocharax paraguayensis*: AI 142, 2 ex. C&S, 18.6-23.3 mm, Argentina, Formosa, flood plain of río Bermejo, in Reserva Ecológica El Bagual. *Astyanax eigenmanniorum*: ANSP 21627, paratypes, 2 ex., 42.5-49.4 mm, Brazil, Rio Grande do Sul. *Astyanax latens*: AI 112, 2 ex. C&S, 41.0-45.0 mm, Argentina, Salta, Orán, arroyo El Oculito. *Astyanax lineatus*: CI-FML 3272, 3 ex., 35.3-72.1 mm, Argentina, Salta, Orán, La Bambú, río Bermejo basin, río Blanco. *Astyanax tupi*: AI 128, 4 ex., 60.8-70.0 mm, Argentina, Misiones, Paraná basin, arroyo Cuñapirú Chico. *Bryconamericus agna*: FML 3700, holotype, 61.5 mm, Argentina, Misiones, arroyo Tabay, Paraná basin; AI 141, 1 ex. C&S, 60.0 mm, Argentina, Misiones, Paraná basin, arroyo Tabay. *Bryconamericus iheringii*: AI 116, 3 ex. C&S, 39.9-44.3 mm, Brazil, Rio Grande do Sul, São Lourenço do Sul, arroios Pinto e Viúva Teresa. *Bryconamericus thomasi*: CI-FML 1969, 94 ex. (2 males, 3 females measured), 40.3-55.4 mm, Argentina, Salta, río Piedras. *Bryconamericus exodon*: MLP 18-IX-80-1, 2 ex., 39.0-43.5 mm, Argentina, Buenos Aires, río de la Plata in Punta Lara. *Characidium* sp.: AI 153, 1 ex. C&S, 29.6 mm, Argentina, Misiones, arroyo Zaimán near its mouth. *Cheirodon interruptus*: CI-FML 3825, 2 ex. C&S, 32.9-33.4 mm, Argentina, Santiago del Estero, Embalse río Hondo; AI 160, 1 ex. C&S, 34.0 mm, Argentina, Buenos Aires, Mar Chiquita coastal lagoon. *Ctenobrycon alleni*: MLP 6774, 5 ex., 50.0-64.2 mm, Argentina, Santa Fe, laguna Setúbal. *Cyanocharax alburnus*: MVD-SG 59, 1 ex. C&S, 42.5 mm, Uruguay, río Yaguarón in Paso Centurión. *Diapoma speculiferum*: AI 151, 1 ex. C&S, 42.6 mm, Brazil, Rio Grande do Sul, Barra de Ribeiro, Açude dos Garcia. *Gymnocharacinus bergi*: AI 143, 1 ex. C&S, 52.4 mm, Argentina, río Negro, arroyo Valcheta. *Gymnocorymbus ternetzi*: CI-FML 3826, 2 ex. C&S, 33.7-35.6 mm, Paraguay, Alto Paraguay, Fortín Patria, río Negro. *Hemigrammus ulreyi*: AI 161, 1 ex. C&S, 34.2 mm, Argentina, Misiones, Nemesio Parma, río Paraná. *Hemigrammus erythrozonus*: CI-FML 3827, 2 ex. C&S, 25.5-26.9 mm, aquarium specimen. *Hypessobrycon boulengeri*: MVD-SG 122, 1 ex. C&S, 38.1 mm, Uruguay, Rocha, río Yaguarón. *Hypessobrycon meridionalis*: AI 145, 2 ex. C&S, 26.5-32.0 mm, Argentina, Buenos Aires, Berazategui, lago del Parque Pereyra Iraola. *Hypobrycon maromba*: AI 140, 3 ex., 45.5-47.5 mm, Brazil, Santa Catarina, Concordia, río Jacutinga. *Hypobrycon poi*: MLP 9573, holotype, 50.5 mm, Argentina, Misiones, arroyo Once Vueltas. 1 ex. C&S, 45.5 mm, Argentina, Misiones, arroyo Once Vueltas. *Markiana nigripinnis*: AI 144, 1 ex. C&S, 71.0 mm, Argentina, Formosa, flood plain of río Bermejo, in Reserva Ecológica El Bagual. *Mimagoniates inequalis*: MVD-SG 119, 1 ex., 30.0 mm, Uruguay, Departamento Rocha, environments close to Laguna Castillos. *Moenkhausia* cf. *intermedia*: CI-FML 3257, 60 ex. (5 measured), 20.1-31.5 mm, Argentina, Salta, Orán, La Bambú, río Bermejo basin, arroyo El Oculito. *Moenkhausia sanctaefilomenae*: AI 158, 1 ex. C&S, 31.7 mm, Argentina, Misiones, río Paraná near Posadas. *Odontostilbe microcephala*: CI-FML 3369, 2 ex.,

48.2-51.6 mm, Argentina, Salta, La Bambú, río Bermejo basin, río Blanco. *Odontostilbe pequirá*: CI-FML 3451, 1 ex., 31.5 mm, Argentina, Salta, Rivadavia, río Bermejo basin, Pozo de los Yacarés. *Oligosarcus bolivianus*: CI-FML 3277, 4 ex., 89.8-113.8 mm, Argentina, Salta, Orán, La Bambú, río Bermejo basin, río Blanco. *Poptella paraguayensis*: AI 148, 1 ex., 50 mm, Argentina, Misiones, río Piray-Miní, in Eldorado. *Prionobrama paraguayensis*: AI 149, 1 ex. C&S, 35.5 mm, Argentina, Chaco, flood plain of río Tragadero. *Psellogrammus kennedyi*: AI 150, 2 ex. C&S, 37.4-39.0 mm, Argentina, Formosa, Formosa, flood plain of río Bermejo, in Reserva Ecológica El Bagual. *Roeboides paranensis*: AI 155, 1 ex. C&S, 39.2 mm, Argentina, Corrientes, río Riachuelo. *Serrapinus microdon*: AI 152, 2 ex. C&S, 25.5-29.0 mm, Argentina, Formosa, flood plain of río Bermejo, in Reserva Ecológica El Bagual. *Serrasalmus maculatus*: CI-FML 3827, 1 ex. C&S, 69.2 mm, Argentina, Salta, La Unión, Pozo de los Yacarés, río Bermejo. *Tetragonopterus argenteus*: AI 156, 2 ex. C&S, 55.5-60.0 mm, Argentina, Corrientes, flood plain of río Riachuelo. *Triportheus paranensis*: AI 154, 1 ex. C&S, 129 mm, Argentina, Buenos Aires, río de la Plata, in Atalaya.

## RESULTS

### *Nans* gen. n.

*Type species. Nans indefessus* sp. n.

*Diagnosis.* *Nans* is a new genus of small characiforms placed within the family Characidae in light of the absence of characters indicating relationships with other families of the order. *Nans* is identified by several probably apomorphic characters: 1- the dorsal fin with ii,7-8 rays, 2- the rotation of the pelvic bone about 90°; 3- rotation of the pelvic fin muscles; 4- the pelvic fins curved, forming a tubular structure in mature males; 5- the incomplete foramen for exit of olfactory nerve in the lateral ethmoid; 6- the posttemporal without an extrascapular sensory canal; and 7- the absence of latero sensory canal segment in the anguloarticular.

The following characters, which are present in other species of characids, also help in the identification of *Nans*, the anal fin with 10-15 branched rays; the reduction of size of infraorbitals 2 and 3; the variable infraorbital number, ranging from 4 to 9; the loss of supraorbital; the short, blunt sphenotic spine; the two rows of ossified gill rakers on the anteroexternal and posteromedial margins of the first to fourth gill arches; the small anterior fenestra between the cleithrum and coracoid in adults; the high number of supraneurals (7-8); the similar number of precaudal and caudal vertebrae; and the naked isthmus.

*Etymology.* *Nans* is a latin word that means swimmer in allusion to the habit of the new genus specimens of living in torrents. Gender masculine.

### *Nans indefessus* sp. n.

Figs 1-6, Table 1

*Holotype.* CI-FML 4000, male, 49.4 mm SL, Argentina, Salta, Orán, río Bermejo basin, río Pescado at Estancia Anta Muerta (22°54.3' S - 64°28.2' W); coll. Mirande, Aguilera & Padilla, August 5, 2003.

*Paratypes.* AI 107, 1 ex. C&S, 42.8 mm SL; AI 138, 1 ex., 41.6 mm SL, Argentina, Salta, Orán, río Anta Muerta tributary of río Blanco; coll. Mirande, Aguilera & Ferro, May 2002. AI 157, 3 ex., 39.7-51.7 mm SL, Argentina, Salta, Orán, arroyo Colorado, tributary of río Blanco; coll. Mirande, Aguilera & Ferro, May 2002. CI-FML 4001, 4 ex., 32.0-41.1 mm SL; MNHNG 2643.87, 6 ex., 31.5-40.9 mm SL; MCNi 911, 2 ex., 30.1-33.2 mm SL, collected with the holotype. CI-FML 4002, 1 ex., 28.4 mm SL, Argentina, Salta, Orán, El Oculto, río Blanco; coll. Mirande, Aguilera & Quoirin, October 2001. CI-FML 4003, 3 ex., 41.6-44.5 mm SL, río Anta Muerta, tributary of río Blanco; coll. Mirande, Aguilera & Ferro, May 2002.

*Diagnosis.* As for the genus.

*Description.* Morphometrics of holotype and 18 paratypes are presented in table 1. Body subcircular in cross section, more laterally compressed posteriorly; maximum body depth just anterior to dorsal-fin insertion. Dorsal profile of body straight or scarcely convex between snout and dorsal-fin origin; straight posterior of base of that fin. Dorsal and ventral profiles of caudal peduncle straight or ventral scarcely concave. Ventral profile from lower jaw to pelvic-fin origin convex, almost straight or slightly convex between pelvic and anal-fin insertions, slightly convex above anal-fin base in females and juveniles, markedly so in males; abruptly slanted dorsally, especially in males.

TABLE 1. *Nans indefessus* gen. n., sp. n. Morphometrics of male holotype and 18 paratypes. Minimum, maximum, and mean  $\pm$  standard deviation in brackets. SL is measured in mm.

SL	Holotype 49.4	Females (n=9) 28.4-51.7	Males (n=10) 31.5-49.4
<b>% of standard length</b>			
Predorsal distance	51.4	52.0-57.7 (53.9 $\pm$ 1.9)	51.0-53.2 (52.0 $\pm$ 0.9)
Preanal distance	63.6	63.4-71.2 (66.1 $\pm$ 2.6)	62.1-67.4 (64.4 $\pm$ 1.7)
Prepectoral distance	19.2	16.0-20.5 (18.4 $\pm$ 1.6)	16.9-20.5 (18.4 $\pm$ 1.1)
Body depth	31.7	27.5-32.1 (29.5 $\pm$ 1.6)	28.7-33.3 (30.6 $\pm$ 1.4)
Dorsal-fin base	13.2	11.1-12.9 (11.8 $\pm$ 0.6)	11.8-13.3 (12.6 $\pm$ 0.6)
Anal-fin base	18.2	14.1-19.8 (16.8 $\pm$ 1.6)	15.7-19.5 (17.5 $\pm$ 1.2)
Pectoral-fin length	23.3	21.4-23.4 (22.4 $\pm$ 0.7)	22.6-25.5 (24.2 $\pm$ 0.9)
Pelvic-fin length	16.3	14.4-15.6 (15.0 $\pm$ 0.5)	15.0-18.0 (16.6 $\pm$ 0.8)
Pectoral-pelvic fin origins	26.0	25.6-30.6 (27.6 $\pm$ 1.7)	23.4-27.5 (26.1 $\pm$ 1.2)
Pelvic-anal fin origins	19.2	16.0-20.5 (18.4 $\pm$ 1.6)	16.9-20.5 (18.4 $\pm$ 1.1)
Head length	26.8	24.7-28.7 (27.1 $\pm$ 1.4)	25.8-30.4 (27.5 $\pm$ 1.4)
Peduncle depth	13.8	12.3-14.6 (13.3 $\pm$ 0.7)	12.6-14.4 (13.5 $\pm$ 0.6)
Peduncle length	24.6	20.5-22.8 (21.4 $\pm$ 0.9)	20.6-24.6 (22.4 $\pm$ 1.4)
<b>% of head length</b>			
Snout length	23.2	19.3-25.1 (22.6 $\pm$ 2.1)	19.7-23.5 (21.8 $\pm$ 1.4)
Orbital diameter	27.8	28.5-34.4 (30.4 $\pm$ 2.2)	25.5-33.6 (29.7 $\pm$ 2.7)
Interorbital width	29.3	27.0-30.4 (28.9 $\pm$ 1.2)	26.6-30.6 (28.3 $\pm$ 1.1)
Maxillary length	24.4	20.6-25.4 (22.7 $\pm$ 1.5)	18.9-26.7 (22.9 $\pm$ 2.5)
Premaxillary+max. length	36.5	36.9-39.6 (38.0 $\pm$ 0.9)	32.4-40.9 (38.3 $\pm$ 2.6)
Postorbital length	50.7	46.9-58.4 (50.5 $\pm$ 3.9)	44.7-52.7 (49.0 $\pm$ 2.6)

Dorsal-fin origin situated almost equidistant from snout and caudal-fin base. Small adipose fin located posterior to vertical through base of posterior most anal-fin ray. Pelvic-fin insertion lightly anterior to vertical through dorsal-fin insertion. Anal-fin origin located at a vertical through base of posteriormost dorsal fin. Pectoral and pelvic fins short, not reaching vertical through pelvic fin insertion or anal-fin origin respectively.

Dorsal fin with ii,7-8 rays (7 in 2 ex. including holotype, 8 in 16 ex.); posterior margin rounded, bearing first two or three branched rays longest. Anal fin with iii-iv,10-15 rays (10 in 1 ex., 11 in 4 ex. including holotype, 12 in 7 ex., 5 in 5 ex., 14 in 1 ex., 15 in 1 ex.). First branched anal-fin rays longest, their length equal to or scarcely longer than base of anal fin. Distal margin of anal fin straight more so in males, and very slightly concave in females. Hooks on anal fin absent.



FIG. 1

*Nans indefessus* gen. n. and sp. n., holotype, 49.4 mm SL, male.

Caudal fin emarginate, with lower lobe slightly broader and longer than upper lobe. Caudal-fin rays numbers variable (10+6 branched and 1 unbranched rays in lower lobe in 1 ex., 10+7 branched and 1 unbranched rays in lower lobe in 1 ex., 9+7 branched and 1 unbranched rays in lower lobe in 1 ex., 10+8 branched and 1 unbranched rays in lower lobe in 16 ex. including holotype).

Pectoral fin with i,10-13 rays (10 in 5 ex., 11 in 10 ex. including holotype, 12 in 3 ex., 13 in 1 ex.). Distal margin of fin rounded. Pelvic fin with pelvic splint and i,7-8 rays (7 in 17 ex. including holotype, 8 in 2 ex.). Males with strong hooks on all branched pelvic-fin rays, even in smallest specimens (Figs 2, 3). Hooks directed anteriorly, one per segment even in unbranched portion of rays, and distributed along all ray branches.

Dorsal profile of snout strongly convex from snout tip to vertical through anterior margin of eye. Head profile slightly convex or straight from that point to top of supraoccipital spine. Mouth terminal, situated just under middle of eye. Eye notably larger than snout. Infraorbitals reduced in size, with ventral margins distant from preopercular sensory canal, leaving a wide area of underlying musculature covered only by skin.

Premaxilla with acute ascending process and short alveolar ramus. Premaxilla bearing two series of teeth; external row with teeth shorter than those of posterior row. Outer tooth series with 2 (1 ex.), 3 (13 ex. including holotype), or 4 (5 ex.) teeth; teeth anteroposteriorly compressed only distally. Inner premaxillary tooth series with 5 conical teeth, compressed only distally, bearing three cusps. Fifth tooth smaller, and slightly posterior to proximate tooth. Maxilla with slender dorsal process and long, relatively narrow, laminar process. Maxilla with 4 (10 ex.), 5 (8 ex.), or 6 (1 ex.) tricuspid, slender, and distally compressed teeth. Dentary bearing 8-10 slightly conical teeth, compressed only distally, with one to three cusps; first four teeth larger, with following teeth smaller.

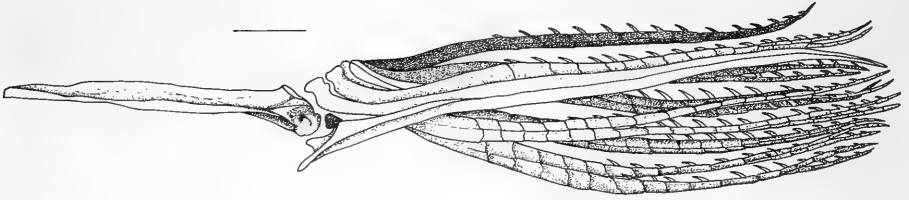


FIG. 2

*Nans indefessus* gen. n. and sp. n., ventral view of right pelvic girdle. Scale bar= 1 mm.

Scales cycloid, with anterior margin rounded, and circuli absent in posterior field. No radii anteriorly directed. Perforated scales on lateral line 36 (3 ex.), 37 (8 ex.), 38 (4 ex.), 39 (2 ex. including holotype), 40 (2 ex.). Five (14 ex.) or 6 (5 ex.) scales between lateral line and dorsal-fin origin and 4.5 scales between lateral line and pelvic-fin origin. Fourteen or 15 scales between supraoccipital tip and dorsal-fin origin. Thirteen or 14 scales around caudal peduncle. Most specimens with two rows composed of 4-6 scales on anal-fin base, few specimens with 5-6 scales in one row; scales always covering first 6 anal-fin rays. Few scales on caudal-fin base. Isthmus naked.

Four cleared and stained specimens with 13 ribs, 35-36 total vertebrae; 7-8 supraneurals; 10-11 dorsal procurrent rays and 9-10 ventral procurrent rays in caudal fin. Two rows of ossified gill rakers on 1<sup>st</sup> to 4<sup>th</sup> branchial arches. First arch with 1-2 gill rakers on hypobranchial, 5-6 on ceratobranchial, 1 on cartilage, 2-4 on epibranchial along anterolateral margin; and 3-4 rakers on ceratobranchial, 1 on cartilage, 3-4 on epibranchial along posteromedial margin.

*Color in life.* Background silvery, with dorsal portion of flanks darker. Metallic gold lateral band visible, although faint. Notable black humeral spot, vertically expanded, narrow. Dorsal, anal, and caudal fins light pink to intense red. Anterior most dorsal and anal-fin rays white.

*Color in alcohol.* Background yellowish. Upper part of flanks with chromatophores forming light, reticulate pattern. Uniformly wide lateral band light grey, beginning close to humeral spot and ending on middle of caudal peduncle. Grey humeral spot vertically-expanded, extending from horizontal through dorsal margin of orbital, to horizontal through ventral margin of preopercle. Humeral spot very narrow in many specimens.

Dorsal fin with numerous chromatophores on membranes, forming a diffuse spot, occupying basal two thirds of fin. Anal fin with scattered chromatophores on membranes. Adipose, caudal, pectoral and pelvic fins hyaline.

Dark narrow line on dorsal portion of body between supraoccipital and caudal peduncle. Dorsal portion of head grey. Few chromatophores present on premaxilla, maxilla, and around infraorbitals. Chromatophores concentrated and forming two black spots on dorsal and ventral regions of eye. Some specimens with chromatophores concentrated on upper preopercular process and on preopercular articular area.

*Sexual dimorphism.* The rotation of the pelvic bone is present also in females, although the curvature of the pelvic fin is more pronounced in males. In mature males



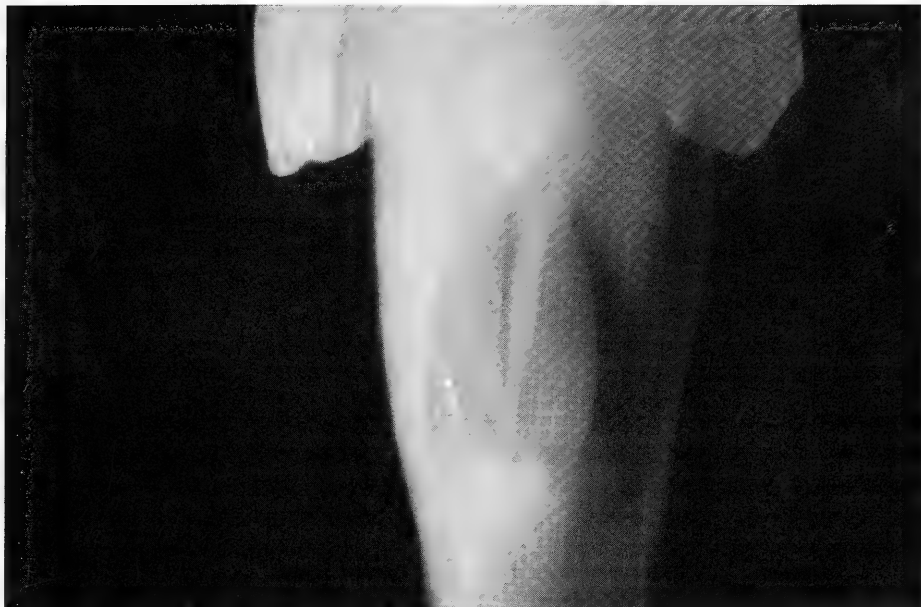


FIG. 3

*Nans indefessus* gen. n. and sp. n., detail of pelvic fin of one paratype, CI-FML 4003, 44.5 mm SL, male.

both pelvic fins form a tubular structure which is always absent in females. The females have relatively longer length between snout tip and insertion of first dorsal-fin ray, and also between origins of pectoral and pelvic fins. The males have relatively longer pectoral and pelvic fins and caudal peduncle.

*Etymology.* The specific name *indefessus* is a latin adjective that means untiring, in allusion to the high velocity of the water in which the specimens were collected.

*Distribution.* The specimens were collected in the río Anta Muerta and arroyo Colorado, tributaries of the río Blanco, and in the río Pescado; all in the upper río Bermejo basin, in the province of Salta, Argentina (Fig. 4). The specimens were collected in areas of the streams or rivers with gravel bottom, low depth, and clear, rapidly flowing water. Submerged vegetation was scarce.

## DISCUSSION

Under the traditional concept of *Astyanax* (Eigenmann, 1921, 1927), *Nans* should be included in that genus because both genera share the premaxilla with five teeth in a second series, complete lateral line, the caudal fin naked, and absence of pre-dorsal spine. Nonetheless, *Nans* has many characters that distinguishes it from *Astyanax*. The dorsal fin with two unbranched plus seven or eight branched rays is present in *Nans*, whereas *Astyanax* has the dorsal fin with two or three unbranched and nine branched rays, considered as the primitive condition of the character. *Nans* has

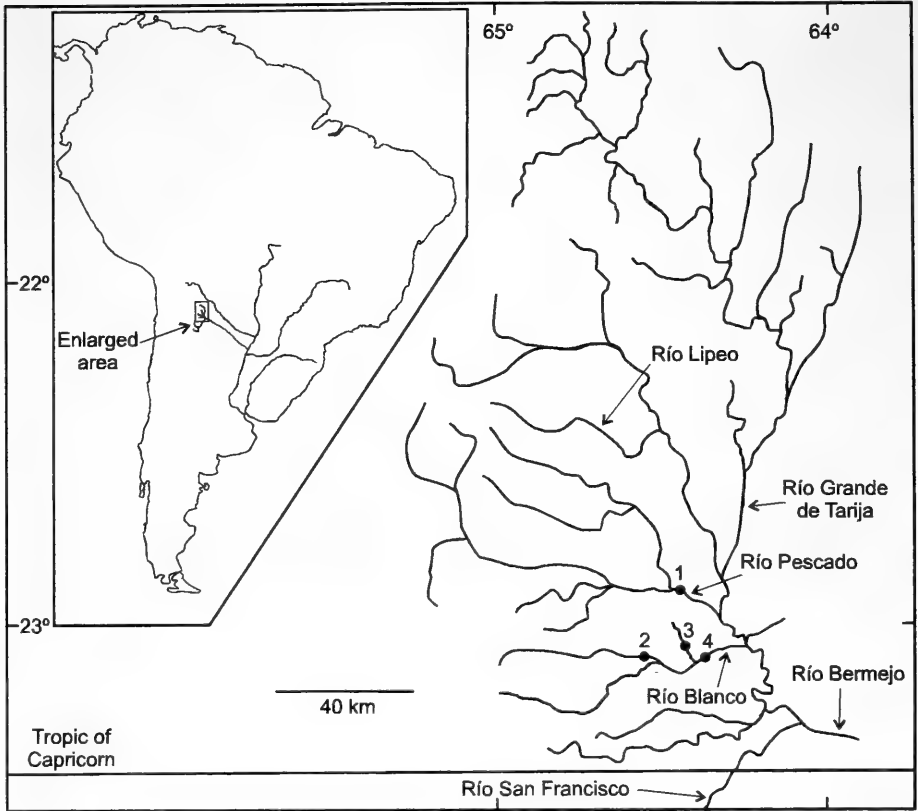


FIG. 4

Geographical known distribution of *Nans indefessus* gen. n. and sp. n. in the upper río Bermejo basin, Orán, province of Salta, Argentina. 1, type locality, río Pescado at Estancia Anta Muerta. 2, río Anta Muerta, tributary of río Blanco. 3, arroyo Colorado, tributary of río Blanco. 4, El Oculito, río Blanco.

short anal fin with 10-15 branched rays. In contrast, *Astyanax* has longer anal fin with more than 18 branched rays, excluded *A. brachypterygium*, *A. cremnobates*, and *A. jenynsii* (Bertaco & Malabarba, 2001). *Nans* has the infraorbitals 2 and 3 reduced in size, with their ventral margins distant from preopercular sensory canal; the ventral margins of the infraorbitals 2 and 3 are situated very near to preopercular sensory canal in *Astyanax*, this is the common condition among characids. Also, *Nans* has the anterior portion of body subcircular in cross section and *Astyanax* has that portion of body laterally compressed. In *Nans*, the gill rakers on first ceratobranchial are short, conical, and located in two rows whereas *Astyanax* has long, setiform gill rakers located in one row. The scales of *Nans* have rounded anterior margin (vs. straight in *Astyanax*). The isthmus is naked in *Nans* and it is covered with scales in *Astyanax*. The premaxillary and dentary teeth of *Nans* are conical although their distal tips are compressed and bear three cusps; in *Astyanax*, premaxillary and dentary teeth have broad crowns with

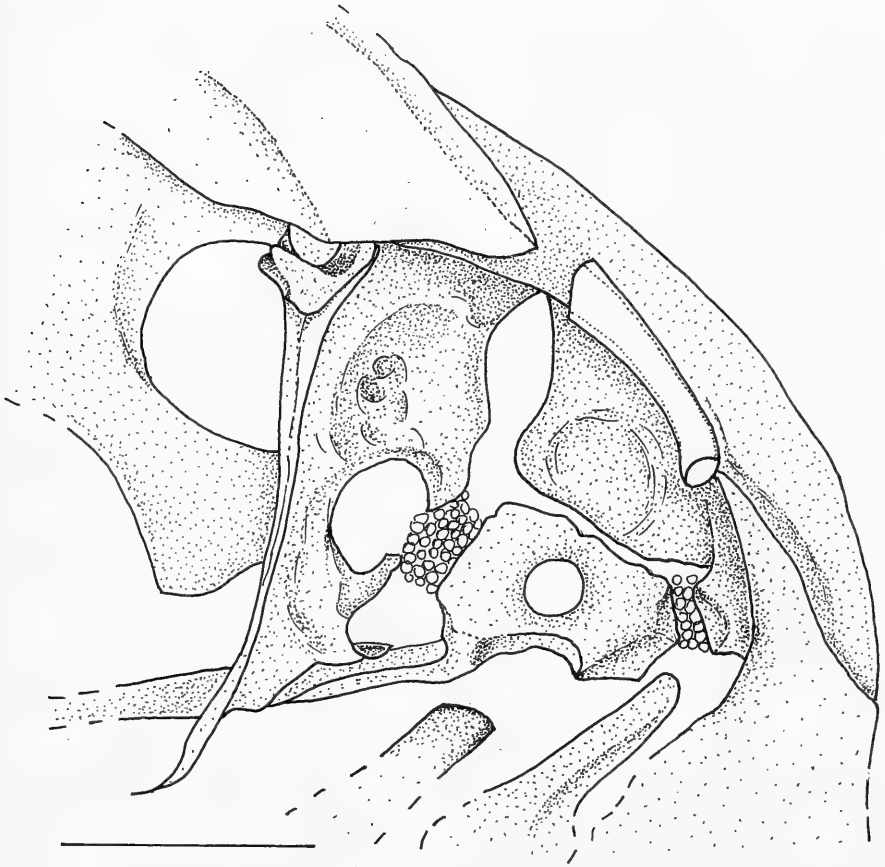


FIG. 5

*Nans indefessus* gen. n. and sp. n., right anterolateral view of snout bones. Olfactory foramen partially bounded by cartilage; a large foramen placed in dorsomedial vomerine lamella for articulation with mesethmoid. Scale bar= 1 mm.

denticulated free margin. The dorsal margin of dentary between coronoid process and symphysis abruptly tapers ventrally in *Nans*, resembling that of *Bryconamericus*, whereas the same margin is almost straight in the dentary of *Astyanax*. Many osteological characters differentiate *Nans* from *Astyanax*: blunt sphenotic spine (vs. long sphenotic spine in *Astyanax*); very short supraoccipital spine (vs. relatively long); seven or eight supraneurals (vs. four to six); large orbitosphenoid with its anteroventral margin near parasphenoid (vs. short orbitosphenoid); slender postcleithrum 3 (vs. postcleithrum 3 with laminar portion); the short nasals do not surpass the lateral wings of mesethmoid (vs. long nasals, surpassing the lateral wings of mesethmoid); the olfactory foramen is partially bounded by cartilage in *Nans* whereas it is completely bounded by bone in *Astyanax*. The latter and other characters present in *Nans* are discussed below.

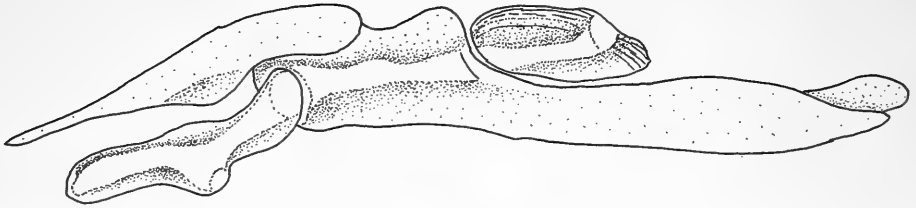


FIG. 6

*Nans indefessus* gen. n. and sp. n., left lateral view of extrascapula, posttemporal and supraclithrum. Sensory canals developed on extrascapula and supraclithrum; a sensory canal is absent on posttemporal. Scale bar = 1 mm.

The new genus lacks the synapomorphies of phylogenetically defined sub-families or genera, such as the Glandulocaudinae (Weitzman & Fink, 1985; Weitzman *et al.*, 1994; Weitzman & Ortega, 1995; Weitzman & Menezes, 1998), Cheirodontinae (Malabarba, 1998), Stethaprioninae (Reis, 1989), Serrasalminae (Machado Allison, 1983), and the genera *Moojenichthys* (Castro & Vari, 1990), *Hypobrycon* (Malabarba & Malabarba, 1994), *Jupiaba* (Zanata, 1997), *Attonitus* (Vari & Ortega, 2000), *Caiapobrycon* (Malabarba & Vari, 2000), *Creagrutus* and *Piabina* (Vari & Harold, 2001), and *Deuterodon* (Lucena & Lucena, 2002).

The following characters are pertinent to the question of the phylogenetic placement of the new genus:

1- The presence of ii,7-8 dorsal fin rays in *Nans*, separates it from most genera of characids. Recently, Malabarba & Weitzman (2003) published the description of *Cyanocharax*, including the phylogenetic diagnosis of a putative clade A which is diagnosed by the presence of ii,8 dorsal-fin rays and 4 teeth in the inner premaxillary row. The first synapomorphy is present in *Nans* which, however, always have 5 premaxillary teeth in the inner row. Furthermore, the terminal mouth of *Nans* distinguishes it from genera included in clade A, all of which have ventrally-located mouths, or modified teeth. The genus *Cyanocharax*, with terminal mouth and generalized teeth, has 6 branched pelvic-fin rays in contrast to the pelvic fin of *Nans* with 7-8 branched rays.

Modifications related to sexual dimorphism are often found in characids. Males of different genera of Glandulocaudinae (Weitzman & Fink, 1983; Weitzman & Fink, 1985; Menezes & Weitzman, 1990), Cheirodontinae (Malabarba, 1998), and many tetragonopterins have hooks variably present on the anal and pelvic fins; some tetragonopterins also have hooks on pectoral, caudal, and/or dorsal fins. Modifications of the pelvic girdle such as those present in *Jupiaba* (Zanata, 1997), are uncommon in characids. *Nans* has three possibly autapomorphic characters related to the pelvic girdle, and pelvic muscles.

2- In most characids, the pelvic bone is located in a horizontal plane. In males and females of *Nans*, the pelvic bone is positioned in a vertical plane, with the primitively external, posterolateral margin of the bone shifted ventrally (Fig. 2).

3- The pelvic fish muscles are usually located on the dorsal and ventral surfaces of the pelvic bone (Winterbottom, 1974; Zanata, 1997). As a consequence of the

rotation of the pelvic bone, the muscles in *Nans* occupy the lateral faces of the bone, with the *abductor pelvicius* located lateromedially and the *adductor pelvicius* occupying the lateral, external surface. The *adductor superficialis* is a large muscle with many fibers covering the anterior portion of the *abductors*, with muscles inserting on medial surface of the pelvic bone. The *arrector ventralis* is very well developed, being larger than that of other examined characids (e. g. *Astyanax*, *Bryconamericus*, *Markiana*).

4- In the Characidae the pelvic fins usually lie in a horizontal plane. As a consequence of the rotation of the pelvic bone in *Nans*, the external unbranched rays also shift ventrally, resulting in pelvic fins with a degree of curvature, with the inner branched ray dorsomedially positioned. The curvature of the fins is most pronounced in males and most modified in mature males in which the margin of the fins overlap to form a tubular structure (Figs 2, 3), with the primitively lateral unbranched fin ray positioned ventromedially. Different modifications occur in the pelvic fins of some species of glandulocaudins, such as *Scopaeocharax atopodus* and *Xenurobrycon macropus* (Weitzman & Fink, 1985). In males of *Bryconamericus thomasi*, *B. eigenmanni*, and *B. rubropictus*, the curvature of the anal rays is similar to that of *Nans*, but in *Bryconamericus* species the rays are curved while the bases of the rays maintain their usual position.

5- The lateral ethmoid of characids has an opening for the olfactory foramen, as described by Weitzman (1962) in *Brycon meeki*. In *Nans*, more than half of the opening for the olfactory foramen is bounded by the lateral ethmoid (Fig. 5). The medial margin of the aperture is surrounded by a cartilage which also contacts the large orbitosphenoid. That foramen is completely bordered by the lateral ethmoid in other examined species. The rhinosphenoid is absent.

Two characters that differentiate *Nans* from other characids are associated with the laterosensory canal system. 6- The supratemporal canal of the laterosensory system of characids usually exits the extrascapula, passes into the posttemporal, and enters into the supratemporal. This is the most common pattern in characids such as *Astyanax latens*, *Bryconamericus agna*, *Cheirodon interruptus*, *Gymnocorymbus ternetzi*, *Salminus maxillosus*, *Gymnocharacinus bergi*, *Tetragonopterus argenteus*, *Hyphessobrycon meridionalis*, and *Brycon orbignyanus*, and also in species of other characiform families such as *Hoplias* cf. *malabaricus*, *Oligosarcus bolivianus*, *Thoracocharax stellatus*, *Steindachnerina brevipinna*, and *Characidium* sp. (Azpelicueta, 1979). The supratemporal sensory canal is absent on the posttemporal of *Nans* (Fig. 6), an absence that also occurs in other species as homoplasy (e.g. *Hemigrammus erythrozonus* in Weitzman & Fink, 1983; per. obs.). The posttemporal of *Hemigrammus ulreyi* and *Hyphessobrycon boulengeri* have a sensory canal segment. 7- The lower jaw of characids bears a sensory canal- the mandibular canal- that passes through the dentary and anguloarticular (Weitzman, 1962). The mandibular sensory canal does not develop within the anguloarticular of *Nans*, instead the sensory system segment runs through the skin from the dentary to the anterior limit of the preopercle. A reduction in the degree of development of sensory canals often occurs in miniature characids but *Nans* reaches total lengths larger than those of the miniature characids discussed by Weitzman & Vari (1988).

Weitzman & Malabarba (1998) pointed out that characid species with modifications related to sexual dimorphism are an excellent source of phylogenetic infor-

mation. This may be the case of *Nans*, although insemination has not been studied in the genus. The relationships of *Nans* with other genera are unknown as are the relationships of many species and genera of Characidae.

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We thank Axel Bachman (Universidad de Buenos Aires, Argentina) for his help with nomenclatural troubles; Luiz Malabarba (Museu de Ciências e Tecnologia, PUCRS, Porto Alegre, Brasil) and Graciela García for exchange or loan of material; one anonymous reviewer who greatly improved the English style and added valuable suggestions; CONICET, Fundación Miguel Lillo and Fundación Proyungas for financial support; Ignacio Ferro, Matías Quoirín, Sebastián Barrionuevo, Guillermo Suárez, and Rogelio Yáñez for help in the collecting expeditions, and the Secretaría de Medio Ambiente y Recursos Renovables de la Provincia de Salta for collecting permits.

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## New species of *Amyntas* Kinberg, 1867 from the Philippines (Oligochaeta: Megascolecidae)

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**New species of *Amyntas* Kinberg, 1867 from the Philippines (Oligochaeta: Megascolecidae).** - Six new *Amyntas* are described from the Philippines: *Amyntas isarogensis* sp. n., *Amyntas malinaoensis* sp. n., *Amyntas philippinensis* sp. n., *Amyntas mindoroensis* sp. n., *Amyntas halconensis* sp. n. and *Amyntas bacoensis* sp. n. *Amyntas isarogensis* sp. n. and *Amyntas malinaoensis* sp. n. have a proandric male sexual system and small penes within enlarged prostatic ducts. *Amyntas philippinensis* sp. n. has spermathecal pores in 4/5, *Amyntas mindoroensis* sp. n. has spermathecal pores in 4/5, 5/6, *Amyntas halconensis* sp. n. has spermathecal pores in 4/5, 5/6, and 6/7, and *Amyntas bacoensis* sp. n. has spermathecal pores in 4/5, 5/6, 6/7, and 7/8. These last four species also have small hoods over the male pores. *Amyntas halconensis* sp. n. and *Amyntas bacoensis* sp. n. were only collected in soils, while the other 4 species were collected in both soils and arboreal habitats. All 6 new species lack genital markings in the spermathecal segments. Descriptions of the new species are provided, including illustrations of the ventral view, male pore region, and spermathecae.

**Keywords:** Earthworms - *Amyntas* - Megascolecidae - Oligochaeta - Philippines - taxonomy.

### INTRODUCTION

Philippines earthworms have never been collected in an organized manner. All 19<sup>th</sup> and 20<sup>th</sup> century accounts of Philippine earthworms were based on haphazardly collected specimens that eventually came to the attention of specialists (James, 2004). Beddard (1912) recorded 4 species of *Amyntas* out of 9 *Pheretima*-complex group species from Luzon Island. Recently Joshi *et al.* (2000), recorded *Amyntas corticis* (Kinberg, 1867) from Ifugao Rice Terraces. The previously known Philippine *Amyntas* belong to 6 species: *A. albobrunneus* (Beddard, 1912), *A. americanorum* (Beddard, 1912), *A. orientalis* (Beddard, 1912), *A. robustus* (Vaillant, 1889), *A. sodalis*

(Beddard, 1912) and *A. corticis* (Kinberg, 1867). However, Beddard's (1912) four species descriptions lack information on the caecum location, so their placement in *Amyntas* must be considered provisional. Types of these species are not locatable (Reynolds & Cook, 1976). The northern part of Luzon apparently lacks indigenous *Amyntas* (James, unpublished data). Furthermore, Beddard's species have some features in common with endemic Philippine *Pithemera* (James *et al.*, 2004), leading us to suspect that the four species are actually *Pithemera*.

In this study, specimens were collected from February to July 2001, on Luzon and Mindoro Islands, mainly in forests on isolated volcanic peaks or large mountain ranges. Material was found in soils and litter layers by digging and hand sorting from 23 localities on Luzon, the Batanes Islands, Mindoro Island, and Catanduanes Island, with a total of 142 collecting stations. Arboreal habitats were also manually searched; these included leaf axils of palms and Pandanaceae, organic debris trapped in various ferns, and layers of mosses and vascular plant epiphytes. In this paper, 6 species of *Amyntas* new to science are reported from the Philippines. The genus *Amyntas* is the largest genus of the *Pheretima*-complex group (Sims & Easton, 1972), consisting of more than 500 species. Ranges of individual *Amyntas* species are limited when known, and most species are probably endemics except for *A. hilgendorfi*, *A. corticis* and other peregrines. However, *Amyntas* is not common in the Philippines, and was only collected at 4 localities: Mt. Isarog, Mt. Malinao, Mt. Halcon, and Mt. Baco. Each of the six new species was found in only one locality.

Holotypes and paratypes are deposited in the National Museum of the Philippines Annelid collection (NMA). Paratypes are deposited in the Field Museum of Natural History (FMNH), and Museum of Natural History of Geneva (MHNG).

## DESCRIPTIONS

### *Amyntas isarogensis* sp. n.

Figs 1A-B

**Material:** Holotype: One clitellate (NMA 0003750): Philippines, Mt. Isarog (13° 39.65' N, 123° 22.28' E), 1987 m, soil, 15 May 2001, S. W. James, M. Levi, P. Nillos, & J. Ffitch colls. 3 paratypes: 1 clitellate (NMA 0003756), 1 clitellate (FMNH 10017), 1 clitellate (MHNG 34812): Same data as for holotype. Other material: Same data as for holotype, 10 clitellate, 1 aclitellate specimens; Mt. Isarog (13° 39.79' N, 123° 21.79' E), 1340 m, arboreal, 3 aclitellate, 13-14 May 2001; Mt. Isarog (13° 39.65' N, 123° 22.28' E), 1987 m, arboreal, 2 aclitellate, 15 May 2001; Mt. Isarog (13° 39.70' N, 123° 22.07' E), 1745 m, soil, 9 clitellate, 9 aclitellate, 15 May 2001, S. W. James, M. Levi, P. Nillos, J. Ffitch colls.; Mt. Isarog (13° 40' N, 123° 22' E), 1560 m, 4 clitellate, Dec. 1993, L. Heaney coll.

**Etymology:** The species is named for its type locality.

**Diagnosis:** Spermathecal pores in 7/8, 8/9. Male sexual system proandric, male pores on penes in chamber formed by enlarged prostatic duct opening on 0.4-0.5 mm male porophore, openings 0.1-0.5 mm diameter; three pairs of genital papillae in male field.

**Description:** Red-brown dorsal pigment. Dimensions 45-99 mm by 3.7-4.2 mm at segment x, 3.3-3.5 mm at xxx, 3.3-3.4 mm at clitellum; body cylindrical throughout, segments 93-98. Setae regularly distributed around segmental equators, numbering 42 at vii, 56 at xx; 6-9 between male pores, size and distance regular; setal formula

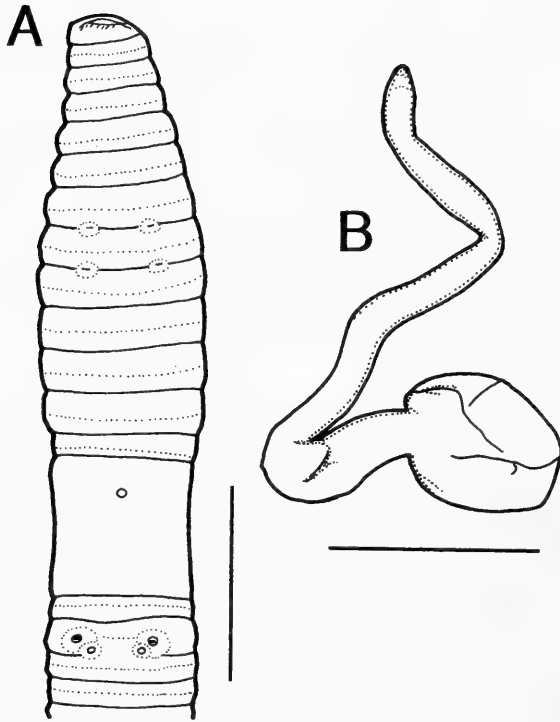


FIG. 1

*Amynthus isarogensis* sp. n. A: ventral view; B: spermathecae. Scale bars = 5 mm (A), 2 mm (B).

AA:AB:YZ:ZZ = 4:2:2:3 at xiii. Female pore single in xiv, 0.25 mm oval shape. First dorsal pore 12/13. Clitellum annular xiv-xvi; setae invisible externally.

Male pores superficial on 0.4-0.5 mm male porophore, openings 0.1-0.5 mm diameter. Between male pores paired postsetal circular 0.3 mm genital papillae xviii, two pairs genital papillae pre-, postsetal xviii, protuberant, dark color, hardened. Spermathecal pores in 7/8, 8/9, ventral, open pores in furrows next to bump on edge of segments. Genital markings absent.

Septa 5/6-6/7 thin, 7/8 thick, 8/9, 9/10 absent, 10/11-13/14 thin. Gizzard large globular in viii-x. Intestine begins in xvii. Typhlosole simple low fold about 1/6 lumen diameter from xxvii. Intestinal caeca simple, originating in xxvii, extending anteriorly about to xxiv, each consisting of a finger-shaped sac. Esophageal hearts four pairs in x-xiii, ix lateral large in left side.

Ovaries in xiii. Paired spermathecae in viii, ix; ampulla small pouch, duct thick, as long as ampulla; diverticulum stalk long slender, ental half not muscular, ectal half muscular, chamber long, slender; no nephridia on spermathecal ducts. Male sexual system proandric, testes and funnels in x in paired ventral sacs. Seminal vesicles in xi only. Prostates xviii extending to xvi-xix; duct muscular, spindle-shaped with large lumen in thick central part, narrowing to very small ectally, opening of male pore on

small penis inside small chamber entirely within body wall; glandular portions of prostates consist of one or two lobes. Genital markings glands sessile or very short stalk xviii.

*Remarks:* *Amyntas isarogensis* sp. n. has a very unusual proandric male sexual system. *Amyntas formosae* Michaelsen, 1922 and several unpublished species (James, unpub. data) from Taiwan and *A. pataniensis* Michaelsen 1896 from Halmahera and Batjan Islands of Indonesia are the only other known proandric *Amyntas*. The Taiwan species are octothecal and the Indonesian has numerous genital markings in the spermathecal segments and in the male field area of xvii-xxi. These two species also lack the expanded prostatic duct and penes found in *Amyntas isarogensis* sp. n. and the following (Michaelsen, 1896, 1922).

*Amyntas malinaoensis* sp. n.

Figs 2A-B

*Material:* Holotype: One clitellate (NMA 0003751): Philippines, Mt. Malinao, Albay Province (13° 25.98' N, 123° 37.63' E), 852 m, soil, 10 May 2001, S. W. James & A. Castillo colls. 3 paratypes: 1 semiclitellate (NMA 0003757), 1 clitellate (FMNH 10018), 1 clitellate (MHNG 34813): Same data as for holotype. Other material: Same data as for holotype, 1 semiclitellate, 1 a clitellate specimens; Mt. Malinao, Albay Province (13° 23.96' N, 123° 37.16' E), 1035 m, soil, 1 clitellate, 11 May 2001; Mt. Malinao, Albay Province (13° 23.96' N, 123° 37.16' E), 1035 m, arboreal, 2 clitellate, 11 May 2001, S. W. James & A. Castillo colls.

*Etymology:* The species is named for its type locality.

*Diagnosis:* Spermathecal pores in 7/8, 8/9. Male sexual system proandric, male pores 1/3 circumference apart on 0.8 mm male porophore, openings 0.2 mm diameter, genital papillae glands stalked.

*Description:* Brown dorsal pigment. Dimensions 35-46 mm by 3.0 mm at segment x, 2.7 mm at xxx, 2.6 mm at clitellum; body cylindrical throughout, segments 66-76. Setae regularly distributed around segmental equators, numbering 47 at vii, 49 at xx; 4-7 between male pores, size and distance irregular; setal formula AA:AB:YZ:ZZ = 1.5:1:2:2 at xiii. Female pore single in xiv, 0.2 mm small oval shape. First dorsal pore 11/12 or 12/13. Clitellum annular xiv-xvi; setae invisible externally.

Male pores 1/3 circumference apart on 0.8 mm male porophore, openings 0.2 mm diameter. Between male pores paired circular presetal 0.3 mm genital papillae, 0.2 mm papilla postsetal near the male pores in lateral margin, distance between male pores 1.5 mm, penis visible within male pores. Spermathecal pores in 7/8, 8/9, ventral, conspicuous, spermathecal pores area thickened slightly. Genital markings absent.

Septa 5/6-7/8 thin, 8/9, 9/10 absent, 10/11-13/14 thin. Gizzard globular in viii-x. Intestine begins in xv, small paired lymph glands from xxvii along the dorsal vessel. Typhlosole low simple fold about 1/5 lumen diameter from xxvii. Intestinal caeca simple, originating in xxvii, extending anteriorly about to xxiv, each consisting of a finger-shaped sac. Esophageal hearts four pairs in x-xiii, ix in right side only, viii, vii lateral, reduced.

Ovaries in xiii. Paired spermathecae in vii, viii; ampulla mushroom-shaped, duct thick, diverticulum stalk thick muscular in ectal half, stalk twice ampulla length, chamber pepper-shaped or long cone; no nephridia on spermathecal ducts. Male sexual system proandric, testes and funnels in ventral paired sacs in x, joined ventrally. Seminal vesicles large in xi only. Prostates xviii extending to xv-xx; duct muscular

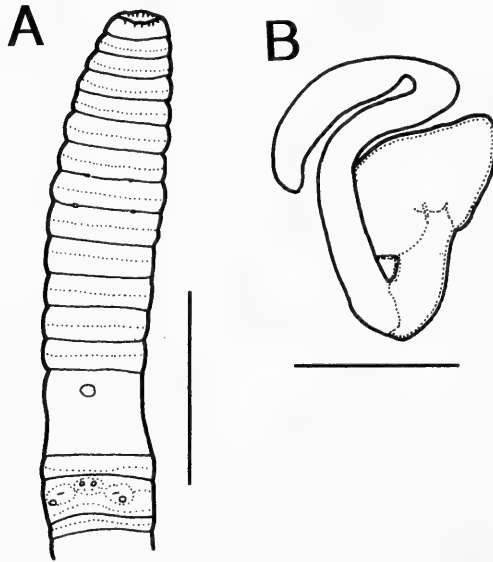


FIG. 2

*Amynthus malinaoensis* sp. n. A: ventral view; B: spermathecae. Scale bars = 5 mm (A), 1 mm (B).

spindle-shaped with large lumen in thick central part, narrowing to very small ectally, opening of male pore on small penis inside small chamber entirely within body wall, glandular portions of prostates consist of one main lobe. Genital papillae of xviii with stalked glands corresponding approximately in number to the externally visible papillae, no circular muscle layer in stalks.

*Remarks:* The species also has the unusual proandric male sexual system with penes. *Amynthus malinaoensis* sp. n. differs from *Amynthus isarogensis* sp. n. in having shorter body length, more narrowly spaced dorsal and ventral gaps, less distance between male pores and less distance between spermathecal pores. Also, *Amynthus isarogensis* sp. n. has paired postsetal circular genital papillae between the male pores, but *Amynthus malinaoensis* sp. n. has paired circular presetal genital papillae between the male pores and one postsetal papilla near the male pores. Intestinal origin is xvii in *Amynthus isarogensis* sp. n. but xv in *Amynthus malinaoensis* sp. n., and the genital papillae glands have longer stalks in *Amynthus malinaoensis* sp. n. than in *Amynthus isarogensis* sp. n.

Proandry is uncommon within the family Megascolecidae, and also within the *Pheretima* complex of genera. Among the latter, most species have a holandric system (testes present in x, xi), with proandric (testes restricted to x) or metandric (testes only in xi) less common.

#### *Amynthus philippinensis* sp. n.

Figs 3A-B

*Material:* Holotype: One clitellate (NMA 0003752): Philippines, Mindoro Island, Mt. Halcon summit (13° 15.83' N, 120° 59.62' E), 2603 m, mainly under woody plants, which in this location are shrubs from 0.5-1.5 m high, 8 July 2001, S. W. James & M. Levi colls. 2 paratypes:

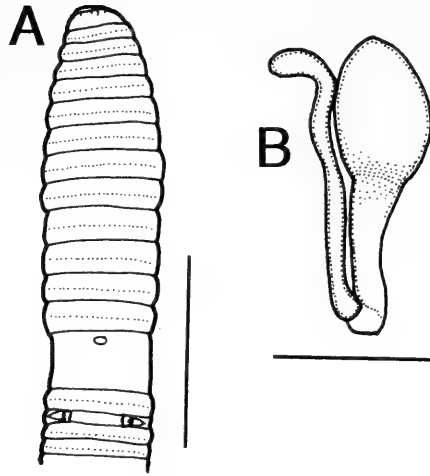


FIG. 3

*Amynthus philippinensis* sp. n. A: ventral view; B: spermathecae. Scale bars = 5 mm (A), 1 mm (B).

1 clitellate (FMNH 10019) Mindoro Island, Mt. Halcon (13° 15.91' N, 120° 59.33' E), 2500 m, summit ridge mossy forest, worms abundant in soil and arboreal soils, 8 July 2001; 1 clitellate (MHNG 34814) Mindoro Island, Mt. Halcon (13° 15.83' N, 120° 59.62' E), 2603 m, soil, 8 July 2001, S. W. James & M. Levi colls.

*Etymology:* The species is named for its country of origin.

*Diagnosis:* *Amynthus* with spermathecal pores in 4/5. Male pores under small half moon-shaped hoods, distance between male pores 1.3 mm, hearts x lacking.

*Description:* Brown dorsal and ventral pigment. Dimensions 70 mm by 3.1 mm at segment x, 2.8 mm at xxx, 2.6 mm at clitellum; body cylindrical throughout, segments 100. Setae regularly distributed around segmental equators, numbering 47 at vii, 48 at xx; 0 between male pores, size and distance regular; setal formula AA:AB:YZ:ZZ = 2:1.5:2:2 at xiii. Female pore single in xiv, 0.4 mm oval shape. First dorsal pore 12/13. Clitellum annular xiv-xvi; setae visible externally.

Male pores superficial near lateral margins of ventrum in xviii, within elevated area, male pores under small half moon-shaped hoods, distance between male pores 1.3 mm. Spermathecal pores in 4/5, ventral, very small, inconspicuous. Genital markings absent.

Septa 5/6-6/7 thick, 7/8-8/9 thin, 9/10 absent, 10/11-13/14 thin. Gizzard globular in viii. Intestine begins in xv, small paired lymph glands from xxvii along the dorsal vessel. Typhlosole simple fold about 1/4 lumen diameter from xxvii. Intestinal caeca simple, originating in xxvii, extending anteriorly about to xxiv or xxv, each consisting of a finger-shaped sac. Esophageal hearts three pairs in xi-xiii, x absent, ix lateral large in right side.

Ovaries in xiii. Paired spermathecae in v; ampulla small pouch, duct longer than ampulla, diverticulum with slender stalk, longer than ampulla, equally slender chamber also longer than ampulla; no nephridia on spermathecal ducts. Male sexual system holandric, testes and funnels in ventral paired sacs in x, xi. Seminal vesicles large in

xi, xii. Prostates xviii extending to xvi-xx; duct thick, muscular, looped, both glandular portions consist of two main lobes.

*Remarks:* In Sims & Easton (1972) the key leads to those species whose first spermathecal pores are in 4/5, which include the holandric bithecate taxa *A. swanus* Tsai, 1964, *A. megascolidioides* Goto & Hatai, 1899, the *pauxillulus* group, and the *hexathecus* group. All have 2 or more pairs of spermathecal pores. Therefore *Amynthas philippinensis* sp. n. is unique in the genus by having one pair of spermathecae in v. The hooded male pores are also unusual, but this characteristic is shared with other Mindoro Island *Amynthas*. The species was collected from Mt. Halcon, near the summit at 2603 m elevation and in mossy forest on the summit ridge. *Amynthas philippinensis* sp. n. was found in soil under low shrubs on the wind swept summit, and in soil and arboreal habitats in mossy forest lower on the summit ridge.

*Amynthas mindoroensis* sp. n.

Figs 4A-B

*Material:* Holotype: One clitellate (NMA 0003753): Philippines, Mindoro Island, Mt. Halcon (13° 16.01' N, 120° 59.05' E), 2442 m, soil low on the summit ridge, 8 July 2001, S. W. James & M. Levi colls. 2 paratypes: 1 clitellate (FMNH 10020), 1 clitellate (MHNG 34815): Same data as for holotype. Other material: Mt. Halcon (13° 17.94' N, 120° 00.21' E), 1584 m, arboreal, 1 clitellate, 1 a clitellate, 6 July 2001, S. W. James, A. Castillo & M. Levi colls; Mt. Halcon (13° 17.94' N, 120° 00.21' E), 1584 m, soil, 1 clitellate, 7 July 2001, S. W. James, A. Castillo & M. Levi colls; Mt. Halcon (13° 16.01' N, 120° 59.05' E), 2442m, soil low on the summit ridge, 4 a clitellate, 8 July 2001; Mt. Halcon (13° 15.91' N, 120° 59.33' E), 2500 m, arboreal, 1 clitellate, 8 July 2001, S. W. James & M. Levi colls; Mt. Halcon (13° 15.91' N, 120° 59.33' E), 2500 m, soil, 2 clitellate, 2 a clitellate, 8 July 2001, S. W. James & M. Levi colls; Mt. Halcon (13° 17.89' N, 120° 59.87' E), 1185 m, riparian forest, 1 clitellate, 1 a clitellate, 9 July 2001, S. W. James & M. Levi colls.

*Etymology:* The species is named for its type locality on Mindoro Island.

*Diagnosis:* Spermathecal pores in 4/5, 5/6. Male pores under small half-moon shaped hoods, distance between male pores 2.3 mm; paired 0.8 x 0.4 mm oval genital papillae between male pores, hearts of x lacking.

*Description:* Brownish dorsal pigment. Dimensions 32-48 mm by 2.7-3.5 mm at segment x, 2.3-3.3 mm at xxx, 2.2-2.4 mm at clitellum; body cylindrical throughout, segments 68-96. Setae regularly distributed around segmental equators, numbering 49 at vii, 48 at xx; size and distance regular; setal formula AA:AB:YZ:ZZ = 2.5:1.5:2:4.5 at xiii. Female pore single in xiv, 0.3 mm oval shape. First dorsal pore 12/13. Clitellum annular xiv-xvi; setae visible externally.

Male pores superficial near lateral margins of ventrum in xviii, within elevated area, male pores under small half-moon shaped hoods, distance between male pores 2.3 mm. Between male pores 0.8 x 0.4 mm paired oval genital papillae, dark color, hardened, no setae between male pores. Spermathecal pores in 4/5, 5/6, ventrally, very small, inconspicuous. Genital markings absent.

Septa 5/6-6/7 thick, 7/8 thin, 8/9-10/11 absent, 11/12-12/13 thick, 13/14 thin. Gizzard globular in viii-x. Intestine begins in xv, small paired lymph glands from xxvii along the dorsal vessel. Typhlosome simple fold about 1/4 lumen diameter from xxvii. Intestinal caeca simple, originating in xxvii, extending anteriorly about to xxiv, each consisting of a finger-shaped sac. Esophageal hearts three pairs in xi-xiii, x absent, ix, viii lateral reduced, vii lateral.

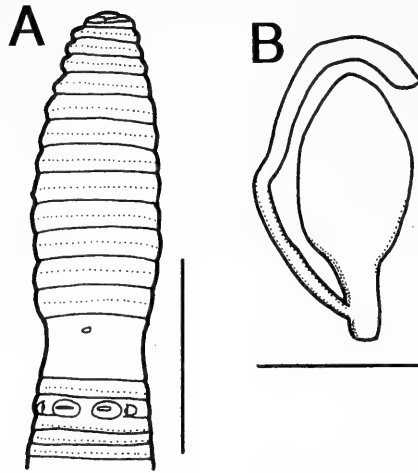


FIG. 4

*Amynthus mindoroensis* sp. n. A: ventral view; B: spermathecae. Scale bars = 5 mm (A), 1 mm (B).

Ovaries in xiii. Paired spermathecae in v, vi; ampulla large pouch, duct thick, diverticulum thin, long slender stalk, long slender chamber, longer than ampulla; no nephridia on spermathecal ducts. Male sexual system holandric, testes and funnels in ventrally joined paired sacs in x, xi. Seminal vesicles large in xi, xii. Prostates xviii extending to xvii-xx; duct thick in middle, short, muscular, both glandular portions consist of two main lobes; slight glandular development above genital papillae in xviii.

*Remarks:* *Amynthus mindoroensis* sp. n. keys to the Taiwanese *A. swanus* in Sims & Easton (1972). *Amynthus mindoroensis* sp. n. appears to be related to *A. swanus* by location of spermathecal pores *A. swanus* but, it is separated easily by the male pore region. Genital papillae of *Amynthus mindoroensis* sp. n. are paired ovals between the male pores, but *A. swanus* has a tubercular surface surrounded anteriorly and posteriorly by oblique wide ridges. *A. swanus* lacks the hoods over the male pores and has hearts in x. *Amynthus mindoroensis* sp. n. was collected from Mt. Halcon in the same habitats as the previous species, from both soil and arboreal locations. *Amynthus mindoroensis* sp. n. differs from *Amynthus philippinensis* sp. n. in having shorter body length, more widely spaced dorsal gap, and more widely spaced male pores. Also it is easily distinguished by having genital papillae and an additional pair of spermathecae in vi.

***Amynthus halconensis* sp. n.**

Figs 5A-B

*Material:* Holotype: One clitellate (NMA 0003754): Philippines, Mindoro Island, Mt. Halcon (13° 15.83' N, 120° 59.62' E), 2603 m, mainly under woody plants, which in this case are shrubs from 0.5-1.5 m high, 8 July 2001, S. W. James & M. Levi colls. 3 paratypes: 1 clitellate (NMA 0003758), 1 clitellate (FMNH 10021), 1 clitellate (MHNG 34816): Same data as for holotype. Other material: Same data as for holotype, 4 clitellate specimens; Mt. Halcon (13° 15.83' N, 120° 59.62' E), 2603 m, soil, 5 clitellate, 2 a clitellate, 8 July 2001, S. W. James & M. Levi colls.



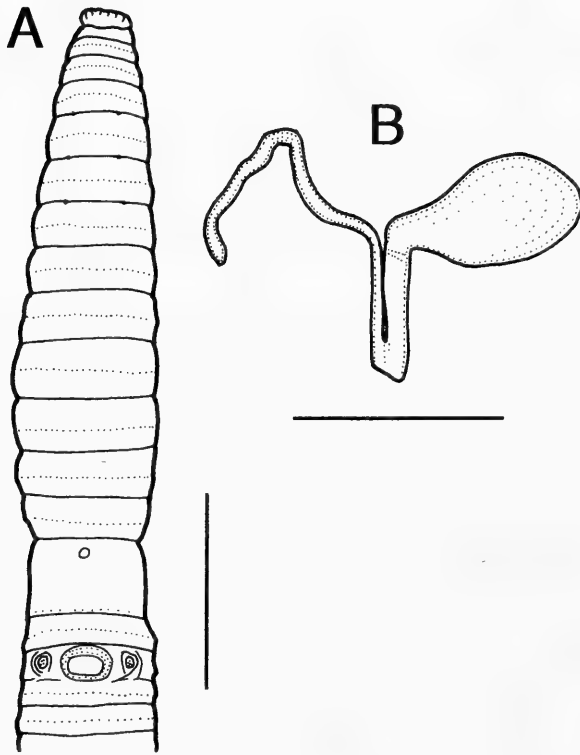


FIG. 5

*Amynthes halconensis* sp. n. A: ventral view; B: spermathecae. Scale bars = 5 mm (A), 2 mm (B).

*Etymology:* The species is named for its type locality.

*Diagnosis:* Spermathecal pores in 4/5-6/7. Male pores under small hoods near lateral margin, distance between male pores 2.2 mm; between male pores one large rectangular 0.9 x 0.5 mm papilla.

*Description:* Dark gray dorsal pigment. Dimensions 67-86 mm by 3.5-3.8 mm at segment x, 3.3-3.5 mm at xxx, 3.0-3.3 mm at clitellum; body cylindrical throughout, segments 111-118. Setae regularly distributed around segmental equators, numbering 44 at vii, 49 at xx; 0 between male pores, size and distance irregular; setal formula AA:AB:YZ:ZZ = 3:1.5:2:3.5 at xiii. Female pore single in xiv, 0.4 mm small oval shape. First dorsal pore 12/13. Clitellum annular xiv-xvi; setae visible externally.

Male pores superficial under small hoods near lateral margin of ventrum in xviii within elevated area, distance between male pores 2.2 mm. Between male pores one large rectangular 0.9 x 0.5 mm papilla. Spermathecal pores in 4/5-6/7, in small flat porophores, pore opening appears black. Genital markings absent.

Septa 5/6-7/8 thin, 8/9, 9/10 absent, 10/11 thin, 11/12-13/14 thick. Gizzard large globular in viii-x. Intestine begins in xv. Typhlosole simple fold about 1/3 lumen diameter from xxvii. Intestinal caeca simple, originating in xxvii, extending anteriorly

about to xxiii, each consisting of a finger-shaped sac. Esophageal hearts four pairs in x-xiii, ix, viii, vii lateral.

Ovaries in xiii. Paired spermathecae in v, vi, vii; ampulla globular pouch, duct medium thickness, as long as ampulla, extremely thin diverticulum three times duct length, ental 1/3 slender chamber; no nephridia on spermathecal ducts. Male sexual system holandric, testes and funnels in ventral paired sacs in x, xi. Seminal vesicles in xi, xii. Prostates xviii extending to xv-xx; both glandular portions consist of 3-4 lobes, duct thick, muscular. Genital papilla of xviii with large sessile gland corresponding to the large square papilla.

*Remarks:* *Amyntas halconensis* sp. n. keys to the *pauillulus* group in Sims & Easton (1972), which is composed of three species, *A. dignus* (Chen, 1946), *A. pauillulus* (Gates, 1936), and *A. swanus* (Tsai, 1964). The species has the same number and location of spermathecal pores as this group but has a different male field containing a single midventral papilla and has hooded male pores, unlike any of the other three (Gates, 1936; Tsai, 1964). *A. swanus*, *A. dignus* and *A. pauillulus* have no genital papillae. The intestinal origin of *Amyntas halconensis* sp. n. is in xv, while it is in xvi in *A. dignus* and *A. pauillulus*. The testis sacs also differ, being paired in the new species and annular or horseshoe-shaped in *A. dignus* and *A. pauillulus*.

*Amyntas bacoensis* sp. n.

Figs 6A-B

*Material:* Holotype: One clitellate (NMA 0003755): Philippines, Mindoro Island, Mt. Baco (12° 38.73' N, 121° 01.25' E), 72 m, soil, 13 July 2001, M. Levi & P. Nillos colls. 3 paratypes: 1 semiclitellate (NMA 0003759), 1 semiclitellate (FMNH 10022), 1 semiclitellate (MHNG 34817): Same data as for holotype. Other material: Same data as for holotype, 1 semiclitellate, 20 acitellate specimens.

*Etymology:* The species is named for its type locality near Mt. Baco.

*Diagnosis:* Spermathecal pores in 4/5-7/8. Male pores on 0.4 mm round protuberant male patches, distance between male pores 3.7 mm; genital papillae paired ovals 1.3 x 0.7 mm, near lateral in xvii, extending to 16/17, 17/18.

*Description:* Light-brown dorsal and ventral pigment. Dimensions 57-68 mm by 3.0-3.3 mm at segment x, 3.0-3.1 mm at xxx, 3.0-3.2 mm at clitellum; body cylindrical throughout, segments 91-102. Setae regularly distributed around segmental equators, numbering 41 at vii, irregular, 64 at xx, regular; between male pores, size and distance irregular; setal formula AA:AB:YZ:ZZ = 2:1.5:2:2 at xiii. Female pore single in xiv, 0.3 mm small oval shape. First dorsal pore 12/13. Clitellum annular xiv-xvi; setae visible externally.

Male pores superficial near lateral margin of ventrum in xviii, on 0.4 mm round protuberant male patches, distance between male pores 3.7 mm. Genital papillae paired oval 1.3 x 0.7 mm, near lateral in xvii, dark, hardened, extending to 16/17, 17/18. Four pairs spermathecal pores in 4/5-7/8, mid-lateral, inconspicuous. Genital markings absent.

Septa 5/6-7/8 thin, 8/9 absent, 9/10, 10/11 very thin, 11/12, 12/13 thick, 13/14 thin. Gizzard globular in viii-ix. Intestine begins in 1/2xv, small paired lymph glands from xxvii along the dorsal vessel. Typhlosole simple fold about 1/3 lumen diameter from xxvii. Intestinal caeca simple, originating in xxvii, extending anteriorly about to

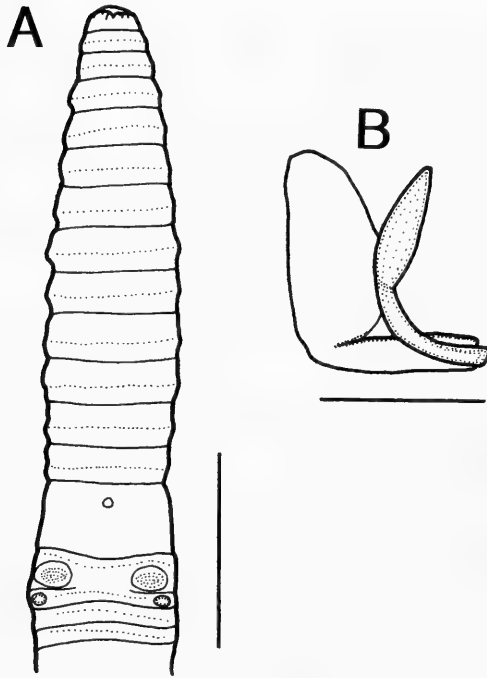


FIG. 6

*Amynthus bacoensis* sp. n. A: ventral view; B: spermathecae. Scale bars = 5 mm (A), 1 mm (B).

xxiv, each consisting of a large finger-shaped sac. Esophageal hearts four pairs in x-xiii, ix, viii, vii lateral.

Ovaries in xiii. Paired spermathecae in v-viii; ampulla small pouch, duct medium thickness, shorter than ampulla, diverticulum chili pepper-shaped, with slender stalk, as long as ampulla; no nephridia on spermathecal ducts. Male sexual system holandric, testes and funnels in ventral paired sacs in x, xi. Seminal vesicles in xi, xii. Prostates xviii extending to xvi-xx; both glandular portions consist of 2 lobes, duct short, muscular. Genital papillae of xviii 1.0 x 0.6 mm, with large sessile glands corresponding approximately to the externally visible oval papillae.

*Remarks:* In Sims & Easton (1972) *Amynthus bacoensis* sp. n. keys to a couplet giving a choice between three and five thecal segments, corresponding to the *pauzellulus* group and *hexathecus* group respectively. Therefore *Amynthus bacoensis* sp. n. has a unique spermathecal battery composed of pairs in v-viii. This species also has unique genital papillae in xvii. It differs from its Mindoro congeners by lacking the hoods over the male pores, in addition to other characteristics.

The proandric species from Luzon have male genitalia showing convergent evolution to *Pheretima* species, in having a penis-like structure within a copulatory chamber. This is an interesting parallel development of a mechanism for internal sperm transfer, compared to *Pheretima*. However, the chamber is intramural and associated with an enlarged prostatic duct which may serve as an ejaculatory bulb. In contrast,

*Pheretima* have an extramural (coelomic) copulatory chamber and no bulb-like development of the prostatic ducts. In contrast to their apomorphic male terminalia, the species from Luzon have spermathecal pores in 7/8 and 8/9, which is a common arrangement in the Megascolecidae.

The four Mindoro species have modified locations of spermathecal pores: 4/5, 4/5-5/6, 4/5-6/7 and 4/5-7/8 respectively, and ordinary prostatic ducts. Three species have an unusual male field feature, the hoods over the male pores. This has not been found in other *Amyntas*, though some Taiwan species have a tendency towards growing a flap of tissue over the male pores (James *et al.*, 2004).

Key to the species of the genus *Amyntas* known from the Philippines

- |    |  |                                      |
|----|--|--------------------------------------|
| 1  | Proandric . . . . .                                | 2                                    |
| -  | Holandric . . . . .                                | 3                                    |
| 2  | Intestinal origin in xv . . . . .                  | <i>Amyntas malinaoensis</i> sp. n.   |
| -  | Intestinal origin in xvii . . . . .                | <i>Amyntas isarogensis</i> sp. n.    |
| 3  | One pair of spermathecae in segment v . . . . .    | <i>Amyntas philippinensis</i> sp. n. |
| -  | More than one pair of spermathecae . . . . .       | 4                                    |
| 4  | Two pairs of spermathecae . . . . .                | 5                                    |
| -  | More than two pairs of spermathecae . . . . .      | 6                                    |
| 5  | Spermathecal pores at 4/5, 5/6 . . . . .           | <i>Amyntas mindoroensis</i> sp. n.   |
| -  | Spermathecal pores at 7/8, 8/9 . . . . .           | <i>Amyntas robustus</i>              |
| 6  | Three pairs of spermathecae . . . . .              | 7                                    |
| -  | More than three pairs of spermathecae . . . . .    | 8                                    |
| 7  | Spermathecal pores at 4/5, 5/6, 6/7 . . . . .      | <i>Amyntas halconensis</i> sp. n.    |
| -  | Spermathecal pores at 6/7, 7/8, 8/9 . . . . .      | <i>Amyntas americanorum</i>          |
| 8  | Four pairs of spermathecae . . . . .               | 9                                    |
| -  | More than four pairs of spermathecae . . . . .     | 10                                   |
| 9  | Spermathecal pores at 4/5, 5/6, 6/7, 7/8 . . . . . | <i>Amyntas bacoensis</i> sp. n.      |
| -  | Spermathecal pores at 5/6, 6/7, 7/8, 8/9 . . . . . | <i>Amyntas corticis</i>              |
| 10 | Spermathecae in V-IX . . . . .                     | 11                                   |
| -  | Spermathecae in IV/V-VII/VIII . . . . .            | <i>Amyntas orientalis</i>            |
| 11 | 18-20 setae between male pores . . . . .           | <i>Amyntas albobrunneus</i>          |
| -  | 8-10 setae between male pores . . . . .            | <i>Amyntas sodalis</i>               |

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## Espèces nouvelles du genre *Pseudosinella* provenant de Moldavie et d'Ukraine (Collembola: Entomobryidae). XVIII<sup>e</sup> contribution

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**New species of the genus *Pseudosinella* from Moldavia and Ukraine (Collembola: Entomobryidae). XVIII<sup>e</sup> contribution.** - The authors have studied ten edaphic species of the genus *Pseudosinella*, two of which are new: *P. pygmaea* sp. n. and *P. variabilis* sp. n. Morphological comparison with similar species and geographical distribution are also considered.

**Keywords:** Collembola - *Pseudosinella* - new species - Moldavia - Ukraine.

### INTRODUCTION

Cette contribution comprend l'étude de dix espèces du genre *Pseudosinella* Schäffer, 1897, dont deux, *P. pygmaea* sp. n. et *P. variabilis* sp. n., sont décrites pour la première fois. Ces deux espèces proviennent de la Moldavie, ainsi que *P. albida* (Stach, 1930) s. Stomp, 1971 qui n'était pas encore connue de ce pays, d'où une centaine d'espèces de Collemboles a été identifiée (Busmachiu *et al.*, 2000), parmi lesquelles 13 espèces de *Pseudosinella* (Gama & Busmachiu, 2002).

De l'Ukraine, *P. horaki* Rusek, 1985 et *P. moldavica* Gama & Busmachiu, 2002 sont citées ici pour la première fois. Dans ce pays à peu près 360 espèces de Collemboles ont été signalées, parmi lesquelles une dizaine d'espèces de *Pseudosinella* (Kaprus, 1998 et communication personnelle).

On a encore identifié dans ces matériaux *P. alba* (Packard, 1873), *P. imparipunctata* Gisin, 1953 et *P. octopunctata* Börner, 1901 qui, avec *P. pygmaea* sp. n. et *P. albida*, sont des représentants de la lignée généalogique dont l'ancêtre doit être *Lepidocyrtus pallidus* Reuter, 1890 emend. Gisin, 1965: p présent sur l'abdomen II, r de la base du labium rudimentaire.

Les autres espèces étudiées, *P. variabilis* sp. n., *P. moldavica*, *P. simpatica* Gama & Busmachiu, 2002, *P. codri* Gama & Busmachiu, 2002 et *P. horaki*, doivent appartenir à la lignée généalogique dont l'espèce - mère est une espèce de *Lepidocyrtus* qui n'est pas encore décrite: p présent sur l'abdomen II, R de la base du labium cilié (Gama, 1984).

Les types des espèces nouvelles sont déposés au Muséum d'histoire naturelle de Genève (MHNG), au Musée de Zoologie de l'Université de Coimbra (MC), au Muséum d'Entomologie de Chisinau (MEC) et au «State Museum of Natural History» de Lviv (MNHL).

## MATÉRIAUX

La plupart des matériaux étudiés dans cet article ont été récoltés principalement en forêt mixte, dans des plantations de *Robinia pseudoacacia* et dans la région de steppe au sud de la République de la Moldavie. Les spécimens récoltés en Ukraine par M. I. Kaprus en forêt mixte, forêt d'*Acerum*, plantations de *Robinia pseudoacacia* et steppe réserve ont été aussi étudiés.

## SYSTÉMATIQUE

### 1. *Pseudosinella pygmaea* sp. n.

Figs 1-4

*Matériel étudié.* MOLDAVIE: Bahmut, forêt mixte, holotype et 2 paratypes (prép.), 08.2003 (MHNG); 2 paratypes (prép.), 08.2003 (MC); 3 paratypes (prép.), 08.2003 (MEC).

*Description.* Taille: 0,44-0,48 mm (n = 8). Habitus normal du genre. Le pigment bleu foncé est disséminé sur tout le corps, les antennes et les portions proximales des pattes et se concentre dans les 5 + 5 yeux de taille identique. Rapport entre la longueur des antennes et la diagonale céphalique = 1,3. Articles antennaires sans écailles. Macrochètes dorsaux: R111/30/0100+2 (Fig.1). Soie accessoire "s" de l'abd. IV absente. Sur l'abd. IV le pseudopore se situe entre les deux macrochètes. Chétotaxie de l'abd. II: p a B q<sub>1</sub> q<sub>2</sub> (Fig. 2). Base du labium: M r E L<sub>1</sub> L<sub>2</sub> (Fig. 3), r est rudimentaire et les autres soies sont ciliées. La dent impaire de la griffe (Fig.4) est située à environ 68% de sa crête interne et les deux dents proximales ont à peu près la même taille. Empodium lancéolé. Ergot tibiotarsal spatulé. Les dents apicale et anteapicale du mucron sont subégales.

*Discussion.* *P. pygmaea* semble se rapprocher de *P. albida* par le nombre des yeux, la structure de la griffe, par le rapport entre la longueur des antennes et la diagonale céphalique et encore par la chétotaxie de la tête, de l'abdomen II, de la base du labium et par l'absence de la soie accessoire "s" sur l'abdomen IV. Néanmoins, l'espèce nouvelle a 3 macrochètes sur le thorax II (contre 1 macrochète chez *P. albida*) et la formule des macrochètes 0 + 2 sur l'abdomen IV (contre 1 + 2 chez *P. albida*).

Cette formule 0 + 2 existe également chez *P. fjellbergi* Gama, 1974, *P. canariensis* Gama, 1974, *P. trioculata* Gama, 1988, *P. insularum* Dallai, 1969 et *P. infrequens* Gisin & Gama, 1969. Chez ces cinq espèces, qui se distinguent entre elles uniquement par le nombre des yeux (fig. 2 in Gama, 1988: 82) et qui s'écartent de *P. pygmaea* spécialement par la chétotaxie de la tête et du thorax II, le pseudopore sur l'abdomen IV est placé avant le premier macrochète (fig. 2 in Gisin & Gama, 1969: 146), tandis que chez l'espèce nouvelle le pseudopore se situe entre le premier et le deuxième macrochète.

### 2. *Pseudosinella variabilis* sp. n.

Figs 5-6

*Matériel étudié.* MOLDAVIE: Bahmut, forêt mixte, holotype et 2 paratypes (prép.), 08.2003 (MHNG); 2 paratypes (prép.), 08.2003 (MC); 1 paratype (prép.), 08.2003 (MEC).



*Description.* Taille: 0,71-0,82 mm (n = 6). Habitus normal du genre. Le pigment bleu foncé est diffus sur la tête, le thorax, l'abdomen ainsi que sur les coxae et l'ensemble des articles antennaires et se concentre dans les 5 + 5 yeux de taille identique. Rapport entre la longueur des antennes et la diagonale céphalique = 1,3. Articles antennaires sans écailles. Macrochètes dorsaux: R011/10/0101+2. Soie accessoire "s" de l'abd. IV absente. Chétotaxie de l'abd. II: p a B q<sub>1</sub> q<sub>2</sub>. Base du labium: M R E L<sub>1</sub> L<sub>2</sub> (Fig. 5). R est cilié, parfois asymétriquement, dans la plupart des exemplaires examinés ou absent. Les autres soies sont ciliées. La dent impaire de la griffe (Fig.6) est située à environ 60% de sa crête interne et les deux dents proximales ont à peu près la même taille. Empodium lancéolé. Ergot tibiotarsal spatulé. Les dents apicale et anté-apicale du mucron sont subégales.

*Discussion.* Il est difficile d'établir des rapports généalogiques entre cette espèce nouvelle et d'autres espèces, probablement dérivées de *Lepidocyrtus* sp., car elle présente une chétotaxie de la base du labium méconnue jusqu'à présent: R cilié associé à un seul M (M R E L<sub>1</sub> L<sub>2</sub>). Chez toutes les espèces connues de cette lignée R de la base du labium est combiné avec M<sub>1</sub> et M<sub>2</sub>.

### 3. *Pseudosinella alba* (Packard, 1873)

*Matériel étudié.* MOLDAVIE: Chisinau, jardin botanique, 2 exemplaires (prép.), 03.1994 (MEC). UKRAINE: Gurzuf, 1 exemplaire (prép.), 09.1997 (MNHL); Kamenets-Podoliskii, 11 exemplaires (prép.), 06.1995 (MNHL); Ostapie, forêt mixte, 4 exemplaires (prép.), 05.1994 (MNHL).

*Répartition géographique.* Espèce cosmopolite.

### 4. *Pseudosinella albida* (Stach, 1930) sensu Stomp, 1971

*Matériel étudié.* MOLDAVIE: Bahmut, forêt mixte, 6 exemplaires (alcool), 06.2003 (MEC); Lozova, forêt de *Fagus*, 4 exemplaires (prép.), 10.1997 (MEC).

*Taxonomie.* Cette espèce possède 5 + 5 yeux et les caractères chétotaxiques suivants: Macrochètes dorsaux: R111/10/0101+2. Chétotaxie de l'abd. II: p a B q<sub>1</sub> q<sub>2</sub>. Base du labium: M r E L<sub>1</sub> L<sub>2</sub>. Dans tous les exemplaires la soie accessoire "s" est absente.

*Répartition géographique.* Cette espèce était connue seulement de trois pays méditerranéens (Espagne, Grèce, Italie) et maintenant elle a été trouvée dans la Moldavie.

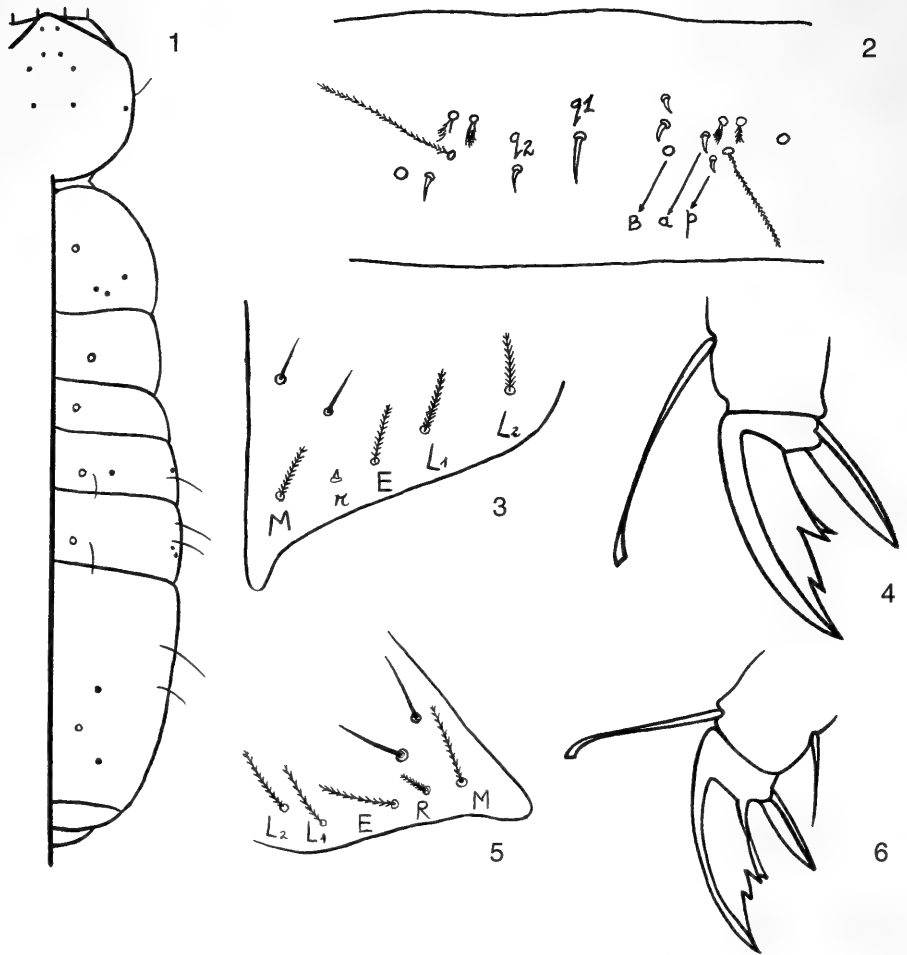
### 5. *Pseudosinella imparipunctata* Gisin, 1953

*Matériel étudié.* MOLDAVIE: Crocmaz, verger de pommiers, 1 exemplaire (alcool), 06.2003 (MEC); Cruglic, plantation de *Robinia pseudoacacia*, 3 exemplaires (alcool), 06.2003 (MEC); Durlesti forêt mixte, 5 exemplaires (prép.), 07.1993, 06.1995, 05.1995 (MEC); Soroça, forêt mixte, 1 exemplaire (alcool), 06.2003 (MEC); Tabara, plantation de *Robinia pseudoacacia*, 1 exemplaire (alcool), 07.2003 (MEC).

*Répartition géographique.* Espèce européenne.

### 6. *Pseudosinella octopunctata* Börner, 1901

*Matériel étudié.* MOLDAVIE: Budjac, steppe réserve, 12 exemplaires (alcool), 08.2003 (MEC); Chisinau, plantation de *Robinia pseudoacacia*, 1 exemplaire (alcool), 06.2003 (MEC);



FIGS 1-6

1-4. *Pseudosinella pygmaea* sp. n. 1. Répartition des macrochètes, des trichobothries et des pseudopores dorsaux. 2. Chétotaxie dorsale de l'abd. II, côté gauche. 3. Chétotaxie de la base du labium, côté gauche. 4. Griffes III, face antérieure. 5-6. *Pseudosinella variabilis* sp. n. 5. Chétotaxie de la base du labium, côté droit. 6. Griffes III, face antérieure.

Cruglic, plantation de *Robinia pseudoacacia*, 1 exemplaire (alcool), 06.2003 (MEC); Malovata, forêt mixte, 3 exemplaires (alcool), 06.2003 (MEC); Visinevca, plantation de *Robinia pseudoacacia*, 8 exemplaires (alcool), 08.2003 (MEC). UKRAINE: Vrublivca, steppe réserve, 2 exemplaires (prép.), 06.1995, 05.1998 (MNHL).

*Répartition géographique.* Espèce cosmopolite.

### 7. *Pseudosinella horaki* Rusek, 1985

*Matériel étudié.* MOLDAVIE: Bahmut, forêt mixte, 1 exemplaire (alcool), 06.2003 (MEC); Cimislia, forêt mixte, 1 exemplaire (alcool), 08.2003 (MEC); Lozova, réserve forestière, 11 exemplaires (alcool), 08.2003 (MEC). UKRAINE: Vrublivca, forêt d'*Acerum*, 4 exemplaires (prép.), 06.1994 (MNHL); Ugolica, 8 exemplaires (prép.), 07.1991 (MNHL).

*Répartition géographique.* Hongrie, Moldavie, Pologne, République Slovaque, République Tchèque et Ukraine.

#### 8. *Pseudosinella moldavica* Gama & Busmachiu, 2002

*Matériel étudié.* MOLDAVIE: Bahmut, forêt mixte, 3 exemplaires (alcool), 06.2003 (MEC); Causani, plantation de *Robinia pseudoacacia*, 3 exemplaires (alcool), 07.2003 (MEC); Cruglic, plantation de *Robinia pseudoacacia*, 3 exemplaires (alcool), 06.2003 (MEC); Sipoteni, plantation de *Robinia pseudoacacia*, 4 exemplaires (alcool), 06.2003 (MEC); Tigheci, forêt mixte, 5 exemplaires (prép.), 07.1993, 06.1995, 05.1995 (MEC). UKRAINE: Vrublivca, plantation de *Robinia pseudoacacia*, 6 exemplaires (prép.), 06.1995 (MNHL); forêt d'*Acerum*, 9 exemplaires (prép.), 06.1994 (MNHL); steppe réserve, 3 exemplaires (prép.), 05.1998 (MNHL).

*Répartition géographique.* Moldavie et Ukraine.

#### 9. *Pseudosinella simpatica* Gama & Busmachiu, 2002

*Matériel étudié.* MOLDAVIE: Durlesti, forêt mixte, 5 exemplaires (prép.), 10.1995 (MEC).

*Répartition géographique.* Moldavie.

#### 10. *Pseudosinella codri* Gama & Busmachiu, 2002

*Matériel étudié.* MOLDAVIE: Bahmut, forêt mixte, 5 exemplaires (prép.), 04.2001 (MEC).

*Répartition géographique.* Moldavie.

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## Two new genera of Zodariidae (Araneae) from Southeast Asia

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**Two new genera of Zodariidae (Araneae) from Southeast Asia.** - Two new genera of Zodariidae, belonging to the Zodariinae and strongly related to *Mallinella* Strand, are reported from evergreen forests in Thailand and Malaysia. *Euryeidon* gen. n. is represented by six species, all of which are new: *E. monticola* sp. n. (the type species; ♂ ♀), *E. musicum* sp. n. (♂ ♀), *E. anthonyi* sp. n. (♂ ♀), *E. sonthichaiiae* sp. n. (♂), *E. consideratum* sp. n. (♀) and *E. schwendingeri* sp. n. (♀). The genus is characterized by its strongly reticulate carapace and widely spaced eyes. *Heradion* gen. n. is represented by five new species, all known from both sexes, which can be clustered in two species groups on the base of somatic characters. The first group, found in Thailand, consists of *Heradion naiadis* sp. n. (the type species) and *H. peteri* sp. n. The second group is restricted to Malaysia and consists of three smaller, long-legged species: *H. pernix* sp. n., *H. damrongi* sp. n. and *H. luctator* sp. n. *Heradion* is characterized by: carapace smooth, domed; chilum drawn out into a point, pointing forward; sternum with anterior concavity accommodating labium; sclerotized field in front of the spinnerets with rows of hairs; femora inflated dorsally near proximal dorsal spine; coxae I and IV elongated. Keys to the genera of Zodariinae in Southeast Asia and to the species of *Euryeidon* and *Heradion* are provided.

**Keywords:** *Euryeidon* - *Heradion* - new genera - new species - taxonomy - zoogeography - Thailand - Malaysia.

### INTRODUCTION

Zodariidae Thorell is a medium-sized family represented by 60 genera and 608 species (Platnick, 2004), which has its main distribution centers in Africa and Australia. Nonetheless, there are significant taxonomic inventory data gaps in our knowledge of the Zodariidae in Southeast Asia as a whole. This region appears to be very poor in zodariids as compared to the tropical areas in Africa and Australia, and only four genera have been listed (Jocqué, 1991; Murphy & Murphy, 2000): *Asceua*

Thorell, *Mallinella* Strand, *Storenomorpha* Simon and *Zodarion* Walckenaer, with the latter represented by a doubtful record from the Philippines. This information obviously represents only a small proportion of zodariid genera likely to occur in the region. The data for Thailand and Malaysia in particular are even more scant. Only one species, *Storenomorpha reinholdae* Jocqué & Bosmans, has been recorded from Thailand (Jocqué & Bosmans, 1989) and two species of *Storena* Walckenaer, *S. cinctipes* Simon 1893 and *S. obnubila* Simon 1901, were reported from Malaysia (Platnick, 2004). The latter two do certainly not belong in *Storena*, which is a purely Australian genus (Jocqué & Baehr, 1992), and they will probably turn out to belong either to *Asceua* or *Mallinella*. Both new genera described here are represented by species with clear preference for humid tropical forests, as it is also the case in *Mallinella* species to which they appear to be closely related. These findings once more indicate that the forest floor fauna of Southeast Asia is still very superficially known and recent field work in the area (unpublished data) has yielded more undescribed supraspecific taxa.

## MATERIAL AND METHODS

All specimens were collected in the leaf litter layer of evergreen tropical forests.

The illustrations were made with an Olympus SZX-9 stereomicroscope equipped with a drawing tube. Measurements of leg segments were taken from the dorsal side. Epigynes were drawn in natural and cleared state (immersing in lactic acid for 10-20 minutes). Male palps were drawn in lateral and ventral view. Structures examined with the scanning electron microscope (JEOL LV-5400) were critical point dried, stud-mounted and sputter coated for observation and photography. Characters given in the generic diagnoses are for the most part not repeated in the species descriptions. All measurements are in millimetres.

The material examined is deposited in the collections of the Muséum d'histoire naturelle, Genève (MHNG) and the Entomology Department of the Koninklijk Belgisch Instituut voor Natuurwetenschappen (KBIN), except for the specimens marked with PDC (Pakawin Dankittipakul Collection, Auckland, New Zealand), which will later be deposited in the MHNG.

Abbreviations used in the text and in the figures: ALE, anterior lateral eyes; ALS, anterior lateral spinnerets; AME, anterior median eyes; CP: central plate of epigyne; DA: distal tegular apophysis; DTA: dorsolateral tibial apophysis; LE, lateral eyes; MA: median apophysis; MAP, major ampulatte spigots; ME, median eyes; MOQ, median ocular quadrangle; PA: patellar apophysis; PE, prolateral extension of cymbium; PER, posterior eyes row; PLE, posterior lateral eyes; PME, posterior median eyes; RTA: retrolateral tibial apophysis. Spination: d, dorsal; disp, dispersed, not in obvious rows; pl, prolateral; rl, retrolateral; v, ventral. Arrangement refers to number of spines from proximal to distal part.

## TAXONOMY

### KEY TO THE GENERA OF SOUTHEAST ASIAN ZODARIINAE

- 1 Small spiders (<4.5 mm) without ventral abdominal spines in front of spinnerets; cymbium of male palp laterally compressed, with large retrolateral fold; epigynal ducts long and strongly tortuous . . . . . *Asceua* Thorell

- Usually larger spiders, with one or more transverse rows of ventral abdominal spines in front of spinnerets; cymbium without large retro-lateral fold . . . . . 2
- 2 Single row of spines in front of spinnerets . . . . . *Mallinella* Strand
- More than one row of spines in front of spinnerets . . . . . 3
- 3 Cephalothorax strongly reticulate; LE far from ME; anterior margin of sternum straight . . . . . *Euryeidon* gen. n.
- Cephalothorax smooth, LE close to ME; anterior margin of sternum with concavity accommodating labium . . . . . *Heradion* gen. n.

***Euryeidon* gen. n.**

*Type species. Euryeidon monticola* sp. n.

*Diagnosis.* *Euryeidon* species are characterized by a strongly domed and coarsely granular carapace (Fig. 1), by a wide eye field in which the LE are situated far apart from the ME (Fig. 20), and by the presence of a ventral abdominal plate in front of the spinnerets (Fig. 2) which carries a field of short spines decreasing in length towards the front (Fig. 3). The palp (Figs 7, 8) is characterized by a cymbium with a prolateral extension (Fig. 13, PE), the embolic base is clearly separated from the tegulum (as in the palp of *Forsterella* Jocqué) and the median apophysis is very simple. Females have a simple epigyne with a median spermatheca of variable shape (Figs 15, 26, 33, 41), and long, coiled, strongly sclerotized spermathecae connected by a transverse band (Figs 16, 17).

*Etymology.* *Euryeidon* is a combination of εὐρύς (Greek prefix: wide) and εἶδον (Greek: to look), and refers to the position of the median and lateral eyes which are situated far apart from each other. The gender is neuter.

*Description.* Medium-sized (5-9 mm) spiders. Carapace (Figs 18, 19) lengthways oval, in profile strongly domed with its highest point just in front of fovea (Fig. 1), more strongly raised in larger specimens. Cervical groove absent. Tegument densely granular (Fig. 1), provided with a marked but shallow median groove running from between PME to the short, longitudinal fovea.

Coloration: carapace usually reddish brown to dark chestnut-brown, in some species orange or pale brown. Chelicerae brown. Sternum orange-brown. Legs pale yellow to brown; femora usually dark brown, remaining leg articles mostly paler than femora. Abdomen (Figs 18, 19) dark sepia with a typical pattern of pale spots and stripes, rarely pale or without dorsal pattern (Fig. 37).

Eight eyes arranged in two rows, both rows strongly procurved (Fig. 20). All eyes subequal in size, circular, pale except for dark AME. AME less than their diameter apart, separated from ALE by almost twice their diameter. PME more than their diameter apart, about 3 times that distance away from PLE. MOQ slightly longer than wide and usually wider behind than in front. Clypeus rather high, 3 to 6 times the diameter of ALE, bulging, covered with setae.

Chilum a single sclerite, drawn out into a point, projecting forward (Fig. 20). Chelicerae (Fig. 20) tapering, sparsely hirsute but with a distinct distomesal group of hairs; condyle well-developed; promargin with 2 small teeth; fangs short and thick. Maxillae (Fig. 21) with anteromesal fringe of hairs. Labium triangular, with constrict-

ted base. Sternum roughly triangular, elevated; margins with short extensions fitting into coxal concavities, posterior part of the sternum protruding between coxae IV (Fig. 21). Small pleurites present.

Leg formula 4123. Spination: few spines on legs I and II, more on legs III and IV. Femora with 1-3 dorsal spines, inflated near proximal dorsal spine. Stridulating ridges present on femora I (Fig. 5), absent on other legs (Fig. 6). Patellae with single, short prolateral spine on posterior legs. Anterior legs with few spines on tibiae and metatarsi, posterior legs with numerous spines. Ventral tuft of metatarsal preening brush with modified chisel-shaped hairs (Fig. 10). Tarsal organ capsulate (Fig. 11). Bothria simple, with a long crescent-shaped ridge (Fig. 12). No claw tufts and no hinged hairs present.

Abdomen oval, covered with numerous fine hairs; prolateral sigilla strongly developed; pedicel sclerotized (Fig. 18). Males with a pale brown dorsal scutum. Six spinnerets (Figs 2, 4); anterior pair long, conical, biarticulate; posterior and median pairs much smaller and shorter. Ventral abdominal plate (Figs 2, 3) slightly sclerotized, situated in front of spinnerets. Colulus represented by few hairs.

Male palp: tibia (Fig. 14) usually with dark retrolateral apophyses; sometimes with additional dorsolateral apophysis. Cymbium provided with long prolateral extension (Fig. 13, PE); few spines on apex; dorsolateral surface of cymbium clothed with thick patch of chemoreceptive hairs (Figs 8, 9); cymbial fold situated proximally on retrolateral side. Subtegulum well-developed. Tegulum with two apophyses: terminal or distal apophysis blunt, projecting outward; median apophysis simple, rising from membranous base. Posterior part of bulbus covered by embolic base, the latter clearly separated from rest of tegulum. Embolus variable in shape, from broad and massive to slender and whip-like, originating from posterior part of embolic base, forming half a loop.

Epigyne simple, provided with a median plate of variable shape (Figs 15, 26, 33, 41); copulatory ducts strongly sclerotized, long and coiled, leading to widely separated posterior spermathecae interconnected by wide, sometimes sclerotized band (Figs 16, 29, 34, 40, 42).

*Species included.* *Euryeidon anthonyi* sp. n., *E. consideratum* sp. n., *E. monticola* sp. n., *E. musicum* sp. n., *E. schwendingeri* sp. n. and *E. sonthichaiiae* sp. n.

*Distribution.* Evergreen hill forests of northern Thailand.

#### Key to the species of *Euryeidon* gen. n.

- |   |  |                         |
|---|--|-------------------------|
| 1 | ♂ ♂ .....  | 2                       |
| - | ♀ ♀ .....  | 5                       |
| 2 | Palpal patella with dorsal apophysis; RTA short, pointed, triangular in lateral view (Fig. 31) ..... | <i>E. anthonyi</i>      |
| - | Palpal patella without dorsal apophysis; RTA bifid or elongate .....                                 | 3                       |
| 3 | Palpal tibia with dorsal apophysis; RTA long and tapered (Fig. 14) .....                             | <i>E. monticola</i>     |
| - | Palpal tibia without dorsal apophysis; RTA bifid .....   | 4                       |
| 4 | Dorsal prong of RTA much longer than ventral one (Fig. 36) ..  | <i>E. sonthichaiiae</i> |



- Prongs of RTA of similar length or dorsal one slightly shorter than ventral one (Fig. 23) . . . . . *E. musicum*
- 5 Abdomen with a pair of pale patches following by rows of transverse bands (Fig. 19) . . . . . 6
- Abdomen with three pairs of pale spots following by rows of transverse bands (Fig. 38) . . . . . *E. consideratum*
- 6 Epigyne plate almost twice as long as wide . . . . . 7
- Epigyne plate not more than 1.5 times longer than wide . . . . . 8
- 7 Epigyne plate tapered with posterior margin rounded (Fig. 15) . . *E. monticola*
- Epigyne plate roughly triangular, posterior margin with short central extension (Fig. 33) . . . . . *E. anthonyi*
- 8 Epigyne plate as long as wide, slightly broader in front than behind (Fig. 41) . . . . . *E. schwendingeri*
- Epigyne slightly longer than wide, posterior end rounded (Fig. 26) . . . . . *E. musicum*

***Euryeidon monticola* sp. n.**

Figs 1-21

*Type material.* HOLOTYPE: ♂, THAILAND: Chiang Mai Province, Chomthong District, Doi Inthanon National Park, Doi Inthanon, 1000 m, pitfall trap, 25.I.-26.II.2000, leg. S. Sonthichai & P. Dankittipakul (MHNG).

PARATYPES: THAILAND: Chiang Mai Province, Doi Suthep-Pui National Park, Doi Suthep, 1400 m: 1 ♀, leaf litter sample, 13.II.1986, KBIN, leg. P. J. Schwendinger. Doi Suthep, 1180 m: 1 ♀, pitfall trap, 2.I.-1.III.1987 (MHNG); 2 ♂, pitfall trap, 4.XII.1986-2.I.1987 (MHNG); 2 ♂, pitfall trap, 2.VII.-2.VIII.1987 (MHNG); 1 ♂, pitfall trap, 18.III.-22.IV.1986 (MHNG); 1 ♂, 19.II.-18.III.1986 (MHNG); 1 ♂, pitfall trap, 18.I.-19.II.1986 (MHNG); 1 ♂, pitfall trap, 30.III.-28.IV.1987 (MHNG); 1 ♂, pitfall trap, 3.XI.-4.XII.1986 (MHNG); 1 ♂, pitfall trap, 28.IV.-30.V.1987 (MHNG); 1 ♂, pitfall trap, 1.III.-30.III.1987 (MHNG); 2 ♂, pitfall trap, 30.XI.-14.XII.1996 (KBIN); 1 ♂, pitfall trap, 14.XII.1996-10.I.1997 (KBIN); 1 ♂, 3.XII.1987-3.I.1988 (KBIN). All latter specimens leg. P. J. Schwendinger. Doi Suthep, 1150 m: 5 ♂, pitfall trap, 10.I.-11.II.1997 (KBIN), leg. P. J. Schwendinger. Doi Suthep, 960 m: 1 ♂, pitfall trap, 2.I.-5.III.1987 (PDC ZD0015); 1 ♂, pitfall trap, 5.III.-4.IV.1987 (PDC ZD0016). All leg. P. J. Schwendinger. Chiang Mai Province, Chiang Dao District, Doi Chiang Dao, Huay Mae Kok, 1500 m: 1 ♀, leaf litter sample, 27.I.1996, leg. P. J. Schwendinger (PDC ZD0017). Doi Inthanon, 1000 m: 6 ♂, 1 ♀, same data as for holotype (PDC ZD0018-0023); 2 ♂, pitfall trap, 25.XII.1999-25.I.2000 (PDC ZD0024-0025); 1 ♂, leaf litter sample, 15.II.2000 (PDC ZD0026). All latter specimens leg. S. Sonthichai & P. Dankittipakul.

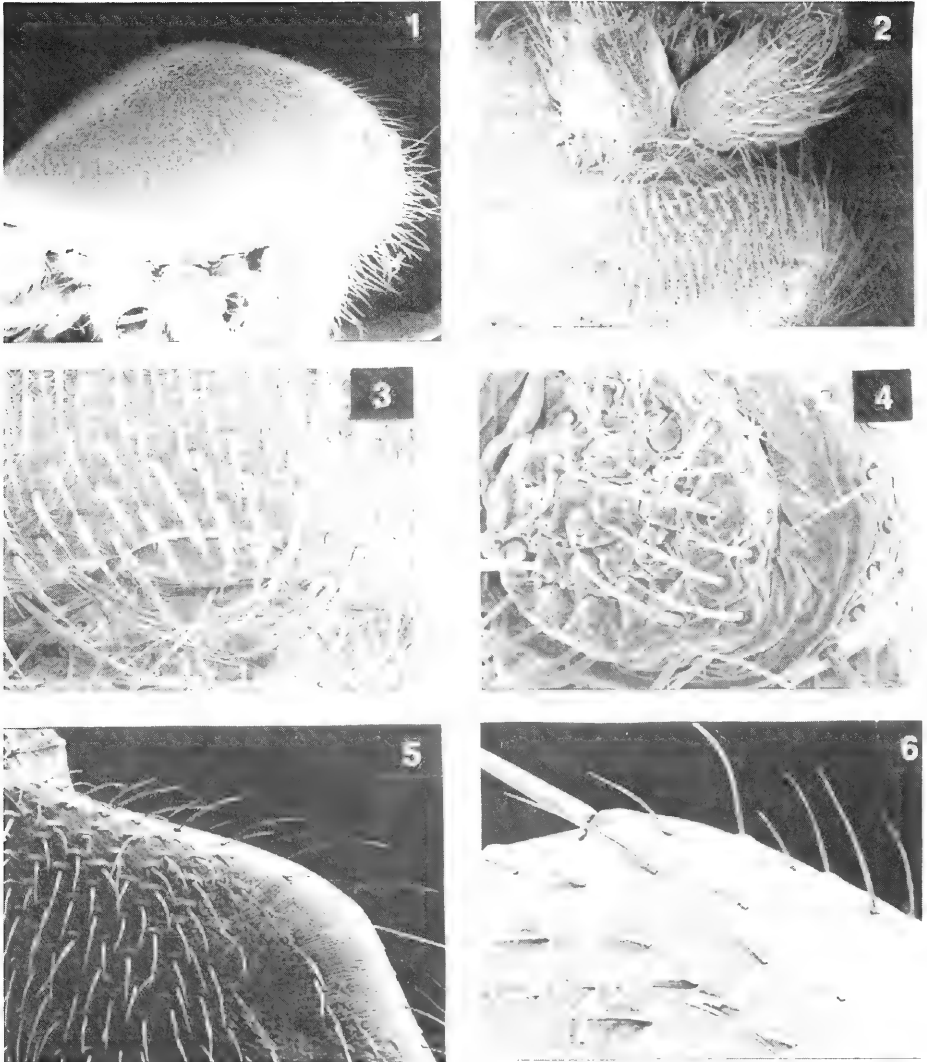
*Other material.* Doi Suthep, 1180 m, 1 ♀, 2.I.-1.III.1987, leg. P. Dankittipakul (PDC ZD00-ex-1).

*Diagnosis.* Males of *E. monticola* sp. n. can be recognized by the broad and massive embolus with swollen embolic tip (Figs 7, 13), the large dorsolateral tibial apophysis with sharp and pointed apex (Fig. 14). Females can be distinguished by the relatively long, tongue-shaped central plate (Fig. 15) of epigyne. *Euryeidon monticola* is the largest of the species so far included in the genus.

*Etymology.* Latin, *monticola* is a noun in apposition for mountain dweller and refers to the habitat in which the spiders were found.

*Description.* ♂ (holotype). Total length 6.67. Carapace 3.31 long, 2.36 wide. Abdomen 3.36 long, 2.38 wide.

Coloration and pattern: carapace coarsely granular. Carapace and chelicerae dark reddish brown, short pubescent on cephalic part, none on thoracic part. Sternum

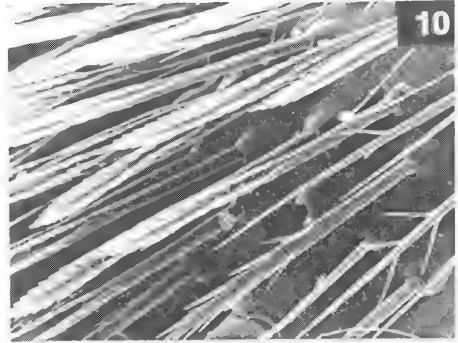
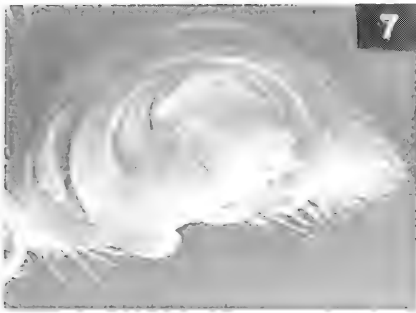


FIGS 1-6

*Euryeidon monticola* gen. n., sp. n. Carapace, lateral view (1). Ventral abdominal plate in front of spinnerets (2). Ditto, detail (3). ALS (4). Stridulating ridges on dorsal side of femur I (5). Dorsolateral side of femur II without stridulating ridge (6).

reddish brown. Legs segments brown except for orange-brown coxae. Abdomen dark sepia, almost black, covered with fine white hairs; dorsum (Fig. 18) with two pairs of pale round spots, followed by a series of chevrons; venter sepia, with 2 pale spots, relatively large; sides with 3 oblique bands. Dorsal scutum brown.

Eye sizes and interdistances: AME 0.20, ALE 0.17, PME 0.15, PLE 0.17; AME-AME 0.07, AME-ALE 0.33, PME-PME 0.15, PME-PLE 0.51, ALE-PLE 0.05; MOQ 0.46 long, front width 0.46, back width 0.43. Clypeus 0.51 high.



FIGS 7-12

*Euryeidon monticola* gen. n., sp. n. Male palp, ventral view (7). Ditto, prolateral view (8). Chemoreceptive hairs (9). Modified hairs of preening bush (10). Tarsal organ (11) on leg I. Trichobothrium (12) on tarsus IV.

Dorsal scutum covering half of abdomen length.

Leg measurements:

	I	II	III	IV
Femur	1.94	1.73	1.73	2.21
Patella	0.78	0.78	0.78	0.84
Tibia	1.68	1.42	1.21	1.68

Metatarsus	1.47	1.42	1.47	2.10
Tarsus	1.31	1.10	0.89	1.31
Total	7.21	6.47	6.10	8.15

Spination: femora I d2 II d2 III d3 IV d3; patellae III pl3 IV pl3; tibiae I v2-2 II v2-1-2 III d3 pl2 rl3 v2-2-2 IV d3 pl3 rl2 v2-2-2; metatarsi I v1-2 II v1-2 III pl1 rl1 v1-2 IV pl3 rl1 v1-1.

Male palp (Figs 7, 8, 13, 14): palpal tibia with strong retrolateral swelling and two tibial apophyses: dark retrolateral one with slightly indented tip; dorsolateral one stout, sharp, strongly tapered. Cymbium rather broad, longer than wide, dorsally convex; dorsolateral area provided with thick patch of chemoreceptive hairs; cymbial fold broad, moderately high. Tegulum with blunt anterior tegular apophysis originating from distal part, truncated in lateral view; large, simple, J-shaped median apophysis situated on membranous base. Subtegulum well-developed, clearly visible in prolateral view. Embolus broad and massive, ending in a swollen, partly membranous tip.

♀ (paratype). Total length 7.88. Carapace 3.57 long, 2.36 wide. Abdomen 4.31 long, 3.42 wide.

Coloration and pattern: carapace less granular than in males, covered with short fine setae running from clypeal rim toward PER. Carapace and chelicerae orange-brown. Sternum orange. Legs yellow except for slightly darker femora. Abdomen (Fig. 19) dark sepia, mottled with small, round pale spots; dorsum with two large pale patches followed by a series of pale chevrons; venter as in males.

Eye sizes and interdistances: AME 0.17, ALE 0.17, PME 0.12, PLE 0.17; AME-AME 0.07, AME-ALE 0.56, PME-PME 0.15, PME-PLE 0.76, ALE-PLE 0.10; MOQ 0.23 long, front width 0.38, back width 0.41. Clypeus 0.64 high.

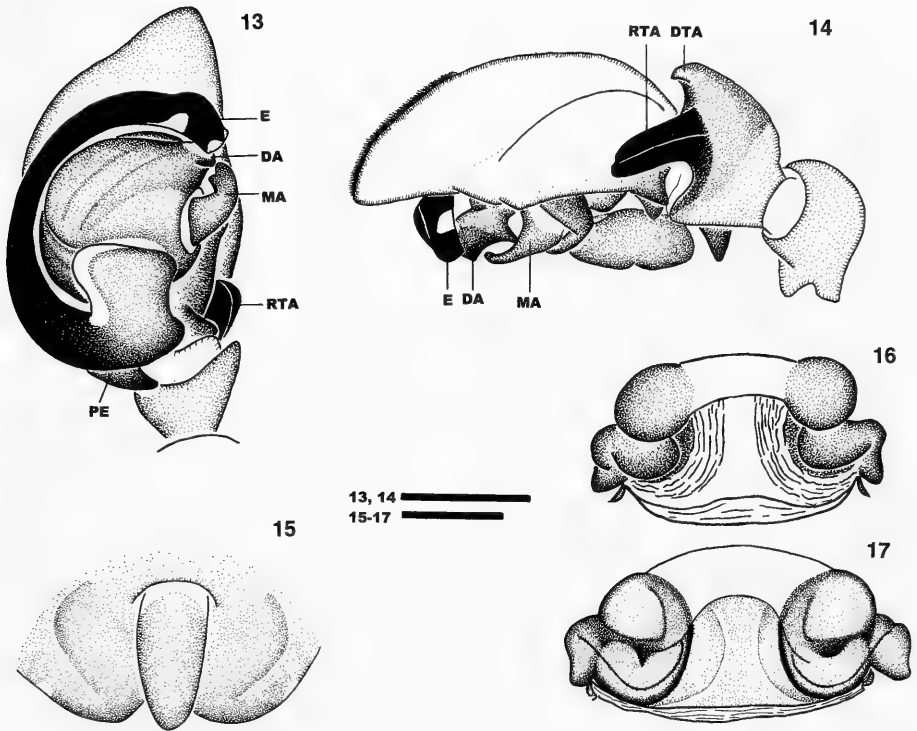
Leg measurements:

	I	II	III	IV
Femur	1.84	1.73	1.73	2.51
Patella	0.89	0.84	0.84	0.89
Tibia	1.57	1.31	1.21	1.73
Metatarsus	1.31	1.31	1.52	2.10
Tarsus	1.31	1.15	1.05	1.36
Total	6.94	6.36	6.36	8.26

Spination: femora I d2 II d2 III d2 IV d3; patellae III pl1 IV pl1; tibiae I v2-2 II v2-2-2 III d3 pl2 rl3 v2-2-2 IV d3 pl2 rl3 v2-2-2; metatarsi I v2-2-2 II v2-2-2 III d7 disp. v4 disp. IV d7 disp. v3 disp.

Epigyne (Fig. 15): central plate tongue-shaped (Fig. 15) Copulatory ducts broad, leading to large, elongate, coiled spermathecae (Figs 16, 17). Tongue-shaped central plate broken and only its proximal part remaining in most females examined.

*Variation.* The color of the carapace varies from dark brown, dark chestnut-brown, reddish brown to orange; the color of the abdomen ranges from black, dark sepia to pale brown; the color of legs ranges from brown, yellowish brown to yellow. The tip of the dorsolateral tibial apophysis varies from blunt to sharp, pointing upward or slightly curved downward. The connection between left and right spermathecae is of variable consistence, from membranous to strongly sclerotized.



FIGS 13-17

*Euryeidon monticola* gen. n., sp. n., ♂ holotype (13, 14) and ♀ paratype (15-17). Male palp, ventral (13) and lateral (14) view. Epigyne, ventral view (15). Internal structure of epigyne, normal (16) and cleared (17) state. Scale lines: 0.5 mm (13, 14); 1.0 mm (15-17).

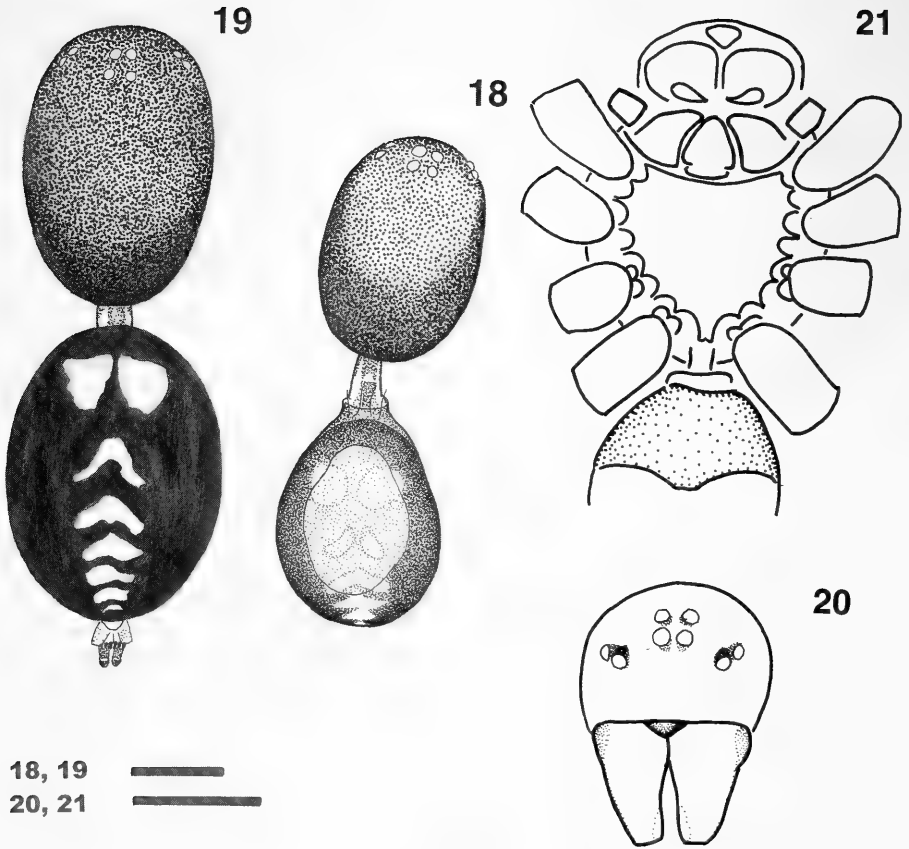
*Distribution and habitat.* *Euryeidon monticola* sp. n. inhabits damp evergreen hill forests at altitudes between 960 and 1610 m in the Doi Suthep-Pui National Park, Doi Inthanon National Park and Doi Chiang Dao Wildlife Sanctuary, all in Chiang Mai Province, northern Thailand. Several spiders were found walking on the forest floor.

***Euryeidon musicum* sp. n.**

Figs 22-29

*Type material.* HOLOTYPE: ♂, THAILAND: Chiang Mai Province, Chiang Dao District, Chiang Dao Wildlife Sanctuary, Pha Tang, evergreen riverine forest, 510 m, pitfall trap, 23.XI.-22.XII.1990, leg. P. J. Schwendinger (MHNG).

PARATYPES: THAILAND: Chiang Mai Province, Chiang Dao District: 2♀, Doi Chiang Dao Wildlife Research Station, 510 m, leaf litter sample, 12-15.VII.2002, leg. S. Sonthichai & P. Dankittipakul (MHNG); 1♀, Tham Klaeb, evergreen riverine forest near cave entrance, 570 m, 14.XII.2002, leg. P. J. Schwendinger & P. Dankittipakul (KBIN). Fang District: 1♀, evergreen forest at 750 m, road to Doi Ang Khang, 30.IX.1987, leg. P. J. Schwendinger (MHNG); 2♂, data as for holotype (MHNG); 1♂, 1♀, data as for holotype, 22.IX.-25.X.1990 (KBIN).



FIGS 18-21

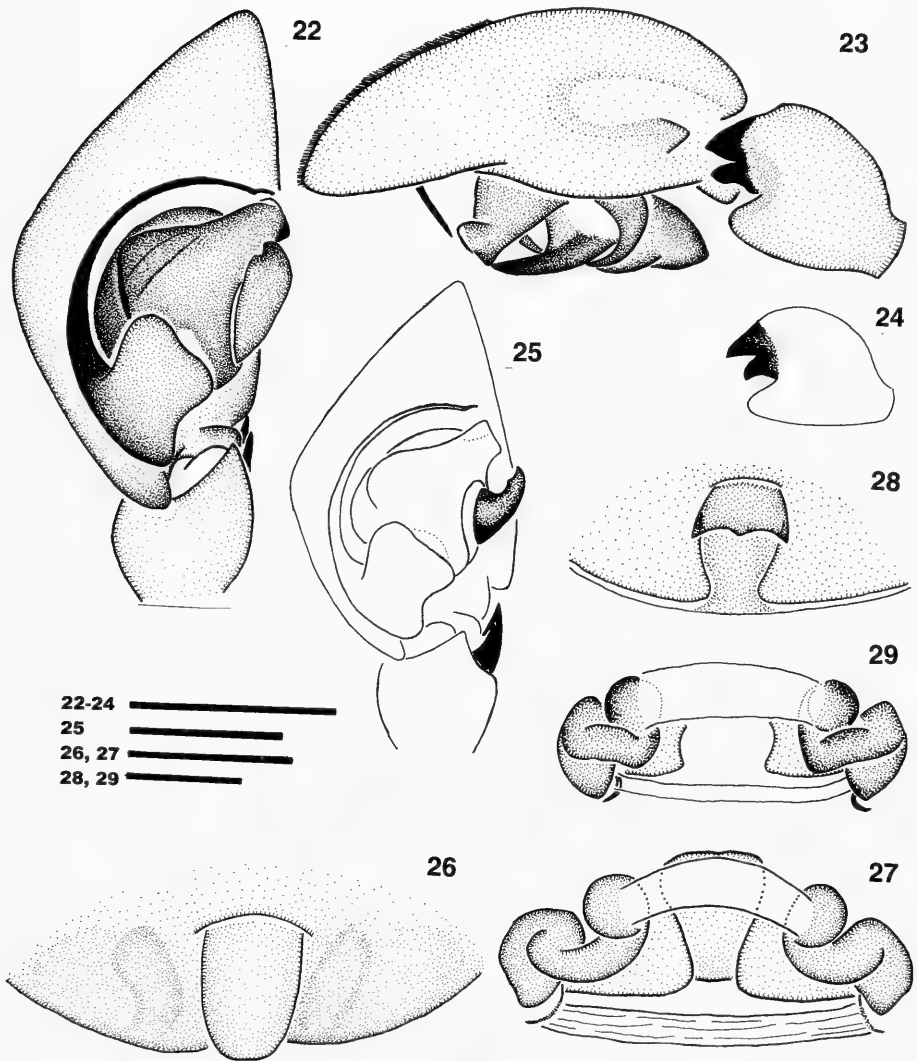
*Euryeidon monticola* gen. n., sp. n., ♂ holotype (18, 20, 21) and ♀ paratype (19). Body of male, dorsal view (18). Body of female, dorsal view (19). Carapace of male, frontal view (20). Sternum, labium and maxillae (21). Scale lines: 1.0 mm (18-21).

**Diagnosis.** Males of *E. musicum* sp. n. can be recognized by the bifid retro-lateral tibial apophysis (Figs 23, 24), by the absence of a dorsolateral tibial apophysis, by the triangular shape of the cymbium and by the slightly upturned embolic tip (Fig. 22). Females have a typical more or less quadrangular central plate on the epigyne (Fig. 26).

**Etymology.** Latin, *musicus* means 'musical' and refers to the stridulating organ of this species which is rare in Zodariidae; a femoral stridulating organ was unknown in spiders until recently (Jocqué, in press).

**Description.** ♂ (holotype). Total length 5.36. Carapace 2.84 long, 1.84 wide. Abdomen 2.52 long, 1.84 wide.

**Coloration and pattern:** carapace coarsely granular, covered with short fine hairs in cephalic area. Carapace and chelicerae brown. Sternum orange-brown. Legs



FIGS 22-29

*Euryeidon musicum* gen. n., sp. n., ♂ holotype (22, 23), ♂ paratype (24, 25) and ♀ paratype (26-29). Male palp, ventral (22, 25) and lateral (23) view. Palpal tibia (24). Epigyne, ventral view (26, 28). Internal structure of epigyne (27, 29). Scale lines: 1.0 mm.

yellowish brown. Abdomen dark sepia, with yellowish brown dorsal scutum overlaying a pair of small, pale patches, followed by a series of chevrons; venter with 2 white patches.

Eye sizes and interdistances: AME 0.17, ALE 0.13, PME 0.12, PLE 0.12; AME-AME 0.06, AME-ALE 0.25, PME-PME 0.07, PME-PLP 0.43, ALE-PLP 0.05; MOQ 0.43 long, front width 0.44, back width 0.35. Clypeus 0.35 high.

## Leg measurements:

	I	II	III	IV
Femur	1.58	1.48	1.44	1.79
Patella	0.68	0.72	0.65	0.68
Tibia	1.37	1.06	0.89	1.37
Metatarsus	1.10	1.03	1.24	1.79
Tarsus	1.03	0.96	0.75	1.10
Total	5.79	5.27	5.00	6.75

Spination: femora I d2 II d2 III d2 IV d3; patellae III pl1 IV pl1; tibiae I v2-1-1-2 II v2-2-1 III d2-1-1 pl2 r12 v2-2-2 IV d1-1-1 pl2 r12 v2-1-1-2; metatarsi II v2-2 III d2-1 pl2 r12 v1-2 IV d2-1-1-1 v2-2.

Male palp (Figs 22-25): palpal tibia with bifid retrolateral tibial apophysis, lower tip with medially concave ventral side and smaller than superior triangular tip (Figs 23-25). Cymbium triangular, provided with dorsolateral patch of chemoreceptive hairs; basolateral fold relatively broad. Tegulum with distal tegular apophysis truncate, pointing laterad; median apophysis simple, with indented border (Fig. 22). Subtegulum clearly visible in prolateral view. Embolus slender, describing half a loop; embolic tip curved upward ending near distal tegular apophysis without touching it.

♀ (paratype). Total length 8.36. Carapace 3.89 long, 2.52 wide. Abdomen 4.47 long, 3.36 wide.

Coloration and pattern: carapace lightly granular, covered with short fine setae. Carapace and chelicerae yellowish brown. Sternum pale brown. Legs pale green. Abdomen sepia; dorsum with pair of pale patches followed by series of pale chevrons.

Eye sizes and interdistances: AME 0.12, ALE 0.17, PME 0.12, PLE 0.16; AME-AME 0.10, AME-ALE 0.48, PME-PME 0.12, PME-PLE 0.64, ALE-PLE 0.10; MOQ 0.51 long, front width 0.41, back width 0.43. Clypeus 0.58 high.

## Leg measurements:

	I	II	III	IV
Femur	1.96	1.89	1.86	2.34
Patella	0.89	0.93	0.93	0.93
Tibia	1.69	1.31	1.24	1.79
Metatarsus	1.44	1.37	1.55	2.31
Tarsus	1.37	1.31	1.06	1.51
Total	7.37	6.82	6.65	8.89

Spination: femora I d2 II d2 III d2 IV d3; patellae III pl1 IV pl1; tibiae I v2-1-1-2 II v2-1-1-2 III d2-1-1-1 pl2 r12 v2-1-1-2 IV d3 pl2 r12 v2-1-1-1-2; metatarsi I v3-1-1-1 II v3-1-1-2 III d2 v1 IV d2 pl2 v3-2-1.

Epigyne (Figs 26, 28): central plate quadrangular. Internal structure as in Figs 27 and 29.

*Remarks.* In most female paratypes the tongue-shaped central plate is broken off and only its proximal part remains (Fig. 28). A living female specimen collected by Schwendinger & Dankittipakul had a dark sepia carapace, a blackish sepia abdomen and dark greenish legs (possibly newly moulted). After preservation in alcohol the



coloration changed: the abdomen became sepia, the femora and tibiae remained greenish, with pale, almost white apical parts, metatarsi became pale and tarsi brown.

*Variation.* Median apophysis and retrolateral tibial apophysis of male palps vary slightly in shape (Figs 22 vs. 25; Figs 23 vs. 24). The internal structure of the epigyne also varies to some extent (Figs 27, 29).

*Distribution and habitat.* Fang and Chiang Dao Districts, Chiang Mai Province. *Euryeidon musicum* sp. n. is a lowland species which occurs in mixed deciduous dipterocarp forests and evergreen riverine forest between 500-750 m elevation.

***Euryeidon anthonyi* sp. n.**

Figs 30-34

*Type material.* HOLOTYPE: ♂, THAILAND: Chiang Mai Province, Chiang Dao District, Chiang Dao Wildlife Sanctuary, Pha Tang, near a stream in evergreen riverine forests, 510 m, pitfall trap, 22.IX.-25.X.1990, leg. P. J. Schwendinger (MHNG).

PARATYPES: ♀, same data as for holotype (MHNG).

*Diagnosis.* *Euryeidon anthonyi* sp. n. clearly differs from other members of *Euryeidon* in having a smooth carapace; abdomen without dorsal pattern; legs long and slender; abdomen of male covered with a small, lightly sclerotized dorsal area instead of a large, strongly sclerotized dorsal scutum; male palpal patellae possessing a pointed dorsal apophysis (Figs 31, 32); spermathecae clearly defined, long and coiled; ventral abdominal plate in front of spinnerets lightly sclerotized but clearly visible.

*Etymology.* The specific name is a patronym dedicated to Anthony Osa, Auckland, New Zealand.

*Description.* ♂ (holotype). Total length 5.57. Carapace 3.0 long, 2.05 wide. Abdomen 2.57 long, 1.94 wide.

Coloration and pattern: carapace smooth and shiny, hairless. Carapace and chelicerae orange. Sternum orange-brown. Legs pale yellow apart from darker coxae and proximal portion of femora. Abdomen pale sepia, dotted with numerous brown spots; dorsal scutum absent, replaced by small, lightly sclerotized area; venter white.

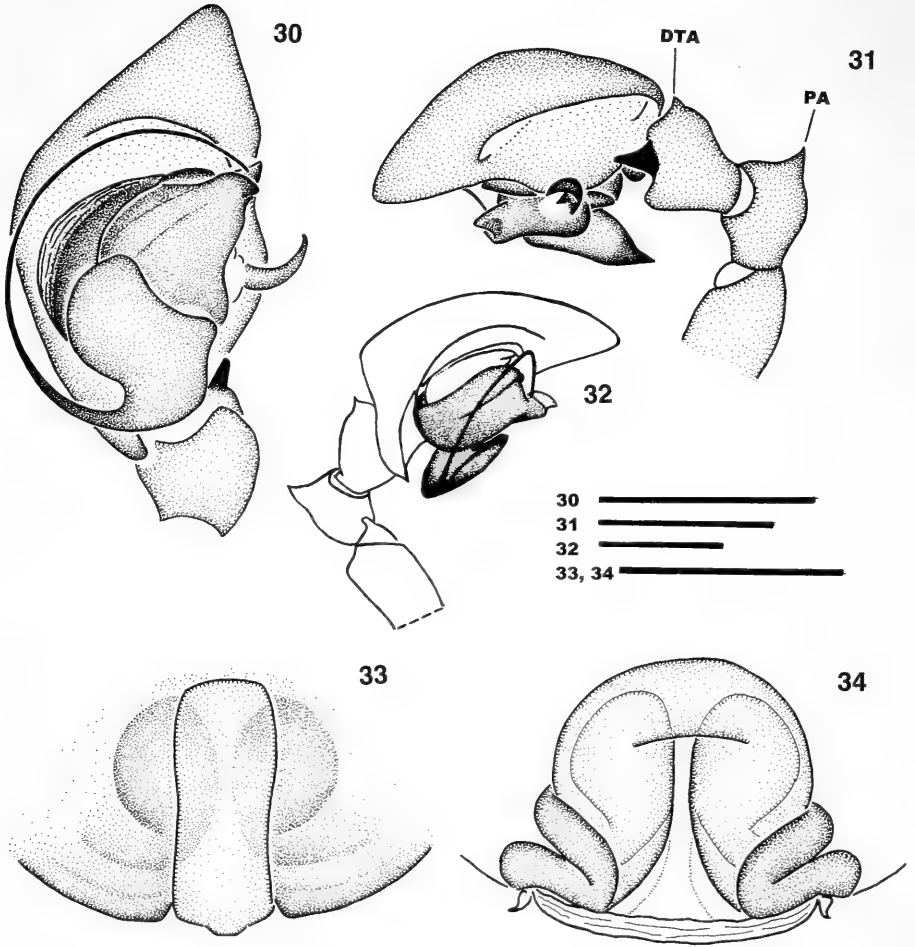
Eye sizes and interdistances: AME 0.17, ALE 0.15, PME 0.14, PLE 0.14; AME-AME 0.08, AME-ALE 0.15, PME-PME 0.15, PME-PLE 0.28, ALE-PLE 0.05; MOQ 0.51 long, front width 0.48, back width 0.46. Clypeus 0.58 high.

Leg measurements:

	I	II	III	IV
Femur	2.58	2.20	2.06	2.75
Patella	0.86	0.86	0.82	0.79
Tibia	2.41	1.82	1.20	2.51
Metatarsus	1.96	1.72	1.82	2.96
Tarsus	1.62	1.27	1.06	1.65
Total	9.44	7.89	7.41	10.68

Spination: femora I d1 II d1 III d2 IV d1-1-2; patellae III pl1 IV pl1; tibiae I v5 disp. II pl1 v4 disp. III d2 pl3 r12 v2-1-1 IV d26 disp. v2-1-1; metatarsi I v2-2-1 II v3-2-2 III d2-2-2 v3-2-2 IV d3-2-2 pl2 r12 v2-1-2.

Male palp (Figs 31, 32): palpal patella with small, acutely pointed dorsal apophysis pointing outward. Palpal tibia provided with short, pointed retrolateral apophysis and small dorsal apophysis. Cymbium with broad retrolateral fold; dorso-



Figs 30-34

*Euryeidon anthonyi* gen. n., sp. n., ♂ holotype (30-32), ♀ paratype (33, 34). Male palp, ventral (30) and lateral (31, 32) view. Epigyne, ventral view (33). Internal structure of epigyne (34). Scale lines: 1.0 mm (Figs 30-32); 0.5 mm (Figs 33, 34).

lateral area with patch of chemoreceptive hairs. Distal tegular apophysis with lateral flange (Fig. 32) supporting tip of long, slender embolus; median apophysis canoe-shaped. Subtegulum clearly visible.

♀ (paratype). Total length 6.10. Carapace 3.10 long, 2.10 wide. Abdomen 3.0 long, 2.26 wide.

Coloration and pattern: carapace smooth and shiny, hairless. Carapace and chelicerae reddish brown. Sternum orange-brown. Legs yellow with slightly darker coxae. Abdomen as in males except for the absence of a dorsal scutum, venter pale sepia.

Eye sizes and interdistances: AME 0.17, ALE 0.15, PME 0.14, PLE 0.15; AME-AME 0.07, AME-ALE 0.23, PME-PME 0.15, PME-PLE 0.37, ALE-PLE 0.02; MOQ 0.51 long, front width 0.41, back width 0.42. Clypeus 0.58 high.

Leg measurements:

	I	II	III	IV
Femur	2.34	1.96	1.82	2.41
Patella	0.82	0.82	0.79	0.79
Tibia	2.82	2.03	1.89	3.17
Metatarsus	2.24	1.86	2.34	3.68
Tarsus	2.03	1.65	1.41	2.13
Total	10.27	8.34	8.27	12.24

Spination: femora I d1 II d1 III d3 IV d3; patellae III pl1 IV pl1; tibiae I pl2 v1-1 II pl1 v2 disp. III d2 pl2 r2 v6 disp. IV d4 pl4 r1; metatarsi I v2-2-2 II v6 disp. III d7 disp. v6 disp. IV d7 disp. v7 disp.

Epigyne (Fig. 33): central plate long and rectangular, both lateral margins slightly concave in the middle, posterior border with short, widely rounded projection. Internal structure as in Fig. 34.

*Remarks.* The somatic characters (smooth carapace, abdominal color pattern and absence of dorsal scutum in male) of *E. anthonyi* sp. n. are untypical for *Euryeidon*, but both male and female genitalia correspond well with those of other species in this genus.

*Distribution and habitat.* Known only from the type locality in an evergreen forest at the foot of Doi Chiang Dao, a limestone mountain in Chiang Mai Province, northern Thailand.

### *Euryeidon sonthichaiiae* sp. n.

Figs 35-37

*Type material.* HOLOTYPE: ♂, THAILAND: Chiang Mai Province, Chiang Dao District, Doi Chiang Dao Wildlife Sanctuary, Pha Tang, evergreen riverine forest, 510 m, pitfall trap, 22.VIII-22.IX.1990, leg. P. J. Schwendinger (MHNG).

*Diagnosis.* *Euryeidon sonthichaiiae* sp. n. is recognizable by the deeply divided retrolateral tibial apophysis with a smaller, sharply pointed, and a larger elongate prong (Fig. 36), and by the simple, long and slender embolus and simple embolic base; the abdomen is uniformly pale cream, without a dorsal pattern; the dorsal scutum of male is lightly sclerotized (Fig. 37).

*Etymology.* The specific name is a patronym dedicated to Professor Saowapa Sonthichai (Chiang Mai University).

*Description.* ♂ (holotype). Total length 5.60. Carapace 2.94 long, 1.94 wide. Abdomen 2.78 long, 1.73 wide.

Coloration and pattern: carapace slightly granular; clypeus covered with fine white setae extending to PME. Carapace and chelicerae orange-brown. Sternum pale brown. Legs yellow. Abdomen (Fig. 37) creamy white, without dorsal pattern, decorated only by pale brown spots; venter white; dorsal scutum oval, pale yellow.

Eye sizes and interdistances: AME 0.12, ALE 0.11, PME 0.10, PLE 0.12; AME-AME 0.06, AME-ALE 0.25, PME-PME 0.12, PME-PLE 0.38, ALE-PLE 0.05; MOQ 0.35 long, front width 0.30, back width 0.33. Clypeus 0.41 high.

## Leg measurements:

	I	II	III	IV
Femur	2.0	1.86	1.72	2.20
Patella	0.79	0.79	0.79	0.82
Tibia	1.79	1.44	1.24	1.86
Metatarsus	1.44	1.37	1.37	2.24
Tarsus	1.34	1.37	1.83	1.44
Total	7.37	6.62	6.17	8.58

Spination: femora I d2 II d2 III d3 IV d3; patellae III pl1 IV pl1; tibiae I v2-1-1-2 II d1 pl2 v2-2-2 III d3 pl2 r13 v2-1-1-2 IV d3 pl3 r13 v2-1-1-2; metatarsi I v2-2-3 II v3-1-1-1-1 III d2 pl2 r12 v1-1-1-1-4 IV d2 pl2 r12 v2-1-1-3.

Male palp (Figs 35, 36): palpal tibia with a single, deeply divided retrolateral tibial apophysis: the upper tip long and blunt; the lower one smaller, sharply pointed. Dorsolateral area of cymbium provided with thick patch of chemoreceptive hairs; cymbial fold broad. Distal tegular apophysis blunt, roughly axe-shaped, with small groove supporting embolic tip. Median apophysis slightly curved, upper side provided with small denticle. Subtegulum well-developed, clearly visible. Embolus long and slender.

Female unknown.

*Distribution and habitat.* Known only from the type locality, an evergreen riverine forest at Doi Chiang Dao, which is also the type locality of *E. musicum* sp. n. and *E. anthonyi* sp. n.

***Euryeidon consideratum* sp. n.**

Figs 38-40

*Type material:* HOLOTYPE: ♀, THAILAND: Chiang Rai Province, Phan District, Doi Luang National Park, riverine forest along Phu Kang Waterfall, 700 m, 20.VII.2002, leg. S. Sonthichai & P. Dankittipakul (MHNG).

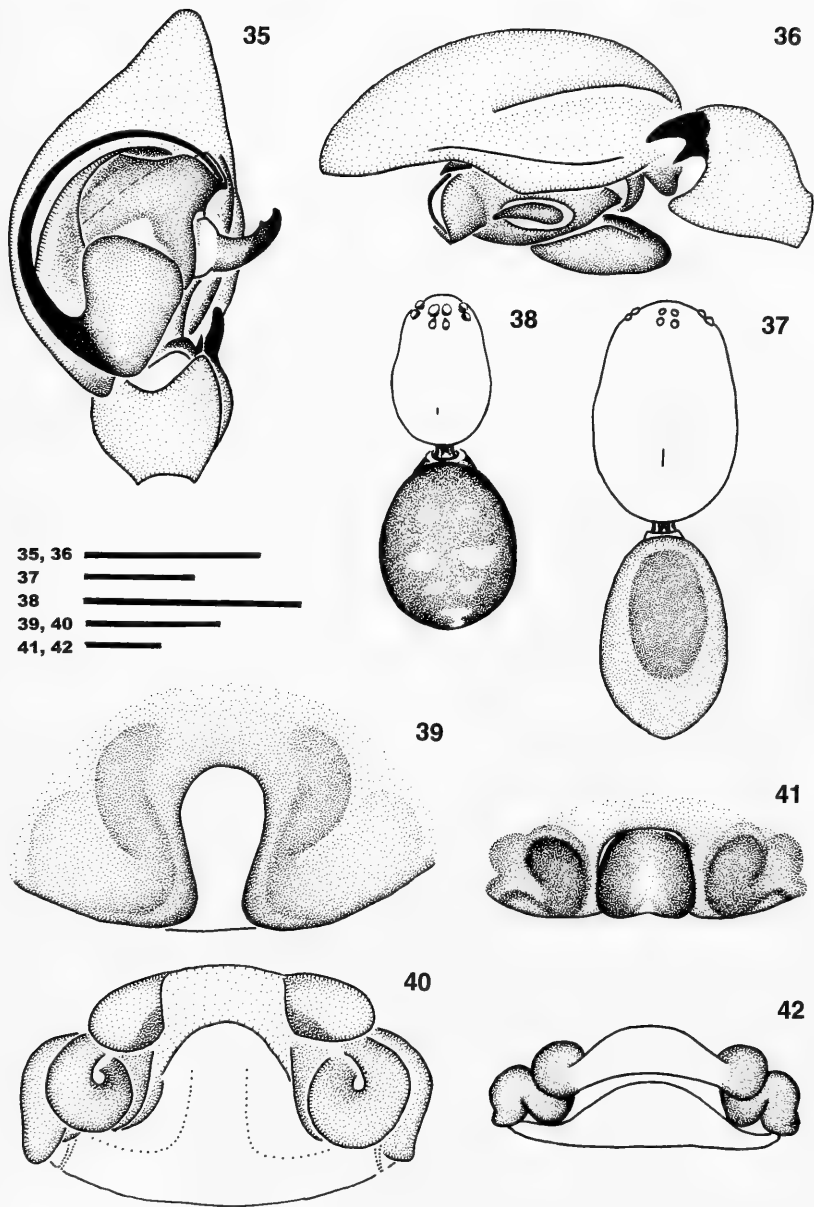
*Diagnosis.* The central epigynal plate of the type of *Euryeidon consideratum* sp. n. was broken off therefore comparing the epigyne of this new species with other *Euryeidon* females is impossible. However, the specific shape and orientation of the vulva clearly separate *E. consideratum* sp. n. from other members of the genus. Generally, the dorsum of *Euryeidon* female possess a pair of pale patches followed by a series of chevrons (Fig. 19) but in this species the pale patches are replaced by a pair of small pale spots, and there is an indistinct separation between the chevrons, which are followed by a connecting band (Fig. 38).

*Etymology.* Latin, *consideratum* means modest and refers to the simple abdominal pattern.

*Description.* ♀ (holotype). Total length 9.15. Carapace 4.0 long, 2.78 wide. Abdomen 4.84 long, 3.52 wide.

Coloration and pattern: carapace coarsely granular, covered with short, fine hairs in clypeal and ocular areas; a pair of small, shallow depression present in the middle of the carapace. Carapace and chelicerae dark reddish brown. Sternum orange-brown. Legs brown. Abdomen dark sepia.

Eye sizes and interdistances: AME 0.17, ALE 0.14, PME 0.12, PLE 0.15; AME-AME 0.07, AME-ALE 0.48, PME-PME 0.20, PME-PL 0.71, ALE-PL 0.12; MOQ 0.56 long, front width 0.43, back width 0.44. Clypeus 0.71 high.



FIGS 35-42

*Euryeidon sonthichiae* gen. n., sp. n. (35-37), ♂ holotype. Male palp, ventral (35) and retrolateral (36) view. Body of male, dorsal view (37). *Euryeidon consideratum* gen. n., sp. n. (38-40), ♀ holotype. Epigyne, ventral view (39). Internal structure of epigyne (40). Body of female, dorsal view (38). *Euryeidon schwendingeri* gen. n., sp. n. (41-42), ♀ holotype. Epigyne, ventral view (41). Internal structure of epigyne (42). Scale lines: 0.5 mm (39-42); 1.0 mm (35, 36); 2.0 mm (37); 5.0 mm (38).

Prolateral side of tibiae of legs I and II smooth, without hairs and spines.

Leg measurements:

	I	II	III	IV
Femur	2.34	2.10	1.96	2.51
Patella	0.96	0.96	0.89	0.93
Tibia	1.86	1.48	1.37	1.82
Metatarsus	1.58	1.41	1.62	2.10
Tarsus	1.20	1.17	1.03	1.20
Total	7.96	7.13	6.89	8.58

Spination: femora I d2 II d2 III d3 IV d3; patellae III pl1 IV pl1; tibiae I v2-1-1-2 II v2-2-2 III d3 pl2 r12 v2-1-1-2 IV d3 pl2 r13 v2-1-1-2; metatarsi III d2 pl2 r12 v2-2-4 IV d1-2 pl1 r11 v1-1-1-4.

Epigyne (Fig. 39): shape of central plate unknown. Spermathecae strongly sclerotized, elongated and coiled as in Fig. 40.

Male unknown.

*Distribution.* Known only from the type locality. The spider was collected as it was walking on the forest floor in a shady area along a stream.

***Euryeidon schwendingeri* sp. n.**

Figs 41, 42

*Type material:* HOLOTYPE: ♀, THAILAND: Chiang Rai Province, Wiang Pa Pao District, Ban Pong Thong, evergreen forest, 1130 m, 4.XII.1987, leg. P. J. Schwendinger (MHNG).

*Diagnosis.* *Euryeidon schwendingeri* sp. n. is characterized by the bell-shaped central plate of its epigyne (Fig. 41).

*Etymology.* The specific name is a patronym in honour of Dr Peter J. Schwendinger (MHNG), who collected the holotype of this species and many other interesting zodariids.

*Description.* ♀ (holotype). Total length 7.10 mm. Carapace 3.89 mm long, 2.63 mm wide. Abdomen 3.36 mm long, 2.73 mm wide.

Coloration and pattern: carapace slightly granular, covered with short fine hairs in clypeal and ocular areas. Carapace orange-brown. Chelicerae brown. Sternum pale yellow. Legs pale yellow, almost white. Abdomen mottled with dark brown spots; dorsum with a pair of pale round patches, followed by a series of chevrons.

Eye sizes and interdistances: AME 0.12, ALE 0.12, PME 0.12, PLE 0.15; AME-AME 0.07, AME-ALE 0.48, PME-PME 0.15, PME-PLA 0.66, ALE-PLA 0.10; MOQ 0.43 long, front width 0.35, back width 0.41. Clypeus 0.66 high.

Leg measurements:

	I	II	III	IV
Femur	2.10	1.96	1.82	2.41
Patella	0.93	0.93	0.93	0.93
Tibia	1.72	1.44	1.20	1.93
Metatarsus	1.34	1.34	1.58	2.41
Tarsus	1.37	1.17	1.03	1.44
Total	7.48	6.86	6.58	9.13

Spination: femora I d2 II d2 III d3 IV d3; patellae III pl1 IV pl1; tibiae I v2-1-1-2 II v2-1-1-2 III d3 pl2 rl2 v2-1-1-2 IV d3 pl2 rl3 v2-1-1-2; metatarsi I v1-2 II v1-2-2-4 III d2 pl1 rl1 v1-1-2-4 IV d2-1 pl1 rl1 v1-4.

Epigyne with bell-shaped central plate (Fig. 41). Entrance ducts simple, coiled (Fig. 42).

Male unknown.

*Distribution and habitat.* Known only from the type locality, a remnant patch of evergreen hill forest surrounded by cultivated land.

### *Heradion* gen. n.

*Type species.* *Heradion naiadis* sp. n.

*Diagnosis.* Members of *Heradion* are characterized by: femora of legs with a basal swelling bearing a proximal dorsal spine (Fig. 43); coxae I and IV elongated (Fig. 64); sternum with frontal concavity accommodating the labium (Fig. 64); a sclerified field with rows of hairs present in front of the spinnerets (Figs 44, 45). Males have an elongate tegulum provided with two apophyses: the median apophysis and a membranous distal one with sclerotized basal and retrolateral margins of variable shape. Females have a simple epigyne in which the sclerotized plate has two copulatory orifices, the copulatory ducts are long and S-shaped, and the spermathecae are thick-walled and of variable shape.

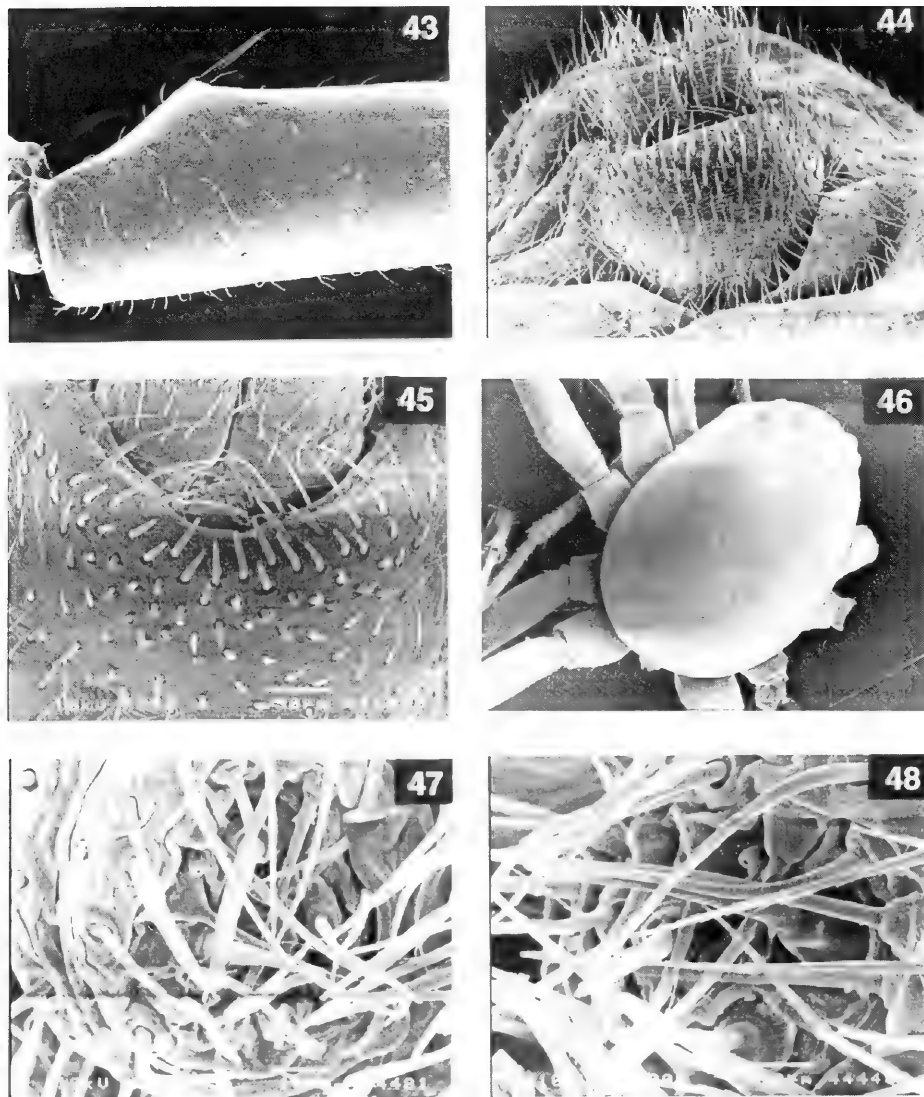
*Etymology.* In view of its beauty the taxon is named after the Greek goddess, Hera. The gender is neuter.

*Description.* Medium-sized (4-6.5 mm) spiders. Carapace oval (Fig. 46), widest between coxae II and III, narrowed in front. Profile domed, with its highest point between PME and short, longitudinal fovea (Fig. 63). Tegument smooth and shining to finely reticulated.

Coloration: carapace usually reddish to chestnut-brown. Chelicerae brown. Sternum orange-brown or medium brown. Legs brown, with femora usually darker brown basally or throughout. Males often with bicolored legs: femora reddish brown to medium brown; patellae, tibiae, metatarsi and tarsi yellow or pale brown. Abdomen pale to dark sepia or almost black, dorsum with typical pattern of pale spots and stripes, seven pairs of white spots usually united to form chevrons from third pair onward.

Eight eyes arranged in two procurved rows (Fig. 62); eyes subcircular; pale, except for dark AME. AME more than their diameter apart, less than their diameter from ALE. PME smallest, less than their diameter apart, twice their diameter from PLE. MOQ in front wider than behind, longer than wide. Clypeus retreating, slightly convex, relatively high (height 3.8 to 5.3 times diameter of ALE).

Chilum (Figs 62, 64) developed as a single triangular sclerite, drawn out into a point, pointing forward. Chelicerae slender, almost glabrous apart from a prolateral distal group of hairs; condyle well-developed; no teeth along cheliceral groove; fangs short, with thick base. Maxillae (Fig. 64) narrowed toward extremity, provided with fine anteromesal scopulae. Labium triangular, with constricted base. Sternum (Fig. 64) heart-shaped, concave in front, accommodating posterior part of labium; short extensions fitting into concavities of leg coxae; posterior end protruding between coxae IV, its tip indented. Pleurites present.

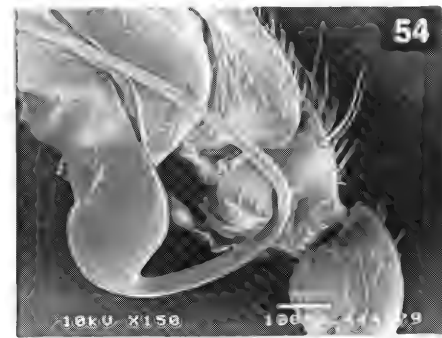
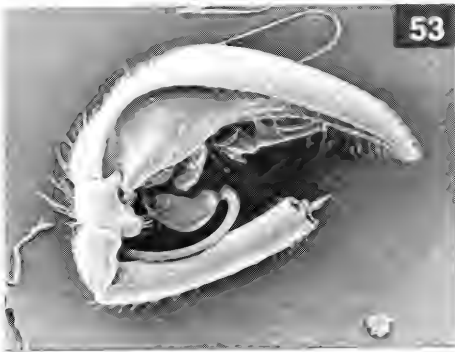
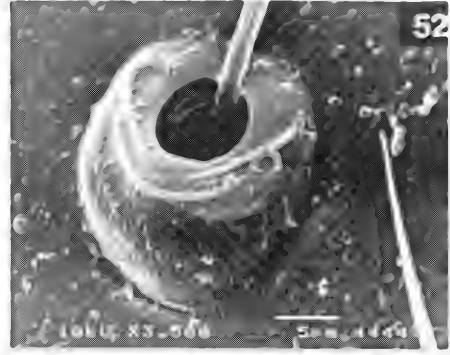
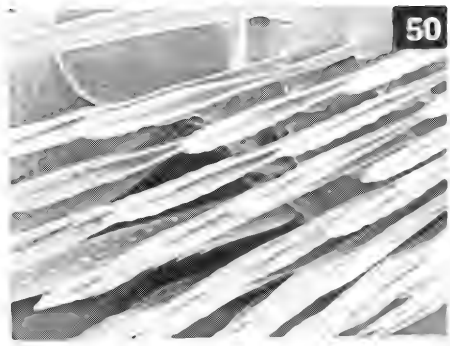
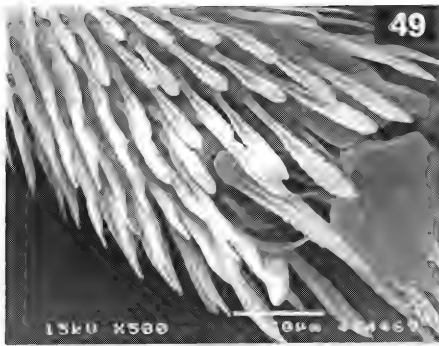


Figs 43-48

*Heradion permix* gen. n., sp. n. Base of femur I (43). Ventral abdominal plate in front of spinnerets (44). Ditto, detail (45). Carapace, dorsal view (46). ALS (47). Ditto, more strongly magnified, indicating MAP (48).

Leg formula 4123. Coxae of legs I and IV elongate. Males of some species with elongated femora, metatarsi and tarsi. Femora inflated at position of proximal dorsal spine (Figs 43, 84). Spination: few spines on legs I and II, numerous spines on legs III and IV. A proximal dorsal spine present on each femur, prolateral spines only on femora I. Patellae with a short prolateral and sometimes also with a retrolateral spine





Figs 49-54

*Heradion damrongi* gen. n., sp. n. Leg II, modified hairs of preening bush (49). Ditto, leg IV, magnified (50). Male palpal tibia showing a row of trichobothria (51). Trichobothrium (52) on palpal tibia. Male palp, retrolateral view (53). Ditto, proteral view (54).

on posterior legs. Ventral tuft of metatarsal preening bush with modified chisel-shaped hairs (Figs 49, 50). A row of trichobothria present on palpal tibiae (Fig. 51); bothria simple, with double crescent-shaped ridges (Fig. 52). Claw tufts absent.

Abdomen oval, almost hairless, with sclerotized ring in anterior part; proteral sigilla small, lightly sclerotized; small dorsal sclerotized field or dorsal scutum in

anterior half present in males of some species. Six spinnerets; anterior pair long, conical and biarticulate (Figs 44, 47, 48); posterior and median pairs much smaller and shorter. A sclerotized field with rows of hairs just in front of spinnerets (Figs 44, 45). Colulus represented by groups of hairs.

Male palp: Tibia with one or two lateral apophyses: ventrolateral apophysis lightly sclerotized, blunt or sharply pointed; retrolateral one relatively dark, pointed in ventral view. Cymbium longer than wide; retrolateral cymbial fold long, extended to distal extremity (Fig. 53); chemoreceptive hairs absent. Tegulum elongate, not clearly separated from embolic base, prolateral side with membranous rim. Tegulum with two apophyses: distal one large, membranous, with field of sclerotization, retrolateral side with modified structure of variable shape; median apophysis situated just short of distal one. Embolic base originating from posterior end of tegulum. Embolus long and thin, describing half a loop.

Epigyne developed as a simple sclerotized plate provided with two prominent copulatory orifices; copulatory ducts long, S-shaped, leading to simple or coiled spermathecae near posterior margin of epigyne.

*Species included.* *Heradion damrongi* sp. n., *H. luctator* sp. n., *H. naiadis* sp. n., *H. pernix* sp. n. and *H. peteri* sp. n.

*Distribution.* Thailand and Malaysia.

#### Key to the species of *Heradion* gen. n.

- |   |   |                    |
|---|---|--------------------|
| 1 | ♂♂ .....  | 2                  |
| - | ♀♀ .....  | 6                  |
| 2 | Papal tibia with obvious basal swelling (Figs 75, 80) .....   | 3                  |
| - | Palpal tibia without swelling .....   | 4                  |
| 3 | Median apophysis of bulb strongly sclerotized, beak-shaped (Fig. 75) .....  | <i>H. damrongi</i> |
| - | Median apophysis of bulb bifid (Fig. 80) .....  | <i>H. luctator</i> |
| 4 | Cymbial fold reaching apex, DA short (Figs 70, 71) .....  | <i>H. pernix</i>   |
| - | Cymbial fold not reaching apex, DA very long, almost reaching cymbial extremity .....                               | 5                  |
| 5 | DA spear-shaped, reaching cymbial extremity; cymbial fold extended far beyond middle of cymbium (Figs 65, 66) ..... | <i>H. peteri</i>   |
| - | DA blunt (Fig. 55); cymbial fold extended just beyond middle of cymbium (Figs 56, 57) .....                         | <i>H. naiadis</i>  |
| 6 | Copulatory orifices in anterior part of epigyne (Fig. 68) .....   | <i>H. peteri</i>   |
| - | Copulatory orifices in posterior part of epigyne .....  | 7                  |
| 7 | Spermathecae coiled .....   | 8                  |
| - | Spermathecae not coiled, in some specimens strongly curved .....  | 9                  |
| 8 | Posterior rim of epigyne convex and smoothly rounded; spermathecae with four coils (Figs 77, 78) .....              | <i>H. damrongi</i> |
| - | Posterior rim of epigyne indented; spermathecae with two coils (Figs 82, 83) .....                                  | <i>H. luctator</i> |
| 9 | Course of copulatory ducts S-shaped (Fig. 59) .....   | <i>H. naiadis</i>  |
| - | Course of copulatory ducts with more curves (Fig. 73) .....   | <i>H. pernix</i>   |

*Heradion naiadis* sp. n.

Figs 55-64

*Type material.* HOLOTYPE: ♂, eastern THAILAND: Nakhon Ratchasima Province, Pak Chong District, Khao Yai National Park, Khao Khieo, montane rain forest, 1150 m, leaf litter sample, 29.VII.2000 (MHNG THMA-00/07).

PARATYPES: THAILAND: Nakhon Ratchasima Province, Pak Chong District, 1♀, same data as for holotype (MHNG THMA-00/07); 1♂, from the type locality, 29.X.1997 (PDC ZO0123); 2♂, 1♀, Khao Yai National Park, rainforest near Orchid Waterfall, 500 m, 4.V.1987 (MHNG, KBIN). All leg. P. J. Schwendinger.

*Diagnosis.* Males of *Heradion naiadis* sp. n. can be recognized by the complex median apophysis and the horn-shaped distal tegular apophysis; females are characterized by the strongly sclerotized posterior margin of the epigyne and the simple, round spermathecae.

*Etymology.* Latin, *nais* (genitive *naiadis*) is a nymph of the woods and the species name alludes to the beauty of this forest-dwelling species.

*Description.* ♂ (holotype). Total length 5.36. Carapace 2.53 long, 1.79 wide. Abdomen 2.25 long.

Coloration and pattern: carapace reddish brown, smooth and shiny, without hairs. Chelicerae and sternum medium brown. Legs orange. Abdomen dark sepia to black; dorsum with pattern of pale spots and stripes (Fig. 60): anteriorly with two longitudinal bands followed by two large spots and transverse bands. Ventral abdominal sclerotized field in front of spinnerets yellow, lightly sclerotized.

Eye sizes and interdistances: AME 0.11, ALE 0.12, PME 0.10, PLE 0.12; AME-AME 0.06, AME-ALE 0.10, PME-PME 0.07, PME-PLE 0.23, ALE-PLE 0.05; MOQ 0.38 long, front width 0.33, back width 0.30. Clypeus 0.51 high.

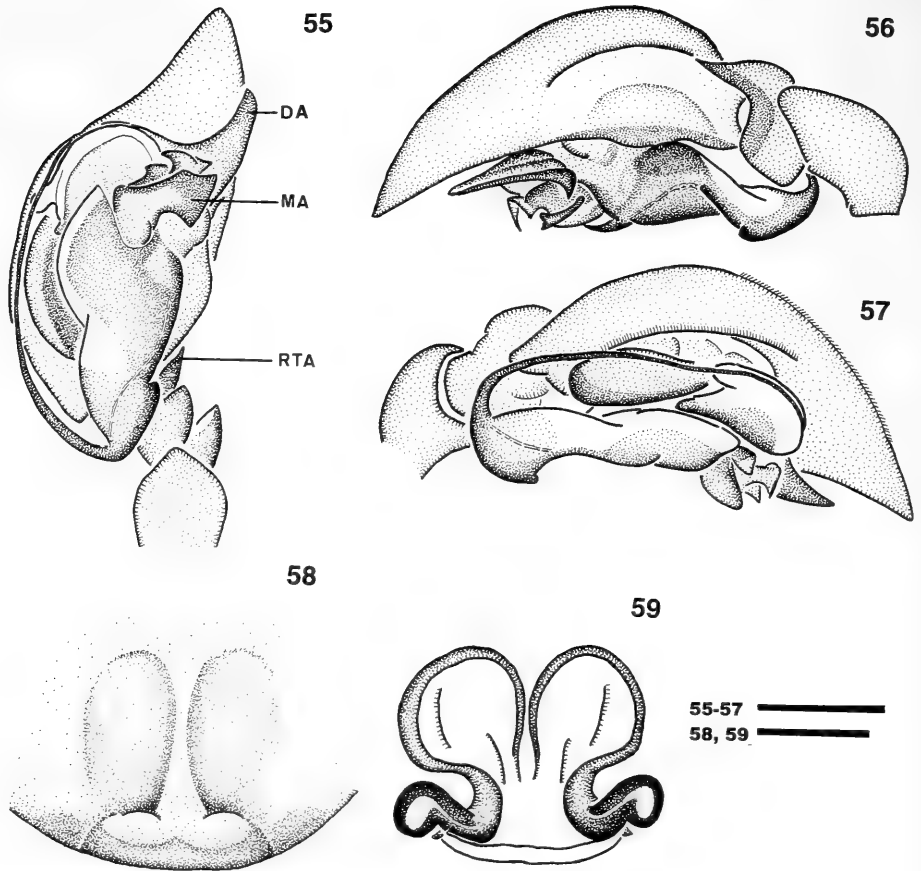
Leg measurements:

	I	II	III	IV
Femur	2.20	1.76	1.65	2.24
Patella	0.68	0.69	0.65	0.69
Tibia	1.96	1.41	1.27	2.14
Metatarsus	1.65	1.38	1.45	2.41
Tarsus	1.41	1.17	1.03	1.45
Total	7.90	6.41	6.05	8.93

Spinination: femora I d1 p11 II d1 III d1 IV d3; patellae III p11 IV p11; tibiae I v1-1-2 II v1-1-2 III d1-1 p11 r11 v1-1-1-2 IV d1-1-1 p11 r11 v1-1-1-1-2; metatarsi I v1-1-1-1 II v2-2-1-1 III d2-2 r11 v2-1-1 IV d1-1-2 p11 r11 v2-1-1-2.

Male palp (Figs 55-57): palpal tibia with simple dorsolateral apophysis, its tip sharp and pointed (Fig. 56). Cymbium with relatively broad fold occupying half of cymbial length; basolateral concavity shallow. Tegulum simple, elongate, separated from embolic base by small prolateral membranous area. Median apophysis (Fig. 55) complicated, lightly sclerotized. Distal tegular apophysis partly sclerotized; dorsolateral sclerotized area well-developed as a large horn-shaped extension with obliquely truncate tip, broad at base, pointing distolaterad. Embolic base originating in posterior part of tegulum. Embolus relatively thick proximally, remainder whiplike, long and slender.

♀ (paratype). Total length 6.01. Carapace 2.64 long, 1.76 wide. Abdomen 2.43 long.



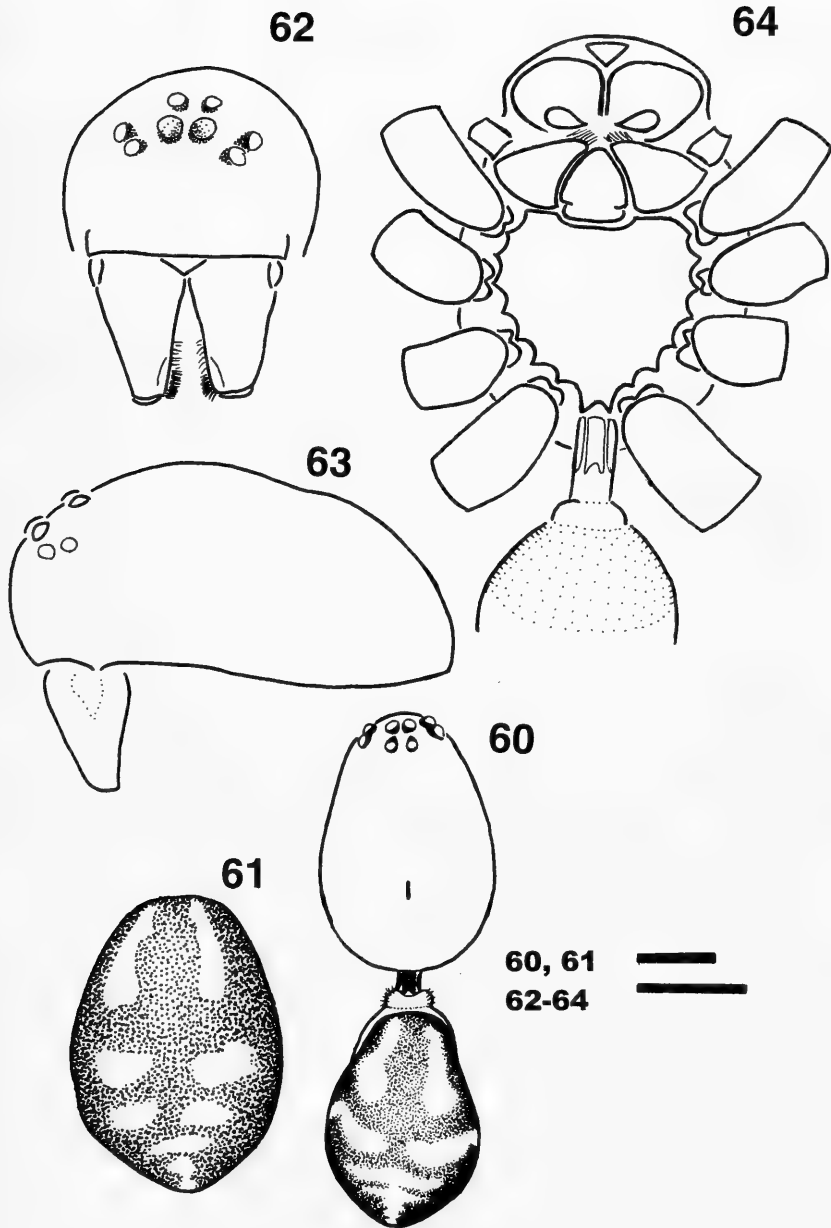
FIGS 55-59

*Heradion naiadis* gen. n., sp. n., ♂ holotype (55-57), ♀ paratype (58, 59). Male palp, ventral (55), prolateral (57) and retrolateral (56) view. Epigyne, ventral view (58). Internal structure of epigyne (59). Scale lines: 0.5 mm (58, 59); 0.75 mm (55-57).

Coloration and pattern: as in male but coloration generally darker: carapace dark reddish brown; chelicerae and sternum medium brown; abdomen dark sepia; dorsum with two longitudinal bands followed by two pairs of pale spots and interconnected chevrons (Fig. 61).

Eye sizes and interdistances: AME 0.10, ALE 0.12, PME 0.10, PLE 0.10; AME-AME 0.06, AME-ALE 0.15, PME-PME 0.06, PME-PLE 0.28, ALE-PLE 0.06; MOQ 0.38 long, front width 0.28, back width 0.29. Clypeus 0.53 high.

Leg measurements:



Figs 60-64

*Heradion naiadis* gen. n., sp. n., ♂ holotype (60, 62-24), ♀ paratype (61). Body of male, dorsal view (60). Abdomen of female, ventral view (61). Carapace of male, frontal (62) and lateral (63) view. Sternum, labium and maxillae (64). Scale lines: 1.5 mm (60, 61); 2.0 mm (62-64).

	I	II	III	IV
Femur	1.89	1.59	1.48	2.00
Patella	0.76	0.72	0.69	0.76
Tibia	1.72	1.31	1.14	2.00
Metatarsus	1.48	1.21	1.34	2.27
Tarsus	0.89	1.03	0.86	1.24
Total	6.74	5.86	5.51	8.27

Spination: femora I d1 pl1 II d1 III d2 IV d3; tibiae I v2-1-1-1 II v2-1-1-1 III d3 pl2 r11 v2-1-1-1 IV d3 r11 v2-1-1-1-1; metatarsi I v2-1-1-1 II v2-1-1-1 III d2-1 pl2 v2-1-1-1-1 IV 13 disp.

Epigyne (Fig. 58) developed as a simple sclerotized plate, more strongly sclerotized along posterior margin. Deep copulatory orifices in posterior part of epigyne; copulatory ducts S-shaped. Spermathecae rounded, strongly sclerotized (Fig. 59).

*Distribution.* Known only from the type locality.

### *Heradion peteri* sp. n.

Figs 65-69

*Type material:* HOLOTYPE: ♂, northern THAILAND: Chiang Mai Province, Chiang Dao District, Doi Chiang Dao Wildlife Sanctuary, Pha Tang, evergreen riverine forest, 510 m, pitfall trap, 23.VIII.-22.IX.1990, leg. P. J. Schwendinger (MHNG).

PARATYPES: same data as for holotype, 1♂, 25.X.-23.XI.1990 (KBIN); 1♂, 23.XI.-22.XII.1990 (PDC ZO0124). All leg. P. J. Schwendinger.

*Other material:* 2♀, THAILAND: Chiang Rai Province, Chiang Khong District, Ban Kew Kan, 780 m, leaf litter sample, 14.X.1994 (MHNG); 1♀, Phrae Province, Mae Khaem Village, 560 m, 20 km east of Phrae City, leaf litter sample, 21.IX.1991 (PDC ZO0125). All leg. P. J. Schwendinger.

*Diagnosis.* Males of *Heradion peteri* sp. n. can be recognized by the spear-shaped retrolateral sclerotized area of distal tegular apophysis and the simple, bifid median apophysis (Fig. 65); females by the copulatory orifices which are situated in the anterior part of the epigyne and by the oval spermathecae (Figs 67, 68).

*Etymology.* The specific name is a patronym in honour of Dr Peter Schwendinger (MHNG) who collected all the material of this species.

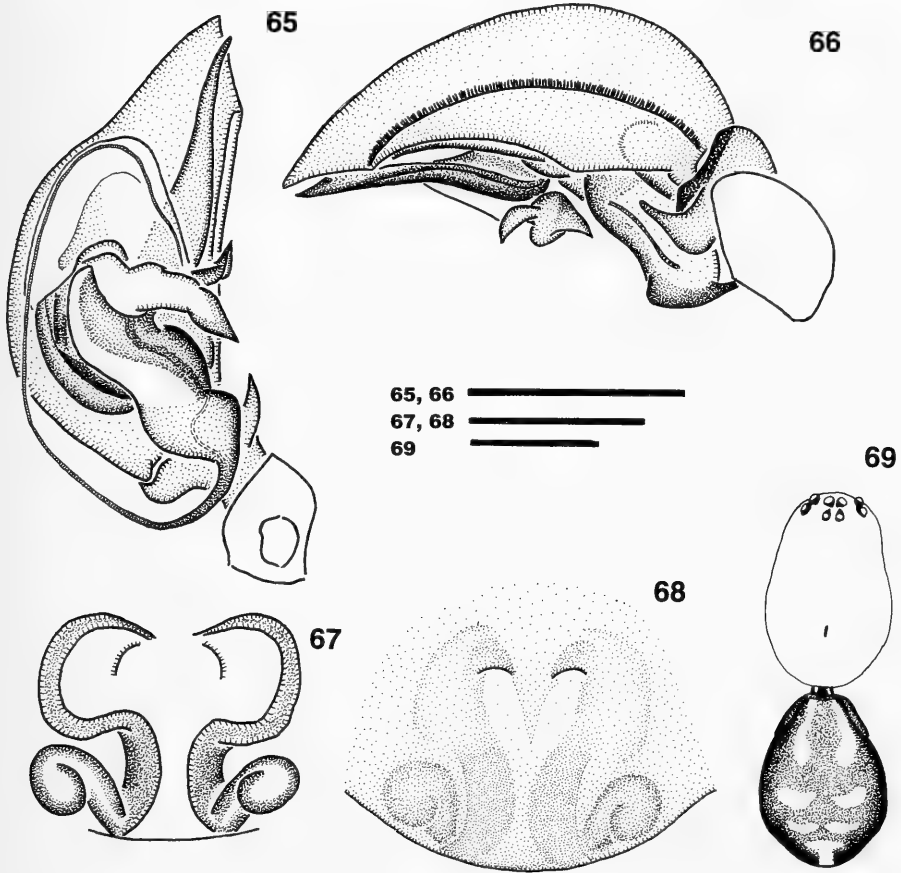
*Description.* ♂ (holotype). Total length: 4.55. Carapace 2.41 long, 1.69 wide. Abdomen 2.00 long.

Coloration and pattern: carapace slightly roughened, without hairs. Fovea deep. Carapace orange-brown. Chelicerae pale brown. Sternum orange. Legs two-colored, i.e. coxae and femora orange, patellae to tarsi yellow. Abdomen (Fig. 69) sepia, sparsely dotted with black pigment; dorsum with a pair of longitudinal pale bands followed by 6 transverse bands, first and second band broken, third to sixth band small, almost as wide as long; venter creamy white, without markings.

Eye sizes and interdistances: AME 0.12, ALE 0.12, PME 0.10, PLE 0.12; AME-AME 0.05, AME-ALE 0.07, PME-PME 0.10, PME-PLA 0.27, ALE-PLA 0.07; MOQ 0.38 long, front width 0.30, back width 0.33. Clypeus 0.51 high.

Leg measurements:

	I	II	III	IV
Femur	1.62	1.44	1.34	1.72
Patella	0.55	0.55	0.58	0.58



Figs 65-69

*Heradion peteri* gen. n., sp. n., ♂ holotype (65, 66, 69), ♀ paratype (67, 68). Male palp, ventral (65) and retrolateral (66) view. Epigyne, ventral view (68). Internal structure of epigyne (67). Body of male, dorsal view (69). Scale lines: 1.0 mm (65-68); 2.0 mm (69).

Tibia	1.48	1.17	1.00	1.68
Metatarsus	1.20	1.03	1.34	1.93
Tarsus	1.13	0.93	0.82	1.17
Total	5.98	5.12	5.08	7.08

Spination: femora I d1 pl1 II d1 III d1 IV d3; patellae III pl1 IV pl1; tibiae I v1-2 II pl1 v1-1-1-1 III d2 pl2 r1 v2-2 IV 11 disp; metatarsi I v2-2-2 II v2 III d2 v2-2 IV d2 pl2 r1 v1-1.

Male palp (Figs 65, 66): palpal tibia with lateral swelling. Ventrolateral tibial apophysis digitiform, small and thin as seen from the side (Fig. 66), sharp and pointed as seen from below (Fig. 65). Cymbium longer than wide, provided with deep and long

furrow almost reaching apex. Tegulum simple, elongated, partly membranous. Median apophysis with membranous basal part; distal part lightly sclerotized, divided into two branches pointing in different directions. Dorsolateral sclerotized area of distal tegular apophysis spear shaped, long and slender, slightly curved outward, reaching apex of cymbium. Embolus whip-like, long and slender, originating at posterior end of tegulum.

♀ (Identification uncertain). Total length 5.78. Carapace 2.67 long, 1.74 wide. Abdomen 2.56 long.

Coloration and pattern: generally as in males but dorsal scutum absent; carapace orange; legs yellow; abdomen dark sepia.

Eye sizes and interdistances: AME 0.15, ALE 0.14, PME 0.14, PLE 0.15; AME-AME 0.05, AME-ALE 0.12, PME-PME 0.11, PME-PLA 0.26, ALE-PLA 0.05; MOQ 0.42 long, front width 0.35, back width 0.38. Clypeus 0.53 high.

Leg measurements:

	I	II	III	IV
Femur	1.62	1.44	1.37	1.79
Patella	0.62	0.62	0.55	0.65
Tibia	1.37	1.10	1.03	1.62
Metatarsus	1.24	1.03	1.24	1.89
Tarsus	0.96	0.86	0.82	1.10
Total	5.81	5.05	5.01	7.05

Spination: femora I d1 pl1 II d2 III d2 IV d3; patellae III pl1 IV pl1; tibiae I v1-1 II pl1 v2-1-1 III d3 pl1 r11 v2-1-1 IV d3 pl2 r12 v2-1-1; metatarsi I v1-1-1-1-1 II v2-2-2 III d2-2 pl1 r11 v2-2-2 IV d2 pl2 r12 v6 disp.

Epigyne (Fig. 68) developed as a slightly sclerotized plate. Copulatory orifices in anterior part of epigyne. Spermathecae relatively large (Fig. 67).

*Variation.* The shape of the pale bands on the dorsal side of the abdomen is variable: the anterior patches are of variable sizes; the following pale areas may be present as round patches or as a transverse, usually broken band; third to sixth transverse bands may be connected or fused, forming a dorsal longitudinal band in front of the spinnerets.

*Remarks.* Female specimens were collected from Chiang Rai and Phrae Provinces, which are 180-200 km away from the type locality in Chiang Mai province. Due to geographical separation, these specimens may not be conspecific. Before this uncertainty is solved by the discovery of males from Chiang Rai and Phrae, the examined females are placed in *Heradion peteri* sp. n. but they are not designated as paratypes.

*Distribution.* Northern Thailand (Chiang Mai, Chiang Rai and Phrae Provinces).

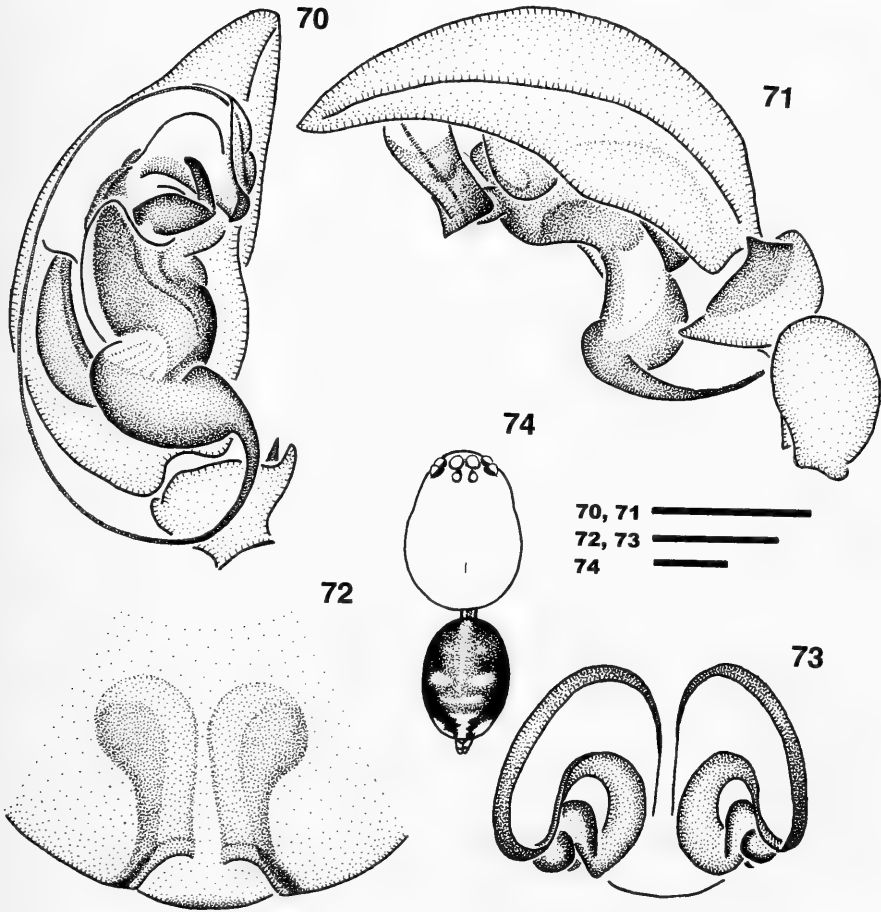
### *Heradion pernix* sp. n.

Figs 43-48, 70-74

*Type material:* HOLOTYPE: ♂, western MALAYSIA: Pahang, Charas Hill, 3 km north of Panching, 60 m, 9-10.VII.2001, leg. P. J. Schwendinger (MHNG SIM-01/12).

PARATYPES: western MALAYSIA: 6 ♀, 7 ♂, same data as for holotype (MHNG SIM-01/12); ♂, Selangor, Templer Park (N 03° 17' 55.2", E 101° 37' 13.5"), north of Kuala Lumpur,





Figs 70-74

*Heradion pernix* gen. n., sp. n., ♂ holotype (70, 71, 74), ♀ paratype (72, 73). Male palp, ventral (70) and retrolateral (71) view. Epigyne, ventral view (72). Internal structure of epigyne (73). Body of male, dorsal view (74). Scale lines: 1.0 mm (70-73); 2.0 mm (74).

230-370 m, rainforest along stream, 13.VII.2001, leg. P. J. Schwendinger (MHNG SIM-01/14); ♂, Pahang, Fraser's Hill, Jerian Waterfall, 1050 m, under bark, 19.III.1993, leg. I. Löbl & F. Calame (MHNG WM93-12a); 3♂, Perak, rainforest 5 km northeast of Chenderiang (north of Tapah), 290-330 m, 22-31.I.1994, leg. P. J. Schwendinger (KBIN).

**Diagnosis.** Males of *Heradion pernix* sp. n. are easily recognizable by the sickle-shaped median apophysis and the relatively simple distal tegular apophysis; females by the presence of an epigynal lip and by the spermathecae with overhanging copulatory ducts on top.

**Etymology.** Latin, *pernix* means 'runner' and refers to the long legs in males. Noun in apposition.

*Description.* ♂ (holotype). Total 5.57 length. Carapace 2.82 long, 2.05 wide. Abdomen 2.10 long.

Coloration and pattern (Fig. 74): carapace dark reddish brown, with fine granulation. Chelicerae and sternum brown. Legs elongated, in particular femora, tibiae and metatarsi. Femora medium brown, other segments yellow. Abdomen dark sepia; dorsum with very small anterior spots, followed by 2 pairs of round spots and transverse bands. Ventral abdominal plate in front of spinneret strongly sclerotized, yellow in color.

Eye sizes and interdistances: AME 0.16, ALE 0.15, PME 0.12, PLE 0.15; AME-AME 0.07, AME-ALE 0.12, PME-PME 0.12, PME-PLE 0.28, ALE-PLE 0.07; MOQ 0.48 long, front width 0.43, back width 0.43. Clypeus 0.66 high.

Leg measurements:

	I	II	III	IV
Femur	2.58	2.13	2.00	2.79
Patella	0.72	0.72	0.72	0.68
Tibia	2.41	1.75	1.55	2.58
Metatarsus	2.24	1.79	1.82	3.20
Tarsus	1.79	1.37	1.20	1.72
Total	9.74	7.76	7.29	10.97

Spination: femora I d2 pl1 II d2 III d3 IV d3; patellae III pl1 IV pl1; tibiae I v1-1-1-1 II pl1 v2-1-1-1 III d3 pl2 rl2 v2-1-1-1 IV d3 pl2 rl2 v2-1-1-1-2 metatarsi I v2-1-1-1 II v2-2-2 III d11 dispersal. v2-1-1-1-1 IV d2 pl2 rl2 v2-2-1-2.

Male palp (Figs 70, 71): palpal tibia with two apophyses: ventrolateral apophysis lightly sclerotized, with rounded tip, curved when seen from below; retrolateral apophysis strong, short and pointed, broad at base. Cymbium with broad and long fold, reaching apex. Tegulum elongated, with clearly separated embolic part. Median apophysis sickle-shaped, slightly curved, pointing upward. Distal tegular apophysis simple, retrolateral sclerotized area lightly sclerotized. Embolus whip-like, long and slender, describing half a loop.

♀ (paratype). Total length 6.05. Carapace 2.69 long, 1.87 wide. Abdomen 2.23 long.

Coloration and pattern: as in male but legs shorter: femora and tibiae of normal length.

Eye sizes and interdistances: AME 0.17, ALE 0.12, PME 0.12, PLE 0.15; AME-AME 0.06, AME-ALE 0.12, PME-PME 0.15, PME-PLE 0.28, ALE-PLE 0.07; MOQ 0.44 long, front width 0.44, back width 0.38. Clypeus 0.61 high.

Leg measurements:

	I	II	III	IV
Femur	1.96	1.72	1.55	2.03
Patella	0.68	0.68	0.65	0.65
Tibia	1.75	1.37	1.24	2.10
Metatarsus	1.62	1.34	1.48	2.41
Tarsus	1.37	1.10	1.03	1.44
Total	7.38	6.21	5.95	8.63

Spination: femora I d2 pl1 II d2 III d3 IV d4; patellae III pl1 IV pl1; tibiae I v2-1-1-1 II pl1 v2-1-1-1 III d2 pl2 rl1 v2-1-1-1-1 IV d3 pl2 rl2 v2-1-1-1-1; metatarsi I v2-2-2 II v2-2-2 III v2-2-1-1 IV d2-2-2 v2-2-2.

Epigyne (Fig. 72) developed as a simple sclerotized plate, its posterior margin with lightly sclerotized rim, lip-like in appearance. Copulatory orifices located posteriorly, touching the epigastric furrow. Copulatory ducts running forward and then downward, lying on top of thick-walled spermathecae (Fig. 73).

*Variation.* Males collected from Chenderiang are smaller and less colorful than the male holotype. The palps of these males are also less sclerotized.

*Distribution.* Malaysia (Pahang and Perak).

### *Heradion damrongi* sp. n.

Figs 49-54, 75-79

*Type material:* HOLOTYPE: ♂, MALAYSIA: Penang Island, Penang Hill (= Bukit Bendera), 650 m, 19.XI.1999, leg. G. Cuccodoro & I. Löbl (MHNG 10a.).

PARATYPES: MALAYSIA: 3♀, 1♂, Penang Hill, 650-760 m, leaf litter sample, 18.I.1995, leg. P. J. Schwendinger (MHNG); 7♀ (2 used for SEM), 1♂, Penang Hill, 710 m, 8-19.XII.1997, leg. P. J. Schwendinger; 1♀, Kelantan, Jeram Pasu Waterfall, south of Kota Baharu, 100 m, 10-11.XI.1999, leg. P. J. Schwendinger (MNHG); 2♀, Perak, Maxwell Hill (=Bukit Larut), east of Taiping, 1200-1320 m, 24-26.I.1995, leg. P. J. Schwendinger (MNHG); 1♂, 1♀, Maxwell Hill, 1290-1320, 7-8.I.1996, leg. P. J. Schwendinger (KBIN); 1♂, Maxwell Hill, 950 m, 22.XI.1999, leg. G. Cuccodoro & I. Löbl (MHNG 12); 1♀, Perak, rainforest near Padang Gerus, northeast of Taiping, 200 m, 15.I.1995, leg. P. J. Schwendinger (MNHG).

*Diagnosis.* Males of *H. damrongi* sp. n. can be identified by the beak-shaped median apophysis, by the anchor-shaped retrolateral sclerotized area of the distal tegular apophysis in ventral view (Fig. 75) and by the blunt ventrolateral tibial apophysis which is membranous at the base (Fig. 76). Females can be recognized by the coiled spermathecae (Fig. 78).

*Etymology.* The specific epithet is a patronym in honour of His Royal Highness Prince Damrong Rajanubhab of Siam (1862-1943), a great statesman who lived in Penang for almost a decade.

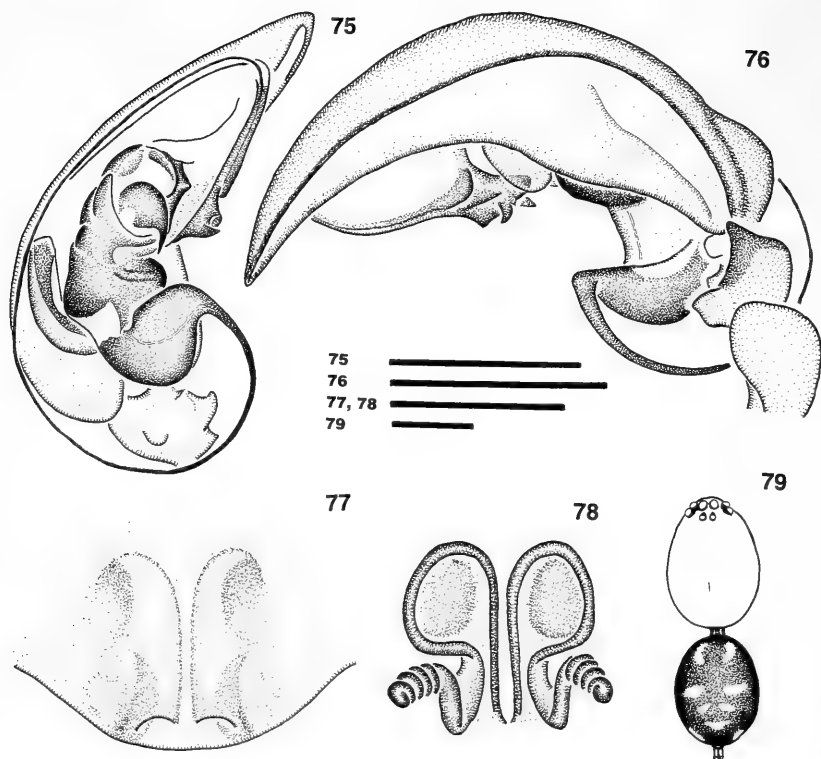
*Description.* ♂ (holotype). Total length 4.51. Carapace 2.56 long, 1.92 wide. Abdomen 1.84 long.

Coloration and pattern (Fig. 79): carapace reddish brown, finely granular. Legs orange-brown; proximal and distal portion of femora and tibiae with darker color, almost brown. Abdomen sepia; cardiac area pale; first pair of pale patches on dorsum elongated, followed by 2 pairs of round spots and transverse bands. Ventral abdominal plate in front of spinnerets yellow, lightly sclerotized.

Eye sizes and interdistances: AME 0.17, ALE 0.12, PME 0.12, PLE 0.15; AME-AME 0.07, AME-ALE 0.10, PME-PME 0.10, PME-PLE 0.20, ALE-PLE 0.05; MOQ 0.46 long, front width 0.41, back width 0.38. Clypeus 0.58 high.

Leg measurements:

	I	II	III	IV
Femur	2.34	1.96	1.82	2.34
Patella	0.65	0.65	0.68	0.62
Tibia	2.13	1.55	1.41	2.24
Metatarsus	2.17	1.55	1.72	2.93
Tarsus	1.82	1.31	1.03	1.62
Total	9.11	7.02	6.66	9.75



FIGS 75-79

*Heradion damrongi* gen. n., sp. n., ♂ holotype (75, 76, 79), ♀ paratype (77, 78). Male palp, ventral (75) and retrolateral (76) view. Epigyne, ventral view (77). Internal structure of epigyne (78). Body of male, dorsal view (79). Scale lines: 0.5 mm (77, 78); 1.0 mm (75, 76); 2.0 mm (79).

Spination: femora I d2 pl1 II d2 III d3 IV d3; patellae III pl1 IV pl1; tibiae I v1-1-1-2 II pl1 v1-1-1-2 III d2 pl2 rl1 v1-1-1-2 IV d3 pl3 rl2 v1-1-1-1-2; metatarsi I v1-1-1-1-2 II v1-1-1-1-2 III d2-2-2 v1-1-1-2 IV d2 pl2 rl2 v6 disp.

Male palp (Figs 75, 76): palpal tibia with two apophyses: ventrolateral apophysis short and thick, membranous at base; retrolateral tibial apophysis round at tip. Cymbium elongated, furrow long and deep, reaching apex. Tegulum with strongly sclerotized beak-shaped median apophysis, pointing downward. Distal tegular apophysis elongated, developed as thin membranous sheet; retrolateral field of sclerotization anchor-shaped. Embolic base round, origin of embolus pointing forward; embolus whip-like, very long.

♀ (paratype). Total length 4.85. Carapace 2.56 long, 1.74 wide. Abdomen 2.17 long.

Coloration and pattern: generally as in males but dorsum without pale longitudinal band on cardiac area.

Eye sizes and interdistances: AME 0.12, ALE 0.14, PME 0.12, PLE 0.12; AME-AME 0.06, AME-ALE 0.12, PME-PME 0.10, PME-PLE 0.23, ALE-PLE 0.06; MOQ 0.42 long, front width 0.33, back width 0.38. Clypeus 0.61 high.

## Leg measurements:

	I	II	III	IV
Femur	1.93	1.55	1.37	2.00
Patella	0.62	0.58	0.58	0.62
Tibia	1.68	1.27	1.20	1.96
Metatarsus	1.55	1.37	1.37	2.44
Tarsus	1.37	1.03	-	2.44
Total	7.15	5.80	4.52	8.46

Spination: femora I d3 pl1 II d3 III d1-2-1-1 IV d5; patellae III pl1 IV pl1; tibiae I v1-1-1-1 II pl1 v1-1-1-2 III d2 pl2 rl1 v1-1-1-2 IV d3 pl3 rl2 v1-1-1-1-2; metatarsi I v1-1-1-2 II v1-1-1-1-2 III d2 pl2 rl2 v1-1-1-1-2 IV d1-1-1-1-2 v1-1-1-1-2.

Epigyne (Fig. 77): developed as a simple sclerotized plate. Copulatory orifices located posteriorly; spermathecae strongly coiled (Fig. 78).

*Distribution*: Malaysia (Penang Island, Kelantan and Perak).

*Heradion luctator* sp. n. –

Figs 80-84

*Type material*: HOLOTYPE: ♂, MALAYSIA: Terengganu, Lake Kenyir, 5 km south-west of dam, 50 km southwest of Kuala Terengganu, N 4° 58', E 102° 19', 300-400 m, 8.VII.2001, leg. A. Schulz & K. Vock (MHNG M01-163).

PARATYPES: MALAYSIA: 1 ♀, same data as for holotype, 10.vii.2001 (MHNG M01-169); 1 ♀, Selangor, Templer Park (N 03° 17' 55.2", E 101° 37' 13.5"), north of Kuala Lumpur, 230-370 m, rainforest along stream, 13.VII.2001, leg. P. J. Schwendinger (MHNG SIM-01/14); 1 ♀, Perak, Pangkor Island, southwest of Ipoh, 30-150 m, 15-16.XII.1997, leg. P. J. Schwendinger (MNHG).

*Diagnosis*. Males of *H. luctator* sp. n. can be easily identified by the swollen tibiae of leg I (Fig. 84) and by the bifid median apophysis of the bulb (Fig. 80); females by the coiled, widely separated spermathecae (Fig. 83).

*Etymology*. Latin, *luctator* means fighter, which refers to the swollen tibiae I of males.

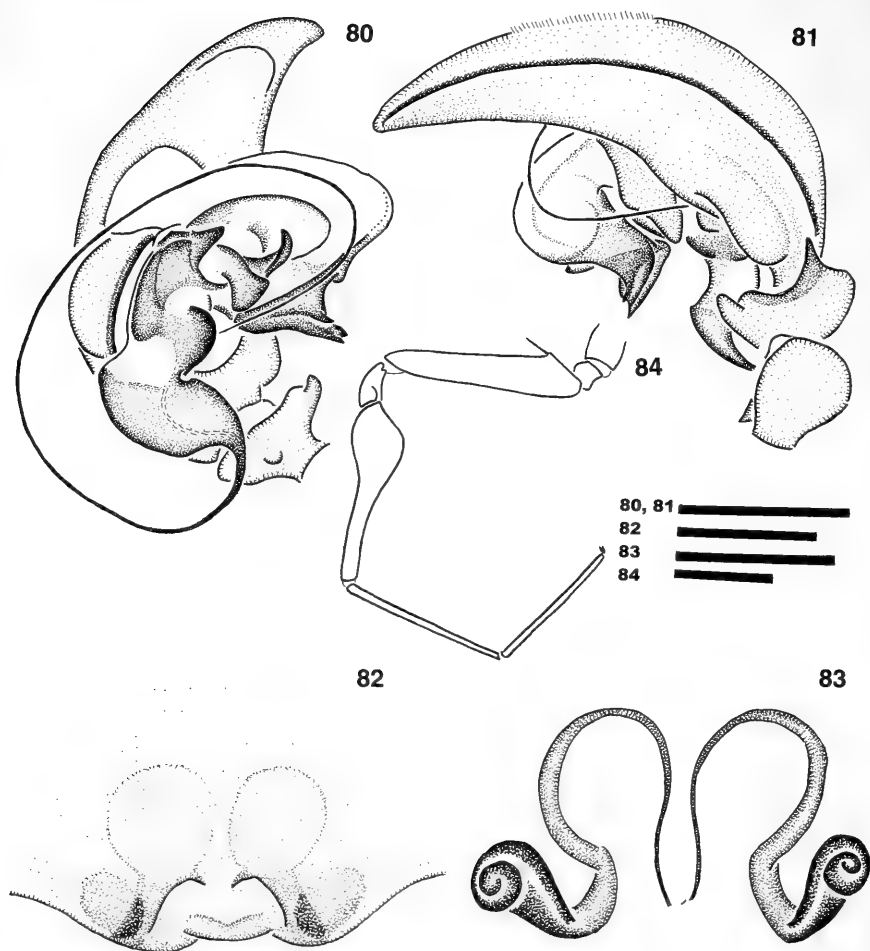
*Description*. ♂ (holotype). Total length 4.74. Carapace 2.38 long, 1.74 wide. Abdomen 1.69 long.

Coloration and pattern: carapace light brown, smooth. Legs yellow. Proximal part of tibiae I swollen (Fig. 84). Abdomen sepia, provided with some white spots. Ventral abdominal plate in front of spinnerets lightly sclerotized, pale yellow.

Eye sizes and interdistances: AME 0.11, ALE 0.12, PME 0.08, PLE 0.12; AME-AME 0.04, AME-ALE 0.07, PME-PME 0.05, PME-PLE 0.17, ALE-PLE 0.05; MOQ 0.48 long, front width 0.37, back width 0.25. Clypeus 0.41 high.

## Leg measurements:

	I	II	III	IV
Femur	2.06	1.62	1.55	2.10
Patella	0.62	0.58	0.62	0.68
Tibia	1.89	1.31	1.20	1.89
Metatarsus	1.86	1.37	1.51	2.41
Tarsus	1.48	1.20	0.93	1.55
Total	7.91	6.08	5.81	8.63



Figs 80-84

*Heradion luctator* gen. n., sp. n., ♂ holotype (80, 81, 84), ♀ paratype (82, 83). Male palp, ventral (80) and retrolateral (81) view. Epigyne, ventral view (82). Internal structure of epigyne (83). Leg I, lateral view (84). Scale lines: 0.5 mm (82, 83); 1.0 mm (80, 81, 84).

Spination: femora I d2 pl1 II d2 III d3 IV d3; patellae III pl1 r11 IV pl1 r11; tibiae I v2-1-1-1 II pl1 v2-1-1 III d2-1-1 pl3 r11 v2-1-2 IV d3 pl4 r12 v2-1-2; metatarsi I v2-1-1-2 II pl1 v2-1-1-2 III d2-2-2 v2-2-1-1 IV d1-2 pl2 r12 v2-1-2-1-1.

Male palp (Figs 80, 81): palpal tibia with two apophyses: ventrolateral tibial apophysis blunt, finger-like; retrolateral one small, sharp and pointed. Cymbium elongated, furrow long and deep, relatively broad. Tegulum with bifid median apophysis: basal branch distally broad; upper branch sickle-shaped. Distal tegular apophysis thin, developed as a membranous sheet, retrolateral field of sclerotization complicated. Embolic base separated from tegulum by membranous area. Embolus thin, whip-like.

♀ (paratype). As the male but larger in size, legs of normal size and tibia I not swollen. Total length 5.73. Carapace 2.43 long, 1.66 wide. Abdomen 2.56 long.

Coloration and pattern: coloration darker than in males.

Eye sizes and interdistances: AME 0.17, ALE 0.12, PME 0.11, PLE 0.12; AME-AME 0.05, AME-ALE 0.12, PME-PME 0.10, PME-PLE 0.26, ALE-PLE 0.05; MOQ 0.43 long, front width 0.41, back width 0.33. Clypeus 0.61 high. Leg formula: 4123.

Leg measurements:

	I	II	III	IV
Femur	1.89	1.62	1.55	2.06
Patella	0.62	0.62	0.62	2.03
Tibia	1.72	1.31	1.20	1.93
Metatarsus	1.55	1.27	1.51	2.48
Tarsus	1.37	1.06	1.00	1.37
Total	7.15	5.88	5.88	9.87

Spination: femora I d2 pl1 II d2 III d3 IV d3; patellae III pl1 IV pl1; tibiae I v1-1-1-1 II v1-1-1-2 III d2 pl1 r1 v1-1-1-2 IV d3 pl2 r2 v2-1-1-2; metatarsi I 5 dispersal. II v1-2-2 III d1-1-2 pl2 r2 v1-1-1-2 IV 13 dispersal.

Epigyne (Fig. 82): with depression on posterior margin. Copulatory orifices elongated, located posteriorly, almost touching epigastric furrow. Copulatory ducts relatively short. Spermathecae widely separated, coiled (Fig. 83).

*Distribution.* Malaysia (Terengganu, Selangor and Perak).

## DISCUSSION

The presence of a metatarsal preening bush composed of chisel-shaped hairs (Figs 10, 49, 50) in both *Euryeidon* gen. n. and *Heradion* gen. n. clearly shows that these two genera belong to the subfamily Zodariinae. Jocqué (1991) defined the subfamily Storeninae on the base of chisel-shaped hairs but this later appeared to be a paraphyletic group. Jocqué (1992) and Benjamin & Jocqué (2000) reason why the two were united. The two new genera are closely related to *Mallinella*, with which they share the typical dome-shaped cephalothorax, the sternum with triangular extensions fitting in coxal concavities, and the very well-delimited chilum with bulging centre. The structures of the secondary genitalia are also similar. Male palps of these three genera are characterized by the presence of a broad cymbial fold, epigynes by a strongly sclerotized internal structure. The easiest way to separate these genera is to look at the type of armature in front of the tracheal spiracle: in *Mallinella* there is a single row of short spines, whereas in both new genera there is a field with several rows of spine-shaped setae decreasing in length toward the front (Figs 2, 3, 44, 45). These characters could be regarded as different stages of a single character, which again stresses the close relationship between these three genera.

Only a single species of Zodariidae, *Stenomomorpha reinholdae*, has previously been recorded from Thailand. Yet, *Mallinella* and *Asceua* are the most abundant zodariid genera that can be found almost everywhere in forests of Thailand, including the summit of Doi Inthanon, the highest mountain culminating at 2565 m. The discovery of species-rich new genera in this part of the tropics was a surprise as *Asceua* and *Mallinella* were indeed considered the only zodariid genera with numerous species.

While several attempts have been made to collect specimens throughout different forests in the northern part of the country, members of *Euryeidon* gen. n. were collected only from the northern part of the Dwana-Tenesserim Range (Chiang Mai and Chiang Rai Provinces). In addition, only two species of *Heradion* gen. n. were collected from the north and the east of Thailand. The remaining three *Heradion* species are widely distributed and quite common in Malaysia.

The syntopic occurrence of three congeneric species of *Euryeidon* gen. n., i.e. *E. musicum* sp. n., *E. anthonyi* sp. n. and *E. sonthichiae* sp. n., together with *H. peteri* sp. n. in the evergreen riverine forest of Doi Chiang Dao is another indication for the high biodiversity of tropical forests in Thailand. This phenomenon has previously been reported for another spider family, i.e. the Amaurobiidae at Doi Inthanon (Dankittipakul & Wang, 2003).

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We are grateful to Dr Peter J. Schwendinger for providing material from his personal collection and for the loan of specimens from the MHNG. We also thank Dr Peter J. Schwendinger for his comments on the manuscript. Work on this paper was carried out while the first author was based at Chiang Mai University, Thailand. He is grateful to people who provided assistance there, in particular to Professor Saowapa Sonthichai (Biology Department, Chiang Mai University), Dr Wipada Vungsilabutr (Department of Entomology and Zoology, Ministry of Agriculture, Bangkok) and Dr Angoon Lewwanich (Institute of Science, The Royal Academy of Thailand, Bangkok). Alan D. Newson (The University of Auckland, New Zealand) kindly checked the English text.

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**The first record of *Horaeomorphus* Schaufuss (Coleoptera, Scydmaenidae) from the Philippines, with description of *H. blattnyi* sp. n.**

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**The first record of *Horaeomorphus* Schaufuss (Coleoptera, Scydmaenidae) from the Philippines, with description of *H. blattnyi* sp. n.** - The first species of the Australo-Oriental genus *Horaeomorphus* Schaufuss known to occur in the Philippines is described, *H. blattnyi* sp. n. The male habitus and key characters including the aedeagus are illustrated.

**Keywords:** Coleoptera - Scydmaenidae - *Horaeomorphus* - new species - Philippines - taxonomy.

## INTRODUCTION

The genus *Horaeomorphus* Schaufuss (Scydmaeninae, Cyrtoscydmini) comprises over fifty species distributed in Southeast Asia, Australia, New Caledonia, Madagascar and Mauritius (Newton & Franz, 1998; Jałoszyński, 2002, 2003). Three species have been described from the southeastern part of Asia: *H. chinensis* Franz from mainland China, *H. babai* Jałoszyński from Taiwan, and *H. sakishimanus* Jałoszyński from Ryukyus, Japan, (Franz, 1985; O'Keefe & Li, 1998; Jałoszyński, 2002, 2003).

Thanks to the kindness of Dr Giulio Cuccodoro, I had the opportunity to examine an interesting specimen preserved in the collection of the Muséum d'histoire naturelle, Geneva, which turned out to be a male of an undescribed species of *Horaeomorphus*. This specimen was collected in the northern part of Luzon, the largest island of the Philippines, and is the first member of this genus reported to occur in this country.

The type material is deposited in the Muséum d'histoire naturelle, Geneva (MHNG).

## TAXONOMY

***Horaeomorphus* Schaufuss, 1889**

*Horaeomorphus* Schaufuss, 1889, p. 21. Type species: *Horaeomorphus eumicroides* Schaufuss.

A detailed set of features, which characterize the genus *Horaeomorphus*, is given in a recent paper (Jałoszyński, 2002). The following diagnosis includes only the

most important key characteristics: body slender, elongate; vertex with pair of foveae; neck broad; antenna gradually thickened toward apex, without distinct club; antennomere XI large, usually subconical, clearly separated from X; pronotum without sharp edges or lateral carinae, with row of 3-5 basal foveae sometimes connected by transverse groove; prosternal process very narrow, weakly separating procoxae; mesosternal process wider than prosternal, moderately projecting ventrally; elytra oval, entire, weakly or not depressed at base, basal foveae covered by posterior margin of pronotum; femora clavate, in some cases hind trochanters are modified in males. Aedeagus with symmetrical parameres and well sclerotized armature of internal sac. Female genitalia have been studied in two species only; *H. sakishimanus* possesses globular spermatheca and elongate bursa copulatrix (Jałoszyński, 2002).

The subgeneric division of *Horaeomorphus* into the nominotypical subgenus and *Pseudosyndicus* Franz is problematic (discussed in Jałoszyński, 2002), and must be verified. Therefore, the new species is not placed in any subgenus to facilitate further revisions.

***Horaeomorphus blattnyi* sp. n.**

Figs 1-6

*Type material.* Holotype male, labelled: Philippines, Luzon, Bontoc Prov. (sic!), Mt. Data, 2270 m, 28. iv. 1979, Orousset leg., from mossy forest under rotten wood (MHNG).

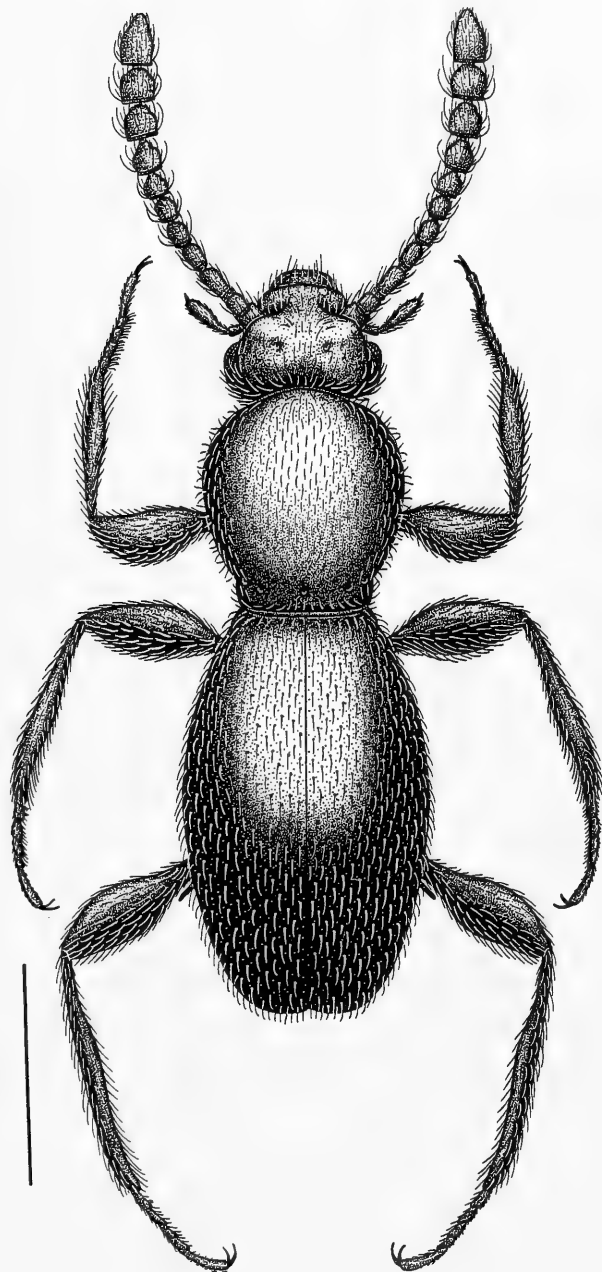
*Description.* Body (Fig. 1) large, body length 3.33 mm, elongate, moderately convex, moderately dark brown, legs (especially femora) and palpi slightly brighter, setation relatively short, moderately dense, yellowish.

Head wider than long, widest at relatively small eyes, length 0.54 mm, width 0.72 mm. Occiput with two small pits in middle of occipital constriction, distance between pits equals to 1/4 width of occiput; vertex distinctly transverse, moderately convex, with pair of shallow but distinct pits; tempora relatively long, rounded, strongly narrowing posteriorly; frons trapezoidal, convex, moderately lowering toward large, transverse, subrectangular clypeus; supraantennal tubercles only slightly raised. Head glossy, punctuation moderately sparse, composed of fine punctures; setation brownish, sparse, moderately long, composed of thin, curved, suberect setae, on tempora slightly thicker and nearly straight.

Antenna (Fig. 5) relatively short, slightly extending past posterior margin of pronotum, 1.62 mm in length, gradually thickened toward apex, relative lengths of antennomeres: 1: 0.8 : 1.2 : 1.15 : 1.05 : 1 : 0.95 : 1 : 1.05 : 1.05 : 1.7; surface of antennomeres uneven, especially segments VIII-XI coarsely, densely granulated; all antennomeres with moderately dense, moderately long, curved suberect to erect setae.

Pronotum large, distinctly elongate, widest near anterior third, length 1.01 mm, maximum width 0.91 mm, width at base 0.57 mm. Anterior and lateral margins rounded; disc distinctly demarcated from narrow posterior collar by transverse row of five small basal foveae (one median and two pairs of lateral foveae); posterior margin of base straight, with very narrow marginal carina, hind angles rounded. Punctuation of pronotum sparse and very fine; setation short and sparse, composed of slightly curved, suberect to erect setae minimally thicker than setation of head.

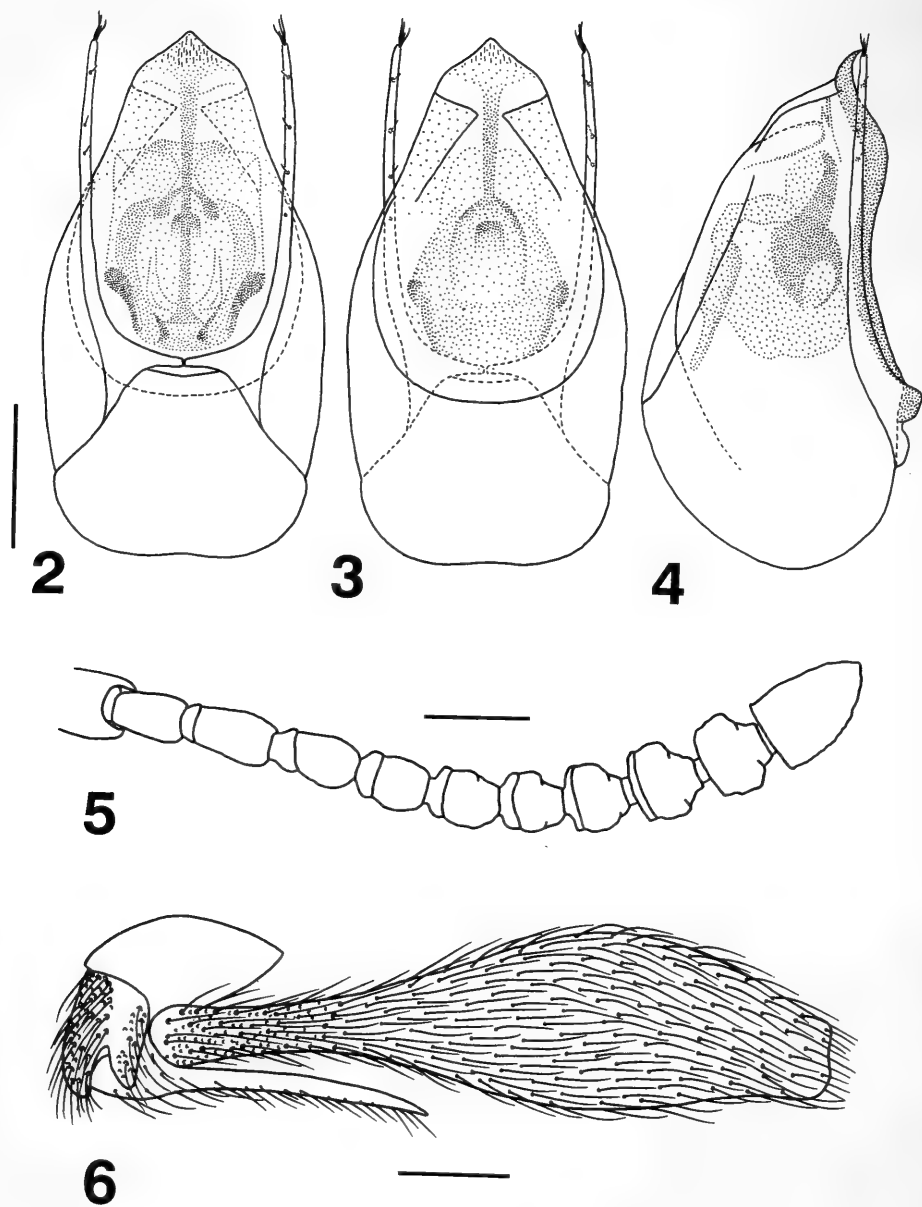
Elytra oval, elongate, more convex than pronotum, widest slightly anterior to



1

FIG. 1

Habitus of *Horaemorphus blattnyi* sp. n., holotype male. Scale 0.5 mm.



FIGS 2-6

*Horaemorphus blatnyi* sp. n. (holotype male): 2 – aedeagus, ventral view, 3 – aedeagus, dorsal view, 4 – aedeagus, lateral view, 5 – right antenna, dorsal view, 6 – left coxa, trochanter and femur, ventral view. Scale 0.2 mm.

middle, length 1.78 mm, combined width at widest point 1.12 mm, elytral index (i.e. ratio length/width) 1.59. Humeri very weakly marked, with shallow and broad internal humeral impression; apices of elytra separately rounded. Elytral punctation as sparse as that on pronotum but composed of more distinct, slightly larger punctures; setation relatively short, sparse, suberect, composed of minimally curved setae as thick as pronotal setation. Hind wings entirely reduced.

Legs moderately long, robust; procoxae large, nearly globular, contiguous; mesocoxae large, flattened dorso-ventrally, separated by relatively narrow mesosternal process; metacoxae smaller, with transverse basal and well demarcated, elongate distal part; pro- and mesotrochanters small, subtriangular; metatrochanters strongly modified, with long, slender rod-like process (Fig. 6). All femora with slender basal part and strongly, but not abruptly clavate distal part; all tibiae slightly recurved; tarsi relatively short, tarsomeres reducing in size from I to IV, tarsomere V minimally longer than II and IV together. Setation of ventral surface of fore and middle tibiae and tarsi distinctly longer than setae on hind legs.

Aedeagus (Figs 2-4) 0.72 mm in length, with symmetrical, moderately darkly sclerotized structures of internal sac.

Female. Unknown.

*Comments.* This species can be easily distinguished from similar Asiatic congeners by its large, dark and shiny body, and by the design of the aedeagus. This is the first species of *Horaeomorphus* known to occur in Philippines. The locality "Bontoc", indicated on the label as "Bontoc Prov." in fact is a capitol of Mountain Province in North Luzon.

*Etymology.* The new species is dedicated to Ctibor Blatný, who described most species of Scydmaenidae known from the Philippines.

## ACKNOWLEDGEMENTS

I express my sincere thanks to Dr Giulio Cuccodoro for lending me the material for study.

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## Falagriini, Deremini, Athetini e Thamiaraeini del Borneo (Coleoptera, Staphylinidae)\*

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**Falagriini, Deremini, Athetini and Thamiaraeini from Borneo (Coleoptera, Staphylinidae).** - Nine genera are new for Borneo, two of the Falagriini: *Pheigetoxenus* Kistner and *Cordalia* Jacobs; one of the Deremini: *Demerinda* Cameron; four of the Athetini: *Emmelostiba* Pace, *Aloconota* Thomson, *Hydrosmecta* Thomson and *Berca* Blackwelder; two of the Thamiaraeini: *Gastropaga* Bernhauer and *Platorischna* Pace. Sixty-six species are recognized, of which fifty-three are described as new. New synonymies are proposed for three species: *Falagria densipennis* Cameron, 1939 is a junior synonym of *Falagria amabilis* Cameron, 1933; *Atheta bogorensis* (Sawada, 1971) and *Atheta mon* Pace, 1992 are two junior synonyms of *Atheta ocellaris* Cameron, 1929. New combinations are proposed for four species. All new species are illustrated and compared with similar looking species. Keys to almost all the species of the genera of the tribes mentioned above are presented.

**Keywords:** Coleoptera - Staphylinidae - Aleocharinae - Falagriini - Deremini - Athetini, Thamiaraeini - taxonomy - Borneo.

### INTRODUZIONE

Il presente lavoro è il risultato dello studio delle importantissime e abbondanti raccolte effettuate, nel corso delle spedizioni sul Monte Kinabalu e dintorni, dal Dott. Aleš Smetana di Ottawa, dal Dott. Ivan Löbl e dal Dott. Daniel Burckhardt, questi due ultimi già del museo di Storia Naturale di Ginevra. Sono integrate da alcuni esemplari raccolti dal defunto Prof. Herbert Franz di Mödling (Austria) e dal noto stafilinidologo Guillaume de Rougemont di Londra, da un piccolo lotto affidatomi dal Dott. Volker Assing di Hannover e da un esemplare del D.E.I di Eberswalde affidatomi dal Dr L. Zerche.

Questo materiale all'esame si è rivelato molto importante perché la fauna delle Aleocharinae del Borneo si arricchisce di nove generi, prima sconosciuti per questa Grande Isola, e di ben cinquantatré nuove specie.

Gli olotipi delle nuove specie sono conservati nel Museo di Storia Naturale di Ginevra (MHNG), nell'Institut Royal des Sciences Naturelles de Belgique di Bruxelles (IRSN), in collezione Franz al Naturhistorisches Museum di Vienna (NHMW) e nel Deutsches Entomologisches Institut di Eberswalde (DEI).

\* 187° Contributo alla conoscenza delle Aleocharinae.

Manoscritto accettato il 17.03.2004

## METODO

L'attribuzione generica delle Aleocharinae del Borneo, come per ogni regione zoogeografica, è basata essenzialmente sulla forma delle parti boccali, particolarmente della ligula, e sulla formula tarsale. L'attribuzione specifica si basa principalmente sulla forma dell'edeago in visione laterale e ventrale e su quella dei suoi pezzi copulatori interni. La spermateca presenta pure eccellenti caratteri differenziali piuttosto stabili. Per questo qui sono descritte specie anche se note su solo esemplari femmina.

Le determinazioni sono state compiute mediante il confronto della forma dell'edeago, spermateca e di altre parti anatomiche osservati al microscopio, talvolta a forte ingrandimento (450 x), con i disegni di edeago, spermateca e habitus delle specie a me note sui tipi o da me descritte in passato. Sono consapevole che i miei lavori da alcuni, ancora ancorati al passato, sono sottoposti a critica svalutativa a motivo della brevità delle descrizioni, limitate all'essenziale, vale a dire a quei caratteri, come la microscultura e la granulosità, non riproducibili graficamente con assoluta precisione con disegni a medio ingrandimento dell'habitus delle singole nuove specie, qui raffigurati per ogni specie, senza eccezione. Pongo l'accento che la parte illustrativa qui non è qualcosa di decorativo e trascurabile, ma la parte più importante delle brevi descrizioni, avendo la figura un linguaggio universale, comprensibile anche a coloro che non conoscono la lingua italiana. Le lunghe descrizioni dell'habitus e anche le chiavi di determinazione, sono rese superflue dalla visione dell'apparato illustrativo. È in tal modo possibile anche il riconoscimento senza problemi del ♂ o della ♀ sconosciuti di una determinata specie. A. Kapp (1995) pur non essendo specialista di Aleocharinae, con la sola consultazione delle figure dell'edeago delle specie di *Leptusa* pubblicate in un mio lavoro (Pace, 1989), ha riconosciuto la ♀ di *Leptusa priesneri* Pace, 1989, fino allora sconosciuta. Assing (2002) pubblicando l'edeago di una pretesa nuova specie di *Leptusa* (*L. spoliata*) della Turchia, ha permesso il riconoscimento sicuro che non è che una specie già descritta (*L. gurgentepensis* Pace), non riconosciuta forse per mancanza di attenta osservazione delle figure dell'edeago da me pubblicate (Pace, 1989). Quest'ultima sinonimia non sarebbe possibile in base alla sola descrizione della specie, anche se minuziosa e precisa. La convinzione dell'autore, come di quasi tutti gli entomologi moderni, è che un disegno anche se imperfetto sostituisce molto efficacemente una minuziosa e lunga descrizione ai fini di un riconoscimento e affinità tassonomica delle specie, anzi le lunghissime descrizioni sono ritenute un inutile orpello se presenti figure precise, complete e di qualità. Il riconoscimento di una determinata specie, inoltre, ha una sicura conferma se il disegno della forma dell'edeago e della spermateca è associato a quello dell'habitus, nel presente lavoro raffigurati per tutte le nuove specie. Mi rendo conto che questo metodo di impostazione del lavoro rappresenta una rottura rispetto alla tradizione delle minuziose e lunghe descrizioni che, nonostante la loro prolissità, non permettono un sicuro riconoscimento della maggior parte delle specie descritte, se non accompagnate da un disegno illustrativo o se non esaminate le serie tipiche.



## ELENCO DELLE SPECIE NOTE

## FALAGRIINI

*Falagria (Leptagria) pygmaea* Kraatz, 1859*Falagria pygmaea* Kraatz, 1859: 7*Falagria (Anaulacaspis) pygmaea*: Cameron, 1939a: 258

3 es., Sabah, Mt. Kinabalu Nat. Pk., Poring Hot Springs, 485 m, 29.VIII.1988, leg. A.Smetana.

DISTRIBUZIONE. Sri Lanka, India, Singapore. Nuova per il Borneo.

*Falagria (Leptagria) amabilis* Cameron, 1933*Falagria (Anaulacaspis) amabilis* Cameron, 1933a: 355*Falagria (Anaulacaspis) densipennis* Cameron, 1939a: 256, **syn. n.***Falagria (Leptagria) densipennis*: Pace, 1984: 428

4 es., Borneo, Sabah, Mt. Kinabalu N.P., HQ Liwagu River, 1520 m, 11.VIII.1988, A. Smetana leg.; 3 es., Borneo, Sabah, Mt. Kinabalu N.P., HQ Liwagu Rv. trail, 1590 m, 5.VI-II.1988, A. Smetana leg.; 6 es., Sabah, M. Kinabalu N.P., Poring Hot Springs, 485-495 m, 30.VI-II.1988, leg. A. Smetana; 1 es., Sabah, Poring Hot Springs, 500 m, 11.V.1987, leg. Burckhardt &amp; Löbl; 3 es., Sabah, Poring Hot Springs, 500 m, 7.V.1987, leg. Burckhardt &amp; Löbl.

DISTRIBUZIONE. India, Birmania, Cina e Borneo.

*Falagria (Myrmecocephalus) javanica* Cameron, 1939*Falagria (Stenagria) javanica* Cameron, 1939b: 4; Pace, 1986: 148

1 ♂, Sabah, Mt. Kinabalu, Poring Hot Springs, 480 m, 10.V.1987, leg. A. Smetana.

DISTRIBUZIONE. Giava, Bali, Celebes e Sumatra (comparata con i tipi). Nuova per il Borneo.

*Falagria (Myrmecocephalus) seminitens* Cameron, 1933*Falagria (Stenagria) seminitens* Cameron, 1933a: 356; Pace, 1986: 150

2 es., Sabah, Poring Hot Springs, 500 m, 7.V.1987, leg. Burckhardt &amp; Löbl; 1 ♀, Sabah, Poring, 9.III.1990, leg. G. de Rougemont.

DISTRIBUZIONE. Malaysia, Bali, Giava, Sumatra e Borneo (comparata con l'holotipus).

## ATHETINI

*Emmelostiba pahangensis* (Cameron, 1936), **comb. n.**

Figg. 41-43

*Atheta* (s. str.) *pahangensis* Cameron, 1936: 51, nec *Atheta pahangensis* Likovski, 1983 (omonimo)

1 ♂, Sabah, Mt. Kinabalu, 1750 m, 21.IV.1987, leg. Burckhardt &amp; Löbl.

DISTRIBUZIONE. Malaysia. Nuova per il Borneo (comparata con il tipo).

*Atheta (Microdota) ocularis* Cameron, 1939*Atheta (Microdota) ocularis* Cameron, 1939a: 327*Atheta (Ceritaxa) spinosa* Scheerpeltz, 1962: 601, **syn. n.***Ischnopoda (Microdota) bogorensis* Sawada, 1971: 72, **syn. n.***Atheta (Amidobia) bogorensis*: Sawada 1974: 154*Atheta (Microdota) bogorensis*: Sawada, 1980b: 353*Atheta (Microdota) mon* Pace, 1992: 251, **syn. n.**

1 ♂, Borneo-Sabah, Mt. Kinabalu Nat. Pk., HQ Silau-Silau Tr., 1550 m, 12.VIII.1988, leg. A. Smetana; 1 ♀, Borneo, Sabah, Mt. Kinabalu Nat. Pk., HQ at Liwagu Rv., 1505 m, 9.VI-II.1988, leg. A. Smetana; 4 es., Sabah, Poring Hot Springs, Langanan Falls, 900-950 m, 6-11.V.1987, leg. Burckhardt & Löbl; 1 ♂ e 1 ♀, Borneo, Sabah, Mt. Kinabalu Nat. Pk., HQ at Liwagu Rv., 1490 m, 5.VIII.1988, leg. A. Smetana; 4 es., Sabah, Poring Hot Springs, 11.V.1987, leg. Burckhardt & Löbl.

DISTRIBUZIONE. India, Cina, Thailandia, Vietnam, Borneo e Filippine (tipi esaminati).

***Atheta (Microdota) putridula* (Kraatz, 1859)**

*Homalota putridula* Kraatz, 1859: 35

*Atheta* (s. str.) *putridula*: Cameron, 1939a: 347

*Atheta (Microdota) putridula*: Sawada, 1980b: 351

1 ♀, Sabah, Mt. Kinabalu Nat. Pk., Poring Hot Springs, 510 m, 12.V.1987, leg. A. Smetana; 1 ♀, Sabah, Mt. Kinabalu Nat. Pk., Poring Hot Springs, 500 m, 6.V.1987, leg. Burckhardt & Löbl; 1 ♂, Sabah, Poring Hot Springs, 11.V.1987, leg. Burckhardt & Löbl.

DISTRIBUZIONE. Sri Lanka e Singapore. Nuova per il Borneo (tipi esaminati).

***Atheta (Acrotona) borneana* Cameron, 1943**

*Atheta (Acrotona) borneana* Cameron, 1943: 42

1 ♂, Sabah, Poring Hot Springs, 500 m, 11.V.1987, leg. Burckhardt & Löbl.

DISTRIBUZIONE. Specie finora nota solo del Mt. Poi, Borneo (holotipus esaminato).

***Atheta (Acrotona) horrida* Cameron, 1933**

*Atheta (Acrotona) horrida* Cameron, 1933a: 359; Sawada, 1980b: 346

6 es., Sabah, M. Kinabalu N.P., Poring Hot Springs, 495 m, 30.VIII.1988, leg. A. Smetana; 2 es., Sabah, M. Kinabalu N.P., Poring Hot Springs, HQ 1500 m, 25-30.IV.1987, leg. A. Smetana; 2 es. Sabah, Mt. Kinabalu N.P., Liwagu River, 1490 m, 3.IX.1988, A. Smetana leg.; 1 es., Sabah, Mt. Kinabalu N.P., HQ at Liwagu Rv., 1500 m, 16.V.1987, A. Smetana leg.; 1 es., Borneo, Sabah, M. Kinabalu N.P., HQ Silau-Silau Tr., 1550 m, 4.IX.1988, leg. A. Smetana; 2 es., Borneo, Sabah, M. Kinabalu N.P., HQ Silau-Silau Tr., 1540 m, 14.VIII-1.IX.1988, leg. A. Smetana; 5 es., Sabah, Poring Hot Springs, 500 m, 11.V.1987, leg. Burckhardt & Löbl; 1 es., Sabah, Poring Hot Springs, 500 m, 6.V.1987, leg. Burckhardt & Löbl.

DISTRIBUZIONE. Specie apparentemente endemica del Kinabalu (holotipus esaminato).

***Codoglossa morbida* (Cameron, 1933)**

*Atheta (Datomicra) morbida* Cameron, 1933a: 359

*Codoglossa morbida*: Sawada, 1980a: 27

1 ♂ e 1 ♀, Borneo-Sabah, E Mt. Kinabalu, 1150 m, rte. Ranau-Kota Kinabalu, 24.V.1987, leg. Burckhardt & Löbl; 1 ♀, Sabah, Poring Hot Springs, 500 m, 6.V.1987, leg. Burckhardt & Löbl; 1 ♀, Sabah, Crocker Ra., 1200 m, Km 63 rte Kota Kinabalu-Tambunan, 19.V.1987, leg. Burckhardt & Löbl.

DISTRIBUZIONE. Specie finora nota solo del Tenompok Pass, presso il Mt. Kinabalu. Nel presente lavoro ho dimenticato di illustrare l'edeago, finora sconosciuto. Esso si distingue per essere di dimensioni ridottissime e assai stretto in visione ventrale.

***Pelioptera monticola* Cameron, 1933***Pelioptera monticola* Cameron, 1933a: 359; Sawada, 1980a: 55

3 es., Borneo, Sabah, Mt. Kinabalu N.P., 1500 m, 30.IV.1987, Burckhardt & Löbl leg.; 2 ♂♂, 1 ♀, Sabah, Poring Hot Springs, 500 m, 8-11.V.1987, leg. Burckhardt & Löbl; 1 es., Sabah, Crocker Range, 1550-1650 m, 16.V.1987, leg. Burckhardt & Löbl; 1 ♀, Sabah, Mt. Kinabalu, 1450-1550 m, 23.V.1987, leg. Burckhardt & Löbl; 1 ♂, Borneo, Sabah, Mt. Kinabalu N.P., HQ Liwagu River, 1495 m, 23.V.1987, A. Smetana leg.; 1 ♀, Sabah, Mt. Kinabalu, Poring Hot Springs, 480-510 m, 30.VIII.1988, leg. A. Smetana; 1 es., Borneo-Sabah, Mt. Kinabalu N.P., Layang Layang, 2600 m, 2-8.V.1987, leg. A. Smetana; 1 ♀, Borneo-Sabah, Mt. Kinabalu N.P., east base St. John's PK, 3900 m, 8.VIII.1988, leg. A. Smetana.

DISTRIBUZIONE. Specie finora nota solo del Borneo.

***Pelioptera opaca* Kraatz, 1857***Pelioptera opaca* Kraatz, 1857: 56; Cameron, 1939a: 418; Sawada, 1980a: 44; Pace, 1998a: 152

1 ♂, Sabah, Mt. Kinabalu, Poring Hot Springs, 480 m, 10.VIII.1987, leg. A. Smetana; 1 ♂, Borneo, Sabah, M. Kinabalu N.P., HQ Silau-Silau Tr., 1540 m, 14.VIII-1.IX.1988, leg. A. Smetana; 1 ♀, Borneo-Sabah, Mt. Kinabalu Nat. Pk., HQ 1500 m, 30.IV-8.V.1987, leg. A. Smetana.

DISTRIBUZIONE. Sri Lanka, India, Singapore, Cina, Vietnam. Nuova per il Borneo (tipi esaminati).

***Pelioptera sagadensis* Pace, 1990***Pelioptera sagadensis* Pace, 1990: 94

1 ♀, Sabah, Mt. Kinabalu, Poring Hot Springs, 480 m, 10.V.1987, leg. A. Smetana; 1 ♂ e 1 ♀, Borneo, Sabah, Mt. Kinabalu N.P., 1500 m, 30.IV-8.V.1987, leg. A. Smetana; 1 ♂, Borneo, Sabah, M. Kinabalu N.P., HQ Silau-Silau Tr., 1540 m, 14.VIII-1.IX.1988, leg. A. Smetana; 1 ♀, Sabah, Mt. Kinabalu, 1580 m, 27.IV.1987, leg. Burckhardt & Löbl; 1 ♂, Sabah, Poring Hot Springs, 500 m, 6.V.1987, leg. Burckhardt & Löbl; 3 es., Sabah, Poring Hot Springs, 8.V.1987, leg. Burckhardt & Löbl; 1 ♀, Sabah, Mt. Kinabalu, 1430 m, 22.V.1987, leg. Burckhardt & Löbl.

DISTRIBUZIONE. Specie finora nota solo delle Filippine e Vietnam. Nuova per il Borneo.

## ELENCO DELLE NUOVE SPECIE

## FALAGRIINI

1. *Pheigetoxenus borneensis* sp. n.
2. *Cordalia kinabaluensis* sp. n.
3. *Cordalia perdistincta* sp. n.
4. *Falagria (Myrmecocephalus) brunei-*  
*ensis* sp.n.
5. *Falagria (Myrmecocephalus) para-*  
*nitens* sp.n.
6. *Ischnopoda lyrafera* sp. n.

## DEREMINI

7. *Demerinda borneensis* sp. n.

## ATHETINI

8. *Gnypeta bruneiorum* sp. n.

9. *Gnypeta kinabaluensis* sp. n.
10. *Aloconota dimidiata* sp. n.
11. *Hydrosnecta pulchricolorata* sp. n.
12. *Atheta (Chaetida) antennaria* sp. n.
13. *Atheta (Acrotona) magnalamina* sp. n.
14. *Atheta (Acrotona) muluensis* sp. n.
15. *Atheta (Acrotona) rufoapicalis* sp. n.
16. *Atheta (Acrotona) thaimastocornis*  
sp. n.
17. *Atheta (Acrotona) borneosuspiciosa*  
sp. n.
18. *Atheta (Acrotona) dilatatiapex* sp. n.
19. *Atheta (Acrotona) microfistula* sp. n.
20. *Atheta (Acrotona) inversitheca* sp. n.

21. *Atheta (Microdota) semitaevagans* sp. n.  
 22. *Atheta (Microdota) taedafera* sp. n.  
 23. *Atheta (Microdota) stenomastaxoides* sp. n.  
 24. *Atheta (Microdota) semiasymmetrica* sp. n.  
 25. *Atheta (Microdota) microtheca* sp. n.  
 26. *Atheta (Poromicrodota) neamicrotheca* sp. n.  
 27. *Atheta (Datomicra) bibulbosa* sp. n.  
 28. *Atheta (Dimetrota) ramifera* sp. n.  
 29. *Atheta (Dimetrota) preludi* sp. n.  
 30. *Berca borneana* sp. n.  
 31. *Pelioptera (Pelioptera) seminuda* sp. n.  
 32. *Pelioptera (Pelioptera) ics* sp. n.  
 33. *Pelioptera (Pelioptera) longearmata* sp. n.  
 34. *Pelioptera (Pelioptera) irigaster* sp. n.  
 35. *Pelioptera (Pelioptera) stenopaca* sp. n.  
 36. *Pelioptera (Pelioptera) borneopaca* sp. n.
37. *Pelioptera (Pelioptera) omissa* sp. n.  
 38. *Pelioptera (Pelioptera) burckhardti* sp. n.  
 39. *Pelioptera (Pelioptera) perinsolita* sp. n.  
 40. *Pelioptera (Tropimenedytron) longicollis* sp. n.  
 41. *Pelioptera (Tropimenedytron) necnigiriensis* sp. n.

## THAMIARAEINI

42. *Gastropaga muluicola* sp. n.  
 43. *Platorischna montana* sp. n.  
 44. *Platorischna borneensis* sp. n.  
 45. *Platorischna assingi* sp. n.  
 46. *Platorischna muluensis* sp. n.  
 47. *Platorischna pusilla* sp. n.  
 48. *Platorischna pseudopusilla* sp. n.  
 49. *Platorischna bicochlea* sp. n.  
 50. *Platorischna lambirensis* sp. n.  
 51. *Platorischna kinabaluensis* sp. n.  
 52. *Platorischna longipennis* sp. n.  
 53. *Platorischna fontium* sp. n.

## DESCRIZIONI

***Pheigetoxenus borneensis*** sp. n.

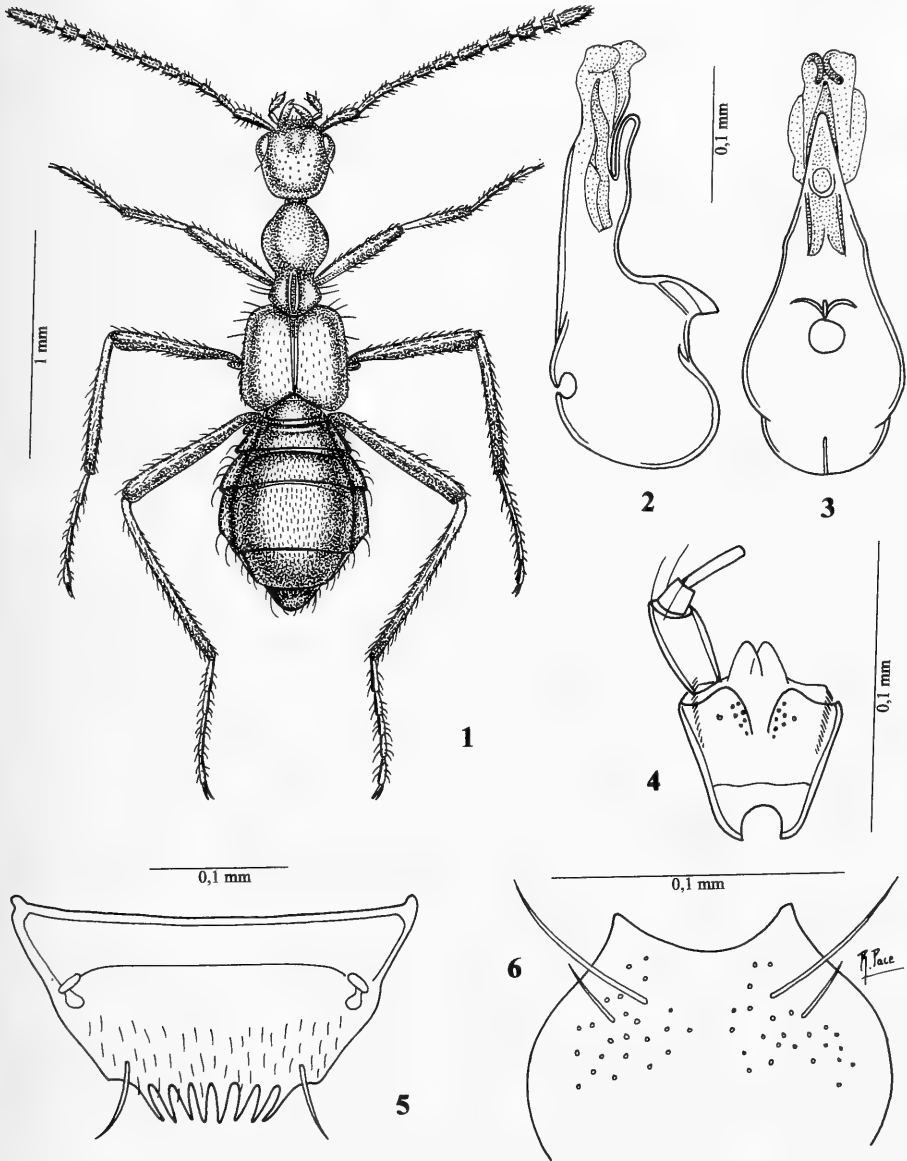
Figg. 1-6

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu N.P., Por[ing] H[ot] S[prings], area Eastern Ridge Tr., 1000 m, 28.VIII.1988, leg. A. Smetana (MHNG).

DESCRIZIONE. Lungh. 2,1 mm. Corpo lucido con elitre opache, parte restante del corpo lucida. Corpo rossiccio, con elitre bruno-rossicce; antenne e zampe giallo-rossicce. La punteggiatura del capo è ombelicata e distinta. Il pronoto presenta una rugosità mediana. La punteggiatura delle elitre è poco distinta. La reticolazione del capo e del pronoto è assente, quella delle elitre è vigorosa. Il capo presenta una concavità frontale. Edeago figg. 2-3, labio con palpo labiale, sesto urotergo libero del ♂ fig. 5, mento fig. 6

COMPARAZIONI. La nuova specie è affine a *P. alzadae* Kistner, 1983, di Sumatra. Se ne distingue per i caratteri dati nella seguente chiave.

- 1    Nonno antennumero trasverso; capo senza concavità frontale; sesto urotergo libero con 14 spine al margine posteriore; parte apicale dell'edeago non sinuata ventralmente. Sumatra . . . . . *P. alzadae* Kistner  
 -    Nonno antennumero più lungo che largo; capo presentante una concavità frontale; sesto urotergo libero con 8 spine al margine posteriore; parte apicale dell'edeago sinuata ventralmente . . . . . *P. borneensis* sp. n.



FIGG. 1-6

Habitus, edeago in visione laterale e ventrale, labio con palpo labiale, sesto urotergite libero del ♂ e mento. 1-6: *Pheigetoxenus borneensis* sp. n.

- 1 Ninth antennomere transverse; head without frontal concavity; sixth free urotergite with 14 thorns to the posterior margin; apical portion of the aedeagus not sinuate ventrally. Sumatra ..... *P. alzadae* Kistner
- Ninth antennomere longer than wide; head with a frontal concavity; sixth free urotergite with 8 thorns to the posterior margin; apical portion of the aedeagus sinuate ventrally ..... *P. borneensis* sp. n.

***Cordalia kinabaluensis* sp. n.**

Figg. 7-10

Holotypus ♂, Sabah, Kinabalu N.P., 29.X.1990, leg. G de Rougemont (MRSN).

Paratypi: 3 es., Sabah, Mt. Kinabalu N.P., Liwagu River, 1490 m, 3.IX.1988, A. Smetana leg.; 7 es., Sabah, Mt. Kinabalu N.P., Liwagu River, 1490-1520 m, 10-11.VIII.1988, A. Smetana leg.; 1 es., Borneo-Sabah, Mt. Kinabalu, Poring Hot Springs, 490 m, 31.VIII.1988, leg. A. Smetana; 1 ♂, Sabah, Poring Hot Springs, 500 m, 7.V.1987, leg. Burckhardt & Löbl; 1 es., Sabah, M. Kinabalu N.P., Poring Hot Springs, 495 m, 30.VIII.1988, leg. A. Smetana.

DESCRIZIONE. Lungh. 2,4 mm. Corpo lucidissimo e bruno-rossiccio; antenne bruno-rossicce con base dell'antennomero basale e l'undicesimo giallo-rossicci; zampe rossicce. La punteggiatura del capo è molto svanita e quella del pronoto e delle elitre è indistinta. Una granulosità saliente è presentata solo sui quattro uroterghi liberi, quella sul quinto urotergo libero è superficiale. Il corpo è coperto di pubescenza irta e lunga. Edeago figg. 8-9, spermateca fig. 10

COMPARAZIONI. La nuova specie si distingue dalle specie note per avere l'introflessione apicale del bulbo distale della spermateca in posizione asimmetrica. Per altri caratteri vedere la chiave di tutte le specie borneensi del genere *Cordalia* posta dopo la descrizione di *C. perdistincta* sp. n.

***Cordalia perdistincta* sp. n.**

Figg. 11-14

Holotypus ♂, Sabah, M. Kinabalu Nat. Pk., Poring Hot Springs, 495 m, 30.VIII.1988, leg. A. Smetana (MHNG).

Paratypi: 1 ♂ e 1 ♀, stessa provenienza dell'holotypus; 1 ♀, Sabah, M. Kinabalu N.P., Poring Hot Springs, 485 m, 29.VIII.1988, leg. A. Smetana; 1 ♀, Sabah, Poring Hot Springs, 500 m, 6.V.1987, leg. Burckhardt & Löbl; 1 ♀, Sabah, Poring Hot Springs, 500 m, 11.V.1987, leg. Burckhardt & Löbl; 5 es., Sabah, Poring Hot Springs, 500 m, 7.V.1987, leg. Burckhardt & Löbl.

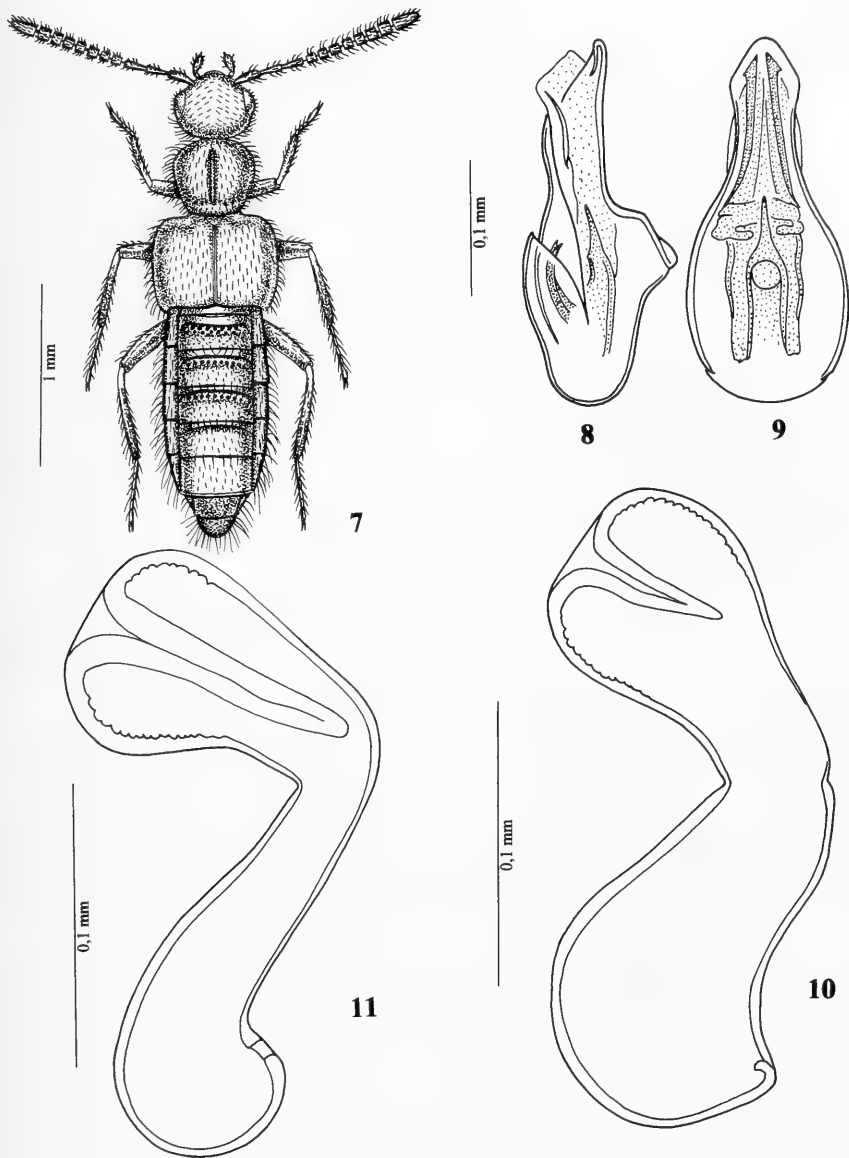
DESCRIZIONE. Lungh. 2,1 mm. Corpo lucido e bruno-rossiccio, con capo e addome bruni; antenne brune con i tre antennomeri basali rossicci e l'undicesimo giallo-rossiccio; zampe giallo-rossicce. L'avancorpo è privo di punteggiatura e granulosità distinte, l'addome è coperto di granulosità che è più saliente sugli uroterghi liberi anteriori che su quelli posteriori. Il pronoto presenta una profonda depressione mediana posteriore. Edeago figg. 13-14.

DERIVATIO NOMINIS. Il nome della nuova specie significa «Molto distinta» dalle specie borneensi note.

COMPARAZIONI. La nuova specie si distingue dalle specie note per avere il primato della lunghezza dell'introflessione apicale del bulbo distale della spermateca. Il genere *Cordalia* Jacobs, 1925, finora era sconosciuto per il Borneo (Hammond, 1984). La nuova specie si distingue dalla precedente per i caratteri dati nella seguente chiave.

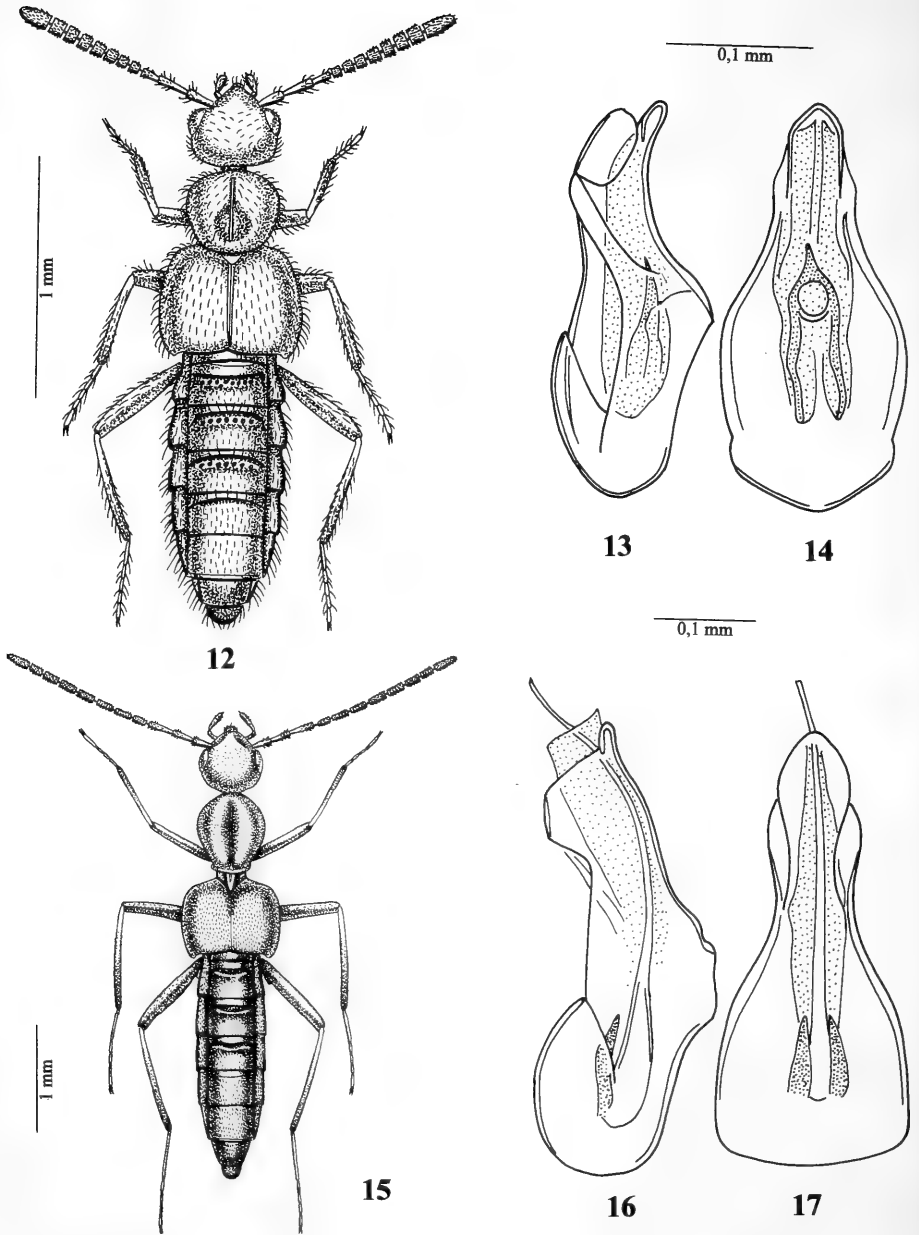
**CHIAVE DELLE SPECIE BORNEENSI DEL GENERE *CORDALIA* JACOBS**

- 1 Corpo uniformemente bruno-rossiccio; occhi più lunghi delle tempie; antennomeri secondo e terzo bruno-rossicci; pronoto più lungo che largo, con solco mediano profondo; edeago con angolo ventrale presso la «crista apicalis» che è presente; introflessione apicale del bulbo distale della spermateca profonda. Lungh. 2,4 mm . . . . . *C. kinabaluensis* sp. n.



FIGG. 7-11. Habitus, edeago in visione laterale e ventrale e spermateca. 7-10: *Cordalia kinabaluensis* sp. n.; 11: *Cordalia perdistincta* sp. n.

- Capo e addome bruni, pronoto ed elitre bruno-rossicci; Occhi più corti delle tempie; antennomeri secondo e terzo rossicci; pronoto più largo che lungo, con profonda depressione posteriore nel ♂; edeago senza angolo ventrale presso la «crista apicalis» che è assente; introflessione apicale del bulbo distale della spermateca molto profonda. Lung. 2,1 mm.  
 ..... *C. perdistincta* sp. n.



FIGG. 12-17

Habitus e edeago in visione laterale e ventrale. 12-14: *Cordalia perdistincta* sp. n.; 15-17: *Falagria (Myrmecocephalus) bruneiensis* sp. n.



KEY TO BORNEAN SPECIES OF THE GENUS *CORDALIA* JACOBS

- 1 Body uniformly brown-reddish; eyes longer than the temples; second and third antennomeres brown-reddish; pronotum longer than wide, with deep median furrow; aedeagus angulate ventrally angle near the «crista apicalis» that is present; apical introflexion of the distal bulb of the spermatheca deep. Length 2.4 mm . . . . . *C. kinabaluensis* sp. n.
- Head and abdomen brown, pronotum and elytra brown-reddish; eyes shorter than the temples; second and third antennomeres reddish; pronotum wider than long, with deep posterior depression in the ♂; aedeagus not angulate ventrally near the «crista apicalis» that is absent; apical introflexion of the distal bulb of the spermatheca very deep. Length 2.1 mm . . . . . *C. perdistincta* sp. n.

*Falagria (Myrmecocephalus) paranitens* sp. n.

Figg. 15-17

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu Nat.Pk, HQ, 1500 m, 30.IV-8.V.1987, int. trap, leg. A. Smetana (MHNG).

DESCRIZIONE. Lung. 4,2 mm. Corpo lucido e bruno con base delle elitre e primo urotergo libero gialli; margine posteriore del secondo urotergo libero rossiccio; antenne brune con i due antennomeri basali e i due terminali giallo-rossicci; zampe brune con tibie e tarsi giallo-rossicci. La punteggiatura del capo e del pronoto è estremamente fine. La granulosità delle elitre e dell'addome è fine e fitta. L'intero corpo è privo di reticolazione. Il pronoto presenta un solco mediano profondo. Edeago figg. 16-17.

DERIVATIO NOMINIS. Il nome della nuova specie significa «Vicina a *F. nitens*».

COMPARAZIONI. La nuova specie è distinta da tutte quelle orientali per avere l'edeago ricurvo al lato ventrale. Per altri caratteri distintivi vedere la chiave di tutte le specie borneensi del genere *Falagria* posta dopo la descrizione di *F. bruneiensis* sp. n.

*Falagria (Myrmecocephalus) bruneiensis* sp. n.

Figg. 18-20

Holotypus ♂, Borneo, Brunei, HW Temburong, Kuala Belalong KBFSC, 10.II.1995, leg. Borcherdigh (IRSN).

DESCRIZIONE. Lung. 3,5 mm. Pronoto opaco, resto del corpo lucido. Corpo bruno-rossiccio, con urotergo libero primo giallo; antenne brune con i due antennomeri basali di un giallo sporco e i tre terminali giallo-rossicci; zampe brune con tarsi ed estremità distale delle tibie rossicci e base dei femori posteriori gialla. La granulosità del capo è fine e confusa, quella del pronoto è fittissima e distinta, quella delle elitre è finissima e quella dell'addome è superficiale. La reticolazione del capo e del pronoto è netta, quella delle elitre è assente e quella dell'addome è superficiale. Il pronoto presenta una larga depressione mediana nel cui fondo un solco si estingue distante dal margine anteriore dello stesso pronoto. Edeago figg. 19-20.

COMPARAZIONI. La nuova specie si distingue dalla precedente e dalle altre specie del Borneo per la forma dell'edeago e per i caratteri dati nella seguente chiave.

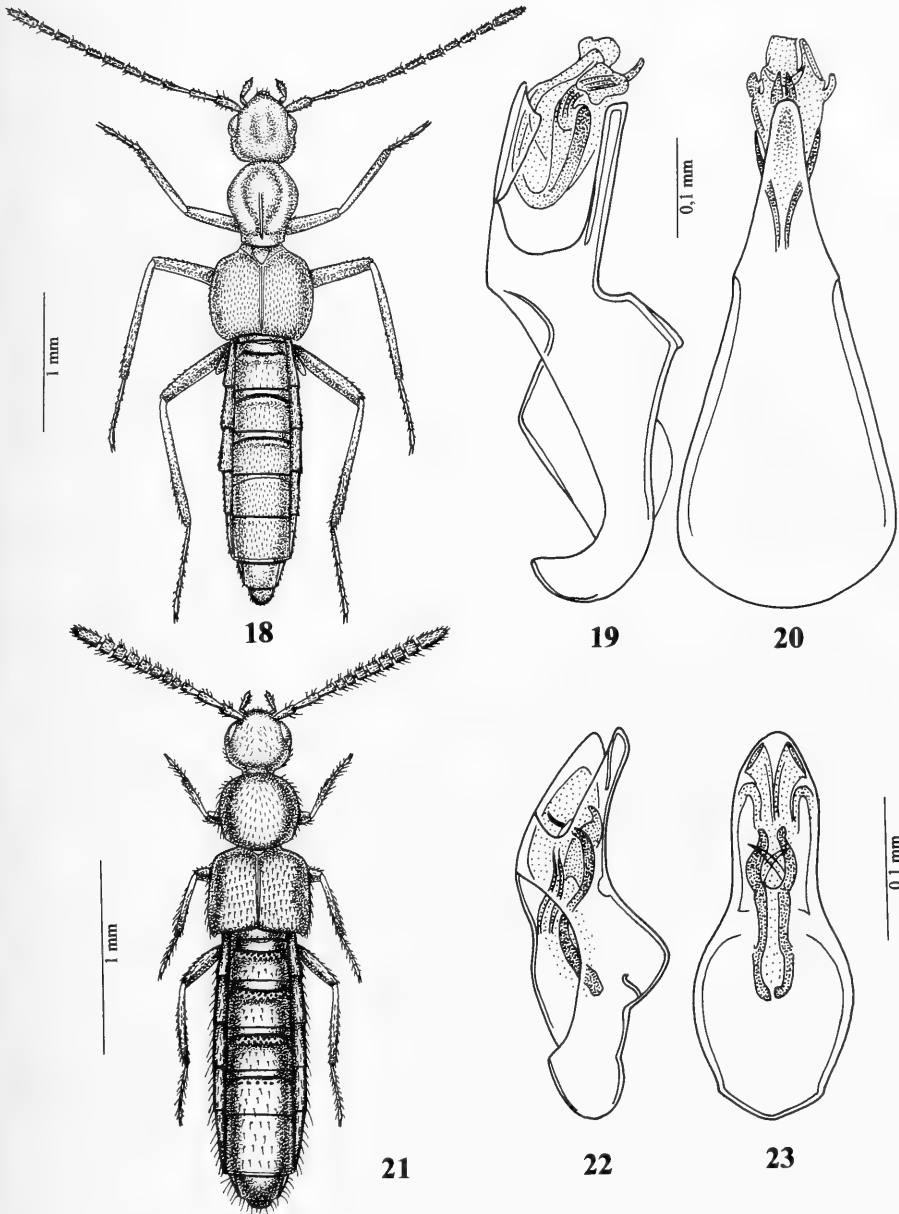
CHIAVE DELLE SPECIE BORNEENSI DEL GENERE *FALAGRIA* LEACH, 1819

- 1 Scutello carenato o solcato, Subgen. *Myrmecocephalus* Macleay, 1873 . . . . . 3
- Scutello non come sopra, Subgen. *Leptagria* Casey, 1906 . . . . . 2

- 2 Decimo antennumero subquadrato; capo e pronoto bruno-rossicci; spermateca corta, con bulbo distale rigonfio e con bulbo prossimale sferico. Lungh. 2,4 mm. Sri Lanka e Borneo: Fort de Kock . . . . . *F. subrugosa* Kraatz
- Decimo antennumero più lungo che largo; capo bruno e pronoto bruno-rossiccio; spermateca lunga, con bulbo distale lievemente arcuato e con bulbo prossimale descrivente un arco. Lungh. 2,7 mm. Borneo: Mt. Kinabalu . . . . . *F. amabilis* Cameron
- 3 Pronoto largamente incavato . . . . . 4
- Pronoto convesso . . . . . 5
- 4 Incavatura del pronoto solo sulla parte posteriore. Lungh. 2,0 mm. Borneo: Mt. Poeh . . . . . *F. mixta* Cameron
- Incavatura del pronoto estesa dal margine anteriore al posteriore. Lungh. 3,5 mm. Borneo: Brunei . . . . . *F. bruneiensis* sp. n.
- 5 Corpo uniformemente bruno-rossiccio. Lungh. 3,1 mm. Borneo: Kinabalu, Tenompota . . . . . *F. sparsipennis* Cameron
- Corpo bicolore, con base delle elitre e dell'addome giallo-rossiccio . . . . . 6
- 6 Solo il primo urotergo libero è giallo . . . . . 7
- Uroterghi liberi primo e secondo gialli . . . . . 8
- 7 Lati del pronoto sinuati davanti agli angoli posteriori; edeago con un'espansione a ciascun lato. Lungh. 3,1 mm. Giava, Sumatra, Borneo: Kinabalu . . . . . *F. seminitens* Cameron
- Lati del pronoto sinuati davanti agli angoli posteriori; edeago senza espansioni laterali. Lungh. 4,2 mm. Borneo: Kinabalu . . . . . *F. paranitens* sp. n.
- 8 Il solco mediano del pronoto non raggiunge il margine anteriore. Lungh. 3,5 mm. Borneo: Mt. Dulit . . . . . *F. monticola* Cameron
- Il solco mediano del pronoto esteso dal margine anteriore al posteriore. Lungh. 2,3 mm. Borneo: Kenokok . . . . . *F. proxima* Cameron

KEY TO THE BORNEAN SPECIES OF THE GENUS *FALAGRIA* LEACH, 1819

- 1 Scutellum carinate or sulcate, Subgen. *Myrmecocephalus* Macleay, 1873 . . . . . 3
- Scutellum not as above, Subgen. *Leptagria* Casey, 1906 . . . . . 2
- 2 Tenth antennomere subsquared; head and pronotum brown-reddish; spermatheca short, with distal bulb hypertrophic and with proximal bulb spherical. Length 2.4 mm. Sri Lanka and Borneo: Fort de Kock . . . . . *F. subrugosa* Kraatz
- Tenth antennomere longer than wide; head brown and pronotum brown-reddish; spermatheca long with distal bulb slightly arched and with proximal bulb forming an arch. Length 2.7 mm. Borneo: Mt. Kinabalu . . . . . *F. amabilis* Cameron
- 3 Pronotum widely depressed . . . . . 4
- Pronotum convex . . . . . 5
- 4 Pronotum depressed only on posterior portion. Length 2.0 mm. Borneo: Mt. Poeh . . . . . *F. mixta* Cameron
- Pronotum depressed on entire length. Length 3.5 mm. Borneo: Brunei . . . . . *F. bruneiensis* sp. n.
- 5 Body brown-reddish uniformly. Length 3.1 mm. Borneo: Kinabalu, Tenompota . . . . . *F. sparsipennis* Cameron
- Body bicoloured, with base of elytra and abdomen yellow-reddish . . . . . 6
- 6 Only the first free urotergite yellow . . . . . 7
- First and second free urotergites yellow . . . . . 8



FIGG. 18-23

Habitus e edeago in visione laterale e ventrale. 18-20: *Falagria (Myrmecocephalus) parantensis* sp. n.; 21-23: *Ischnopoda lyrafera* sp. n.

- 7 Sides of the pronotum sinuate in front of the posterior angles; aedeagus expanded laterally. Length 3.1 mm. Giava, Sumatra, Borneo: Kinabalu *F. seminitens* Cameron  
 - Sides of the pronotum not sinuate in front of the posterior angles; aedeagus without lateral expansions. Length 4.2 mm. Borneo: Kinabalu . . . . . *F. paranitens* sp. n.  
 8 The median furrow of the pronotum not reaching the anterior border. Length 3.5 mm. Borneo: Mt. Dulit . . . . . *F. monticola* Cameron  
 - The median furrow of the pronotum extended on entire length. Length 2.3 mm. Borneo: Kenokok . . . . . *F. proxima* Cameron

***Ischnopoda lyrafera* sp. n.**

Figg. 21-23

Holotypus ♂, Borneo Sabah, Mt. Kinabalu Nat. Pk., Poring Hot Springs, 480 m, 10.V.1987, leg. A. Smetana (MHNG).

DESCRIZIONE. Lungh. 2,4 mm. Corpo lucido e nero-bruno; antenne nero-brune con antennumero basale rossiccio; zampe bruno-rossicce. La punteggiatura del capo è fine e distinta, quella dell'addome è grossolana, fitta e distinta nel fondo dei solchi trasversi basali dei tre uroterghi liberi basali. La granulosità del pronoto è molto superficiale e quella delle elitre è distinta. Assente è la reticolazione sul corpo. Edeago figg. 22-23.

DERIVATIO NOMINIS. Il nome della nuova specie significa «Portatrice di lira» a motivo di una parte dell'armatura genitale interna dell'edeago a forma di lira, in visione ventrale.

COMPARAZIONI. La nuova specie si distingue da quelle note del Borneo per i caratteri dati nella seguente chiave.

CHIAVE DELLE SPECIE BORNEENSI DEL GENERE *ISCHNOPODA* STEPHENS, 1835

- 1 Corpo uniformemente nero-bruno; antennumeri intermedi trasversi. Lung. 2,3 mm. Borneo: Kinabalu . . . . . *I. lyrafera* sp. n.  
 - Corpo bruno, con scutello o base e margine posteriore del pronoto gialli o giallo-rossicci; antennumeri intermedi più lunghi che larghi . . . . . 2  
 2 I tre antennumeri basali giallo-rossicci; pronoto con fovea mediana posteriore; elitre lunghe quanto il pronoto. Lungh. 2,5 mm. Borneo: Mt. Dulit . . . . . *I. asperata* (Cameron), **comb. n.**  
 (olim *Tachyusa asperata* Cameron, 1928)  
 - I tre antennumeri basali bruni; pronoto con depressione mediana; elitre lievemente più lunghe del pronoto. Lungh. 2,6 mm. Borneo: Mt. Matang . . . . . *I. opaca* (Bernhauer), **comb. n.**  
 (olim *Tachyusa opaca* Bernhauer, 1915)

KEY TO THE BORNEAN SPECIES OF THE GENUS *ISCHNOPODA* STEPHENS, 1835

- 1 Body black-brown uniformly; intermediary antennomeres transverse. Length 2.3 mm. Borneo: Kinabalu . . . . . *I. lyrafera* sp. n.  
 - Body brown, with scutellum or anterior and posterior margin of the pronotum yellow or yellow-reddish; intermediary antennomeres longer than wide . . . . . 2  
 2 The three basal antennomeres yellow-reddish; pronotum with posterior median fovea; elytra as long as pronotum. Length 2.5 mm. Borneo: Mt. Dulit . . . . . *I. asperata* (Cameron), **comb. n.**  
 (olim *Tachyusa asperata* Cameron, 1928)

The three basal antennomeres brown; pronotum with median depression; elytra slightly longer than pronotum. Length 2.6 mm. Borneo: Mt. Matang  
 ..... *I. opaca* (Bernhauer), **comb. n.**  
 (olim *Tachyusa opaca* Bernhauer, 1915)

***Gnypeta bruneiorum* sp. n.**

Figg. 24-25

Holotypus ♀, Borneo, Brunei, HW Temburong, Kuala Belalong KBFSC, 10.II.1995, leg. Borcheringh (IRSN).

DESCRIZIONE. Lungh. 2,8 mm. Corpo lucido e nero-bruno con base dell'addome bruno-rossiccia; antenne nere con i due antennomeri basali di un giallo sporco; zampe gialle. La granulosità del capo è distinta solo all'indietro, sul resto della superficie del capo si trova una punteggiatura molto fine e molto evanescente. La punteggiatura del pronoto è poco ben visibile, quella delle elitre è distinta. La granulosità dell'addome è confinata solo sulla metà posteriore di ciascun urotergo libero. Il capo presenta un evidente solco mediano frontale e il pronoto ha una fossetta mediana posteriore evidente. Spermateca. fig. 25.

COMPARAZIONI. La nuova specie si distingue dalle altre specie del genere per la forma della spermateca e per i caratteri dati nella la chiave di tutte le specie borneensi del genere *Gnypeta* Thomson, 1858 posta dopo la descrizione di *G. kinabaluensis* sp. n.

***Gnypeta kinabaluensis* sp. n.**

Figg. 26-29

Holotypus ♀, Sabah, Poring Hot Spring, 9.III.1990, leg. G. de Rougemont (IRSN).

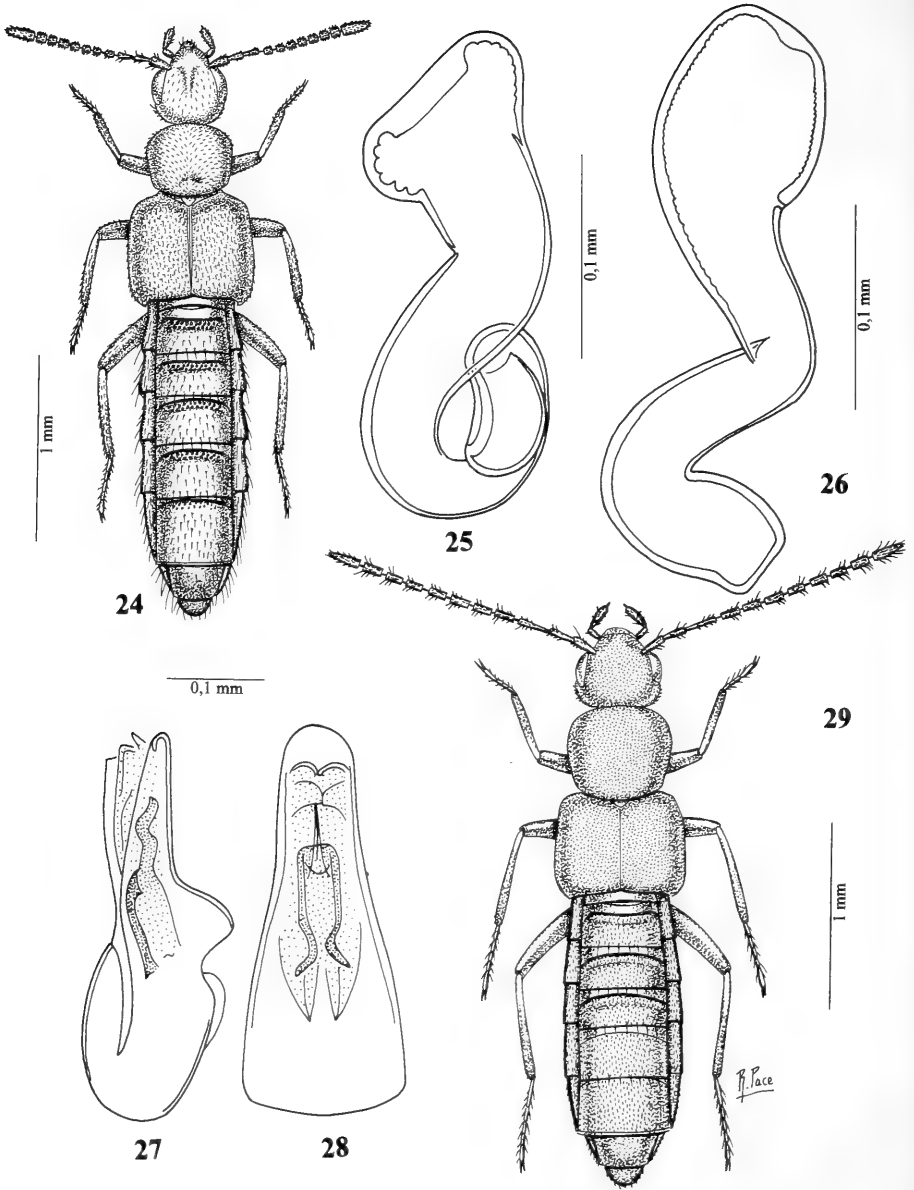
Paratypi: 2 es., Sabah, Poring Hot Springs, 500 m, 6.V.1987, leg. Burckhardt & Löbl; 4 es., Sabah, Poring Hot Springs, 500 m, 7.V.1987, leg. Burckhardt & Löbl; 10 es., Sabah, Poring Hot Springs, 486-510 m, 14-30.VIII.1987, leg. Bright & Smetana; 1 ♀, Sabah, Danum Valley F.S., 85 km W Lahad Datu, 100 m, 23.VIII.1988, leg. Bright & Smetana.

DESCRIZIONE. Lungh. 2,8 mm. Avancorpo debolmente opaco, addome lucido. Corpo nero-bruno con i due uroterghi liberi basali giallo-bruni; antenne bruno-rossicce con i tre antennomeri basali e l'undicesimo giallo-rossicci; zampe gialle con femori medi e posteriori giallo-bruni. L'avancorpo è coperto di granulosità fittissima. L'addome presenta reticolazione distinta e granulosità fine e meno fitta di quella dell'avancorpo. Edeago figg. 27-28, spermateca fig. 26.

COMPARAZIONI. La nuova specie si distingue da quelle note del Borneo e dalla nuova sopra descritta per la forma dell'edeago e della spermateca e per i caratteri dati nella seguente chiave.

CHIAVE DELLE SPECIE BORNEENSI DEL GENERE *GNYPETA* THOMSON, 1858

- 1 Capo nero; pronoto e base dell'addome giallo-rossicci; Lungh. 3,0 mm.  
 Borneo: Kinabalu ..... *G. abdominalis* Cameron
- Capo e pronoto nero-bruni ..... 2
- 2 Fronte solcata; fossetta trasversa basale del pronoto; base dell'addome bruno-rossiccia; bulbo distale della spermateca assai trasverso. Lungh. 2,8 mm. Borneo: Brunei ..... *G. bruneiorum* sp. n.
- Fronte senza solco; assenza di fossetta basale trasversa del pronoto; base dell'addome giallo-bruna; bulbo distale della spermateca ovale allungato. Lungh. 2,9 mm. Borneo: Kinabalu ..... *G. kinabaluensis* sp. n.



FIGG. 24-29

Habitus, spermateca e edeago in visione laterale e ventrale. 24-25: *Gnypeta bruneiurum* sp. n.; 26-29: *Gnypeta kinabaluensis* sp. n.

KEY TO THE BORNEAN SPECIES OF THE GENUS *GNYPETA* THOMSON, 1858

- 1 Head black; pronotum and base of the abdomen yellow-reddish; Length 3.0 mm.  
Borneo: Kinabalu . . . . . *G. abdominalis* Cameron
- Head and pronotum black-brown . . . . . 2

- 2 Forehead furrowed; basal fovea of the pronotum transverse; base of the abdomen brown-reddish; distal bulb of the spermatheca a great deal transverse. Length 2.8 mm. Borneo: Brunei . . . . . *G. bruneiorum* sp. n.  
 - Forehead without furrow; transverse basal fovea of the pronotum absent; base of the abdomen yellow-brown; distal bulb of the spermatheca lengthened oval. Length 2.9 mm. Borneo: Kinabalu . . . . . *G. kinabaluensis* sp. n.

***Demerinda borneensis* sp. n.**

Figg. 30-32

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu Nat.Pk., HQ Liwagu Rv. Tr., 1520 m, 11.VI-II.1988, A. Smetana leg. (MHNG).

DESCRIZIONE. Lungh. 2,2 mm. Corpo lucido e rossiccio, con elitre brune, tranne la base che è rossiccia; addome giallo-rossiccio con uroterghi liberi quarto e base del quinto rossicci; antenne di un giallo sporco, con i due antennomeri basali e l'apice dell'undicesimo gialli; zampe gialle. La punteggiatura del capo è fitta e svanita, quella del pronoto è assente. La granulosità del pronoto è assente, quella delle elitre è fine e quella degli uroterghi liberi è saliente solo alla base di ciascuno. Il pronoto presenta due fossette posteriori laterali e un appiattimento mediano posteriore tra esse. Edeago figg. 31-32.

COMPARAZIONI. Il genere *Demerinda* Cameron, 1927, è nuovo per il Borneo. La nuova specie per la forma dell'edeago è affine a *D. hongkongensis* Pace, 1998a, di Hong Kong. Se ne distingue per i caratteri dati nella seguente chiave.

- 1 Capo nero, pronoto bruno-rossiccio; edeago profondamente sinuato presso la «crista apicalis» che è ben sviluppata; flagello dell'armatura genitale interna dell'edeago, corto. Lungh. 3,2 mm. Hong Kong . . . . . *D. hongkongensis* Pace  
 - Capo e pronoto rossicci; edeago senza profonda sinuosità ventrale presso la «crista apicalis» che non è sviluppata; flagello dell'armatura genitale interna dell'edeago, lunghissima. Lungh. 2,2 mm . *D. borneensis* sp. n.  
 1 Head black, pronotum brown-reddish; aedeagus deeply sinuate near the well developed «crista apicalis»; flabellum of the internal genital armature of the aedeagus short. Length 3.2 mm. Hong Kong . . . . . *D. hongkongensis* Pace  
 - Head and pronotum reddish; aedeagus without deep ventral sinuosity near the obsolete «crista apicalis»; flabellum of the internal genital armature of the aedeagus long. Length 2.2 mm . . . . . *D. borneensis* sp. n.

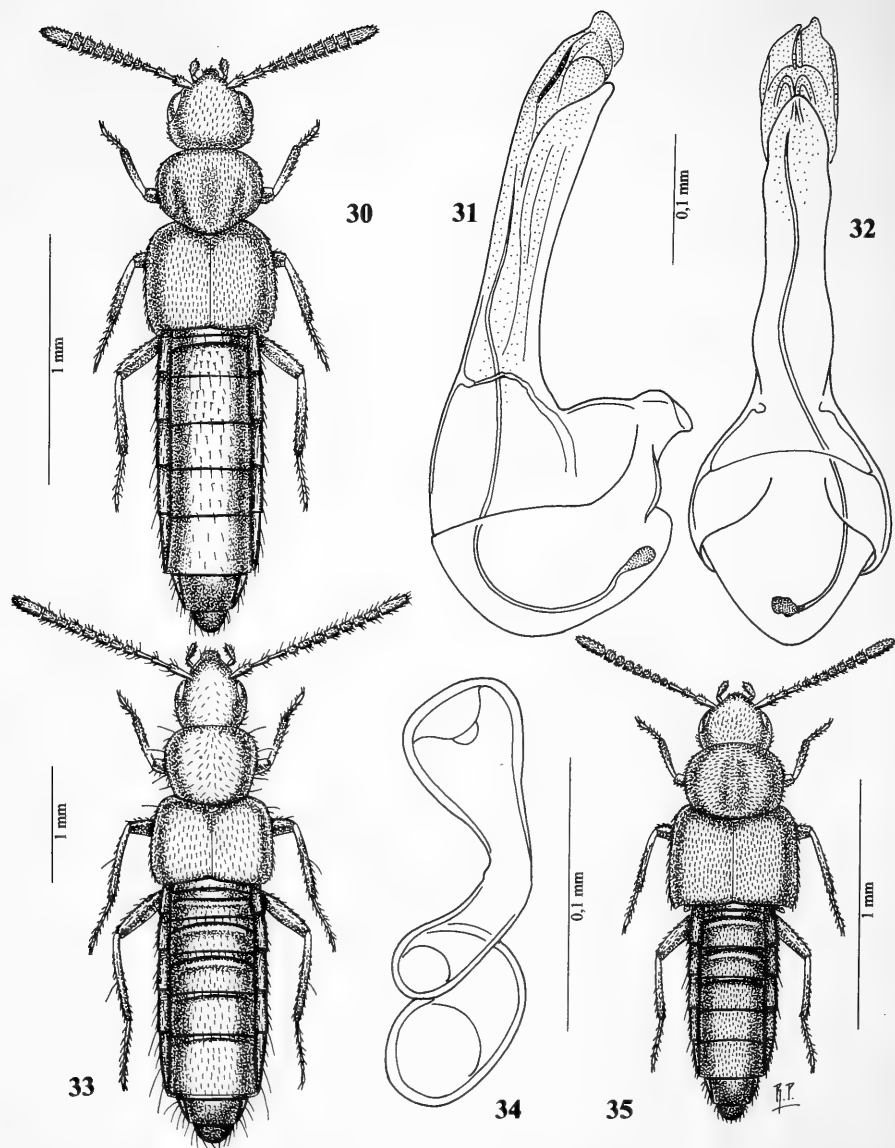
***Aloconota dimidiata* sp. n.**

Figg. 33-34

Holotypus ♀, Borneo-Sabah, Mt. Kinabalu Nat. Pk., HQ Liwagu Riv. Tr., 1495 m, 12.VIII.1988, leg. A. Smetana (MHNG).

DESCRIZIONE. Lungh. 3,8 mm. Corpo lucido, con avancorpo bruno e addome giallo-rossiccio; antenne nero-brune con antennomero basale e apice e base del secondo giallo-rossicci; zampe gialle. La granulosità del capo è indistinta, quella del pronoto e delle elitre è estremamente superficiale e quella dell'addome è svanita. La reticolazione del capo e del pronoto è assente, quella delle elitre è svanita e quella del quinto urotergo libero è distinta. Spermateca fig. 34.

DERIVATIO NOMINIS. Il nome della nuova specie significa «Dimezzata», a motivo del colore dell'avancorpo molto differente da quello dell'addome.



FIGG. 30-35

Habitus, edeago in visione laterale e ventrale e spermateca. 30-32: *Demerinda borneensis* sp. n.; 33-34: *Aloconota dimidiata* sp. n.; 35: *Hydrosmeeta pulchricolorata* sp. n.

COMPARAZIONI. Il genere *Aloconota* Thomson, 1858, è nuovo per il Borneo. Per l'habitus e per la forma della spermateca può essere affine ad *A. connexa* (Cameron, 1939a), **comb. n.** (olim *Atheta* (*Metaxya*) *connexa* Cameron, 1939a, tipi esaminati) dell'India. Se ne distingue per la parte prossimale della spermateca descrittive spire (senza spire in *connexa*).



***Hydrosmeeta pulchricolorata* sp. n.**

Figg. 35-40

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu Nat. Pk., HQ Liwagu River, 1495 m, 13.VI.II.1988, leg. A. Smetana (MHNG).

Paratypi: 2 ♂♂ e 4 ♀♀, Borneo, Sabah, Mt. Kinabalu Nat. Pk., HQ Liwagu River, 1495 m, 13.VIII.1988 e 21.V.1988, leg. A. Smetana; 1 ♂, Borneo, Sabah, Mt. Kinabalu N.P., Poring Hot Springs, area Kipungit CRK, 1530 m, 26.VIII.1988, leg. A. Smetana; 1 ♂, Borneo, Sabah, Mt. Kinabalu N.P., HQ Liwagu Rv. tr., 1655 m, 11.VIII.1988, A. Smetana leg.; 17 es., Sabah, Mt. Kinabalu, 1750 m, 27.IV.1987, leg. Burckhardt & Löbl; 4 es., Sabah, Poring Hot Springs, Langanan Falls, 900-950 m, 12-14.V.1987, leg. Burckhardt & Löbl.

DESCRIZIONE. Lungh. 1,7 mm. Corpo lucido e rossiccio, con capo ed elitre bruno-rossicce, addome bruno con i due uroterghi liberi basali e il pigidio gialli; antenne brune con il primo antennomero basale e l'undicesimo gialli, il secondo e il terzo sono giallo-rossicci; zampe gialle. La punteggiatura del capo è fine e fitta. La granulosità del pronoto e delle elitre è fine e molto superficiale. Il pronoto presenta un debole e largo solco mediano. Edeago figg. 36-37, spermateca fig. 38, labio con palpo labiale fig. 39.

COMPARAZIONI. Il genere *Hydrosmeeta* Thomson, 1858, è nuovo per il Borneo. Per la forma della spermateca, la nuova specie sembra affine a *H. rougemonti* Pace, 1998a, della Cina. Se ne distingue per avere il bulbo distale della spermateca non dilatato e l'edeago stretto nella regione intermedia, in visione ventrale, (quello di *rougemonti* assai dilatato).

***Atheta (Chaetida) antennaria* sp. n.**

Figg. 44-47

*Kleistoglossa antennaria* Pace, in litteris

Holotypus ♂, Borneo Sabah, Mt. Kinabalu, Poring Hot Springs, 435 m, 30.VIII.1988, leg. A. Smetana (MHNG).

Paratypi: 1 ♂ e 1 ♀, stessa provenienza.

DESCRIZIONE. Lungh. 2,2 mm. Corpo lucido e bruno con gli uroterghi liberi terzo e quarto nero-bruni; antenne nero-brune con primo antennomero basale di un giallo sporco, secondo e undicesimo giallo-bruni; zampe giallo-rossicce. La punteggiatura del capo è fitta e superficiale. La granulosità del pronoto, delle elitre e dell'addome è fine e saliente. La reticolazione del capo è assente, quella del pronoto è estremamente evanescente. Edeago figg. 45-46, spermateca fig. 47.

COMPARAZIONI. Il sottogenere *Chaetida* Mulsant & Rey, 1874, è nuovo per il Borneo. Per la forma dell'edeago, la nuova specie è simile ad *A. drescheri* Cameron, 1939b, di Giava, di cui ho esaminato l'holotypus ♂. La nuova specie se ne distingue per avere l'edeago più ricurvo al lato ventrale, il pronoto più trasverso e il quarto antennomero lungo quanto largo (più lungo che largo in *drescheri* il cui esemplare holotypus manca degli antenomeri dal quinto all'undicesimo).

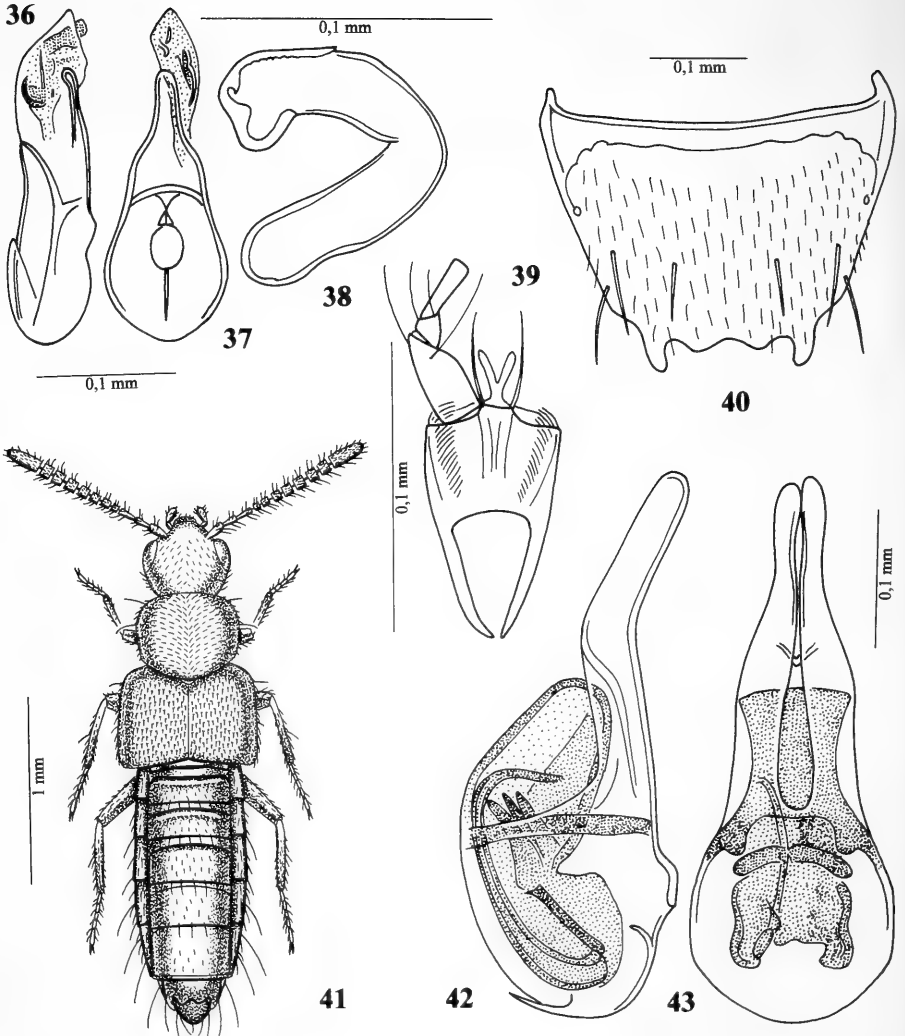
***Atheta (Acrotona) magnalamina* sp. n.**

Figg. 48-51

Holotypus ♂, Borneo Sabah, Mt. Kinabalu, Poring Hot Springs, 495 m, 27.VIII.1988, leg. A. Smetana (MHNG).

Paratypi: 3 es., stessa provenienza.

DESCRIZIONE. Lungh. 1,9 mm. Corpo lucido e bruno-rossiccio, con i tre uroterghi liberi basali gialli e con il margine posteriore bruno sugli uroterghi liberi

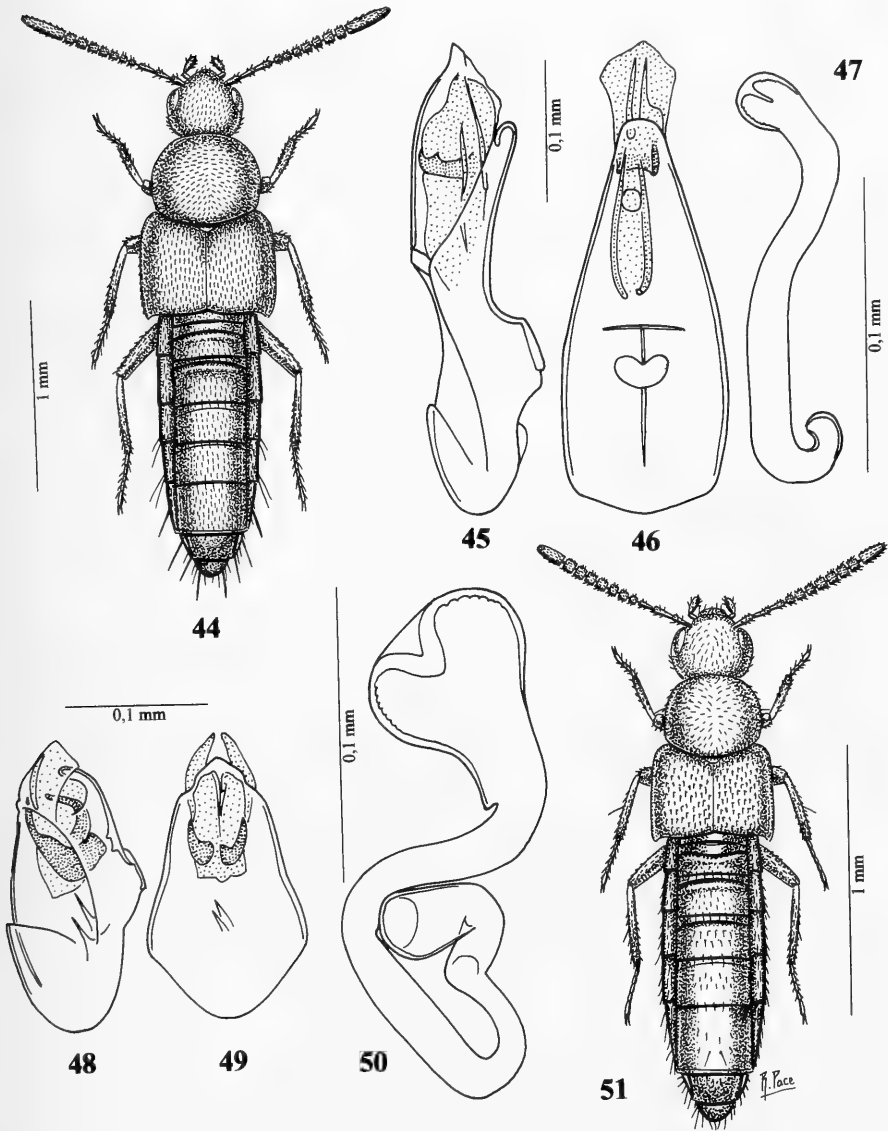


FIGG. 36-43

Eedeago in visione laterale e ventrale, spermateca sesto urotergo libero del ♂, labio con palpo labiale e habitus. 36-40: *Hydrosmeeta pulchricolorata* sp. n.; 41-43: *Emmelostiba pahangensis* (Cameron, 1936), comb. n.

secondo e terzo; antenne brune con i due antennomeri basali rossicci; zampe gialle. La granulosità del capo e del pronoto è fitta e superficiale, quella delle elitre e dell'addome è distinta. La reticolazione del capo è estremamente evanescente, quella del pronoto e delle elitre è assente e quella dell'addome è trasversa e distinta. Eedeago figg. 48-49, spermateca fig. 50.

DERIVATIO NOMINIS. Il nome della nuova specie significa «Grande lamina», quella dell'armatura genitale interna dell'eedeago.



FIGG. 44-51

Habitus, edeago in visione laterale e ventrale e spermatheca. 44-47: *Atheta (Chaetida) antennaria* sp. n.; 48-51: *Atheta (Acrotona) magnalamina* sp. n.

COMPARAZIONI. La nuova specie è distinta per la forma dell'edeago e della spermatheca e per i caratteri dati nella chiave di tutte le specie borneensi del sottogenere *Acrotona* Thomson, 1859, posta dopo la descrizione di *A. inversitheca* sp. n.

***Atheta (Acrotona) muluensis* sp. n.**

Figg. 52-55

Holotypus ♂, Sarawak Borneo, Mulu Nat. Park, leg. Franz (NHMW).

Paratypi: 1 ♂, Borneo Sabah, Mt. Kinabalu, HQ 1500 m, 17-23.IV.1987, leg. A. Smetana; 1 ♂, Borneo-Sabah, E Mt. Kinabalu, 1150 m, rte. Ranau-Kota Kinabalu, 24.V.1987, leg. Burckhardt & Löbl.

DESCRIZIONE. Lugh. 1,8 mm. Corpo lucido e giallo-bruno, elitre giallo-brune con base di un giallo sporco; antenne nero-brune con i due antennomeri basali gialli; zampe gialle. La punteggiatura del capo è superficiale. La granulosità del pronoto è svanita, quella delle elitre è assai fitta e quella dell'addome è fine. Edeago figg. 53-54, spermateca fig. 55.

COMPARAZIONI. La nuova specie è distinta per la forma dell'edeago e della spermateca e per i caratteri dati nella chiave di tutte le specie borneensi del sottogenere *Acrotona* Thomson, 1859, posta dopo la descrizione di *A. inversitheca* sp. n.

***Atheta (Acrotona) rufoapicalis* sp. n.**

Figg. 56-58

Holotypus ♂, Sabah, Kinabalu N.P., Poring Hot Spring, 26.X.1990, from rotten tarap fruit (*Artocarpus* sp.), leg. G. de Rougemont (IRSN).

Paratypi: 1 ♂, Borneo, Sabah, Mt. Kinabalu N.P., HQ Liwagu Rv. trail, 1520 m, 11.VI-II.1988, A. Smetana leg.; 1 ♂, Borneo Sabah, Mt. Kinabalu, Poring Hot Springs, 495 m, 30.VI-II.1988, leg. A. Smetana.

DESCRIZIONE. Lugh. 2,7 mm. Avancorpo debolmente lucido, addome lucido. Corpo giallo-bruno con capo bruno e addome giallo-rossiccio; antenne brune con il primo antennomero basale e l'undicesimo giallo-rossicci, il secondo e il terzo bruno-rossicci; zampe gialle. La granulosità del capo è saliente ai lati e molto superficiale sul disco, quella del pronoto è fine e poco saliente e quella delle elitre è quasi indistinta. Solo sulle elitre è presente una reticolazione che è evanescente. Edeago figg. 57-58.

DERIVATIO NOMINIS. Il nome della nuova specie significa «All'apice rossiccia», per avere l'undicesimo antennomero giallo-rossiccio.

COMPARAZIONI. La nuova specie è distinta per la forma dell'edeago e per i caratteri dati nella chiave di tutte le specie borneensi del sottogenere *Acrotona* Thomson, 1859, posta dopo la descrizione di *A. inversitheca* sp. n.

***Atheta (Acrotona) thaimastocornis* sp. n.**

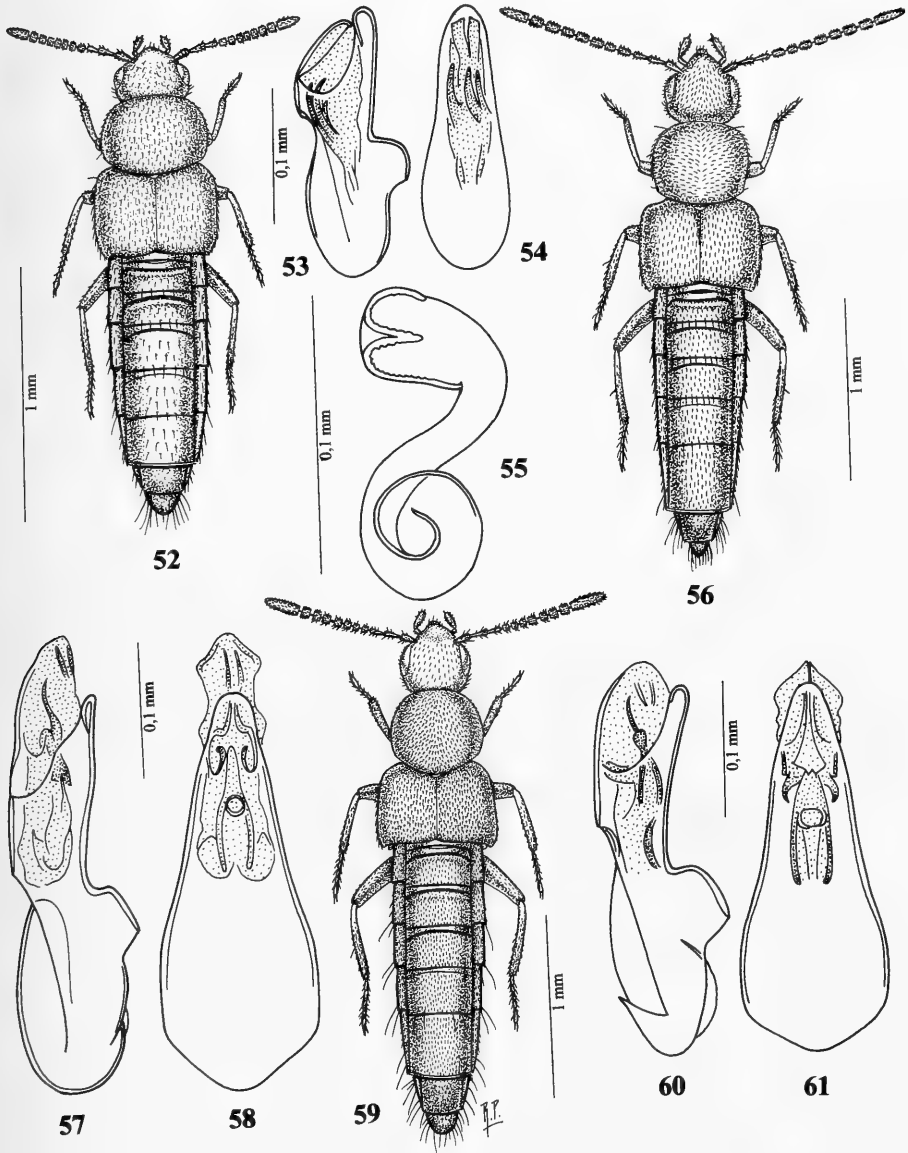
Figg. 59-61

Holotypus ♂, Borneo, Brunei, Ricus Temburong, Kuala Belalong KBFS, 4.V.1995, Borchherding leg. (IRSN).

DESCRIZIONE. Lugh. 2,6 mm. Corpo lucido e di un giallo sporco, base ed apice dell'addome gialli; antenne nere con il primo antennomero basale giallo, il secondo di un giallo sporco e l'undicesimo rossiccio; zampe gialle. La granulosità del capo è poco saliente, quella del pronoto e delle elitre è evidente e fine e quella dell'addome è fitta. Edeago figg. 60-61.

DERIVATIO NOMINIS. Il nome della nuova specie significa «Antenne mirabili».

COMPARAZIONI. La nuova specie è distinta per la forma dell'edeago e per i caratteri dati nella chiave di tutte le specie borneensi del sottogenere *Acrotona* Thomson, 1859, posta dopo la descrizione di *A. inversitheca* sp. n.



FIGG. 52-61

Habitus, edeago in visione laterale e ventrale e spermatea. 52-55: *Atheta (Acrotona) muluensis* sp. n.; 56-58: *Atheta (Acrotona) rufoapicalis* sp. n.; 59-61: *Atheta (Acrotona) thymastocornis* sp. n.

***Atheta (Acrotona) borneosuspiciosa* sp. n.**

Figg. 62-65

Holotypus ♂, Sabah, Mt. Kinabalu Nat. Pk., HQ Liwagu River, 1490 m, 10.VIII.1988, A. Smetana leg. (MHNG).

Paratypus: 1 ♀, Borneo, Sabah, Mt. Kinabalu N.P., 1500 m, 30.IV.1987, Burckhardt & Löbl leg.

DESCRIZIONE. Lungh. 2,6 mm. Corpo lucido e bruno pece; antenne nero pece con i due antennomeri basali bruno-rossicci; zampe di un giallo sporco. La granulosità del capo è estremamente superficiale, quella del pronoto è molto svanita, quella delle elitre è distinta e quella dell'addome è saliente e meno fitta di quella delle elitre. La reticolazione del capo e del pronoto è assente, quella delle elitre è distinta e quella dell'addome è trasversa e molto evanescente, assente sul quinto urotergo libero. Edeago figg. 63-64, spermateca fig. 65.

DERIVATIO NOMINIS. Il nome della nuova specie significa «*Atheta suspiciosa* del Borneo», avendo spermateca simile a quella di *A. suspiciosa* dell'India.

COMPARAZIONI. La nuova specie è distinta per la forma dell'edeago e della spermateca e per i caratteri dati nella chiave di tutte le specie borneensi del sottogenere *Acrotona* Thomson, 1859, posta dopo la descrizione di *A. inversitheca* sp. n.

***Atheta (Acrotona) dilatatiapex* sp. n.**

Figg. 66-69

Holotypus ♂, Sabah, Mt. Kinabalu Nat. Pk., HQ Liwagu River, 1490 m, 3.IX.1988, A. Smetana leg. (MHNG).

Paratypi: 1 ♀, stessa provenienza; 1 ♀, Borneo, Sabah, Mt. Kinabalu N.P., Poring Hot Springs, area Eastern Ridge Tr., 850 m, 28.VIII.1988, leg. A. Smetana; 1 ♂, Sabah, Crocker Ra., 1270 m, Km 60 r.te Kota Kinabalu-Tambunan, 17.V.1987, leg. Burckhardt & Löbl; 3 es., Sabah, Poring Hot Springs, 500 m, 7.V.1987, leg. Burckhardt & Löbl; 1 ♂, Sabah, Poring Hot Springs, 500 m, 6.V.1987, leg. Burckhardt & Löbl; 2 es., Borneo-Sabah, E Mt. Kinabalu, 1150 m, r.te. Ranau-Kota Kinabalu, 24.V.1987, leg. Burckhardt & Löbl.

DESCRIZIONE. Lungh. 1,7 mm. Corpo lucido e giallo-rossiccio; antenne brune con i due antennomeri basali gialli, il terzo e l'undicesimo giallo-rossicci; zampe gialle. La punteggiatura del capo è svanita. La granulosità del pronoto è fine e distinta, quella delle elitre è evanescente e quella dell'addome è saliente e fitta sui due uroterghi liberi basali e rada sui tre restanti e contigui. La reticolazione del capo, del pronoto e dell'addome è assente, quella delle elitre è evidente. Edeago figg. 67-68, spermateca fig. 69.

DERIVATIO NOMINIS. Il nome della nuova specie significa «Apice dilatato», quello dell'edeago, in visione ventrale.

COMPARAZIONI. La nuova specie è distinta per la forma dell'edeago e della spermateca e per i caratteri dati nella chiave di tutte le specie borneensi del sottogenere *Acrotona* Thomson, 1859, posta dopo la descrizione di *A. inversitheca* sp. n.

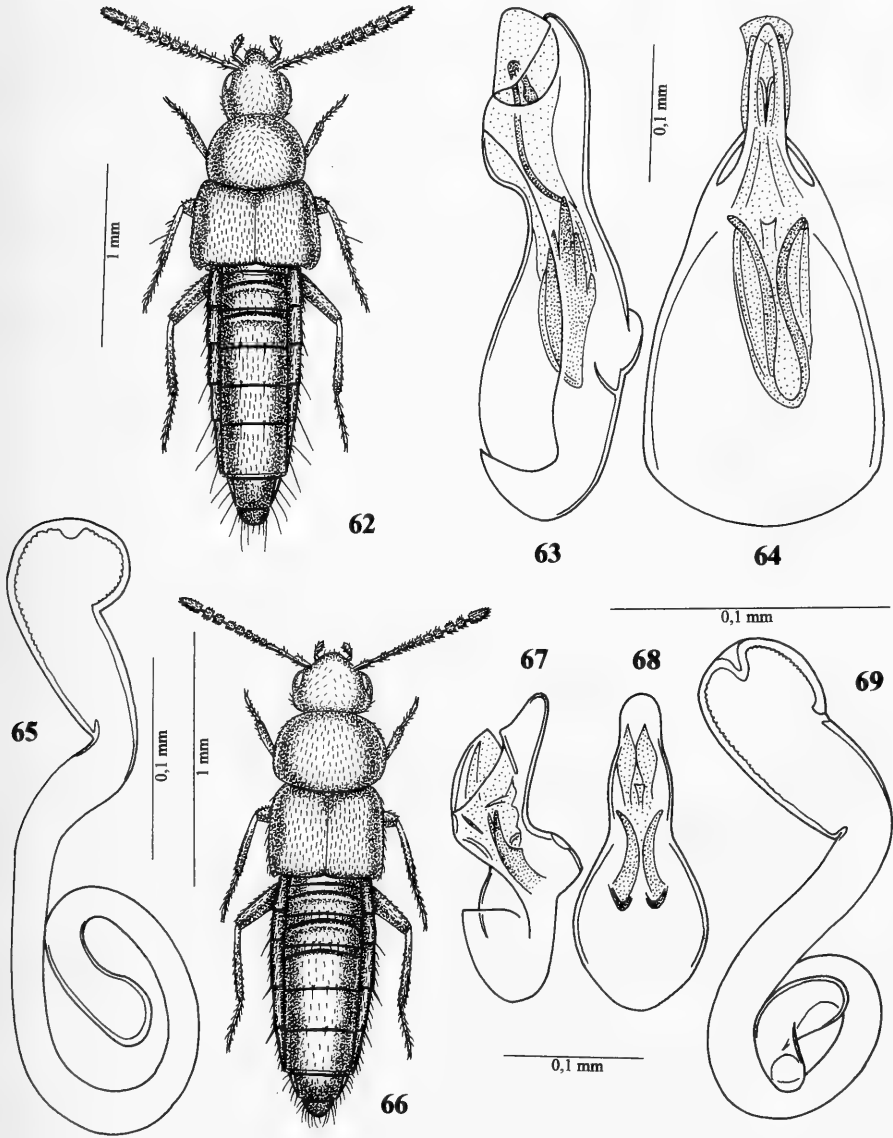
***Atheta (Acrotona) microfistula* sp. n.**

Figg. 70-72

Holotypus ♂, Borneo Sabah, Mt. Kinabalu Nat. Pk., Poring Hot Springs, 495 m, 27.VI-II.1988, leg. A. Smetana (MHNG).

Paratypi: 2 ♂♂, Borneo Sabah, M. Kinabalu Nat. Pk., Poring Hot Springs, 495 m, 30.VIII.1988, leg. A. Smetana.

DESCRIZIONE. Lungh. 1,8 mm. Corpo lucido e bruno pece, con capo, pronoto, base dell'addome e pigidio bruni; antenne nero-brune con i due antennomeri basali



FIGG. 62-69

Habitus, edeago in visione laterale e ventrale e spermateca. 62-65: *Atheta (Acrotona) borneosuspiciosa* sp. n.; 66-69: *Atheta (Acrotona) dilatatiapex* sp. n.

giallo-bruni; zampe gialle. La granulosità del capo è distinta e diradata sulla fronte, quella del pronoto e delle elitre è saliente e quella dell'addome è distinta, più fitta sui tre uroterghi liberi basali. La reticolazione del capo e del pronoto è assente, quella delle elitre è distinta e quella dell'addome è presente solo sui due uroterghi liberi basali dove è anche trasversa. Edeago figg. 71-72.

DERIVATIO NOMINIS. Il nome della nuova specie significa «Tubo microscopico», quello dell'armatura genitale interna dell'edeago.

COMPARAZIONI. La nuova specie è distinta per la forma dell'edeago e per i caratteri dati nella chiave di tutte le specie borneensi del sottogenere *Acrotona* Thomson, 1859, posta dopo la descrizione di *A. inversitheca* sp. n.

***Atheta (Acrotona) inversitheca* sp. n.**

Figg.73-74

Holotypus ♂, Borneo Sabah, Mt. Kinabalu Nat. Pk., HQ Mempening trail, 1600 m, 17.V.1987, leg. A. Smetana (MHNG).

DESCRIZIONE. Lungh. 2,0 mm. Corpo lucido e rossiccio, con capo ed elitre bruno-rossicci, addome giallo-rossiccio; antenne brune con i due antennumeri basali di un giallo sporco; zampe gialle. La punteggiatura del capo è fine e poco distinta, quella delle elitre è distinta. La granulosità del pronoto è saliente, quella dell'addome è fine. La reticolazione del capo è superficiale, quella del pronoto è svanita, quella delle elitre è distinta e quella dell'addome è evidente solo alla base degli uroterghi liberi terzo e quarto dove è molto trasversa. Spermateca fig. 74.

DERIVATIO NOMINIS. Il nome della nuova specie significa «Spermateca inversa».

COMPARAZIONI. La nuova specie e le precedenti del sottogenere *Acrotona* si distinguono dalle note del Borneo per i caratteri dati nella seguente chiave. L'holotypus ♀ di *A. bryanti* Cameron, 1943 e il lectotypus ♂ (da me designato) di *A. borneana* Cameron, 1943, sono stati da me esaminati. *A. horrida* Cameron, 1933a, è stata esaminata e illustrata da Sawada (1980b), *A. mjobergi* Cameron, 1928 è stata trasferita al genere *Borneoxenia* Pace, 1993.

CHIAVE DEI ♂♂ DELLE SPECIE BORNEENSI DI *ATHETA* DEL SOTTOGENERE *ACROTONA*

- |   |  |                                   |
|---|--|-----------------------------------|
| 1 | Corpo uniformemente giallo-rossiccio o bruno pece .....  | 2                                 |
| - | Corpo bicolore o tricolore .....   | 3                                 |
| 2 | Corpo giallo-rossiccio; undicesimo antennumero giallo-rossiccio in contrasto con i precedenti antennumeri bruni; elitre larghe quanto il pronoto; metà apicale dell'edeago rettilinea in visione laterale. Lungh. 1,7 mm. Borneo: Kinabalu ..... | <i>A. dilatatiapex</i> sp. n.     |
| - | Corpo bruno pece; undicesimo antennumero nero quanto i precedenti antennumeri; elitre più larghe del pronoto; metà apicale dell'edeago sinuosa in visione laterale. Lungh. 2,6 mm. Borneo: Kinabalu .....  | <i>A. borneosuspiciosa</i> sp. n. |
| 3 | Addome uniformemente colorato; elitre giallo-brune con base di un giallo sporco; edeago minuscolo con tre strette lamine falciformi dell'armatura genitale interna. Lungh. 1,8 mm. Borneo: Kinabalu, Mulu N.P .....                              | <i>A. muluensis</i> sp. n.        |
| - | Addome bicolore; elitre unicolori; edeago maggiore con armatura genitale interna non come sopra .....  | 4                                 |
| 4 | Undicesimo antennumero giallo o rossiccio, in contrasto con i precedenti antennumeri bruni o neri .....  | 5                                 |
| - | Undicesimo antennumero dello stesso colore dei precedenti .....  | 6                                 |



- 5 Decimo antennomero più lungo che largo; undicesimo antennomero lungo quanto i due precedenti riuniti; parte apicale dell'edeago lievemente convessa, in visione laterale. Lungh. 2,7 mm. Borneo: Kinabalu ..... *A. rufoapicalis* sp. n.
- Decimo antennomero trasverso; undicesimo antennomero più lungo dei tre precedenti riuniti; parte apicale dell'edeago lievemente concava, in visione laterale. Lungh. 2,6 mm. Borneo: Brunei . . . . *A. thaymastocornis* sp. n.
- 6 Avancorpo bicolore bruno pece e bruno; parte apicale dell'edeago rettilinea, in visione laterale. Lungh. 1,8 mm. Borneo: Kinabalu ..... *A. microfistula* sp. n.
- Avancorpo unicolore bruno-rossiccio o giallo-bruno . . . . . 7
- 7 Base dell'addome rossiccia; quinto urotergo libero fittamente pubescente; edeago snello e assai stretto nella parte apicale. Lungh. 1,9 mm. Borneo: Mt. Pais . . . . . *A. borneana* Cameron
- Base dell'addome gialla; quinto urotergo libero coperto di pubescenza rada; edeago tozzo e assai largo nella parte apicale. Lungh. 1,9 mm. Borneo: Kinabalu . . . . . *A. magnalamina* sp. n.

CHIAVE DELLE ♀ DELLE SPECIE BORNEENSI DI *ATHETA* DEL SOTTOGENERE *ACROTONA*

- 1 Corpo uniformemente giallo-rossiccio o bruno pece . . . . . 2
- Corpo bicolore . . . . . 4
- 2 Corpo bruno pece; spermateca assai sviluppata in lunghezza, con parte prossimale descrivente un'ampia spira e mezzo. Lungh. 2,6 mm. Borneo: Kinabalu . . . . . *A. borneosuspiciosa* sp. n.
- Corpo giallo-rossiccio; spermateca meno sviluppata in lunghezza, con parte prossimale descrivente una stretta spira . . . . . 3
- 3 Undicesimo antennomero bruno-rossiccio come i precedenti antennomeri; introflessione apicale del bulbo distale della spermateca, assente. Lungh. 1,7 mm. Borneo: Mt. Pais . . . . . *A. bryanti* Cameron
- Undicesimo antennomero giallo-rossiccio in contrasto con i precedenti antennomeri bruni; introflessione apicale del bulbo distale della spermateca, presente. Lungh. 1,7 mm. Borneo: Kinabalu . . . . *A. dilatatiapex* sp. n.
- 4 Addome unicolore giallo sporco o giallo-rossicci . . . . . 5
- Addome bicolore . . . . . 6
- 5 Elitre bicolori, brune con base gialla; introflessione apicale del bulbo distale della spermateca, stretta e profonda. Lungh. 1,8 mm. Borneo: Kinabalu, Mulu N.P . . . . . *A. muluensis* sp. n.
- Elitre unicolori; introflessione apicale del bulbo distale della spermateca, larghissima. Lungh. 2,0 mm. Borneo: Kinabalu . . . . *A. inversitheca* sp. n.
- 6 Pronoto molto trasverso; pubescenza del quinto urotergo libero, fitta; introflessione apicale del bulbo distale della spermateca, minuscola. Lungh. 1,9 mm. Borneo: Mt. Pais . . . . . *A. borneana* Cameron
- Pronoto poco trasverso; pubescenza del quinto urotergo libero, rada; introflessione apicale del bulbo distale della spermateca, forte. Lungh. 1,9 mm. Borneo: Kinabalu . . . . . *A. magnalanima* sp. n.

KEY TO THE ♂♂ OF THE BORNEAN SPECIES OF *ATHETA* OF THE SUBGENUS *ACROTONA*

- 1 Body uniformly yellow-reddish or pitchy brown . . . . . 2  
 - Body bicoloured . . . . . 3  
 2 Body yellow-reddish; eleventh antennomere yellow-reddish in contrast with the preceding brown antennomere; elytra as wide as pronotum; apical half of the aedeagus straight, in lateral view. Length 1.7 mm. Borneo: Kinabalu . . . . . *A. dilatatiapex* sp. n.  
 - Body pitchy brown; tenth and eleventh antennomeres black; elytra wider than pronotum; apical half of the aedeagus sinuate, in lateral view. Length 2.6 mm. Borneo: Kinabalu . . . . . *A. borneosuspiciosa* sp. n.  
 3 Abdomen uniformly coloured; elytra yellow-brown with base of a dirty yellow; aedeagus minute with three narrow falciform foils on the internal genital armature. Length 1.8 mm. Borneo: Kinabalu, Mulu N.P. . . . . *A. muluensis* sp. n.  
 - Abdomen bicoloured; elytra unicoloured; aedeagus bigger with internal genital armature not as above . . . . . 4  
 4 Eleventh antennomere yellow or reddish, in contrast with the preceding antennomere brown or black . . . . . 5  
 - Tenth and eleventh antennomeres concolorous . . . . . 6  
 5 Tenth antennomere longer than wide; eleventh antennomere as long as the combined length of 8<sup>th</sup> and 9<sup>th</sup> antennomeres; apical portion of the aedeagus slightly convex, in lateral view. Length 2.7 mm. Borneo: Kinabalu . . . . . *A. rufoapicalis* sp. n.  
 - Tenth antennomere transverse; eleventh antennomere longer than the combined length of 7<sup>th</sup>, 8<sup>th</sup> and 9<sup>th</sup> antennomeres; apical portion of the aedeagus slightly concave, in lateral view. Length 2.6 mm. Borneo: Brunei . . . . *A. thymastocornis* sp. n.  
 6 Fore-body bicoloured, pitchy brown and brown; apical portion of the aedeagus straight, in lateral view. Length 1.8 mm. Borneo: Kinabalu . . . . . *A. microfistula* sp. n.  
 - Fore-body brown-reddish or yellow-brown, unicoloured . . . . . 7  
 7 Base of the abdomen reddish; fifth free urotergite densely pubescent; aedeagus slender and narrowed apically. Length 1.9 mm. Borneo: Mt. Pais . . . . . *A. borneana* Cameron  
 - Base of the abdomen yellow; fifth free urotergite covered with thin pubescence; aedeagus widened apically. Length 1.9 mm. Borneo: Kinabalu . . *A. magnalamina* sp. n.

KEY TO THE ♀♀ OF THE BORNEAN SPECIES OF *ATHETA* OF THE SUBGENUS *ACROTONA*

- 1 Body uniformly yellow-reddish or pitchy brown . . . . . 2  
 - Body bicoloured . . . . . 4  
 2 Body pitchy brown; spermatheca well developed in length, with proximal portion forming an ample coil and a half. Length 2.6 mm. Borneo: Kinabalu . . . . . *A. borneosuspiciosa* sp. n.  
 - Body yellow-reddish; spermatheca less developed in length, with proximal portion forming a narrow coil . . . . . 3  
 3 Tenth and eleventh antennomeres brown-reddish; apical umbilicus of the distal bulb of the spermatheca absent. Length 1.7 mm. Borneo: Mt. Pais . *A. bryanti* Cameron  
 - Eleventh antennomere yellow-reddish in contrast with the preceding brown antennomere; apical umbilicus of the distal bulb of the spermatheca present. Length 1.7 mm. Borneo: Kinabalu . . . . . *A. dilatatiapex* sp. n.  
 4 Abdomen dirty yellow or yellow-reddish, unicoloured . . . . . 5  
 - Abdomen bicoloured . . . . . 6  
 5 Elytra bicoloured, brown with base yellow; apical umbilicus of the distal bulb of the spermatheca narrow and deep. Length 1.8 mm. Borneo: Kinabalu, Mulu N.P. . . . . *A. muluensis* sp. n.  
 - Elytra unicoloured; apical umbilicus of the distal bulb of the spermatheca wide. Length 2.0 mm. Borneo: Kinabalu . . . . . *A. inversitheca* sp. n.

- 6 Pronotum very transverse; pubescence of the fifth free urotergite dense; apical umbilicus of the distal bulb of the spermatheca small. Length 1.9 mm. Borneo: Mt. Pais . . . . . *A. borneana* Cameron  
 - Pronotum slightly transverse; pubescence of the fifth free urotergite sparse; apical umbilicus of the distal bulb of the spermatheca large. Length 1.9 mm. Borneo: Kinabalu . . . . . *A. magnalanima* sp. n.

***Atheta (Microdota) semitaevagans* sp. n.**

Figg. 75-77

Holotypus ♂, Borneo, Sabah, Mt. Kinab[alu] N.P., Por[ing] H[ot] S[prings], area Eastern Ridge Tr., 850 m, 28.VIII.1988, leg. A. Smetana (MHNG).

Paratypes: 1 ♀, Sabah, Crocker Ra., 1270 m, Km 60 r.te Kota Kinabalu-Tambunan, 17.V.1987, leg. Burckhardt & Löbl; 1 ♂, Borneo-Sabah, Crocker Ra., 1550-1650 m, 16.V.1987, leg. Burckhardt & Löbl; 1 ♂, Borneo-Sabah, Mt. Kinabalu, 1500 m, 25.IV.1987, leg. Burckhardt & Löbl.

DESCRIZIONE. Lungh. 1,9 mm. Corpo lucidissimo e bruno, con capo brunorossiccio; pronoto e uroterghi liberi primo e secondo e pigidio giallo-rossicci; antenne bruno-rossicce con i tre antennomeri basali giallo-rossicci; zampe gialle. La granulosità del capo è distinta e assente sulla fascia longitudinale mediana, quella delle elitre è fine e quella dell'addome è superficiale. La punteggiatura del pronoto è fine e distinta. La reticolazione dell'avancorpo è assente, quella dell'addome è distinta. Il pronoto presenta due forti punti isolati. Edeago figg. 76-77.

DERIVATIO NOMINIS. Il nome della nuova specie significa «Vagante dei sentieri».

COMPARAZIONI. La nuova specie è distinta per la forma dell'edeago e per i caratteri dati nella chiave di tutte le specie borneensi del sottogenere *Microdota* Mulsant & Rey, 1873, posta dopo la descrizione di *A. microtheca* sp. n.

***Atheta (Microdota) taedafera* sp. n.**

Figg. 78-80

Holotypus ♂, ♂, Borneo, Sabah, Mt. Kinab[alu] N.P., Por[ing] H[ot] S[prings], area Eastern Ridge Tr., 1060 m, 17.VIII.1988, leg. A. Smetana (MHNG).

DESCRIZIONE. Lungh. 1,7 mm. Corpo lucido e bruno con pronoto, i due uroterghi liberi basali e il pigidio giallo-rossicci; omeri rossicci, antenne di un giallo sporco con i due antennomeri basali gialli; zampe gialle. La granulosità del capo è poco distinta, quella del pronoto è assente e quella delle elitre e dell'addome è distinta. Il pronoto presenta un debole solco mediano. Edeago figg. 79-80.

DERIVATIO NOMINIS. Il nome della nuova specie significa «Portatrice di fiaccola» a motivo della forma di fiaccola accesa di una parte dell'armatura genitale interna dell'edeago, in visione laterale.

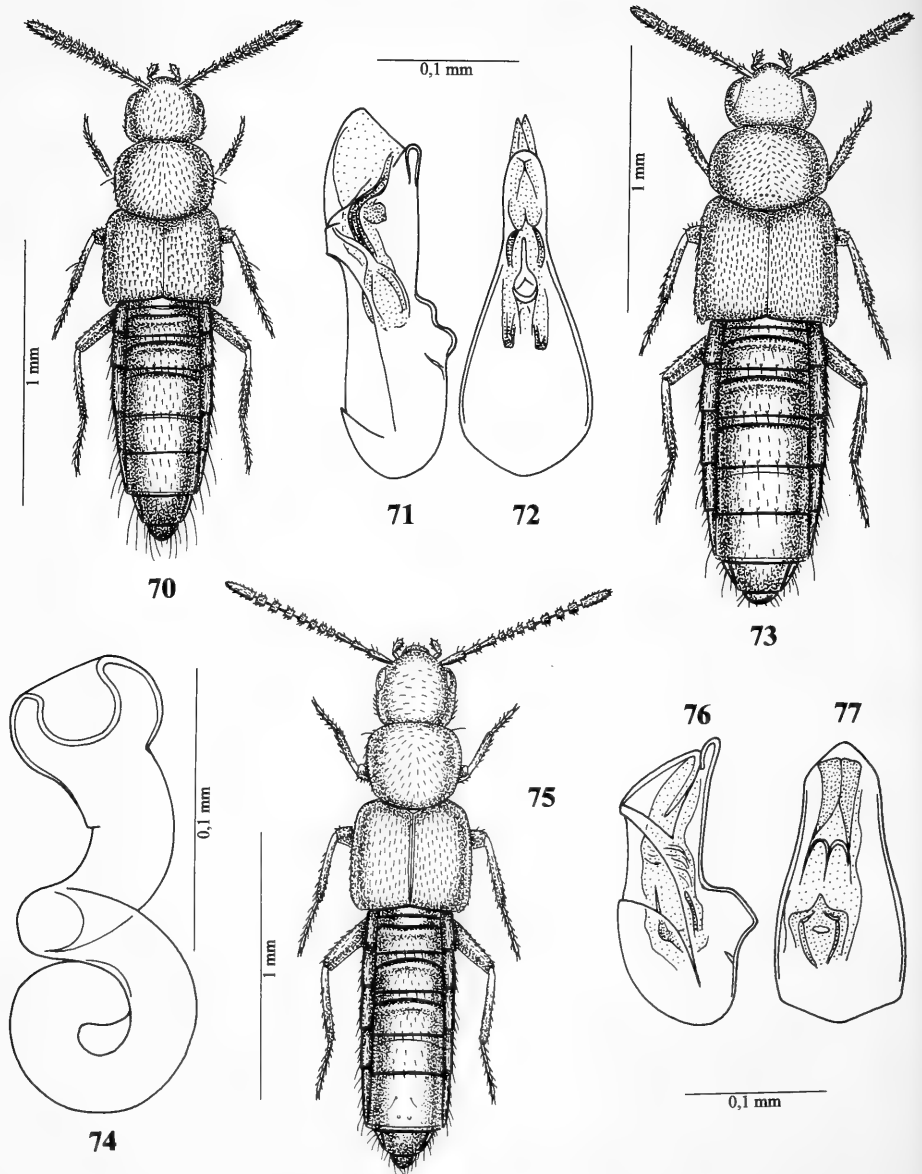
COMPARAZIONI. La nuova specie è distinta per la forma dell'edeago e per i caratteri dati nella chiave di tutte le specie borneensi del sottogenere *Microdota* Mulsant & Rey, 1873, posta dopo la descrizione di *A. microtheca* sp. n.

***Atheta (Microdota) stenomastaxoides* sp. n.**

Figg. 81-84

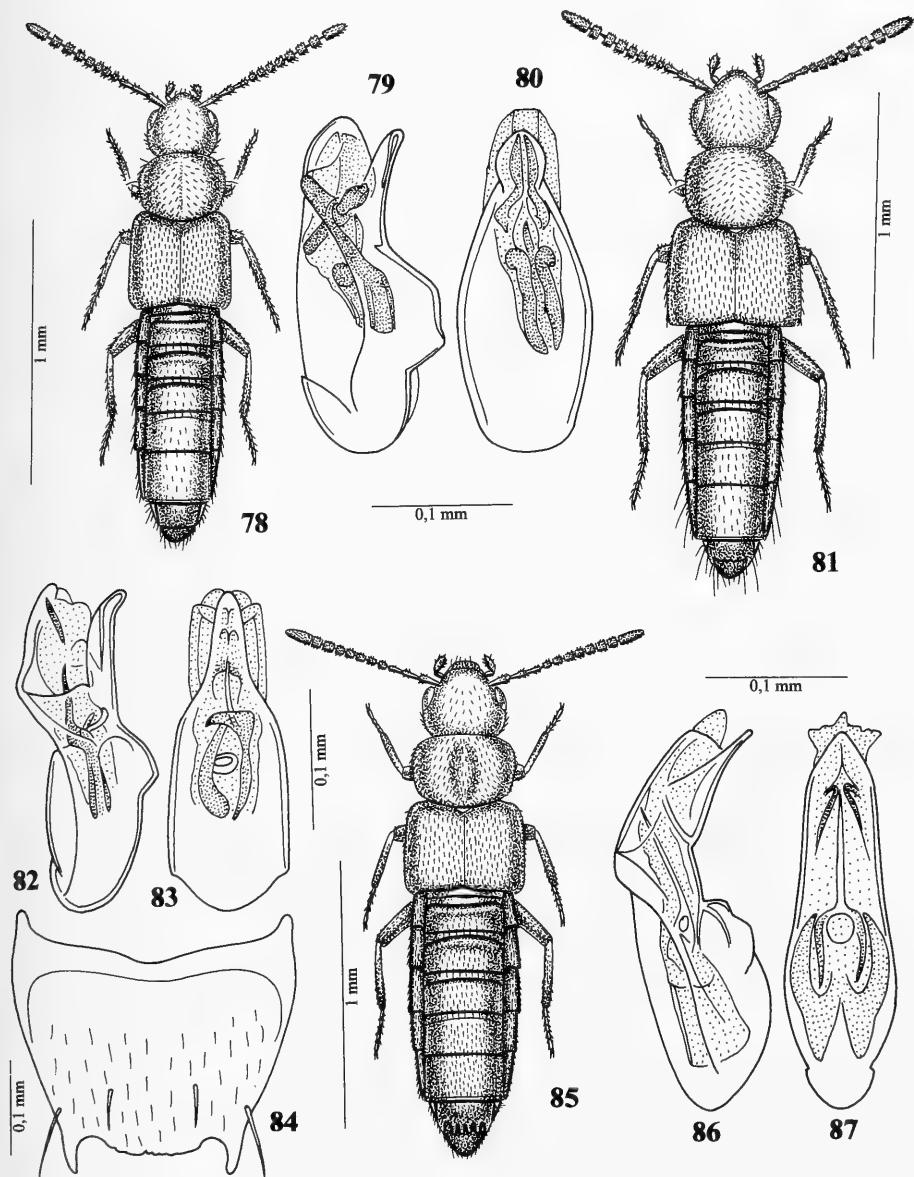
Holotypus ♂, Borneo, Sabah, Mt. Kinabalu Nat. Pk., HQ Silau-Silau Tr., 1550 m, 12.VI.II.1988, leg. A. Smetana (MHNG).

DESCRIZIONE. Lungh. 1,9 mm. Corpo lucido e bruno, con elitre e uroterghi liberi quarto e base del quinto nero-bruni; antenne brune con i due antennomeri basali giallo-



FIGG. 70-77

Habitus, edeago in visione laterale e ventrale e spermateca. 70-72: *Atheta (Acrotona) microfistula* sp. n.; 73-74: *Atheta (Acrotona) inversitheca* sp. n.; 75-77: *Atheta (Microdota) semitaevagans* sp. n.



FIGG. 78-87

Habitus, edeago in visione laterale e ventrale e spermateca. 78-80: *Atheta (Microdota) taedafera* sp. n.; 81-84: *Atheta (Microdota) stenomastaxoides* sp. n.; 85- 87: *Atheta (Microdota) semi-symmetrica* sp. n.

bruni. La granulosità del capo è assente, quella del pronoto è finissima e quella delle elitre è fitta. La reticolazione del capo è netta, quella del pronoto e delle elitre è distinta. Sull'addome la reticolazione è distinta sui tre uroterghi liberi basali, superficiale sul quarto urotergo libero e assente sul quinto. Il disco del capo è impresso. Edeago figg. 82-83, sesto urotergo libero del ♂ fig. 84.

DERIVATIO NOMINIS. Il nome della nuova specie significa «Simile a *Stenomastax*», un genere di Aleocharinae.

COMPARAZIONI. La nuova specie è distinta per la forma dell'edeago e per i caratteri dati nella chiave di tutte le specie borneensi del sottogenere *Microdota* Mulsant & Rey, 1873, posta dopo la descrizione di *A. microtheca* sp. n.

***Atheta (Microdota) semiasymmetrica* sp. n.**

Figg. 85-88

Holotypus ♂, Sabah, Poring Hot Springs, 500 m, 7.V.1987, leg. Burckhardt & Löbl (MHNG).

DESCRIZIONE. Lungh. 1,8 mm. Corpo lucido e giallo-bruno, con elitre brune; antenne di un giallo sporco con i due antennomeri basali gialli; zampe gialle. La punteggiatura del capo è fitta e poco distinta. La granulosità del pronoto è confusa, quella delle elitre è poco evidente e quella dell'addome è superficiale e fitta. La reticolazione del capo e del pronoto è distinta, quella delle elitre è netta e quella dell'addome è assente. Il pronoto mostra un largo solco mediano. Edeago figg. 86-87, sesto urotergo libero del ♂ fig. 88.

DERIVATIO NOMINIS. Il nome della nuova specie significa «Quasi asimmetrica».

COMPARAZIONI. La nuova specie è distinta per la forma dell'edeago e per i caratteri dati nella chiave di tutte le specie borneensi del sottogenere *Microdota* Mulsant & Rey, 1873, posta dopo la descrizione di *A. microtheca* sp. n.

***Atheta (Microdota) microtheca* sp. n.**

Figg. 89-90

Holotypus ♀, Borneo Sabah, Mt. Kinabalu Nat. Pk., Poring Hot Springs, 495 m, 27.VI-II.1988, leg. A. Smetana (MHNG).

DESCRIZIONE. Lungh. 1,3 mm. Corpo lucido e giallo-bruno, pigidio rossiccio; antenne brune con i due antennomeri basali giallo-bruni; zampe gialle. La punteggiatura del capo è molto superficiale, quella del pronoto è poco distinta. La granulosità delle elitre è svanita. La reticolazione del capo si trova solo sul disco dove è evidente, sul resto del corpo è assente. Spermateca fig. 90.

DERIVATIO NOMINIS. Il nome della nuova specie significa «Spermateca microscopica».

COMPARAZIONI. Il sottogenere *Microdota* Mulsant & Rey, 1873, di *Atheta* è nuovo per il Borneo. Le specie sopra descritte, insieme all'ampiamente diffusa in oriente *A. ocellaris* Cameron, si distinguono per i caratteri dati nella seguente chiave.

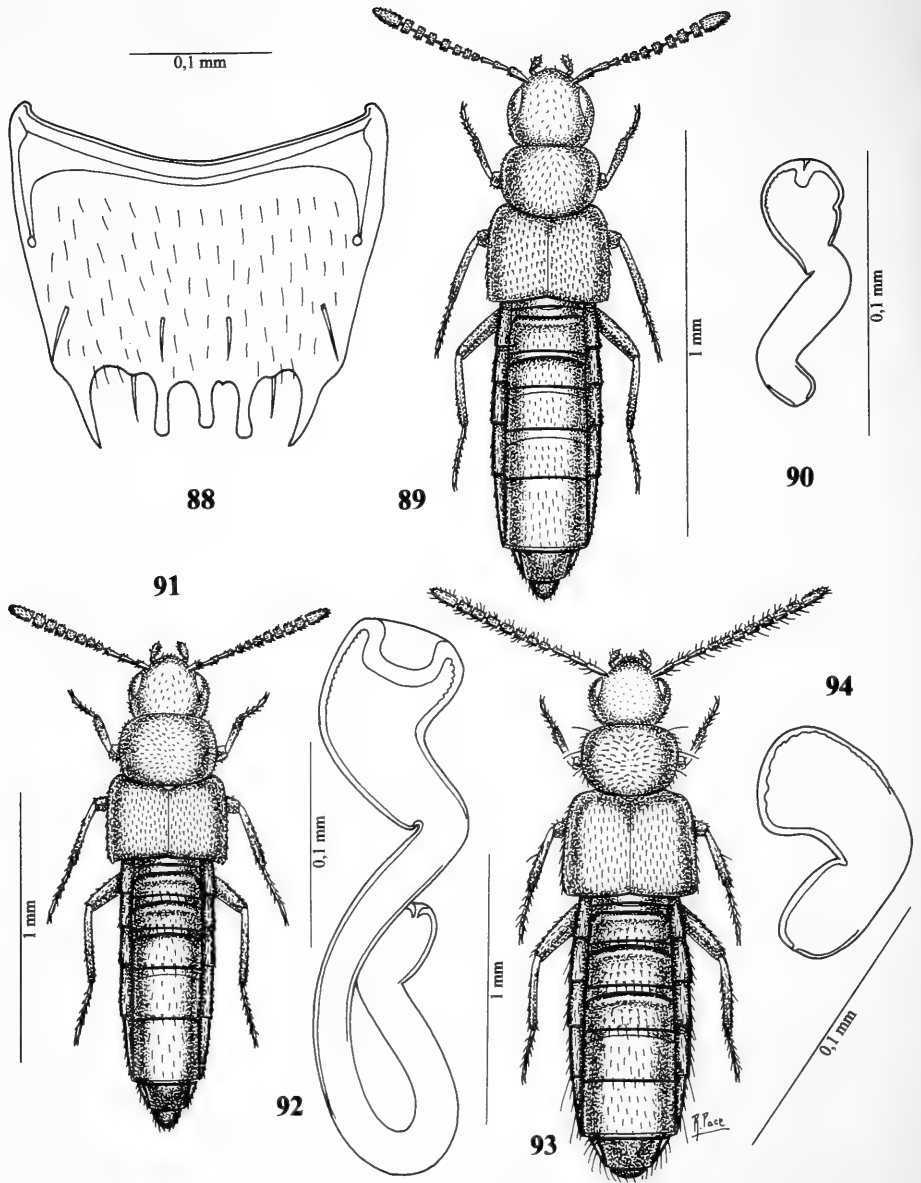
CHIAVE DELLE SPECIE BORNEENSI DI *ATHETA* DEL SOTTOGENERE *MICRODOTA*

- |   |  |                             |
|---|--|-----------------------------|
| 1 | Occhi molto più lunghi delle tempie .....  | 2                           |
| - | Occhi più corti delle tempie .....   | 4                           |
| 2 | Taglia corporea ridotta, 1,3 mm; addome unicolore, tranne il pigidio rossiccio. Borneo: Kinabalu ..... | <i>A. microtheca</i> sp. n. |

- Taglia corporea superiore a 1,7 mm; addome bicolore bruno o giallo-bruno, con una fascia nera o bruna al quarto urotergo libero . . . . . 3
- 3 Corpo giallo-bruno; parte apicale dell'edeago poco prolungata; armatura genitale interna dello stesso edeago composta di due corti pezzi cultriformi. Lungh. 1,7 mm. India, Cina, Thailandia, Vietnam, Filippine e Borneo . . . . . *A. ocularis* Cameron
- Corpo bruno; parte apicale dell'edeago molto prolungata; armatura genitale interna dello stesso edeago composta da un pezzo molto lungo e stretto all'estremità distale. Lungh. 1,9 mm. Borneo: Kinabalu . . . . . *A. stenomastaxoides* sp. n.
- 4 Pronoto debolmente trasverso e senza solco mediano; armatura genitale interna dell'edeago con un pezzo a forma di ago. Lungh. 1,9 mm. Borneo: Kinabalu . . . . . *A. semitaevagans* sp. n.
- Pronoto fortemente trasverso e con solco mediano; armatura genitale interna dell'edeago senza pezzo a forma di ago . . . . . 5
- 5 Quarto antennomero più lungo che largo; il solco mediano del pronoto è largo; elitre unicolori brune; addome unicolore giallo-bruno. Lungh. 1,8 mm. Borneo: Kinabalu . . . . . *A. semiasymmetrica* sp. n.
- Quarto antennomero trasverso; il solco mediano del pronoto è stretto; elitre brune con omeri rossicci; addome bicolore con base e pigidio giallo-rossicci. Lungh. 1,7 mm. Borneo: Kinabalu . . . . . *A. taedafera* sp. n.

KEY OF THE BORNEAN SPECIES OF *ATHETA* OF THE SUBGENUS *MICRODOTA*

- 1 Eyes longer than temples . . . . . 2
- Eyes shorter than temples . . . . . 4
- 2 Body length 1.3 mm; abdomen unicoloured, except the reddish pigidium. Borneo: Kinabalu . . . . . *A. microtheca* sp. n.
- Body length exceeding 1.7 mm; abdomen bicoloured brown or yellow-brown, with a black or brown stripe on the fourth free urotergite . . . . . 3
- 3 Body yellow-brown; apical part of the aedeagus slightly extended; internal genital armature of the aedeagus consisting of two short cultriform pieces. Length 1.7 mm. India, China, Thailand, Vietnam, Philippines and Borneo . . . . . *A. ocularis* Cameron
- Body brown; apical part of the aedeagus conspicuously extended; internal genital armature of aedeagus consisting of a very long piece narrowed apically. Length 1.9 mm. Borneo: Kinabalu . . . . . *A. stenomastaxoides* sp. n.
- 4 Pronotum slightly transverse, without median furrow; internal genital armature of aedeagus with a needle-shaped piece. Length 1.9 mm. Borneo: Kinabalu . . . . . *A. semitaevagans* sp. n.
- Pronotum strongly transverse, with median furrow; internal genital armature of the aedeagus without needle-shaped piece . . . . . 5
- 5 Fourth antennomere longer than wide; median furrow of pronotum wide; elytra brown, unicoloured; abdomen yellow-brown, unicoloured. Length 1.8 mm. Borneo: Kinabalu . . . . . *A. semiasymmetrica* sp. n.
- Fourth antennomere transverse; median furrow of pronotum narrow; elytra brown with reddish humeri; bicoloured abdomen with base and pigidium yellow-reddish. Length 1.7 mm. Borneo: Kinabalu . . . . . *A. taedafera* sp. n.



FIGG. 88-94

Sesto urotergo libero del ♂, habitus e spermateca. 88: *Atheta (Microdota) semiasymmetrica* sp. n.; 89-90: *Atheta (Microdota) microtheca* sp. n.; 91-92: *Atheta (Datomicra) bibulbosa* sp. n.; 93-94: *Atheta (Poromicrodota) neamicrotheca* sp. n.

***Atheta (Datomicra) bibulbosa* sp. n.**

Figg. 91-92

Holotypus ♀, Sabah, Poring Hot Springs, 500 m, 11.V.1987, leg. Burckhardt & Löbl (MHNG).



DESCRIZIONE. Lungh. 1,8 mm. Corpo lucido e bruno-rossiccio con pigidio giallo-bruno; antenne brune con i due antennomeri basali giallo-bruni; zampe gialle. La punteggiatura del capo è fitta e superficiale. La granulosità del pronoto e delle elitre è distinta, fine sul primo. La reticolazione è presente solo sui tre uroterghi liberi basali dove è molto trasversa e superficiale. Spermateca fig. 92.

DERIVATIO NOMINIS. Il nome della nuova specie significa «Con due bulbi», quelli della spermateca.

COMPARAZIONI. La nuova specie è ben distinta da *A. lewisiana* Cameron, 1933b, del Giappone e di Giava, per le elitre poco più lunghe del pronoto (molto più lunghe del pronoto in *lewisiana*) e per la larghissima introflessione apicale del bulbo distale della spermateca (introflessione stretta in *lewisiana*).

*Atheta (Poromicrodota) neamicrotheca* sp. n.

Figg. 93-94

Holotypus ♀, Borneo, Sabah, Mt. Kinabalu N.P., below Layang Layang, 2595 m, 2.V.1987, A. Smetana leg. (MHNG).

DESCRIZIONE. Lungh. 3,7 mm. Corpo lucido e bruno, con elitre giallo-brune, pigidio rossiccio; antenne brune con primo antennomero basale rossiccio; zampe giallo-rossicce. La granulosità del capo è fine e distinta, quella del pronoto è netta e fitta, quella delle elitre è superficiale e confusa e quella dell'addome è saliente sui tre uroterghi liberi basali e assente sui restanti. La reticolazione del capo e del pronoto è netta, quella delle elitre è distinta e quella dell'addome è trasversa ed evidente. Spermateca fig. 94.

DERIVATIO NOMINIS. Il nome della nuova specie significa «Nuova con spermateca microscopica».

COMPARAZIONI. Per la forma della spermateca, la nuova specie si mostra affine ad *A. subamicula* Cameron, 1939a, dell'India. Se ne distingue per gli antennomeri intermedi più lunghi che larghi (trasversi in *subamicula*) e per l'assenza di introflessione apicale del bulbo distale della spermateca.

*Atheta (Dimetrota) ramifera* sp. n.

Figg. 95-98

Holotypus ♂, Sabah, Kinabalu N.P., Poring Hot Spring, 26.X.1990, from rotten tarap fruit (*Artocarpus* sp.), leg. G. de Rougemont (IRSN).

DESCRIZIONE. Lungh. 2,4 mm. Corpo debolmente lucido, addome lucido. Corpo bruno-rossiccio con capo e uroterghi liberi terzo, quarto e quinto bruni; antenne brune con i tre antennomeri basali giallo-rossicci; zampe gialle. La punteggiatura del capo è fittissima e superficiale. La granulosità del pronoto è poco distinta, quella delle elitre è poco saliente e quella dell'addome è superficiale. La reticolazione del capo è superficiale, quella del pronoto è molto svanita, quella delle elitre è evanescente, quella dei due uroterghi liberi basali è superficiale e non trasversa e quella degli uroterghi liberi terzo, quarto e quinto è molto trasversa e svanita. Il pronoto presenta un debole solco mediano. Edeago figg. 96-97, sesto urotergo libero del ♂ 98.

DERIVATIO NOMINIS. Il nome della nuova specie significa «Portatrice di ramo» quello dell'armatura genitale interna dell'edeago in visione laterale.

COMPARAZIONI. La nuova specie è distinta per la forma dell'edeago e della spermateca e per i caratteri dati nella chiave di tutte le specie borneensi del sottogenere *Dimetrota* Mulsant & Rey, 1873, posta dopo la descrizione di *A. preludei* sp. n.

***Atheta (Dimetrota) preludei* sp. n.**

Figg. 99-100

Holotypus ♀, Borneo, Sabah, Mt. Kinabalu, 1500 m, 25.IV.1987, leg. Burckhardt & Löbl (MHNG).

DESCRIZIONE. Lungh. 2,6 mm. Corpo lucido e bruno; antenne brune con i due antennumeri basali e la base del terzo gialli e apice dell'undicesimo rossiccio; zampe gialle. La granulosità del capo è poco saliente, quella del pronoto è molto superficiale, quella delle elitre è svanita e quella dell'addome è fine e distinta. La reticolazione del capo e dell'addome è assente, quella del pronoto è distinta e quella delle elitre è superficiale. Spermateca fig. 100.

DERIVATIO NOMINIS. Il nome della nuova specie significa «Del preludio» uno di quelli per organo di J.S. Bach del *Manoscritto di Lipsia* che ascoltavo su CD mentre esaminavo questa nuova specie.

COMPARAZIONI. Le due specie del Borneo in precedenza attribuite al sottogenere *Dimetrota* sono state da Sawada (1980a) trasferite a genere e sottogenere differenti. *A. morbida* Cameron, 1933a al genere *Codoglossa* Sawada, 1980a, *A. aprilis* Cameron, 1933a al sottogenere *Notothecta* Thomson, 1858. Le due nuove specie vengono ad essere le prime autentiche appartenenti al sottogenere *Dimetrota*.

CHIAVE DELLE SPECIE BORNEENSI DEL SOTTOGENERE *DIMETROTA* DI *ATHETA*

- 1 Quarto antennumero più lungo che largo; quinto urotergo libero fittamente pubescente, quanto l'urotergo libero basale. Lungh. 2,2 mm. Borneo: Kinabalu . . . . . *A. ramifera* sp. n.  
- Quarto antennumero trasverso; quinto urotergo libero con pubescenza più rada di quella dell'urotergo libero basale. Lungh. 2,7 mm. Borneo: Kinabalu . . . . . *A. preludei* sp. n.

KEY TO THE BORNEAN SPECIES OF THE SUBGENUS *DIMETROTA* OF *ATHETA*

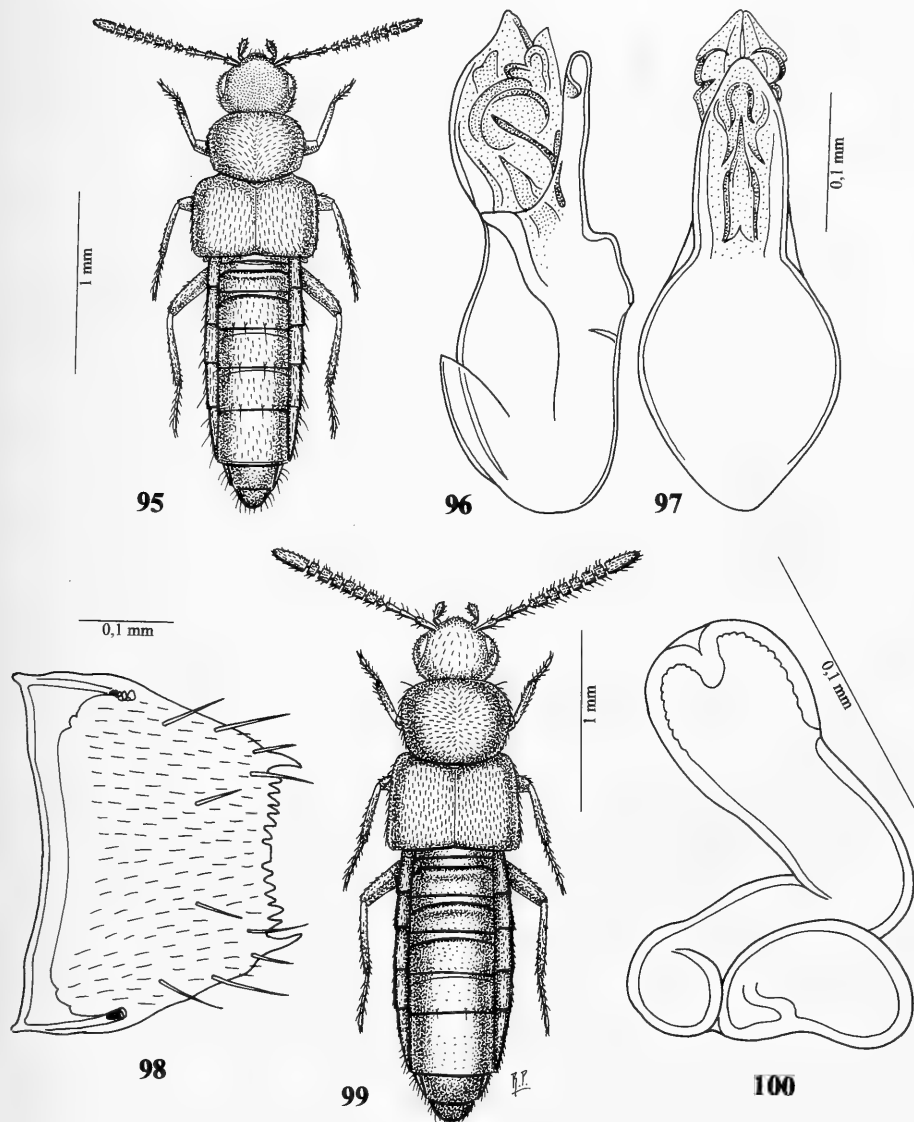
- 1 Fourth antennomere longer than wide; fifth free urotergite densely pubescent, as pubescent as the basal free urotergite. Length 2.2 mm. Borneo: Kinabalu . . . . . *A. ramifera* sp. n.  
- Fourth antennomere transverse; fifth free urotergite with pubescence sparser than that of the basal free urotergite. Length 2.7 mm. Borneo: Kinabalu . . . . . *A. preludei* sp. n.

***Berca borneana* sp. n.**

Figg. 101-104

Holotypus ♂, N. Borneo, Sabah, Ranau, 2.VIII.1985, leg. K. Maruyama (DEI).  
Paratypi: 2 ♀ ♀, stessa provenienza.

DESCRIZIONE. Lungh. 2,6 mm. Corpo lucidissimo e bruno-rossiccio con gli uroterghi liberi terzo, quarto, quinto e sesto bruni; antenne brune con i due antennumeri basali e la base del terzo giallo-rossicci; zampe giallo-rossicce. La punteggiatura del capo è ombelicata e nettissima, assente sulla fascia longitudinale mediana, quella del



FIGG. 95-100

Habitus, edeago in visione laterale e ventrale, spermateca e sesto urotergo libero del ♂. 95-98: *Atheta (Dimetrota) ramifera* sp. n.; 99-100: *Atheta (Dimetrota) preludi* sp. n.

pronoto è distinta, ma pure assente sulla fascia longitudinale mediana, quella delle elitre è poco distinta. La reticolazione del capo è assente, quella delle elitre e dell'addome è distinta. Il capo del ♂ presenta una larga concavità discale e due pliche molto salienti tra le antenne, la ♀ è priva di tale concavità, sostituita da un solco mediano. Il pronoto del ♂ mostra un'ampia e profonda depressione con solco mediano posteriore,

nella ♀ solo con il solco superficiale. Le elitre presentano forti punti isolati sparsi. Edeago figg. 102-103, spermateca fig. 104.

COMPARAZIONI. Il genere *Berca* Blackwelder, 1952, è nuovo per il Borneo. La nuova specie è simile a *B. thailandensis* Pace 2000, da cui si distingue per i caratteri dati nella seguente chiave.

- 1 Occhi più lunghi delle tempie; pronoto convesso, con una fossetta mediana posteriore; elitre senza forti punti isolati; parte apicale dell'edeago accentuatamente sinuosa al lato ventrale. Lungh. 1,8 mm. Thailandia  
 ..... *B. thailandensis* Pace
- Occhi più corti delle tempie; pronoto con ampia e profonda depressione mediana, senza fossetta mediana posteriore; elitre con forti punti isolati; parte apicale dell'edeago impercettibilmente sinuosa al lato ventrale. Lungh. 2,7 mm. Borneo: Ranau ..... *B. borneana* sp. n.
- 1 Eyes longer than temples; pronotum convex, with a medio-posterior fovea; elytra without conspicuous and isolated punctures; apical portion of the aedeagus deeply sinuate ventrally. Length 1.8 mm. Thailand . . . . *B. thailandensis* Pace
- Eyes shorter than temples; pronotum with wide and deep median depression, without medio-posterior fovea; elytra with strong isolated points; apical portion of the aedeagus obsoletely sinuate ventrally. Length 2.7 mm. Borneo: Ranau  
 ..... *B. borneana* sp. n.

***Pelioptera (Pelioptera) seminuda* sp. n.**

Figg. 105-108

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu Nat. Pk., Poring Hot Springs, 485 m, 29.VI-II.1988, leg. A. Smetana (MHNG).

DESCRIZIONE. Lungh. 1,8 mm. Corpo lucidissimo e bruno-rossiccio con i due terzi posteriori delle elitre e il quarto urotergo libero bruni; antenne brune con i tre antennomeri basali di un giallo sporco; zampe gialle. La granulosità del capo è netta, ma rada, quella del pronoto è fine e poco distinta, quella delle elitre è distinta. Assente è la reticolazione sul corpo. Gli uroterghi presentano setole solo al margine posteriore, tranne che sul quinto. Edeago figg. 106-107, sesto urotergo libero del ♂ fig. 108.

COMPARAZIONI. La nuova specie è distinta per la forma dell'edeago e per i caratteri dati nella chiave di tutte le specie borneensi del genere *Pelioptera* Kraatz, 1857, posta dopo la descrizione di *P. necnilgiriensis* sp. n.

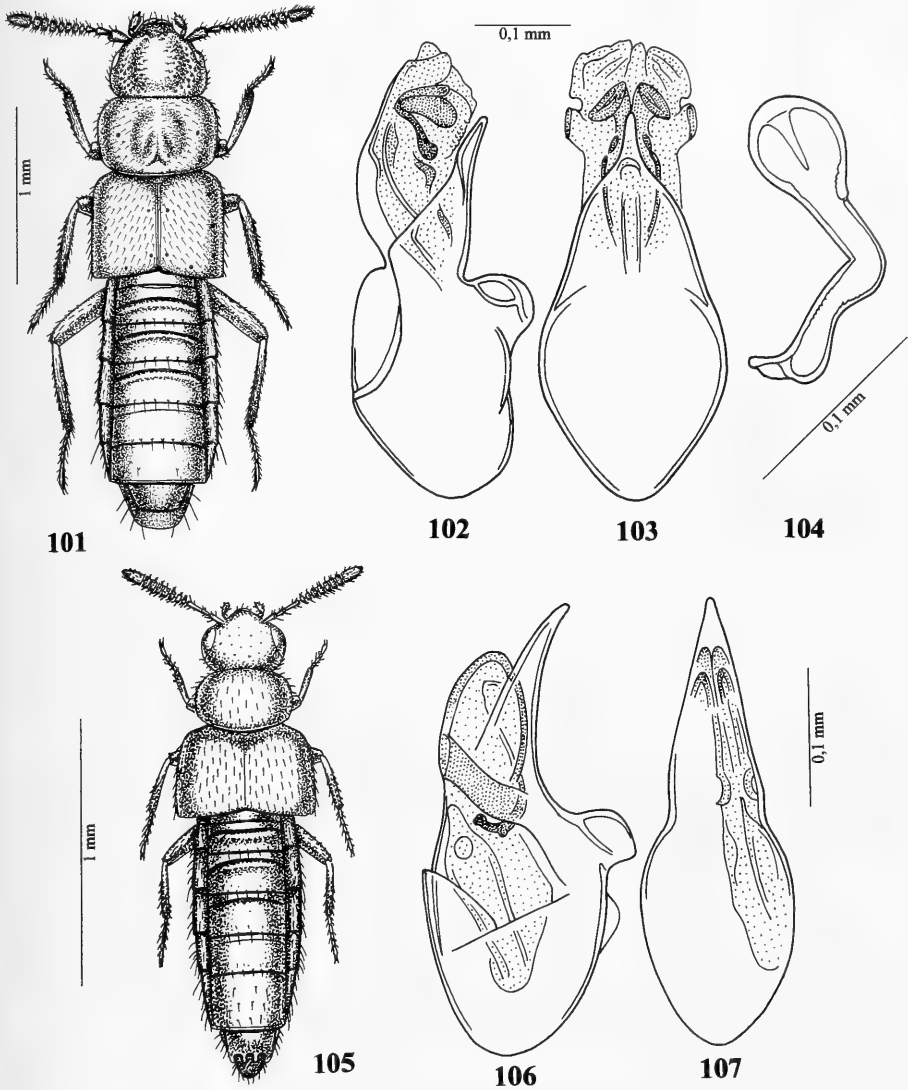
***Pelioptera (Pelioptera) ics* sp. n.**

Figg. 109-111

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu Nat. Pk., Poring Hot Springs, 500 m, 10.V.1987, leg. A. Smetana (MHNG).

Paratypi: 1 ♂, Sabah, Poring Hot Springs, 500 m, 8.V.1987, leg. Burckhardt & Löbl; 1 ♂, Sabah, Poring Hot Springs, 500 m, 7.V.1987, leg. Burckhardt & Löbl.

DESCRIZIONE. Lungh. 2,2 mm. Corpo lucido e bruno con deboli riflessi bronzeei; antenne brune con antennomero basale rossiccio; zampe gialle. La punteggiatura del capo è molto superficiale e rada. La granulosità del pronoto è fine e svanita, quella delle elitre è fitta e distinta. La reticolazione del capo è netta, quella del pronoto e delle elitre è distinta e quella dell'addome è ben visibile, a maglie molto trasverse. Il secondo urotergo libero del ♂ presenta un tubercolo saliente. Edeago figg. 110-111.



FIGG. 101-107

Habitus, edeago in visione laterale e ventrale e spermateca. 101-104: *Berca borneana* sp. n.; 105-107: *Pelioptera (Pelioptera) seminuda* sp. n.

DERIVATIO NOMINIS. Il nome della nuova specie prende nome dalla lettera ics che sembra disegnata sull'edeago in visione ventrale.

COMPARAZIONI. La nuova specie è distinta per la forma dell'edeago e per i caratteri dati nella chiave di tutte le specie borneensi del genere *Pelioptera* Kraatz, 1857, posta dopo la descrizione di *P. necnilgiriensis* sp. n.

***Pelioptera (Pelioptera) longearmata* sp. n.**

Figg. 112-114

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu N.P., east base St. John's PK, 3900 m, 8.VI-II.1988, leg. A. Smetana (MHNG).

Paratypus: 1 ♂, Borneo, Sabah, Mt. Kinabalu N.P., 1500 m, 30.IV.1987, Burckhardt & Löbl leg.

DESCRIZIONE. Lungh. 2,0 mm. Corpo lucido e bruno; antenne brune con antennumero basale giallo-bruno; zampe gialle. La granulosità del capo è distinta, ma superficiale sulle tempie, quella del pronoto è evidente e quella delle elitre è confusa. La reticolazione del capo e del pronoto è netta, quella dei quattro uroterghi liberi basali è molto trasversa e distinta e quella del quinto urotergo libero è assente. Il capo presenta un debole tubercolo frontale. Il primo urotergo libero basale del ♂ mostra una debole bozza mediana, il secondo un granulo mediano. Edeago figg. 113-114.

DERIVATIO NOMINIS. Il nome della nuova specie significa «Lungamente armata» come riferimento all'armatura genitale interna dell'edeago.

COMPARAZIONI. La nuova specie è distinta per la forma dell'edeago e per i caratteri dati nella chiave di tutte le specie borneensi del genere *Pelioptera* Kraatz, 1857, posta dopo la descrizione di *P. necnigiriensis* sp. n.

***Pelioptera (Pelioptera) irigaster* sp. n.**

Figg. 115-118

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu Nat. Pk, Poring Hot Springs, 480 m, 10.V.1987, leg. A. Smetana (MHNG).

Paratypus: 1 ♂, Sabah, Poring Hot Springs, 500 m, 8.V.1987, leg. Burckhardt & Löbl.

DESCRIZIONE. Lungh. 2,6 mm. Corpo lucido e bruno-rossiccio con uroterghi liberi quarto e quinto iridescenti; antenne giallo-brune con i due antennumeri basali e la base del terzo, giallo-rossicci; zampe giallo-rossicce. La punteggiatura del capo è distinta e assente sulla fascia longitudinale mediana. La granulosità del pronoto e delle elitre è fine e superficiale. Assente è la reticolazione sul corpo. Il quinto urotergo libero del ♂ presenta un tubercolo mediano posteriore affilato e molto saliente. Edeago figg. 116-117, sesto urotergo libero del ♂ fig. 118.

DERIVATIO NOMINIS. Il nome della nuova specie significa «Addome iridescente».

COMPARAZIONI. La nuova specie è distinta per la forma dell'edeago e per i caratteri dati nella chiave di tutte le specie borneensi del genere *Pelioptera* Kraatz, 1857, posta dopo la descrizione di *P. necnigiriensis* sp. n.

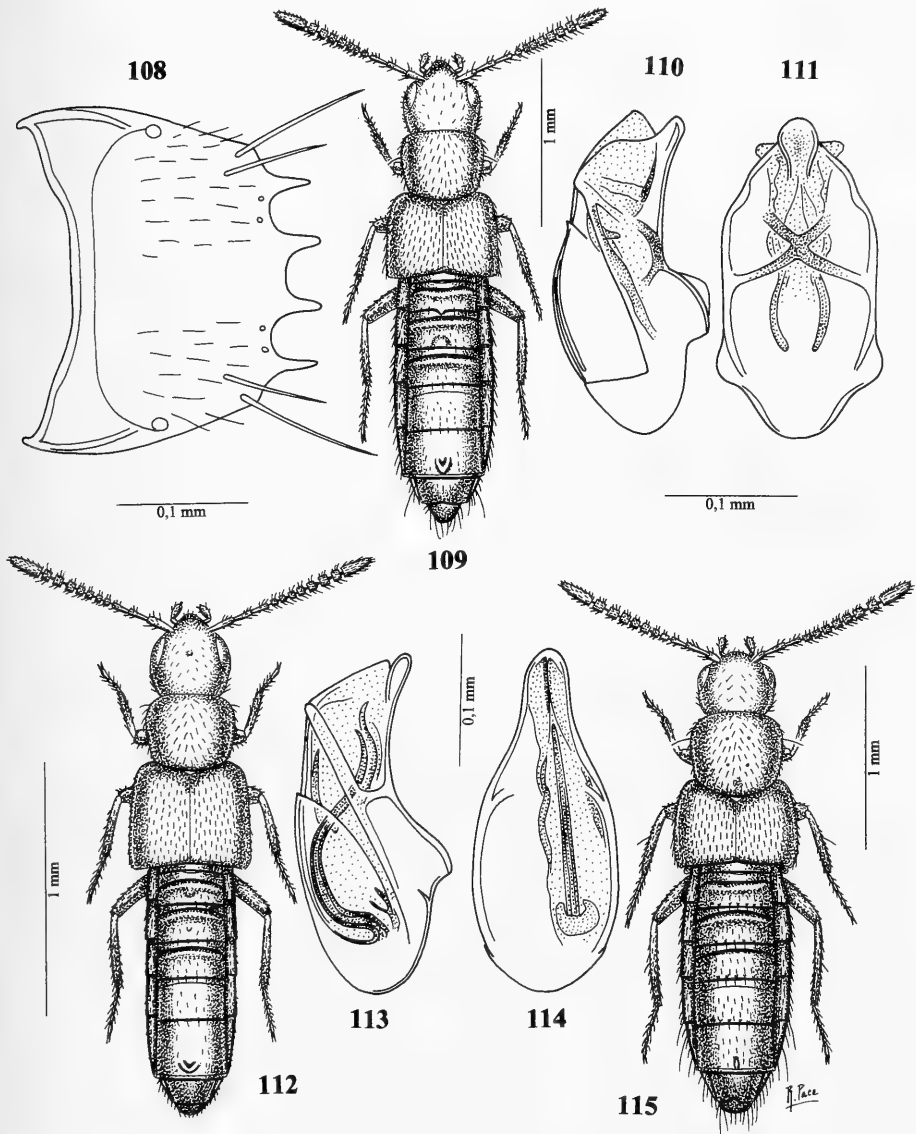
***Pelioptera (Pelioptera) stenopaca* sp. n.**

Figg. 119-123

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu Nat. Pk., HQ at Liwagu Rv., 1505 m, 14.VI-II.1.IX.1988, A. Smetana leg. (MHNG).

Paratypi: 1 ♀, stessa provenienza; 2 ♀♀, Borneo, Sabah, Mt. Kinabalu N.P., 1500-1580 m, 27-30.IV.1987, Burckhardt & Löbl leg.; 1 ♂, Sabah, Poring Hot Springs, 500 m, 7.V.1987, leg. Burckhardt & Löbl.

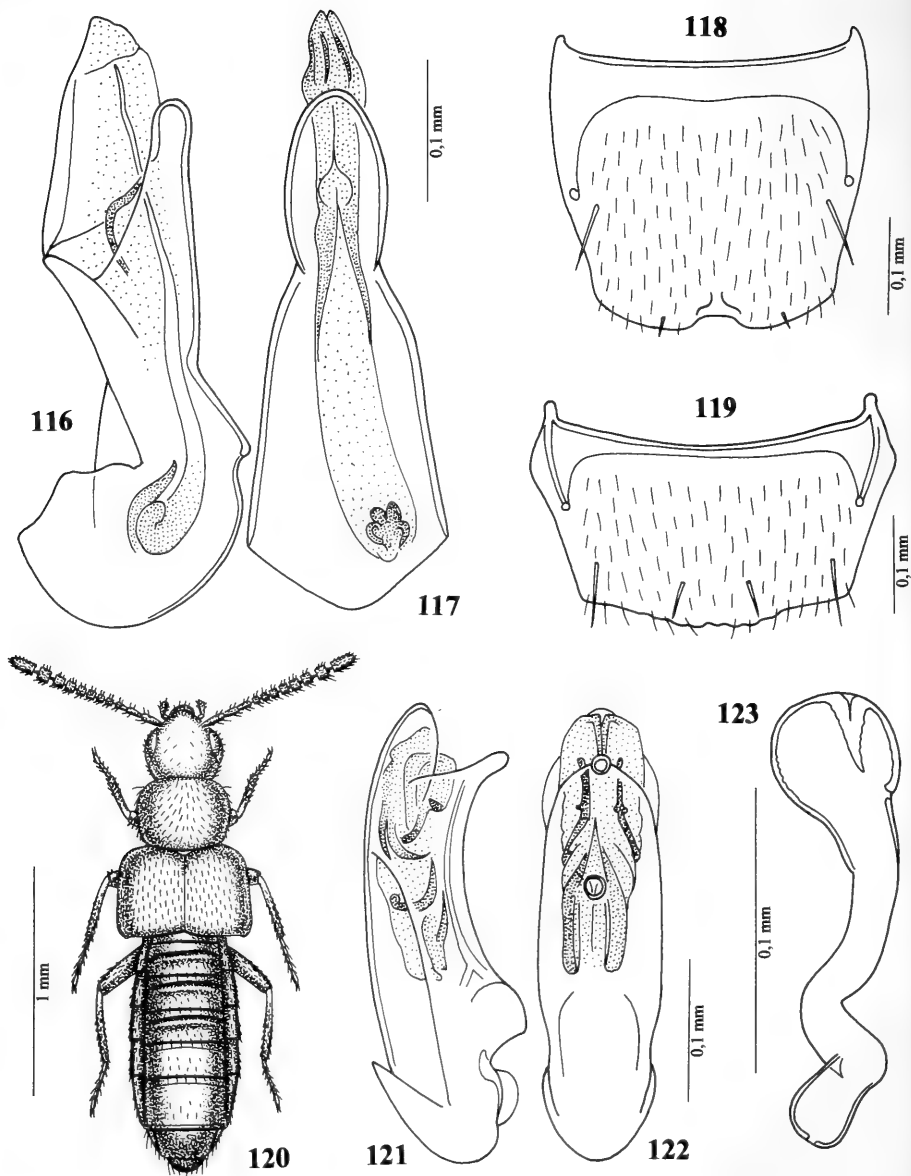
DESCRIZIONE. Lungh. 2,0 mm. Corpo lucido e bruno-rossiccio; antenne bruno-rossicce; zampe gialle. La punteggiatura del capo è fine e superficiale, assente sulla fascia longitudinale mediana. La granulosità del pronoto è indistinta, quella delle elitre è svanita e quella dell'addome è finissima. La reticolazione del capo e delle elitre è superficiale, quella del pronoto e dell'addome è distinta, a maglie molto trasverse sull'addome. Edeago figg. 121-122, spermateca fig. 123, sesto urotergo libero del ♂ fig. 119.



FIGG. 108-115

Sesto urotergo libero del ♂, habitus e edeago in visione laterale e ventrale. 108: *Pelioptera (Pelioptera) seminuda* sp. n.; 109-111: *Pelioptera (Pelioptera) ics* sp. n.; 112-114: *Pelioptera (Pelioptera) longearmata* sp. n.; 115: *Pelioptera (Pelioptera) irigaster* sp. n.

DERIVATIO NOMINIS. Il nome della nuova specie significa « *Opaca* stretta » e indica l'affinità della nuova specie con *P. opaca* Kraatz dello Sri Lanka e regioni vicine, ma ha il corpo stretto.



FIGG. 116-123

Edeago in visione laterale e ventrale, sesto urotergo libero del  $\delta$  e spermateca. 116-118: *Pelioptera (Pelioptera) irigaster* sp. n.; 119-123: *Pelioptera (Pelioptera) stenopaca* sp. n.

COMPARAZIONI. La nuova specie è distinta per la forma dell'edeago e della spermateca e per i caratteri dati nella chiave di tutte le specie borneensi del genere *Pelioptera* Kraatz, 1857, posta dopo la descrizione di *P. necnilgiriensis* sp. n.



***Pelioptera (Pelioptera) borneopaca* sp. n.**

Figg. 124-127

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu Nat. Pk., Poring Hot Springs, 500 m, 10.V.1987, leg. A. Smetana (MHNG).

Paratypi: 3 ♂♂, Borneo, Sabah, M. Kinabalu N.P., HQ Silau-Silau Tr., 1540 m, 14.VI-II.1988, leg. A. Smetana; 1 ♂, Borneo-Sabah, Mt. Kinabalu Nat. Pk., Int. trap., HQ 1500 m, 25-30.IV.1987, leg. A. Smetana; 1 ♂, Borneo, Sabah, Mt. Kinabalu N.P., 1500 m, 30.IV.1987, Burckhardt & Löbl leg.; 1 ♂, Sabah, Poring Hot Springs, 500 m, 8.V.1987, leg. Burckhardt & Löbl.

DESCRIZIONE. Lungh. 1,8 mm. Corpo lucido e bruno; antenne brune; zampe giallo-rossicce. La granulosità del capo è distinta, ma assente sulla fascia longitudinale mediana, quella del pronoto è assente, quella delle elitre è ben visibile e quella dell'addome è fine. La reticolazione del capo è assente, quella del pronoto e delle elitre è superficiale, quella dell'addome è molto trasversa. Edeago figg. 125-126, sesto urotergo libero del ? fig. 127.

DERIVATIO NOMINIS. Il nome della nuova specie significa «*Pelioptera opaca* del Borneo» al fine di indicare che la nuova specie mostra affinità con *P. opaca*.

COMPARAZIONI. La nuova specie è distinta per la forma dell'edeago e per i caratteri dati nella chiave di tutte le specie borneensi del genere *Pelioptera* Kraatz, 1857, posta dopo la descrizione di *P. necnilgiriensis* sp. n.

***Pelioptera (Pelioptera) omissa* sp. n.**

Figg. 128-129

Holotypus ♀, Sabah, Mt. Kinabalu, 1750 m, 21.IV.1987, leg. Burckhardt & Löbl (MHNG).

Paratypi: 2 ♀♀, Sabah, M. Kinabalu N.P., Poring Hot Springs, HQ 1500 m, 25-30.IV.1987, leg. A. Smetana.

DESCRIZIONE. Lungh. 2,0 mm. Corpo lucido e nero-bruno, con addome bruno-rossiccio avente gli uroterghi liberi quarto e quinto bruni; antenne brune con i due antennomeri basali rossicci; zampe gialle. La punteggiatura del capo è distinta, quella del pronoto è assente. La granulosità delle elitre è molto superficiale e quella dell'addome è svanita. Una reticolazione è presente solo sull'addome dove è molto superficiale. Spermateca fig. 129.

COMPARAZIONI. La nuova specie è distinta per la forma della spermateca e per i caratteri dati nella chiave di tutte le specie borneensi del genere *Pelioptera* Kraatz, 1857, posta dopo la descrizione di *P. necnilgiriensis* sp. n.

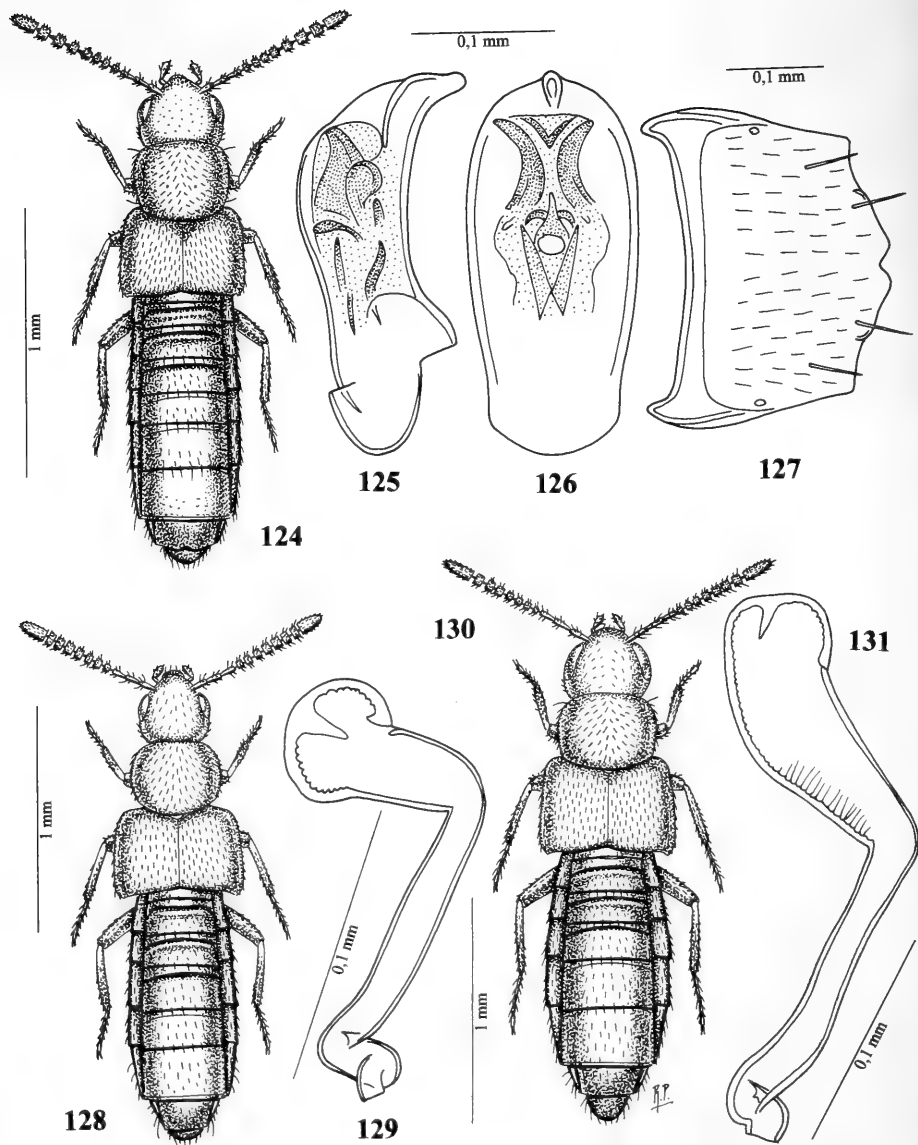
***Pelioptera (Pelioptera) burckhardti* sp. n.**

Figg. 130-131

Holotypus ♀, Sabah, Mt. Kinabalu, 1500 m, 25.IV.1987, leg. Burckhardt & Löbl (MHNG).

DESCRIZIONE. Lungh. 2,1 mm. Corpo lucido e bruno, con base dell'addome bruno-rossiccio; antenne brune con i due antennomeri basali e la base del terzo rossicci; zampe gialle. La granulosità del capo e del pronoto è superficiale, quella delle elitre è assente. La reticolazione del capo è assente, quella del pronoto è superficiale e quella delle elitre e dell'addome è molto svanita, a maglie molto trasverse sull'addome. Spermateca fig. 131.

DERIVATIO NOMINIS. La nuova specie è dedicata a uno dei suoi raccoglitori, il dr. Daniel Burckhardt, già del Museo di Storia Naturale di Ginevra.



FIGG. 124-131

Habitus, edeago in visione laterale e ventrale, sesto urotergo libero del ♂ e spermateca. 124-127: *Pelioptera (Pelioptera) borneopaca* sp. n.; 128-129: *Pelioptera (Pelioptera) omissa* sp. n.; 130-131: *Pelioptera (Pelioptera) burckhardti* sp. n.

COMPARAZIONI. La nuova specie è distinta per la forma della spermateca e per i caratteri dati nella chiave di tutte le specie borneensi del genere *Pelioptera* Kraatz, 1857, posta dopo la descrizione di *P. necnilgiriensis* sp. n.

***Pelioptera (Pelioptera) perinsolita* sp. n.**

Figg. 138-139

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu N.P., btw Layang Layang, 2600 m, 2-8.V.1987, int. trap, leg. A. Smetana (MHNG).

DESCRIZIONE. Lungh. 4,0 mm. Corpo lucido e bruno, con capo e uroterghi liberi quarto e quinto nero-bruni; antenne brune con i due antennomeri basali rossicci; zampe giallo-rossicce. La punteggiatura del capo e delle elitre è fitta e distinta, assente sulla fascia longitudinale mediana del capo. La granulosità del pronoto e dell'addome è fine e distinta. La reticolazione del capo, elitre e addome è molto superficiale, quella del pronoto è assente. Spermateca fig. 139.

DERIVATIO NOMINIS. Il nome della nuova specie significa «Molto insolita» a motivo della forma della spermateca e dello strano pigidio.

COMPARAZIONI. La nuova specie è distinta per la forma della spermateca e per i caratteri dati nella chiave di tutte le specie borneensi del genere *Pelioptera* Kraatz, 1857, posta dopo la descrizione di *P. necnilgiriensis* sp. n.

***Pelioptera (Tropimenelytron) longicollis* sp. n.**

Figg. 132-135

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu Nat. Pk., HQ 1500 m, 25-30.IV.1987, leg. A. Smetana (MHNG).

Paratypi: 3 es., stessa provenienza; 1 es., ♂, Borneo, Sabah, Mt. Kinabalu Nat. Pk., HQ at Liwagu Rv., 1500 m, 1.IX.1988, A. Smetana leg.; 1 es., Borneo, Sabah, M. Kinabalu N.P., HQ Silau-Silau Tr., 1540 m, 14.VIII.1988, leg. A. Smetana; 1 ♂, Borneo, Sabah, Mt. Kinabalu N.P., 1500 m, 30.IV.1987, Burckhardt & Löbl leg.; 1 ♂ e 1 ♀, Borneo-Sabah, Crocker Ra., 1600 m, 18.V.1987, leg. Burckhardt & Löbl; 1 ♂, Borneo, Sabah, Mt. Kinabalu N.P., 1600 m, 26.IV.1987, Burckhardt & Löbl leg.

DESCRIZIONE. Lungh. 2,2 mm. Corpo lucido e rossiccio, con capo e quarto urotergo libero bruni; antenne bruno-rossicce con i due antennomeri basali giallo-rossicci; zampe gialle. La granulosità del capo e delle elitre è superficiale, quella del pronoto è assente. La reticolazione dell'avancorpo è svanita, quella dell'addome è distinta. Edeago figg. 133-134, spermateca fig. 135.

DERIVATIO NOMINIS. Il nome della nuova specie significa «Pronoto lungo».

COMPARAZIONI. La nuova specie è distinta per la forma dell'edeago e della spermateca e per i caratteri dati nella chiave di tutte le specie borneensi del genere *Pelioptera* Kraatz, 1857, posta dopo la descrizione di *P. necnilgiriensis* sp. n.

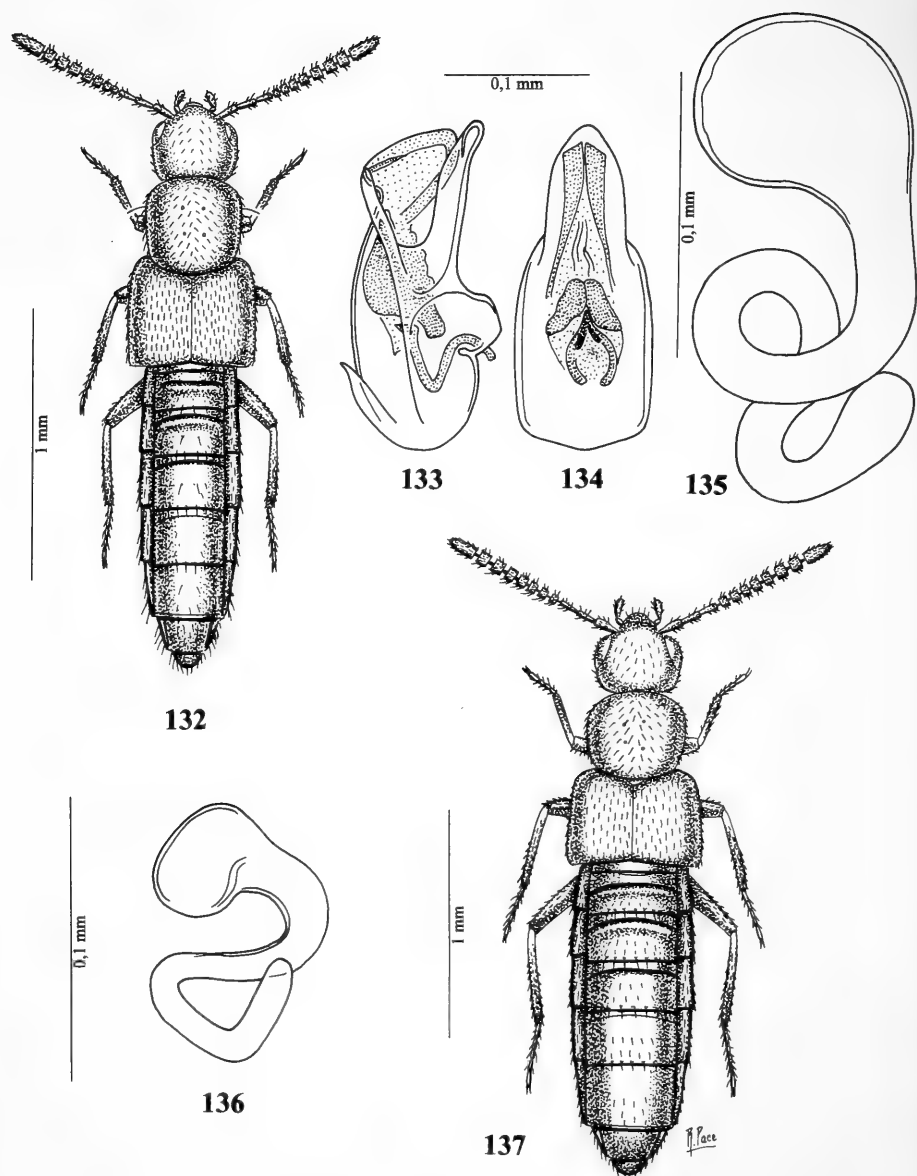
***Pelioptera (Tropimenelytron) necnilgiriensis* sp. n.**

Figg. 136-137

Holotypus ♀, Borneo, Sabah, M. Kinabalu Nat. Pk., HQ Silau-Silau Tr., 1540 m, 14.VI-II-1.IX.1988, leg. A. Smetana (MHNG).

DESCRIZIONE. Lungh. 2,5 mm. Corpo lucido e bruno, con uroterghi liberi terzo, quarto e quinto nero-bruni; antenne brune; zampe gialle con femori posteriori lievemente oscurati di bruno. La reticolazione del capo, pronoto e addome è molto superficiale, quella delle elitre è svanita, a maglie molto trasverse sull'addome. Il pronoto ha quattro punti in trapezio. Spermateca fig. 136.

DERIVATIO NOMINIS. La nuova specie si mostra affine a *P. nilgiriensis* (Fauvel, 1904), ma il pronoto ha quattro punti in trapezio e la parte prossimale della spermateca



FIGG. 132-137

Habitus, edeago in visione laterale e ventrale e spermateca. 132-135: *Pelioptera (Tropimenelytron) longicollis* sp. n.; 136-137: *Pelioptera (Tropimenelytron) necnilgiriensis* sp. n.

è molto più prolungata di quella di *nilgiriensis*. Per questi caratteri è chiamata «Non *nilgiriensis*».

COMPARAZIONI. Cameron (1936) cita per il Borneo quattro specie largamente diffuse in oriente: *P. opaca* Kraatz, 1857, dello Sri Lanka, India e Singapore e *P. iner-*

*mis* Cameron, 1925, *P. germana* Cameron, 1925, *P. similis* Cameron, 1925, tutte e tre di Giava. C'è da dubitare su queste determinazioni, non controllate da Cameron con l'esame dell'edeago e della spermateca. Ad esempio *P. opaca*, di cui ho esaminato la serie tipica dello Sri Lanka, è rappresentata nel Borneo da due specie ad essa affini. Pertanto queste specie non sono qui prese in considerazione per la constatazione della regola generale del ristretto areale della maggior parte delle specie di Aleocharinae. *P. monticola* è stata esaminata e illustrata adeguatamente da Sawada (1980).

La nuove specie è distinta dalle precedenti sopra descritte per la forma della spermateca e per i caratteri dati nella seguente chiave.

#### CHIAVE DELLE SPECIE BORNEENSI A ME NOTE DEL GENERE *PELIOPTERA* KRAATZ

- 1 Mesocoxe largamente separate, Subgen. *Pelioptera* Kraatz . . . . . 2
- Mesocoxe quasi contigue, Subgen. *Tropimelytron* Pace . . . . . 10
- 2 Pronoto debolmente trasverso . . . . . 3
- Pronoto fortemente trasverso . . . . . 6
- 3 Pronoto con quattro punti discali in rettangolo e con una debole impressione mediana posteriore; addome iridescente. Lungh. 2,6 mm. Borneo: Kinabalu . . . . . *Pelioptera irigaster* sp. n.
- Pronoto senza punti discali e senza impressione mediana posteriore; addome non iridescente . . . . . 4
- 4 Occhi lunghi quanto le tempie; quinto antennumero lungo quanto largo; capo nero-bruno, pronoto bruno; punteggiatura del capo assente sulla fascia longitudinale mediana. Lungh. 4,0 mm. Borneo: Kinabalu . . . . . *Pelioptera perinsolita* sp. n.
- Occhi più lunghi delle tempie; quinto antennumero fortemente trasverso; capo e pronoto bruni; punteggiatura del capo uniformemente distribuita, anche sul disco . . . . . 5
- 5 Capo con tubercolo frontale; elitre molto più lunghe del pronoto; edeago molto stretto nella regione apicale. Lungh. 2,0 mm. Borneo: Kinabalu . . . . . *Pelioptera longearmata* sp. n.
- Capo senza tubercolo frontale; elitre poco più lunghe del pronoto; edeago assai largo nella regione apicale. Lungh. 2,2 mm. Borneo: Kinabalu . . . . . *Pelioptera ics* sp. n.
- 6 Pronoto più fortemente trasverso; penultimi antennumeri molto trasversi; elitre brune con base bruno-rossiccia. Lungh. 1,8 mm. Borneo: Kinabalu . . . . . *Pelioptera seminuda* sp. n.
- Pronoto meno trasverso; penultimi antennumeri trasversi; elitre unicolori brune . . . . . 7
- 7 Addome bicolore, bruno con base bruno-rossiccia . . . . . 8
- Addome unicolore bruno . . . . . 9
- 8 Occhi meno sviluppati; spermateca breve, con bulbo distale ovale trasverso. Lungh. 2,0 mm. Borneo: Kinabalu . . . . . *Pelioptera omissa* sp. n.
- Occhi più sviluppati; spermateca lunga, con bulbo distale botuliforme. Lungh. 2,1 mm. Borneo: Kinabalu . . . . . *Pelioptera burckhardti* sp. n.

- 9 Occhi maggiori; edeago stretto in visione ventrale; armatura genitale interna dell'edeago con due pezzi apicali lunghi e stretti; sesto urotergo libero del ♂ con margine posteriore ondulato. Lungh. 2,0 mm. Borneo: Kinabalu . . . . . *Pelioptera stenopaca* sp. n.
- Occhi minori; edeago largo in visione ventrale; armatura genitale interna dell'edeago con due pezzi falciformi apicali larghi; sesto urotergo libero del ♂ con margine posteriore inciso a metà. Lungh. 1,8 mm. Borneo: Kinabalu . . . . . *Pelioptera borneopaca* sp. n.
- 10 Pronoto lungo quanto largo; occhi molto più corti delle tempie; capo bruno, pronoto rossiccio. Lungh. 2,2 mm. Borneo: Kinabalu . . . . . *Pelioptera longicollis* sp. n.
- Pronoto trasverso; occhi più lunghi delle tempie; capo e pronoto bruni. Lungh. 2,5 mm. Borneo: Kinabalu . . . . . *Pelioptera necnilgiriensis* sp. n.

KEY TO THE BORNEAN SPECIES KNOWN TO ME OF THE GENUS *PELIOPTERA* KRAATZ

- 1 Mesocoxae widely separate, Subgen. *Pelioptera* Kraatz . . . . . 2
- Mesocoxae almost contiguous, Subgen. *Tropimenedytron* Pace . . . . . 10
- 2 Pronotum slightly transverse . . . . . 3
- Pronotum strongly transverse . . . . . 6
- 3 Pronotum with four discal punctures in rectangle and with a shallow medio-posterior impression; abdomen iridescent. Length 2.6 mm. Borneo: Kinabalu . . . . . *Pelioptera irigaster* sp. n.
- Pronotum without discal punctures and without medio-posterior impression; abdomen not iridescent . . . . . 4
- 4 Eyes as long as temples; fifth antennomere as wide as long; head black-brown, pronotum brown; punctuation of the head absent medially. Length 4.0 mm. Borneo: Kinabalu . . . . . *Pelioptera perinsolita* sp. n.
- Eyes longer than temples; fifth antennomere strongly transverse; head and pronotum brown; punctuation of the head uniform . . . . . 5
- 5 Head with frontal tubercle; elytra longer than pronotum; aedeagus narrowed apically. Length 2.0 mm. Borneo: Kinabalu . . . . . *Pelioptera longearmata* sp. n.
- Head without frontal tubercle; elytra slightly longer than pronotum; aedeagus wide apically. Length 2.2 mm. Borneo: Kinabalu . . . . . *Pelioptera ics* sp. n.
- 6 Pronotum strongly transverse; subapical antennomeres very transverse; elytra brown with brown-reddish base. Length 1.8 mm. Borneo: Kinabalu . . . . . *Pelioptera seminuda* sp. n.
- Pronotum slightly transverse; subapical antennomeres slightly transverse; elytra unicoloured brown . . . . . 7
- 7 Abdomen bicoloured, brown with brown-reddish base . . . . . 8
- Abdomen unicoloured brown . . . . . 9
- 8 Eyes poorly developed; spermateca brief, with distal bulb transverse oval. Length 2.0 mm. Borneo: Kinabalu . . . . . *Pelioptera omissa* sp. n.
- Eyes well developed; spermateca long, with distal bulb botuliform. Length 2.1 mm. Borneo: Kinabalu . . . . . *Pelioptera burckhardtii* sp. n.
- 9 Eyes well developed; aedeagus narrow in ventral view; internal genital armature of aedeagus with two long and narrow apical pieces; sixth free urotergite of the ♂ with undulated posterior margin. Length 2.0 mm. Borneo: Kinabalu . . . . . *Pelioptera stenopaca* sp. n.
- Eyes poorly developed; aedeagus wide in ventral view; internal genital armature of aedeagus with two wide falciform apical pieces; sixth free urotergite of the ♂ with posterior margin incised medially. Length 1.8 mm. Borneo: Kinabalu . . . . . *Pelioptera borneopaca* sp. n.

- 10 Pronotum as wide as long; eyes much shorter than temples; head brown, pronotum reddish. Length 2.2 mm. Borneo: Kinabalu . . . . . *Pelioptera longicollis* sp. n.  
 - Pronotum transverse; eyes longer than temples; head and pronotum brown. Length 2.5 mm. Borneo: Kinabalu . . . . . *Pelioptera necnilgiriensis* sp. n.

***Gastropaga muluicola* sp. n.**

Figg. 140-141

Holotypus ♀, Sarawak-Borneo, Mulu Nat. Park, leg. Franz (NHMW).

DESCRIZIONE. Lungh. 1,7 mm. Corpo lucido e giallo-rossiccio sporco; antenne brune con i due antennomeri basali gialli; zampe gialle. La punteggiatura del capo è fine, fitta e assai superficiale. La granulosità del pronoto e delle elitre è superficiale, quella dell'addome è saliente. Assente è la reticolazione su tutto il corpo. Spermateca fig. 141.

COMPARAZIONI. Il genere *Gastropaga* Bernhauer, 1915, è nuovo per il Borneo. Per la forma della spermateca la nuova specie è vicina a *G. philippina* Pace, 1990, delle Filippine. Se ne distingue per i caratteri dati nella seguente chiave.

- 1 Occhi più lunghi delle tempie; quarto antennomero debolmente trasverso; parte prossimale della spermateca, lunga e flessa. Lungh. 1,8 mm. Filippine . . . . . *G. philippina* Pace  
 - Occhi lunghi quanto le tempie; quarto antennomero fortemente trasverso; parte prossimale della spermateca, corta e non flessa. Lungh. 1,8 mm. Borneo: Mulu Nat. Park . . . . . *G. muluicola* sp. n.
- 1 Eyes longer than temples; fourth antennomere slightly transverse; proximal portion of the spermatheca long and arcuate. Length 1,8 mm. Philippines . . . . . *G. philippina* Pace  
 - Eyes as long as temples; fourth antennomere strongly transverse; proximal portion of the spermatheca short and not arcuate. Length 1,8 mm. Borneo: Mulu Nat. Park . . . . . *G. muluicola* sp. n.

***Platorischna montana* sp. n.**

Figg. 142-145

Holotypus ♂, Sabah, Mt. Kinabalu, 1550-1650 m, 24.IV.1987, leg. Burckhardt & Löbl (MHNG).

Paratypi: 49 es., Borneo-Sabah, Mt. Kinabalu, 1430-1500-1550-1650 m, 21-22-23-24-29.IV.1987, leg. Burckhardt & Löbl.

DESCRIZIONE. Lungh. 1,2 mm. Corpo lucido e giallo-bruno, con elitre brune e pigidio giallo-rossicci; antenne giallo-brune con i due antennomeri basali giallo-rossicci; zampe gialle. La punteggiatura del capo è fine e fittissima. La granulosità del pronoto è fine e fittissima come quella dell'addome, quella delle elitre è distinta. Edeago figg. 142-143, spermateca fig. 144.

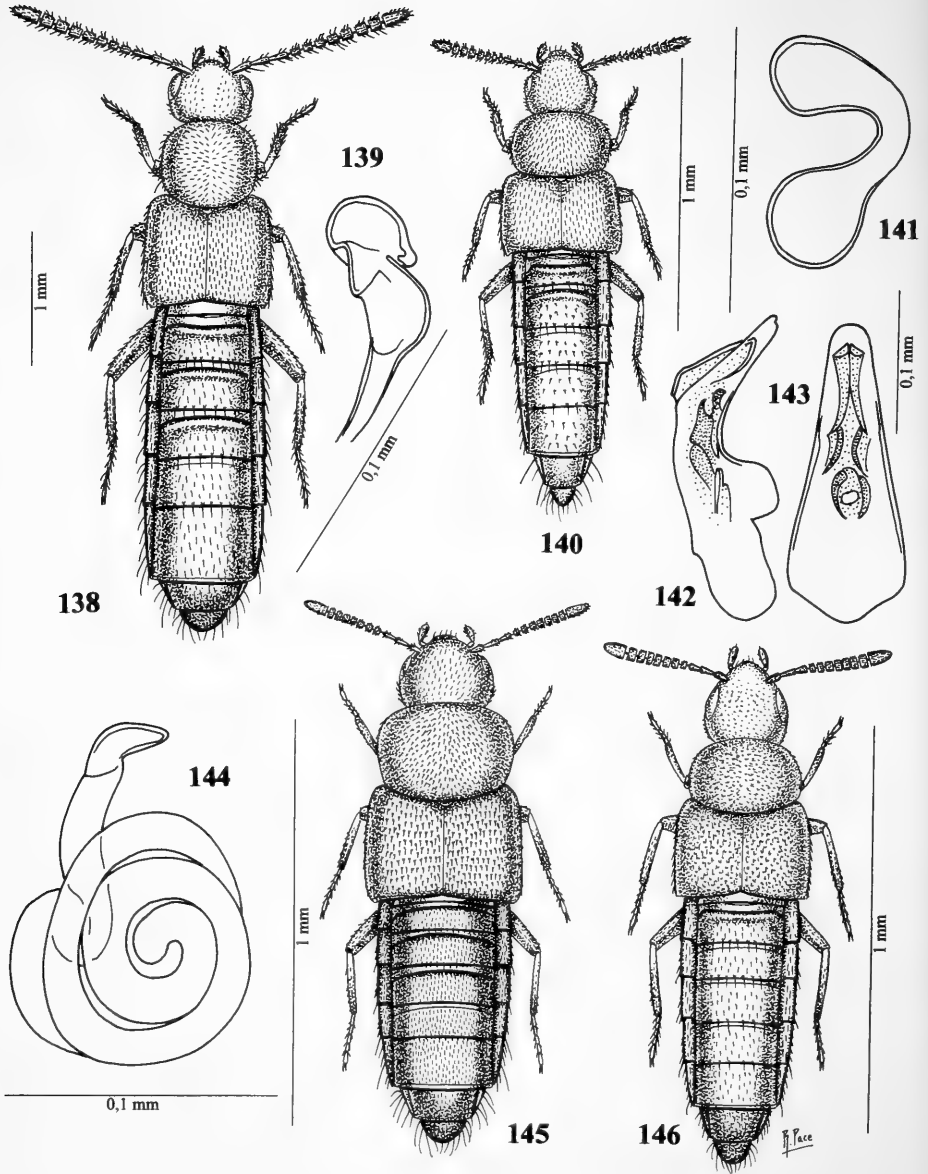
COMPARAZIONI. La nuova specie è distinta per la forma dell'edeago e della spermateca e per i caratteri dati nella chiave di tutte le specie borneensi del genere *Platorischna* Pace, 1991, posta dopo la descrizione di *A. fontium* sp. n.

***Platorischna borneensis* sp. n.**

Figg. 146-149

Holotypus ♀, Sabah, Kinabalu N.P., 29.X.1990, leg. G. de Rougemont (IRSN).

Paratypi: 20 es., Borneo-Sabah, Mt. Kinabalu, 1550 m, 29.IV.1987, leg. Burckhardt & Löbl; 6 es., Sabah, Poring Hot Springs, nr. Bat Cave, 500-600 m, 6-10.V.1987, leg. Burckhardt

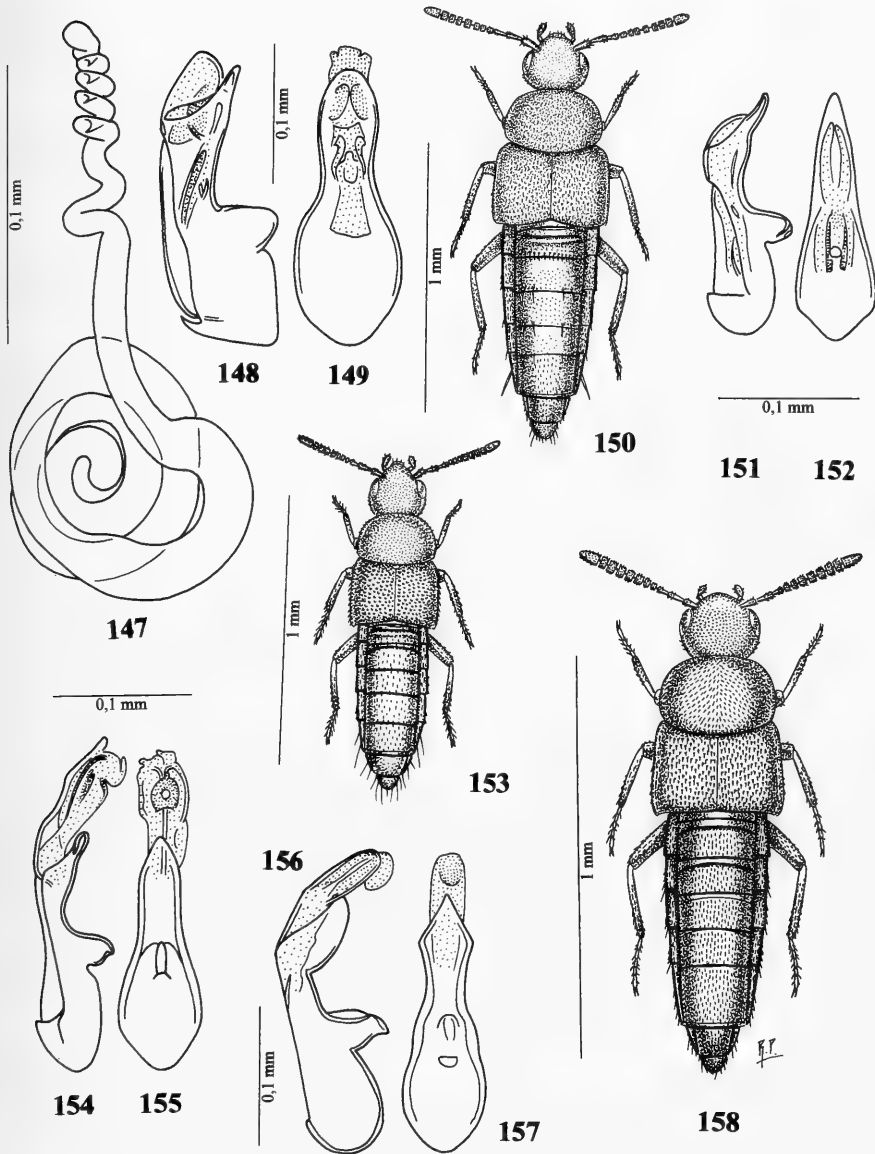


FIGG. 138-146

Habitus, spermatheca e edeago in visione laterale e ventrale. 138-139: *Pelioptera (Pelioptera) perinsolita* sp. n.; 140-141: *Gastropaga muluicola* sp. n.; 142-145: *Platorischna montana* sp. n.; 146: *Platorischna borneensis* sp. n.

& Löbl; 3 es., Borneo-Sabah, Crocker Ra., 1270-1350-1550 m, 16-17.V.1987, leg. Burckhardt & Löbl; 12 es., Sabah, Poring Hot Springs, 600-950 m, 10-12.V.1987, leg. Burckhardt & Löbl; 17 es., Sabah, Crocker Range, 1600 m, 51 km r.te Kota Kinabalu-Tambunan, 18.V.1987, leg. Burckhardt & Löbl; 82 es., Borneo, Sabah, Mt. Kinabalu N.P., HQ Liwagu Rv. trail, 1520 m,





FIGG. 147-158

Spermateca, edeago in visione laterale e ventrale e habitus. 147-149: *Platorischna borneensis* sp. n.; 150-152: *Platorischna assingi* sp. n.; 153-155: *Platorischna muluensis* sp. n.; 156-158: *Platorischna pusilla* sp. n.

11.VIII.1988, A. Smetana leg.; 1 es., Borneo, Sabah, Mt. Kinabalu N.P., HQ Silau Silau tr., 1550 m, 12.VIII.1988, A. Smetana leg.; 52 es., Borneo, Sabah, Mt. Kinabalu N.P., HQ Liwagu Riv., 1490 m, 5.VIII.1988, A. Smetana leg.; 1 es, Borneo-Sabah, Mt. Kinabalu N.P., east base St. John's PK, 3900 m, 8.VIII.1988, leg. A. Smetana; 1 es., ♂, Borneo, Sabah, Mt. Kinabalu Nat. Pk., HQ at Liwagu Rv., 1500 m, 4.IX.1988, A. Smetana leg.

DESCRIZIONE. Lungh. 1,2 mm. Corpo lucido e nero pece, con base addominale e pigidio bruno-rossicci; antenne nere con i tre antenomeri basali gialli; zampe gialle. L'intero corpo è coperto di granulosità distinta e fine su un fondo non reticolato. Edeago figg. 148-149, spermateca fig. 147.

COMPARAZIONI. La nuova specie è distinta per la forma dell'edeago e della spermateca e per i caratteri dati nella chiave di tutte le specie borneensi del genere *Platorischna* Pace, 1991, posta dopo la descrizione di *A. fontium* sp. n.

***Platorischna assingi* sp. n.**

Figg. 150-152

Holotypus ♂, Borneo, Brunei, Temburong, Kuala Belalong KBFSC, 4.V.1995, Borchherding leg. (IRSN).

Paratypi: 2 ♂♂ e 1 ♀, stessa provenienza.

DESCRIZIONE. Lungh. 1,6 mm. Corpo debolmente lucido, poco convesso e giallo-bruno; antenne giallo-brune, con i due antenomeri basali gialli; zampe gialle. La granulosità del capo è superficiale, quella del pronoto e delle elitre è distinta, quella dei tre uroterghi liberi è più fitta di quella degli uroterghi liberi quarto e quinto. Edeago figg. 151-152.

DERIVATIO NOMINIS. La nuova specie è dedicata a V. Assing di Hannover, per avermi affidato questa ed altre specie del Borneo.

COMPARAZIONI. La nuova specie è distinta per la forma dell'edeago e per i caratteri dati nella chiave di tutte le specie borneensi del genere *Platorischna* Pace, 1991, posta dopo la descrizione di *A. fontium* sp. n.

***Platorischna muluensis* sp. n.**

Figg. 153-155

Holotypus ♂, Sarawak-Borneo, Mulu Nat. Park, leg. H. Franz (NHMW).

DESCRIZIONE. Lungh. 1,2 mm. Corpo lucido, con capo e pronoto rossicci ed elitre brune aventi base rossiccia e addome giallo-rossiccio con quarto urotergo libero e base del quinto bruno-rossicci; antenne nere con i due antenomeri basali gialli; zampe gialle. L'intero corpo è coperto di granulosità fine e distinta. Edeago figg. 154-155.

COMPARAZIONI. La nuova specie è distinta per la forma dell'edeago e per i caratteri dati nella chiave di tutte le specie borneensi del genere *Platorischna* Pace, 1991, posta dopo la descrizione di *A. fontium* sp. n.

***Platorischna pusilla* sp. n.**

Figg. 156-158

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu Nat. Pk., Poring Hot Springs, 480 m, 10.V.1987, leg. A. Smetana (MHNG).

DESCRIZIONE. Lungh. 1,2 mm. Corpo debolmente lucido e giallo-bruno, con pronoto, i due uroterghi liberi basali e il pigidio di un giallo sporco; antenne brune con i due antenomeri basali gialli; zampe gialle. Una granulosità distinta e fitta copre l'intero corpo. Edeago figg. 156-157.

DERIVATIO NOMINIS. Il nome della nuova specie significa «specie piccola».

COMPARAZIONI. La nuova specie è distinta per la forma dell'edeago e per i caratteri dati nella chiave di tutte le specie borneensi del genere *Platorischna* Pace, 1991, posta dopo la descrizione di *A. fontium* sp. n.

***Platorischna pseudopusilla* sp. n.**

Figg. 159-162

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu Nat. Pk., Poring Hot Springs, 510 m, 30.VI-II.1988, leg. A. Smetana (MHNG).

Paratypi: 1 ♀, stessa provenienza; 3 es., Sabah, Mt. Kinabalu, Poring Hot Springs, 485 m, 29.VIII.1988, leg. A. Smetana; 3 es., Sabah, Mt. Kinabalu N.P., Liwagu River, 1490 m, 3.IX.1988, A. Smetana leg.; 3 es., Sabah, Mt. Kinabalu N.P., Liwagu River, 1500 m, 1.IX.1988, A. Smetana leg.; 1 es., Sabah, Mt. Kinabalu N.P., Liwagu River, 1505 m, 2.IX.1988, A. Smetana leg.; 1 es., Borneo, Sabah, Mt. Kinabalu N.P., Poring Hot Springs, area Eastern Ridge Tr., 850 m, 28.VIII.1988, leg. A. Smetana; 1 ♂, Sabah, Poring Hot Springs, 550-600 m, 9.V.1987, leg. Burckhardt & Löbl; 32 es., Sabah, Poring Hot Springs, 500-550-600 m, 6-7-9.V.1987, leg. Burckhardt & Löbl.

DESCRIZIONE. Lungh. 1,2 mm. Corpo lucido e giallo-bruno, con pigidio giallo; antenne giallo-brune con i due antennumeri basali gialli; zampe gialle. Una granulosità distinta e fitta copre l'intero corpo. Edeago figg. 160-161, spermateca 162.

DERIVATIO NOMINIS. Il nome della nuova specie significa «Falsa *pusilla*».

COMPARAZIONI. La nuova specie è distinta per la forma dell'edeago e della spermateca e per i caratteri dati nella chiave di tutte le specie borneensi del genere *Platorischna* Pace, 1991, posta dopo la descrizione di *A. fontium* sp. n.

***Platorischna bicochlea* sp. n.**

Figg. 163-166

Holotypus ♂, Borneo, Sabah, Mt. Kinab[alu] N.P., Por[ing] H[ot] S[prings], area Eastern Ridge Tr., 850 m, 28.VIII.1988, leg. A. Smetana (MHNG).

Paratypi: 10 es., stessa provenienza, ma anche 1000.

DESCRIZIONE. Lungh. 1,2 mm. Corpo lucido e giallo-rossiccio, con elitre e uroterghi liberi terzo, quarto e base del quinto bruni; antenne brune con i tre antennumeri basali e l'undicesimo giallo-rossicci; zampe gialle. La punteggiatura del capo è fitta e fine. Una granulosità fine e distinta copre il resto del corpo. Edeago figg. 164-165, spermateca fig. 166.

DERIVATIO NOMINIS. Il nome della nuova specie significa «Due spire», quelle della spermateca.

COMPARAZIONI. La nuova specie è distinta per la forma dell'edeago e della spermateca e per i caratteri dati nella chiave di tutte le specie borneensi del genere *Platorischna* Pace, 1991, posta dopo la descrizione di *A. fontium* sp. n.

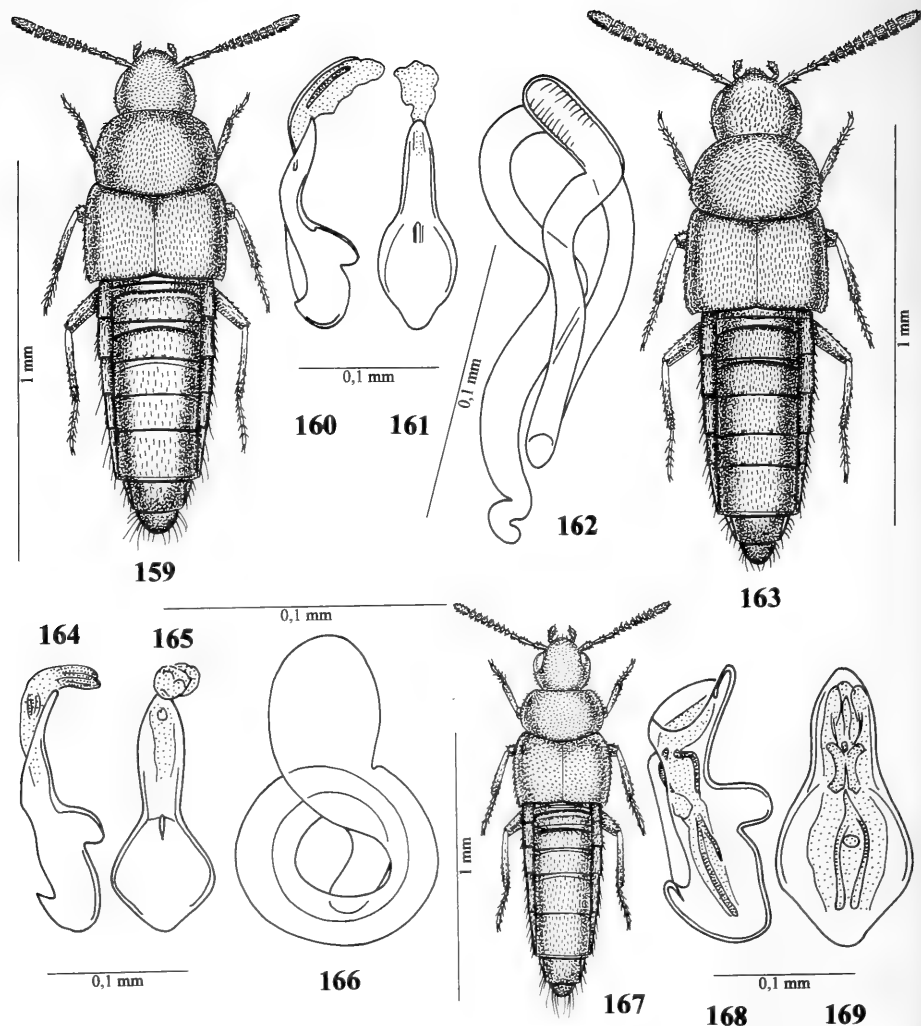
***Platorischna lambirensis* sp. n.**

Figg. 167-169

Holotypus ♂, Sarawak, Borneo, Lambir Nat. Park, leg. Franz (MHMW).

DESCRIZIONE. Lungh. 1,3 mm. Corpo lucido con capo e pronoto giallo-rossicci, elitre nero-brune con base bruno-rossiccia e addome giallo-bruno con uroterghi liberi terzo e quarto bruni; antenne brune con i tre antennumeri basali gialli; zampe gialle. La punteggiatura del capo è fine, fitta e superficiale. La granulosità del pronoto è fine e saliente, quella delle elitre e dell'addome è distinta e fitta. Assente è la reticolazione sul corpo. Edeago figg. 168-169.

COMPARAZIONI. La nuova specie è distinta per la forma dell'edeago e per i caratteri dati nella chiave di tutte le specie borneensi del genere *Platorischna* Pace, 1991, posta dopo la descrizione di *A. fontium* sp. n.



FIGG. 159-169

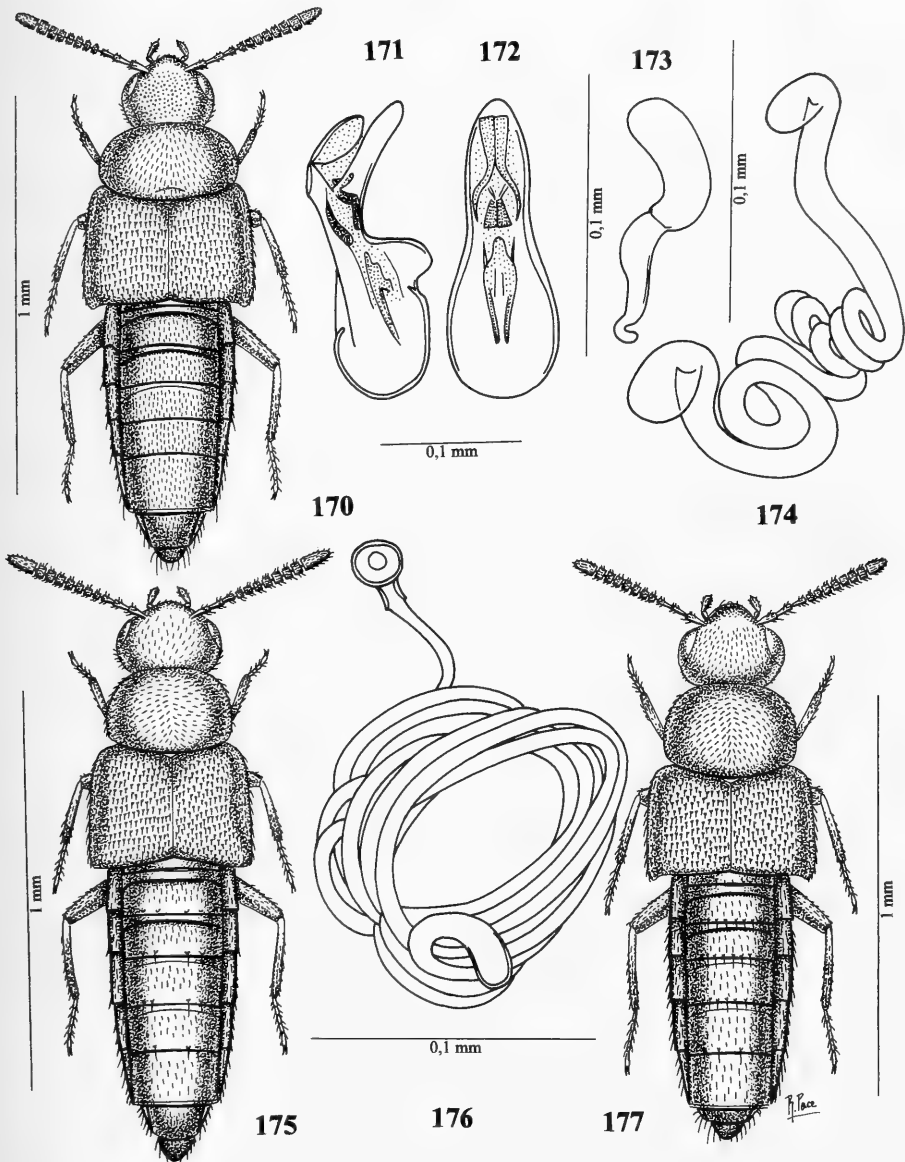
Habitus, edeago in visione laterale e ventrale e spermateca. 159-162: *Platorischna pseudopusilla* sp. n.; 163-166: *Platorischna bicochlea* sp. n.; 167-169: *Platorischna lambirensis* sp. n.

***Platorischna kinabaluensis* sp. n.**

Figg. 170-173

Holotypus ♂, Borneo, Sabah, Mt. Kinabalu Nat. Pk., HQ at Liwagu Rv., 1500 m, 25.IV.1987, leg. A. Smetana (MHNG).

Paratypi: 1 ♀, stessa provenienza; 8 es., Borneo, Sabah, Mt. Kinabalu Nat. Pk., HQ at Liwagu Rv., 1500 m, 27.IV.1987, leg. A. Smetana; 5 es., Borneo-Sabah, Mt. Kinabalu, 1550 m, 29.IV.1987, leg. Burckhardt & Löbl; 9 es., Borneo-Sabah, Crocker Ra., 1550-1650 m, 16.V.1987, leg. Burckhardt & Löbl; 2 es., Sabah, Mt. Kinabalu, 1450-1550 m, 23.V.1987, leg. Burckhardt & Löbl; 2 es., Borneo, Sabah, Crocker Ra., 1600 m, Km 51 rte. Kota Kinabalu-Tambunan, 18.V.1987, Burckhardt & Löbl leg.; 2 es., Borneo-Sabah, E Mt. Kinabalu, 1150 m,



FIGG. 170-177

Habitus, edeago in visione laterale e ventrale e spermateca. 170-173: *Platorischna kinabaluensis* sp. n.; 174-175: *Platorischna longipennis* sp. n.; 176-177: *Platorischna fontium* sp. n.

rte. Ranau-Kota Kinabalu, 24.V.1987, leg. Burckhardt & Löbl; 1 es., Sabah, Poring Hot Springs, 500 m, 8.V.1987, leg. Burckhardt & Löbl; 1 es., Sabah, Mt. Kinabalu, 1550 m, 23.IV.1987, leg. Burckhardt & Löbl; 1 es., Sabah, Mt. Kinabalu, 1550-1650 m, 24.IV.1987, leg. Burckhardt & Löbl; 1 ♂, Sabah, Kibongol V., 7 Km N Tambunan, 700 m, 20.V.1987, leg. Burckhardt & Löbl; 6 es., Sabah, Mt. Kinabalu, 1550-1650-1750 m, 23-24-27.IV.1987, leg. Burckhardt & Löbl; 1 ♂, Sabah, Poring Hot Springs, 500 m, 11.V.1987, leg. Burckhardt & Löbl.

DESCRIZIONE. Lungh. 1,3 mm. Corpo lucido e giallo-rossiccio, con elitre e uroterghi liberi terzo e quarto rossicci; antenne giallo-brune con i tre antennomeri basali gialli; zampe gialle. La punteggiatura del capo è fitta e distinta. La granulosità del pronoto, elitre e addome è fine e distinta, posta su un fondo non reticolato. Edeago figg. 171-172, spermateca 173.

COMPARAZIONI. La nuova specie è distinta per la forma dell'edeago e della spermateca e per i caratteri dati nella chiave di tutte le specie borneensi del genere *Platorischna* Pace, 1991, posta dopo la descrizione di *A. fontium* sp. n.

***Platorischna longipennis* sp. n.**

Figg. 174-175

Holotypus ♀, Borneo, Sabah, Mt. Kinabalu Nat. Pk., HQ Mempening trail, 1600 m, 17.V.1987, leg. A. Smetana (MHNG).

Paratypus: 1 ♀, Borneo, Sabah, Mt. Kinabalu Nat. Pk., HQ at Liwagu Rv., 1500 m, 1.IX.1988, A. Smetana leg.

DESCRIZIONE. Lungh. 1,4 mm. Corpo lucido e bruno-rossiccio, con elitre brune aventi omeri rossicci e con addome giallo-rossiccio avente gli uroterghi liberi terzo e quarto bruni; antenne brune con i due antennomeri basali giallo-rossicci; zampe giallo-rossicce. La punteggiatura del capo e del pronoto è superficiale, quella dell'addome è fine, assente presso il margine posteriore di ciascun urotergo libero. La granulosità delle elitre è fitta e distinta. Spermateca fig. 174.

DERIVATIO NOMINIS. Il nome della nuova specie significa «Elitre lunghe».

COMPARAZIONI. La nuova specie è distinta per la forma della spermateca e per i caratteri dati nella chiave di tutte le specie borneensi del genere *Platorischna* Pace, 1991, posta dopo la descrizione di *A. fontium* sp. n.

***Platorischna fontium* sp. n.**

Figg. 176-177

Holotypus ♀, Borneo, Sabah, Mt. Kinabalu Nat. Pk., Poring Hot Springs, 500 m, 10.V.1987, leg. A. Smetana (MHNG).

DESCRIZIONE. Lungh. 1,35 mm. Corpo lucido e giallo-rossiccio; antenne brune con i due antennomeri basali gialli; zampe gialle. La punteggiatura del capo è fitta e superficiale. La granulosità del pronoto è molto svanita e poco distinta, quella delle elitre e dell'addome è ben visibile. Assente è la reticolazione sul corpo. Spermateca fig. 176.

DERIVATIO NOMINIS. Il nome della nuova specie significa «Delle sorgenti», quelle di Poring Hot Springs, località tipica.

COMPARAZIONI. Il genere *Platorischna* Pace, 1991, è nuovo per il Borneo. Le nuove specie sopra descritte si distinguono tra esse per i caratteri dati nella seguente chiave.

CHIAVE DELLE SPECIE BORNEENSI DEL GENERE *PLATORISCHNA* PACE

- |   |  |                          |
|---|--|--------------------------|
| 1 | Corpo unicolore .....  | 2                        |
| - | Corpo bicolore o tricolore .....                             | 4                        |
| 2 | Corpo uniformemente bruno-rossiccio. Lungh. 1,35 mm. Borneo: |                          |
|   | Kinabalu .....   | <i>P. fontium</i> sp. n. |
| - | Corpo giallo-bruno .....                                     | 3                        |

- 3 Quarto antennumero lungo quanto largo; parte apicale dell'edeago bisinuosa in visione laterale. Lungh. 1,6 mm. Borneo: Brunei . . . . *P. assingi* sp. n.
- Quarto antennumero trasverso; parte apicale dell'edeago sinuosa in visione laterale. Lungh. 1,2 mm. Borneo: Kinabalu . . . . *P. pseudopusilla* sp. n.
- 4 Avancorpo unicolore nero pece. Lungh. 1,2 mm. Borneo: Kinabalu  
 . . . . . *P. borneensis* sp. n.
- Avancorpo bicolore . . . . . 5
- 5 Capo con colore differente da quello del pronoto . . . . . 6
- Capo e pronoto unicolori . . . . . 7
- 6 Apice dell'edeago in visione ventrale a punta triangolare. Lungh. 1,2 mm. Borneo: Kinabalu . . . . . *P. pusilla* sp. n.
- Apice dell'edeago in visione ventrale a punta arcuata. Lungh. 1,2 mm. Borneo: Kinabalu . . . . . *P. montana* sp. n.
- 7 Undicesimo antennumero giallo-rossiccio in contrasto con i precedenti antennumeri bruni. Lungh. 1,2 mm. Borneo: Kinabalu . . . . *P. bicochlea* sp. n.
- Undicesimo antennumero dello stesso colore dei precedenti . . . . . 8
- 8 Elitre unicolori . . . . . *P. kinabaluensis* sp. n.
- Elitre bicolori . . . . . 9
- 9 Solo gli omeri colorati di rossiccio; elitre molto più lunghe del pronoto: Lungh. 1,4 mm. Borneo: Kinabalu . . . . . *P. longipennis* sp. n.
- Base delle elitre colorate di bruno-rossiccio o rossiccio . . . . . 10
- 10 Regione della «crista apicalis» dell'edeago, larga e molto sporgente. Lungh. 1,3 mm. Borneo: Lambir . . . . . *P. lambirensis* sp. n.
- Regione della «crista apicalis» dell'edeago, stretta e poco sporgente. Lungh. 1,2 mm. Borneo: Mulu Nat. Park . . . . . *P. muluensis* sp. n.

KEY TO THE BORNEAN SPECIES OF THE GENUS *PLATORISCHINA* PACE

- 1 Body unicoloured . . . . . 2
- Body bicoloured or tricoloured . . . . . 4
- 2 Body uniformly brown-reddish. Length 1.35 mm. Borneo: Kinabalu . . *P. fontium* sp. n.
- Body yellow-brown . . . . . 3
- 3 Fourth antennumere as wide as long; apical portion of the aedeagus bisinuate in lateral view. Length 1.6 mm. Borneo: Brunei . . . . . *P. assingi* sp. n.
- Fourth antennumere transverse; apical portion of the aedeagus sinuate in lateral view. Length 1.2 mm. Borneo: Kinabalu . . . . . *P. pseudopusilla* sp. n.
- 4 Fore-body unicoloured, pitchy black. Length 1.2 mm. Borneo: Kinabalu  
 . . . . . *P. borneensis* sp. n.
- Fore-body bicoloured . . . . . 5
- 5 Head and pronotum of different colour . . . . . 6
- Head and pronotum concoloured . . . . . 7
- 6 Apex of the aedeagus in ventral view pointed. Length 1.2 mm. Borneo: Kinabalu  
 . . . . . *P. pusilla* sp. n.
- Apex of the aedeagus in ventral view blunt. Length 1.2 mm. Borneo: Kinabalu  
 . . . . . *P. montana* sp. n.
- 7 Eleventh antennumere yellow-reddish in contrast with the preceding brown antennumeres. Length 1.2 mm. Borneo: Kinabalu . . . . . *P. bicochlea* sp. n.
- Eleventh antennumere concolorous with the preceding antennumeres . . . . . 8
- 8 Elytra unicoloured . . . . . *P. kinabaluensis* sp. n.
- Elytra bicoloured . . . . . 9

- 9 Only the humeri reddish; elytra longer than pronotum: Length 1.4 mm. Borneo: Kinabalu . . . . . *P. longipennis* sp. n.  
 - Base of the elytra brown-reddish or reddish . . . . . 10  
 10 Region of the «crista apicalis» of the aedeagus, wide and conspicuously protruding. Length 1.3 mm. Borneo: Lambir . . . . . *P. lambirensis* sp. n.  
 - Region of the «crista apicalis» of the aedeagus narrow and inconspicuously protruding. Length 1.2 mm. Borneo: Mulu Nat. Park . . . . . *P. muluensis* sp. n.

#### NOTA

Nei miei precedenti lavori, a partire dall'anno di pubblicazione 2001, holotipi e paratipi di Aleocharinae del Borneo, indicati come depositati nel Museo Regionale di Scienze Naturali di Torino (MRSN), sono invece conservati nell'Institut Royal des Sciences Naturelles de Belgique di Bruxelles (IRSN). I funzionari amministrativi del Museo di Torino hanno rifiutato il materiale tipico, anche se in dono, nonostante il parere favorevole degli zoologi dello stesso Museo.

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Rivolgo i miei più cordiali ringraziamenti a coloro che mi hanno affidato in studio il raro materiale oggetto del presente lavoro: il Dr. Aleš Smetana di Ottawa, il Dr. Ivan Löbl, già del Museo di Storia Naturale di Ginevra, il defunto Prof. Herbert Franz di Mödling (Austria), il Dr. Volker Assing di Hannover e il collega Guillaume de Rougemont di Londra.

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## A review of the *Gnathonarium* species (Araneae: Linyphiidae) of China

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### **A review of the *Gnathonarium* species (Araneae: Linyphiidae) of China.**

- The present paper gives a review of the *Gnathonarium* species known from China. A total of four species are recorded, including one new species *G. biconcavum* sp. n., *G. cornigerum* Zhu & Wen, 1980, *G. phragmigerum* Gao & Zhu, 1988 and *G. flavidum* Gao & Zhu, 1993 are synonymized with *G. cambridgei* Schenkel, 1963. A description of the new species and redescriptions of the known species are given.

**Keywords:** Taxonomy - Linyphiidae - *Gnathonarium* - new species - China.

### INTRODUCTION

The monotypic linyphiid spider genus *Gnathonarium* was established by Karsch (1881) for *Gnathonarium rohlfsianum* Karsch, 1881, which was later regarded as a junior synonym of *Theridion dentatum* Wider, 1834. According to the catalogue of Platnick (2004), the genus currently comprises eight species, and seven of them have been reported from China. After having checked the paratype material of *Gnathonarium cornigerum* Zhu & Wen, 1980, *G. phragmigerum* Gao & Zhu, 1988, *G. flavidum* Gao & Zhu, 1993 and holotype of *G. cambridgei* Schenkel, 1963, we have come to the conclusion that they are conspecific. Furthermore, the distributional records of *G. exsiccatum* (Bösenberg & Strand, 1906) in China (Gao & Zhu, 1990; Song, Zhu & Chen, 1999) are doubtful, and should be deleted from the Chinese spider list. Therefore, only three species reported before really occur in China: these are *G. cambridgei* Schenkel, 1963, *G. dentatum* (Wider, 1834), and *G. gibberum* Oi, 1960.

In the present paper, a forth *Gnathonarium* species from China, *G. biconcavum* sp. n., is reported. Descriptions and diagnoses of the new species and of the other known species occurring in China, as well as a key to all these species are given. Further information on distribution and illustrations of somatic and genital characters of all species are provided.

### MATERIAL AND METHODS

Specimens were examined and measured under a SZ11-Olympus stereomicroscope. Left palps of males and epigyna of females were illustrated after they were dissected from the spider body; vulvae were cleared in boiling NaOH solution. For

examination of the genital structures under a transmission light microscope, genital organs were immersed in 75% alcohol, embolic divisions and vulvae were mounted in Hoyer's Solution. All illustrations were made under an Olympus BX40 compound microscope by using a drawing tube.

The material examined is deposited in the Institute of Zoology, Chinese Academy of Sciences, Beijing, China (IZCAS), in the Jilin University, Changchun, China (JLU), in the Burke Museum, Seattle, USA (UWBM), in the Museum National d'Histoire Naturelle, Paris, France (MNHN), in the Naturhistorisches Museum Basel, Switzerland (NMB) and in the Muséum d'histoire naturelle, Genève, Switzerland (MHNG).

For each species, only references to original description and references to relevant papers by Chinese colleagues are given in the text. Other references listed in Platnick's spider catalogue (Platnick, 2004) are not provided. Updated information on the distribution of each species in China is presented at the provincial level (see Peng, Li & Rollard, 2003).

Leg measurements are given in the following sequence: Total (femur, patella + tibia, metatarsus, tarsus). All measurements are in millimeters. All scale lines are 0.1 mm in length. Terminology for somatic morphology and genital structures is after Hormiga (2002) and Saaristo & Koponen (1998). Abbreviations are used as followed:

Somatic morphology: AER- anterior eye row; ALE- anterior lateral eye; AME- anterior median eye; AME-ALE- distance between AME and ALE; AME-AME- distance between AMEs; AMEd- diameter of AME; CL- carapace length; CW- carapace width; OL- opisthosomal length; OW- opisthosomal width; PER- posterior eye row; PLE- posterior lateral eye; PME- posterior median eye; PMEd- diameter of PME; PME-PLE- distance between PME and PLE; PME-PME- distance between PMEs; TL- total length; Tm I- distance of trichobothrium from metatarsus base of leg I (as a fraction of metatarsus length); Tm IV – trichobothrium on metatarsus IV.

Male palp: ATC- anteroventral tegular cornu; DSA- distal suprategular apophysis; E- embolus; EM- embolic membrane; MT- mesal tooth of tibial apophysis; P- paracymbium; PT- protégulum; R- radix; SPT- suprategulum; T- tegulum.

Epigynum: CD- copulatory duct; CO- copulatory opening; DE- ventral depression; EI- epigynal index [expressed as a/b, a is the width of ventral plate between copulatory openings and b is the width of copulatory opening]; FD- fertilization duct; FO- fertilization opening; PMP- posterior median plate [= VP + DE]; PR- posterior cone-shaped recess of PMP; SRS- spherical part of seminal receptacula; VP- ventral plate.

## TAXONOMY

### *Gnathonarium* Karsch, 1881

*Gnathonarium* Karsch, 1881: 10. Type species by monotypy *Gnathonarium rohlfianum* Karsch, 1881 [= *G. dentatum* (Wider, 1834), originally placed in *Theridion*].

*Diagnosis.* The genus is characterized by the following set of characters in the male palp (Figs 1-4C-E): paracymbium shaped like a number "3" (Fig. 4C), although usually only the distal half of the paracymbium is visible in retrolateral view (Figs 1-3C); distal suprategular apophysis large, somewhat resembling a straw hat in lateral

view; radix exceptionally small, bearing a long, whip-like embolus and a long, narrow embolic membrane. Female epigynum vase-like in general appearance, posterior median plate with deep posterior recess (PR) covered by ventral plate (Figs 1H, 2-4F).

*Description.* Tm I 0.59- 0.66. Tm IV present. Tibial spines 2-2-1-1. Carapace protruding slightly over clypeus, in males with some modifications (Figs 1A, 4A) or without (Figs 2A, 3A). Chelicerae of both sexes with warty granulations anterolaterally, with 4-6 promarginal and 2-4 retromarginal teeth, males also with a tooth-like subapical frontal process bearing a fine hair at its tip (Figs 1G, 2-4B).

Male palp (Figs 1-4C): Patella with small ventral process at distal end. Tibia (Fig. 1F) with one prolateral and two retrolateral trichobothria, tibial dorsal apophysis long, distally hooked, with a tooth on its mesal margin (MT). Paracymbium in the shape of a "3" (Fig. 4C), carrying several long hairs, usually only the distal half visible in retrolateral view (Figs 1-3C). Protegulum fleshy, boat-shaped, but sometimes contracted and somewhat metamorphosed (Figs 2C, 4C). Distal suprategular apophysis (DSA) large, somewhat like a straw hat in lateral view. Structures of embolic division simple and with little interspecific variation: radical part (R) conspicuously small, but embolus (E) long, whip-like and strongly sclerotized, embolic membrane (EM) long and narrow (Figs 1-4E).

Epigynum and vulva (Figs 1H-I, 4F-G): Epigynum vase-like due to combined effect of transparent copulatory ducts (CD) and posterior median plate (PMP). The latter with a median recess (PR) and entirely or partly covered by ventral plate (VP), copulatory openings (CO) on both sides with shallow roundish depressions (DE). Copulatory ducts conspicuously wide, first converging towards each other, then running parallel, touching each other at median line, and finally turning more or less abruptly laterally. Seminal receptacula situated laterally of parallel parts of copulatory ducts.

#### KEY TO CHINESE *GNATHONARIUM* SPECIES

- 1 Male ..... 2
- Female ..... 5
- 2 Carapace with lobe-like elevation behind ocular area (Fig. 4A) . . . . . *gibberum*
- Carapace only slightly elevated behind ocular area . . . . . 3
- 3 Carapace with a pair of oval sulci behind ocular area in dorsal view (Fig. 1B) . . . . . *biconcavum* sp. n.
- Carapace without sulci behind ocular area (Figs 2A, 3A) . . . . . 4
- 4 The dorsal lobe of DSA large and with a somewhat flat-roof (Fig. 3C) . . . . . *dentatum*
- The dorsal lobe of DSA only moderately elevated and with a point-top (Fig. 2C) . . . . . *cambridgei*
- 5 Ventral plate entirely covering PR, posterior margin of PMP almost straight (Fig. 2F) . . . . . *cambridgei*
- Ventral plate partly covering PR, posterior margin of PMP deeply notched . . 6
- 6 Copulatory ducts long, about one and half circle, apical part point (Fig. 4F) . . . . . *gibberum*

- Copulatory ducts shorter, about one circle, apical part blunt and only slightly rolling . . . . . 7
- 7 Copulatory openings large and EI= 1.2 (Fig. 1G) . . . . . *biconcavum* sp. n.
- Copulatory openings small and EI= 5.5 (Fig. 3F) . . . . . *dentatum*

### 1. *Gnathonarium biconcavum* sp. n.

Fig. 1

Holotype: ♂ (IZCAS-Tu0041), shore of Ulungur Lake, Fuhai (also called Burultokay) District (47.1°N, 87.5°E), Xinjiang Uygur Autonomous Region, alt. 510 m, 11.VII.1991. The specimen was found under mats of grass covering the lakeshore. Paratypes: 2♂5♀ (IZCAS), same data as for holotype; 1♀ (IZCAS), Narat District (43.3°N, 84.0°E), Xinjiang Uygur Autonomous Region, 30.VII.1991.

*Diagnosis.* The male of *G. biconcavum* sp. n. is distinguished easily from all other *Gnathonarium* species by carapace having a pair of oval sulci and long, frontally curved hairs behind ocular area (Figs 1A-B). The female can be distinguished by the posterior median plate with large copulatory openings and an exposed posterior recess (Fig. 1H).

*Description of male.* TL 2.55, CL 1.25, CW 0.90, OL 1.50, OW 0.85. Carapace reddish brown. Rows of long hairs lying on the anteromedian part of the carapace, and bending downwards frontally. Behind ocular area, a pair of oval sulci on each side, with several circular pits in them and each pit bearing a short white hair. Eyes with black surroundings, AME smallest and ALE biggest, others subequal. AER recurved, PER straight, ALE and PLE close together; AME-AME equal to AME-ALE, less than AMEd; PME-PME slight longer than PMEd and PME-PLE shorter. Chelicerae brown, anterolaterally furnished with small warty granulations and with a tooth-like frontal process (Fig. 1G); promargin with four and retromargin with two teeth, first retromarginal one bifurcated. Legs pale brown; length of legs: I 3.42 (0.95, 1.12, 0.80, 0.55), II 3.44 (0.90, 1.02, 1.00, 0.52), III 2.75 (0.80, 0.85, 0.65, 0.45), IV 3.75 (1.00, 1.25, 0.95, 0.55). Tibial spines: 2-2-1-1; Tm I: 0.63; Tm IV present. Sternum brown. Abdomen grey.

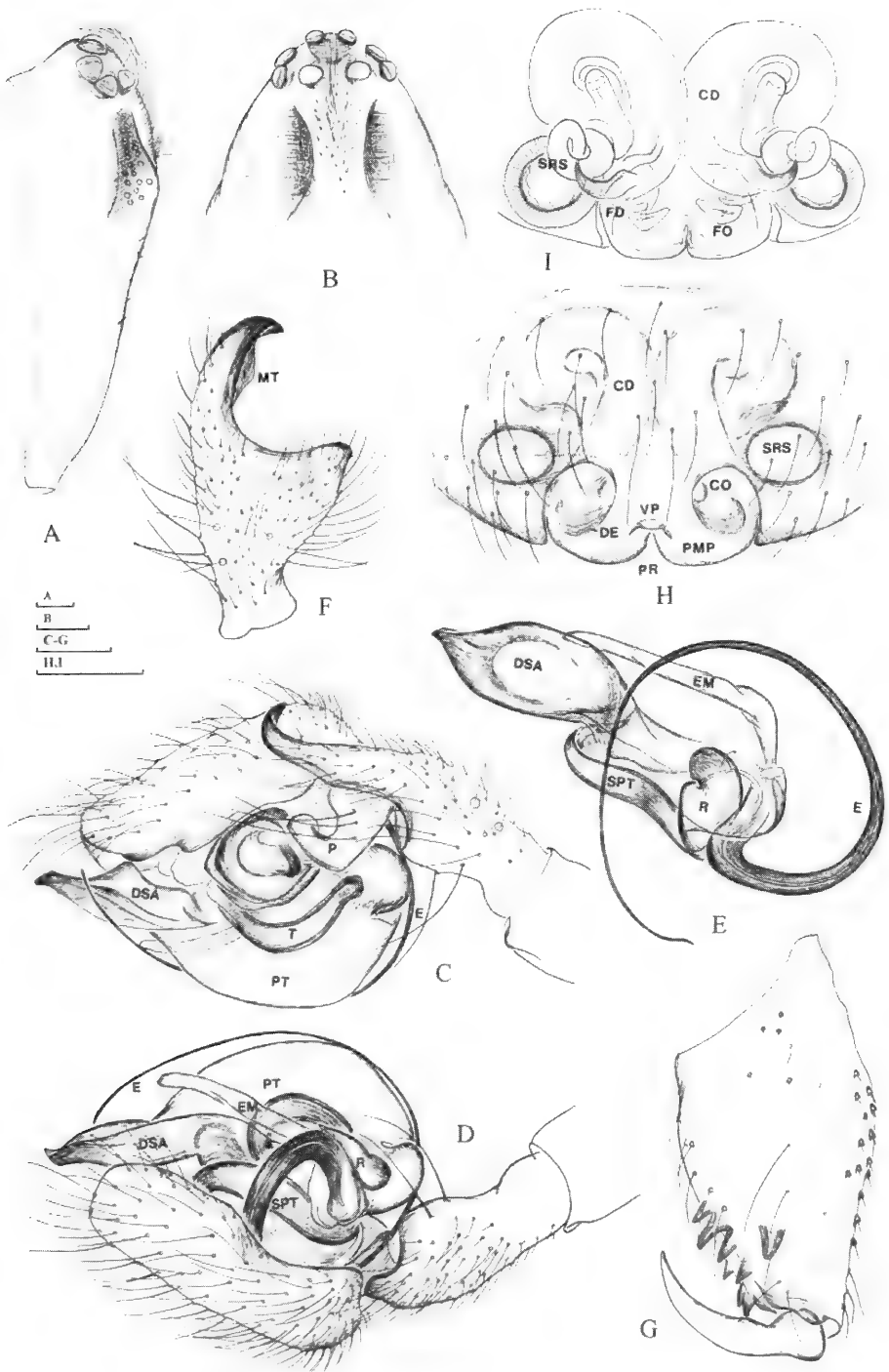
Palp: Distal process of patella very small. Mesal tooth (MT) of tibial dorsal apophysis wider than in other species (Fig. 1F). Distal suprategular apophysis (DSA) strongly sclerotized, especially at apical tip, the dorsal lobe small and cone-shaped in retrolateral view (Fig. 1C).

*Description of female.* Carapace without conspicuous modification, and chelicerae without tooth-like frontal process. Besides these, somatic characters of the female are same as in the male.

Epigynum: Vase-like, cuticle of seminal receptacula and a pair of coiled copulatory ducts clearly visible through the body wall. Posterior median plate (PMP) with large copulatory openings (CO) and large depressions (DE), EI= 1.2. Ventral plate short, most part of posterior recess (PR) exposed.

FIG. 1

*Gnathonarium biconcavum* sp. n. A, carapace of male, lateral view; B, carapace of male, dorsal view; C, left male palp, retrolateral view; D, left male palp, prolateral view; E, embolus division, ventral view; F, palpal tibia, dorsal view; G, left chelicera of male, anterior view; H, epigynum, ventral view; I, vulva, dorsal view. [Scale lines: 0.1 mm].



*Etymology.* The Latin adjective “biconcavus, -a, -um”, meaning two hollows on sides, refers to the two sulci on the dorsal surface of the carapace of male.

*Distribution.* China (Xinjiang).

## 2. *Gnathonarium cambridgei* Schenkel, 1963

Fig. 2

*Gnathonarium cambridgei* Schenkel, 1963: 114, fig. 67 (♀).

*Gnathonarium cornigerum* Zhu & Wen, 1980: 19, figs 2A-F (♂ ♀); Hu, 1984: 193, figs 202.1-6 (♂ ♀); Zhu & Shi, 1985: 114, figs 100A-F (♂ ♀); Zhang, 1987: 126, figs 104.1-4 (♂ ♀); Song, Zhu & Chen, 1999: 169, figs 95N-O, 96J-K (♂ ♀); Hu, 2001: 543, figs 364.1-5 (♂ ♀); Song, Zhu & Chen, 2001: 128, figs 67A-F (♂ ♀). (**Syn. n.**)

*Gnathonarium phragmigerum* Gao & Zhu, 1988: 350, figs 1-7 (♂ ♀); Song, Zhu & Li, 1993: 860, figs 16A-E (♂ ♀); Song, Zhu & Chen, 1999: 170, figs 96H-I, 97B-C (♂ ♀). (**Syn. n.**)

*Gnathonarium flavidum* Gao & Zhu, 1993: 28, figs 7-13 (♂ ♀); Song, Zhu & Chen, 1999: 169, figs 96D-E, O-P (♂ ♀). (**Syn. n.**)

*Type material examined.* 1 ♀ (MNHNP AR12799, Potanin 56), type of *G. cambridgei* Schenkel, 1963, Donkyr City in Amdo (today's name not clear), Gansu Province, leg. Dr G. N. Potanin, 14-15.IV.1885; 2 ♂ 8 ♀ (JLU), paratypes of *G. cornigerum* Zhu & Wen, 1980, from a small place called Beijiushui, Mt. Laoshan, Qingdao City, Shandong Province, leg. C. D. Zhu, 20.VIII.1979; 3 ♂ 3 ♀ (JLU), paratypes of *G. flavidum* Gao & Zhu, 1993, between Yangri Town and Xinhua Town, Shennongjia Forest Region, Hubei Province, leg. J.C. Gao, 18.VIII.1986; 6 ♂ 2 ♀ (JLU), paratypes of *G. phragmigerum* Gao & Zhu, 1988, Yangri Town, Shennongjia Forest Region, Hubei Province, leg. J.C. Gao, 22.VII.1986.

*Additional material examined.* 1 ♂ 1 ♀ (UWBM), under outdoor deck, Brayton Drive, Anchorage 160' 9599, Alaska (61.134°N, 149.852°W), USA, leg. B. S. Blitz, 15.IV.1990; 2 ♀ (UWBM), under outdoor deck, Brayton Drive, Anchorage 160' 9599, Alaska (61.134°N, 149.852°W), USA, leg. B. S. Blitz, 15.IV.1990; 1 ♀ (UWBM), in house, Cook Inlet area, Anchorage 0-350', Alaska (61.15-25°N, 149.7-9°W), USA, leg. J. Strassenburgh, 14.VII.1989; 10 ♂ 25 ♀ (MHNG), the thermal spring, Mt. Songshan, Yanqing District, Beijing City, leg. L. H. Tu, 12.VII.2002; 1 ♂ 2 ♀ (IZCAS), Qiujiaba Village, Wen District, Gansu Province, alt. 2550 m, leg. J. H. Wang, 20.VI.1999; 1 ♂ 1 ♀ (IZCAS), Panqu District, Gansu Province, Shatan Forestry Centre, alt. 2350-2400 m, leg. J. Chen, 5.VII.1998; 2 ♂ (IZCAS), Kangding District, Sichuan Province, leg. X. J. Peng, 8.VIII.2001; 1 ♂ 1 ♀ (IZCAS), Yutong, Kangding District, Sichuan Province, alt. 1500 m, 18.VIII.1981; 1 ♂ (IZCAS), Guanding thermal spring, Kangding District, Sichuan Province, alt. 3700 m, 16.VIII.1981; 3 ♀ (IZCAS), Xiushan District, Sichuan Province, 10.VI.1987; 2 ♀ (IZCAS), Changdu District, Tibet Autonomous Region, leg. X. J. Peng, 15.VI-II.2001; 1 ♂ 1 ♀ (IZCAS), Riwoqê District, Tibet Autonomous Region, leg. X. J. Peng, 18.VI-II.2001; 1 ♀ (IZCAS), Maniganggo Town, Dêgê District, Tibet Autonomous Region, leg. X. J. Peng, 11.VIII.2001; 1 ♀ (IZCAS), Mt. Moirigkawagarbo, Dêqên District, Yunnan Province, 24.VII.1982; 1 ♀ (IZCAS), Mt. Liupanshan, Jingyuan District, Ningxia Hui Autonomous Region, leg. Y. Q. Tang, 4.VII.1988; 1 ♀ (IZCAS), Qiuqianjia, Mt. Liupanshan, Ningxia Hui Autonomous Region, leg. Y. Q. Tang, 6.VII.1988; 3 ♂ 3 ♀ (IZCAS), Beijing City, 1974-1976; 1 ♀ (IZCAS), Yuanmingyuan Park, Beijing City, 19.VII.2002; 1 ♀ (IZCAS), Hanshiqiao Natural Reservoir, Shunyi District, Beijing City, leg. L. H. Tu, 11.VII.2002; 1 ♂ 4 ♀ (IZCAS), Badaling Great Wall, Yanqing District, Beijing City, 3.VII.1974; 1 ♂ 5 ♀ (IZCAS), Badaohe Village, Yanqing District, Beijing City, leg. L. H. Tu, 7.VII.2002; 6 ♀ (IZCAS), Xiadelongwan Village, Yanqing District, Beijing City, leg. L. H. Tu, 18.VIII.2002; 1 ♂ 3 ♀ (IZCAS), Baoshansi Village, Yanqing District, Beijing City, leg. L. H. Tu, 19.VIII.2002; 30 ♂ 38 ♀ (IZCAS), the thermal spring, Mt. Songshan, Yanqing District, Beijing City, leg. L. H. Tu, 12.VII.2002; 4 ♀ (IZCAS), Songshan Forest Center, Mt. Songshan, Yanqing District, Beijing City, leg. L. H. Tu, 14.VII.2002; 65 ♂ 60 ♀ (IZCAS), Mt. Jingdongdaxiagu, Pinggu District, Beijing City, leg. S. Q. Li, 11.VII.2002; 2 ♀ (IZCAS), Chaoyang District, Liaoning Province, VII.1985; 1 ♂ 2 ♀ (IZCAS), Tianjun District, Qinghai Province, alt. 3450 m, leg. X. J. Peng, 17.IX.2001; 1 ♀ (IZCAS), Mt. Qingshshan, Pingan District, Qinghai Province, leg. M. Wu, 14.VI.1997; 1 ♀ (IZCAS),



Maixiu Forest Center, Tongren District, Qinghai Province, leg. M. Wu, 14.VI.1997; 2♀ (IZCAS), Beishan National Nature Forest Park, Qinghai Province, leg. M. Wu, 7.VI.1997; 8♂ 7♀ (IZCAS), Hunan Province, leg. J. C. Gao, V.1985; 6♂ 11♀ (IZCAS), Hunan Province, leg. J. C. Gao, V.1985; 1♀ (IZCAS), Mt. Changbaishan, Jilin Province, 26.VII.1987; 2♂ 3♀ (IZCAS), Mt. Longqishan, Jiangle District, Fujian Province, 16-20.VIII.1991; 5♀ (IZCAS), Kongcun Village, Yongnian District, Hebei Province, leg. S. Q. Li, 18.IX.1994.

*Diagnosis.* The carapace shape is similar to that of *G. dentatum*, without conspicuous modification, but the male is easily recognized by its slightly sclerotized distal suprategular apophysis (DSA) with a low conical lobe dorsally (Fig. 2C), and the female by its epigynum having posterior median plate with very large copulatory openings (CO) and depressions (DE), and with a straight posterior margin (Fig. 2F).

*Description.* TL 2.47-2.94. Carapaces of both sexes as illustrated in Fig. 2A, without conspicuous modification, ocular area slightly protruding over clypeus, some hairs lying behind ocular area. Chelicerae of both sexes with warty granulations anterolaterally; promargin with six teeth, retromargin with four; the first one on retromargin bifurcated; male also with a large frontal tooth-like process bearing a fine hair at the tip (Fig. 2B). Tm I 0.58- 0.61. Tm IV present. Measurements and a detailed description of the somatic morphology were provided by Zhu & Wen (1980) and Gao & Zhu (1988, 1993).

Male palp (Figs 2C-E): Distal process on patella seemingly bigger than in other species. Mesal tooth of tibial apophysis (MT) triangular, smaller than in the new species. Flethy prottegulum boat-shaped (in some specimens slightly contracted and metamorphosed). Anterior part of tegulum with a distinct anteroventral cornu (ATC). Distal suprategular apophysis (DSA) much more slender and less sclerotized, and most importantly, with smaller dorsal conical lobe than in other species.

Epigynum (Figs 2F-G): Posterior median plate (PMP) with the largest copulatory openings (CO) and depressions (DE) in currently known species of *Gnathonarium*. Ventral plate very large, posteriorly widening and entirely covering posterior recess (PR) of posterior median plate (PMP), acting as a septum between both copulatory openings; posterior margin of posterior median plate almost straight. Copulatory ducts longer than those in *G. biconcavum* sp. n., and apical part turning posteriorly.

*Distribution.* China (Beijing, Fujian, Gansu, Hebei, Hubei, Hunan, Jilin, Ningxia, Qinghai, Shandong, Sichuan, Tibet, Yunnan), USA (Alaska).

*Remarks.* A comparison of the holotype of *G. cambridgei* Schenkel, 1963 and paratypes of *G. cornigerum* Zhu & Wen, 1980, *G. phragmigerum* Gao & Zhu, 1988, *G. flavidum* Gao & Zhu, 1993 by us has revealed that they all are conspecific, and accordingly *G. cornigerum*, *G. phragmigerum*, and *G. flavidum* are herein regarded as junior synonyms of *G. cambridgei*. The distinctions observed by Gao & Zhu (1988, 1993) are due to intraspecific variation and different angles of view. Furthermore, Gao & Zhu (1988) emphasized that *G. cambridgei* should not be placed in the genus *Gnathonarium* because of the absence of a Tm IV. However, when checking the type of *G. cambridgei* we noticed that though the hair of Tm IV was missing, its socket was well discernible.

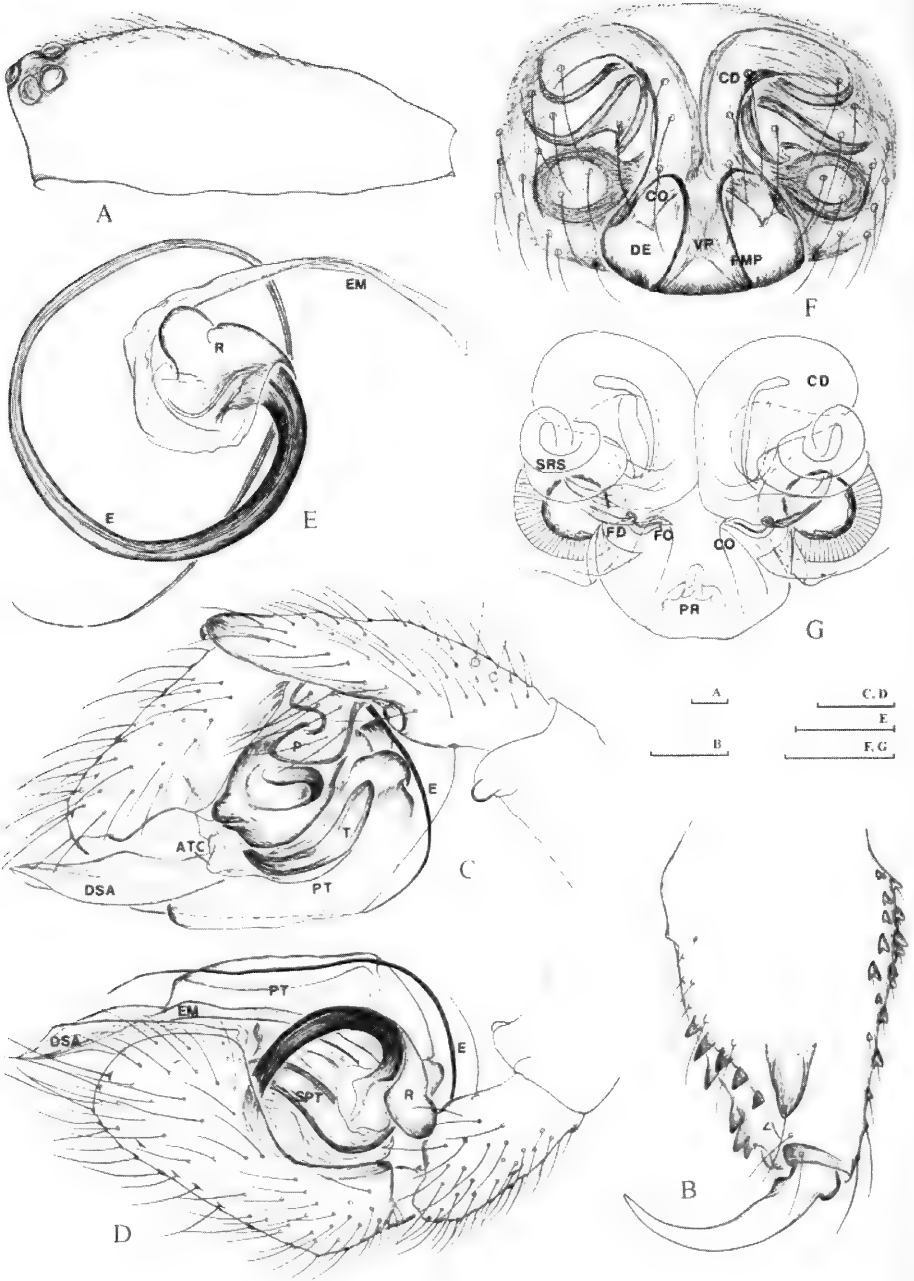


FIG. 2

*Gnathonarium cambridgei* Schenkel, 1963. A, carapace of male, lateral view; B, left chelicera of male, anterior view; C, left male palp, retrolateral view; D, left male palp, prolateral view; E, embolus division, ventral view; F, epigynum, ventral view; G, vulva, dorsal view. [Scale lines: 0.1 mm].

3. *Gnathonarium dentatum* (Wider, 1834)

Fig. 3

*Theridion dentatum* Wider, 1834: 229, pl.15, fig. 8 (♂ ♀).

*Gnathonarium dentatum*: Anonymous, 1977: 37, figs 5A-F (♂ ♀); Song, 1980: 155, figs 83A-F (♂ ♀); Hu, 1984: 194, figs 203.1-4 (♂ ♀); Guo, 1985: 105, figs 2-47.1-3 (♂ ♀); Zhu & Shi, 1985: 115, figs 101A-E (♂ ♀); Song, 1987: 150, figs 111 (♂ ♀); Zhang, 1987: 127, figs 105.1-5 (♂ ♀); Feng, 1990: 134, figs 109.1-5 (♂ ♀); Chen & Gao, 1990: 108, figs 135A-B (♂ ♀); Chen & Zhang, 1991: 176, figs 174.1-6 (♂ ♀); Song, Zhu & Li, 1993: 860, figs 14A-D (♂ ♀); Zhao, 1993: 183, figs 84A-C (♂ ♀); Song, Zhu & Chen, 1999: 169, figs 96A, L (♂ ♀); Hu, 2001: 544, figs 365.1-4 (♂ ♀); Song, Zhu & Chen, 2001: 129, figs 68A-F (♂ ♀).

*Material examined.* 2♂2♀ (NMB, KATNR 296), Kloster Tschokurtan (today's name not clear), Gansu Province, leg. Dr G. N. Potanin, 07.04.1886; 2♂4♀ (MHNG), Dashitou Town, Jilin Province, leg. Y. Tao, 28.VII.1988; 4♂3♀ (IZCAS, Tu0007), Shandan District, Gansu Province, leg. X. P. Wang, 1.VIII.1988; 1♀ (IZCAS), Yangri Town to Xinhua Town, Shennongjia Forest Region, Hubei Province, leg. S.Q. Li, 18.VIII.1986; 6♂13♀ (IZCAS), Chunhua District, Jilin Province, leg. J.C. Gao, 17.VIII.1990; 8♂12♀ (IZCAS, Tu0008), Kongcun Village, Yongnian District, Hebei Province, leg. S. Q. Li, VI-XII.1994; 3♀ (IZCAS), Kongcun Village, Yongnian District, Hebei Province, leg. S. Q. Li, VI-XII. 1994; 1♂ (IZCAS), Liaoning Province, 1985; 2♂1♀ (IZCAS), Yuanmingyuan Park, Beijing City, leg. S.Q. Li, 11.V.1990; 2♂1♀ (IZCAS), Mt. Xiangshan, Beijing City, leg. S.Q. Li, 25.X.1987; 1♀ (IZCAS), Bameng, Inner Mongolia Autonomous Region, leg. S. Y. Yu, 17.V.1980; 1♂ (IZCAS), Xiaoxi Natural Reservoir, Xiushan District, Sichuan Province, 9.VI.1989; 1♂1♀ (IZCAS), Qapqal Xibe Autonomous District, Xinjiang Uygur Autonomous Region, 5.VII.1991; 1♂ (IZCAS), Liuba District, Shaanxi Province, leg. J. Chen, 20.VII.1998.

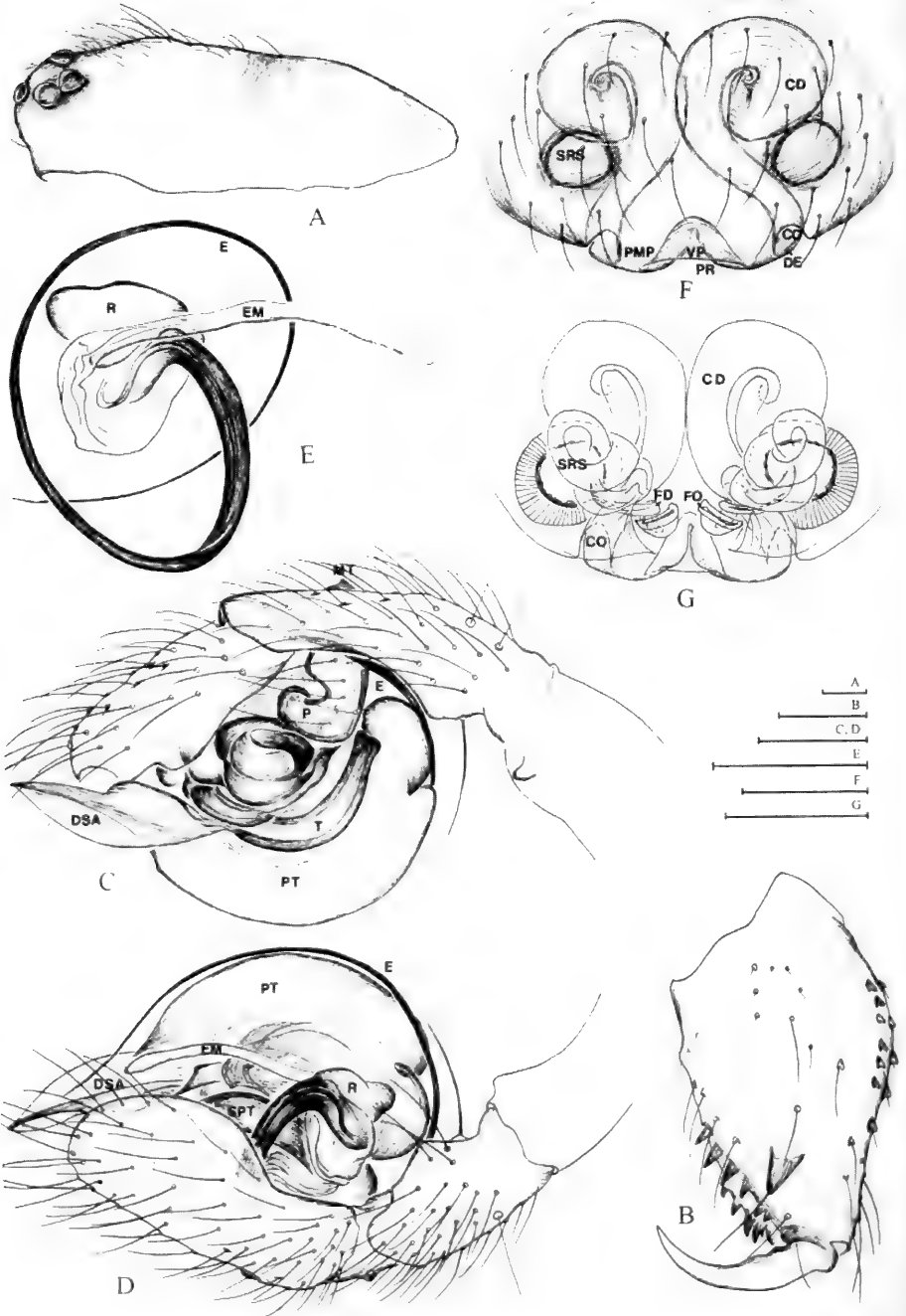
*Diagnosis.* Shape of carapace similar to that of *G. cambridgei*, but the male is easily recognized by the distal suprategular apophysis (DSA) having a large dorsal lobe with a flat-roof (Fig. 3C) and the female by having a posterior median plate with small copulatory openings (CO) and depressions (DE), as well as a large posterior recess (PR) (Fig. 3F).

*Description.* TL 1.83-2.42. Carapaces of both sexes as illustrated in Fig. 3A, without conspicuous modification, ocular area protruding slightly over clypeus, with some hairs lying behind ocular area. Chelicerae of both sexes with warty granulations anterolaterally, promargin with six teeth, retromargin with four, the first one of retromargin bifurcated; male with an additional tooth-like frontal process, with a fine hair at its tip (Fig. 3B). Tm I 0.58- 0.59. Tm IV present. Measurements and a detailed description of the somatic morphology were provided by Wider (1834).

Male palp (Figs 3C-E): Distal process of patella small. Mesal tooth of tibial apophysis (MT) triangular, smaller than in *G. biconcavum* sp. n.. Distal suprategular apophysis (DSA) dominated by a large dorsal lobe with the roof almost flat. Unlike in *G. cambridgei*, anterior part of tegulum without conspicuous anteroventral cornu.

Epigynum (Figs 2-3F): Copulatory ducts seemingly shorter than in *G. cambridgei*, about one circle with its apicle part blunt and slightly rolled. Posterior median plate with very small copulatory openings (CO) and depressions (DE), EI= 5.53, ventral plate covering most part of posterior recess (PR), posterior margin of posterior median plate deeply notched.

*Distribution.* Palearctic. In China the species was found in Beijing, Gansu, Hebei, Hubei, Inner Mongolia, Jilin, Liaoning, Shaanxi, Sichuan and Xinjiang.



4. *Gnathonarium gibberum* Oi, 1960

Fig. 4

*Gnathonarium gibberum* Oi, 1960: 149, figs 44-49; Anonymous, 1977: 37, figs 6A-E; Zhu *et al.*, 1980: 158, figs 84A-E; Wang, 1981: 109, figs 50A-C; Hu, 1984: 194, figs 204.1-4; Guo, 1985: 106, figs 2-48.1-2; Song, 1987: 152, fig 112; Zhang, 1987: 128, figs 106.1-3; Feng, 1990: 135, figs 110.1-5; Chen & Gao, 1990: 109, figs 136a-b; Chen & Zhang, 1991: 177, figs 175.1-5; Song, Zhu & Li, 1993: 860, figs 15A-E; Zhao, 1993: 185, figs 85A-D; Song, Zhu & Chen, 1999: 170, figs 96F-G, 97A; Song, Zhu & Chen, 2001: 131, figs 69A-E.

*Material examined.* 1♂1♀ (MHNG), Huzhou City, Zhejiang Province, 2. VI.1979; 1♀ (IZCAS), Sanmen District, Zhejiang Province, VI.1979; 2♀ (IZCAS), Sanmen District, Zhejiang Province, leg. S. X. Zheng; 1♂ (IZCAS), Guoliang Farm, Liangdu Town, Yuhang District, Zhejiang Province, 15.X.1966; 1♂3♀ (IZCAS), Beijing, VII.1974; 1♂ (IZCAS), Hongqi Town, Guangji District, Hubei Province, 27.VII.1976.

*Diagnosis.* The male of *G. gibberum* is easily distinguishable from all other Chinese *Gnathonarium* species by the carapace having a large, hump-like elevation behind the ocular area (Fig. 4A). The epigynum (Fig. 4C) is very similar to that of *G. dentatum*, but can be distinguished by its longer copulatory ducts (CD), with a point apex (Figs 4F, G).

*Description.* TL 2.00-3.00. Carapace of male rising into large lobe behind ocular area; a deep groove lying between lobe and ocular area, and plenty of hairs present in groove and on lobe (Fig. 4A). Carapace of female as in other species, without conspicuous modification. Chelicerae of both sexes with warty granulations anterolaterally, promargin with five teeth, retromargin with four, the first one of retromargin bifurcated; male with an additional tooth-like frontal process, with a fine hair at its tip (Fig. 4B). Tm I 0.62- 0.66. Tm IV present. Measurements and a detailed description of the somatic morphology were provided by Oi (1960).

Male palp (Figs 4C-E): Distal process of patella blunt. Morphological characters of male palp almost the same as in *G. dentatum*. See diagnosis and description of *G. dentatum* for more details. It is difficult to distinguish the two species by the male palp only.

Epigynum (Figs 4F-G): Copulatory ducts (CD) longer than those of *G. dentatum*, about one and half circle, with a point apex (Fig. 4F; cf Fig. 3F). Posterior median plate with small copulatory openings (CO) and depressions (DE), EI= 3.09, posterior margin of posterior median plate notched.

*Distribution.* China, Korea, Japan and Russia. In China the species was found in Beijing, Hubei and Zhejiang.

FIG. 3

*Gnathonarium dentatum* (Wider, 1834). A, carapace of male, lateral view; B, left chelicera of male, anterior view; C, left male palp, retrolateral view; D, left male palp, prolateral view; E, embolus division, ventral view; F, epigynum, ventral view; G, vulva, dorsal view. [Scale lines: 0.1 mm].

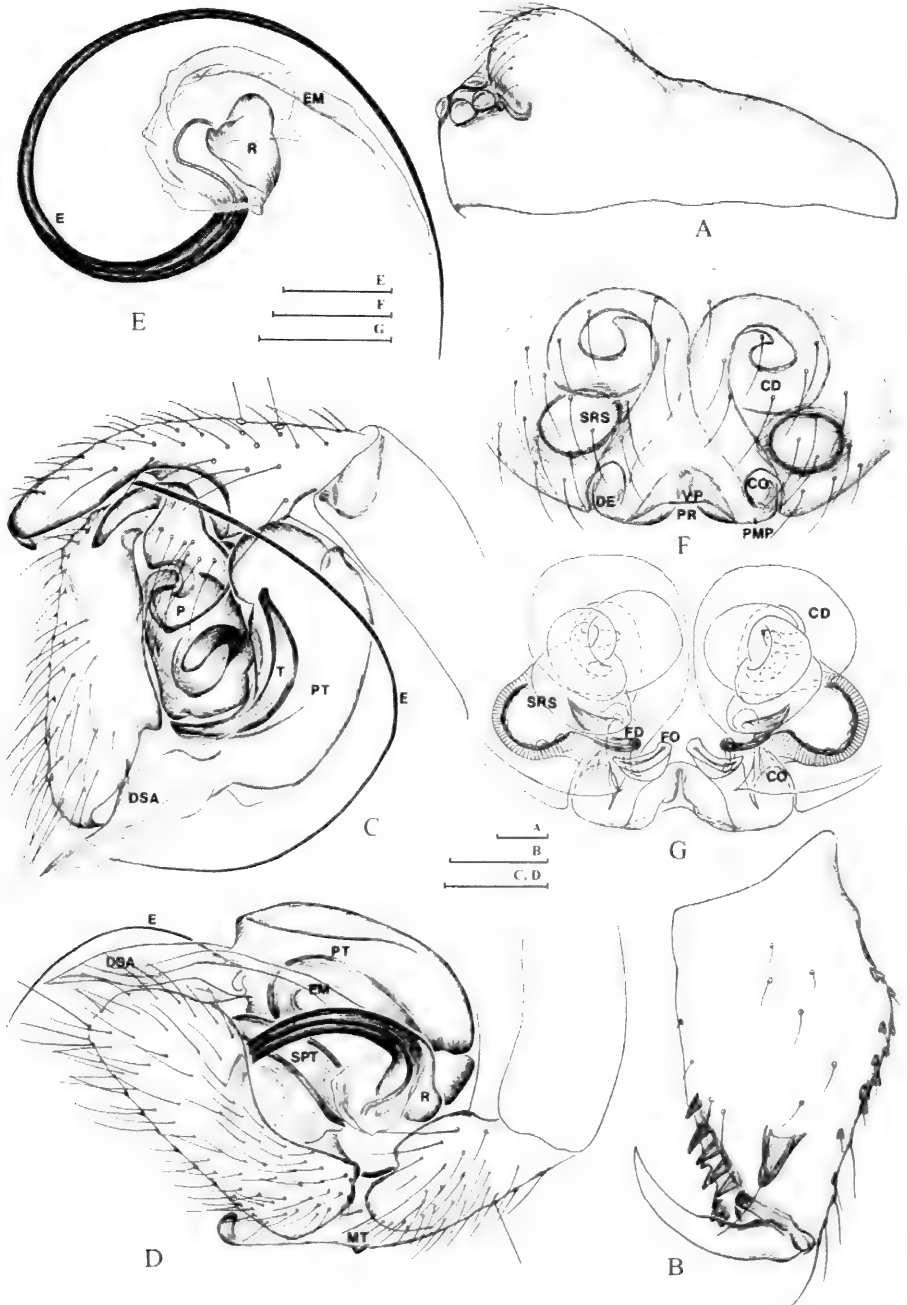


FIG. 4

*Gnathonarium gibberum* Oi, 1960. A, carapace of male, lateral view; B, left chelicera of male, anterior view; C, left male palp, retrolateral view; D, left male palp, prolateral view; E, embolus division, ventral view; F, epigynum, ventral view; G, vulva, dorsal view. [Scale lines: 0.1 mm].

## ACKNOWLEDGEMENTS

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***Siamoglaris zebrina* gen. n., sp. n., the first representative of Prionoglarididae from the Oriental Region (Insecta: Psocoptera)**

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***Siamoglaris zebrina* gen. n., sp. n., the first representative of Prionoglarididae from the Oriental Region (Insecta: Psocoptera).** - *Siamoglaris zebrina* gen. n., sp. n. is described and illustrated from a male specimen collected in Thailand. The new genus is closely related to the Palearctic genus *Prionoglaris* Enderlein. Illustrations of the type species of that genus, *P. stygia* Enderlein, are also given. The systematic position of these two genera within the family Prionoglarididae is discussed and the family is subdivided into two subfamilies: Prionoglaridinae Badonnel and Speleketorinae Smithers. A key to the adults of the genera of the family Prionoglarididae is provided.

**Keywords:** Prionoglaridinae - Speleketorinae - *Prionoglaris* - *Speleketor* - *Sensitibilla* - new genus - new species - mouthparts - cave fauna - Thailand.

INTRODUCTION

The family Prionoglarididae (sensu Mockford, 1984 and Lienhard, 2000), at present assigned to the suborder Trogiomorpha and the infraorder Psocathropetae, comprises the following three genera: *Prionoglaris* Enderlein, 1909 (three species known), *Speleketor* Gurney, 1943 (three species) and *Sensitibilla* Lienhard, 2000 (monotypic) (cf. Lienhard & Smithers, 2002 and Lienhard, 2000). A family diagnosis can be found in Mockford (1993) and Lienhard (1998). The distribution of all known species is discussed in detail by Lienhard (2000) and an exhaustive bibliography concerning synonymies and faunistics is presented by Lienhard & Smithers (2002). The three genera have a vicariant distribution on different continents: *Prionoglaris* is known from the western Palearctic (reaching east to Afghanistan), *Speleketor* from the Nearctic (southern USA) and *Sensitibilla* from the Ethiopian Region (Namibia). Most species live predominantly in caves or similar subterranean habitats (under stones or within rocky debris) (cf. Badonnel & Lienhard, 1994 and Lienhard, 2000).

In this paper the first representative of this family from the Oriental Region is described from a single male collected in a dry stream bed near Wang Badan Cave in western central Thailand. The new species is related to the genus *Prionoglaris*, but it is unique in many aspects of its morphology, so that the erection of a new genus appears justified.

The following abbreviations are used in the descriptions: BL = body length (in alcohol); IO/D = shortest distance between compound eyes divided by anteroposterior diameter of compound eye in dorsal view of head; P1-P4 = articles of maxillary palpus; f1, f2, f3, ... = antennal flagellomeres; F = hindfemur; T = hindtibia; t1, t2, t3 = tarsomeres of hindtarsus (lengths measured from condyle to condyle); FW = forewing; PS = pterostigma of forewing; HW = hindwing. For standard abbreviations concerning wing venation, see Lienhard (1998).

## DESCRIPTIONS OF NEW TAXA

### *Siamoglaris* gen. n.

*Diagnosis* (see also key to the genera of Prionoglarididae, below). General habitus very similar to *Prionoglaris* (cf. Plate 1A). Differing from *Prionoglaris* by the following characters. Compound eye with distinct colour pattern (Fig. 1a). Maxillary palpus relatively short, about half of head length (measured in frontal view, from edge of vertex to tip of labrum), with P3 shorter than half of P4 (Fig. 10). Terminal article of labial palpus shorter than twice its width (Fig. 8). Vein *an*<sub>2</sub> of forewing present (Fig. 3). Preapical claws strikingly asymmetrical, membranous extension of anterior preapical claw of each leg strongly developed, covering almost the whole claw (Fig. 5). Phallosome (Fig. 11): medioventral process short and rounded, with a pair of membranous ventrolateral blisters; mediointernal process well-developed, apically with a pair of sclerotized claspers; dorsolateral processes (= external parameres?, see "Discussion") well-developed, bearing some lateral pores.

*Type species.* *Siamoglaris zebrina* sp. n.

*Etymology.* The genus name is of feminine gender and refers to the country of origin of its type species (Siam is an old name for Thailand) and to the most closely related genus *Prionoglaris* ("glaris" is the Greek word for chisel, referring to the lacinia which shows a very particular morphology in these genera).

### *Siamoglaris zebrina* sp. n.

Figs 1 and 3-15

#### MATERIAL

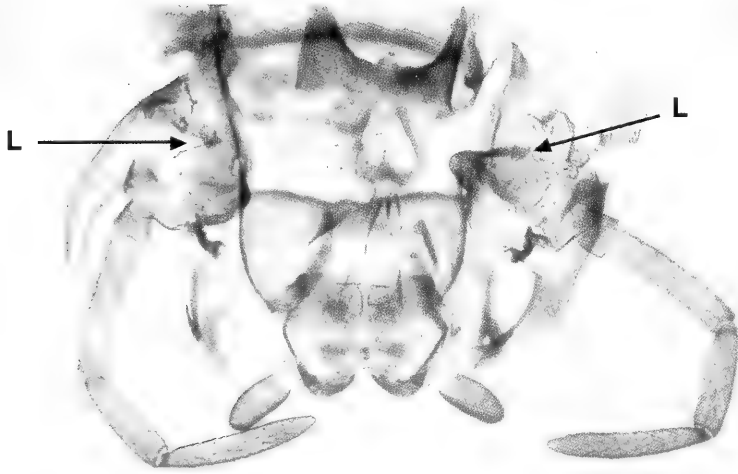
Holotype . THAILAND (Kanchanaburi Province, Sai Yok District): near Wang Badan Cave, ca. 2 km N of Sai Yok Noi Waterfall (14° 14' N, 99° 03' E), 220 m, dry stream bed (on low vegetation), 9.XII.2003, leg. P. Schwendinger (TH-03/17). Deposited at the Muséum d'histoire naturelle, Geneva (Switzerland). The specimen has been completely dissected and mounted on four slides. Before mounting its exoskeleton the pterothorax has been sent to Kazunori Yoshizawa (Sapporo) for DNA extraction, after having detached all wings and legs. NOTE: The type locality is situated very close to Wang Badan Cave, about 200-300 m from its main entrance, in a rocky limestone region full of subterranean crevices (cf. remarks on biology, below).

#### PLATE 1

*Prionoglaris stygia* Enderlein (from cave "Grotte inférieure du Queire", French Pyrenees, cf. Lienhard, 1988). A: live male, habitus. B: male, mouthparts (slide-mounted, in occipital view; L = remnant of lacinia). C: nymph, mouthparts (slide-mounted, in frontal view; L = lacinia, retracted on right side).



**A**



**B**



**C**

## ETYMOLOGY

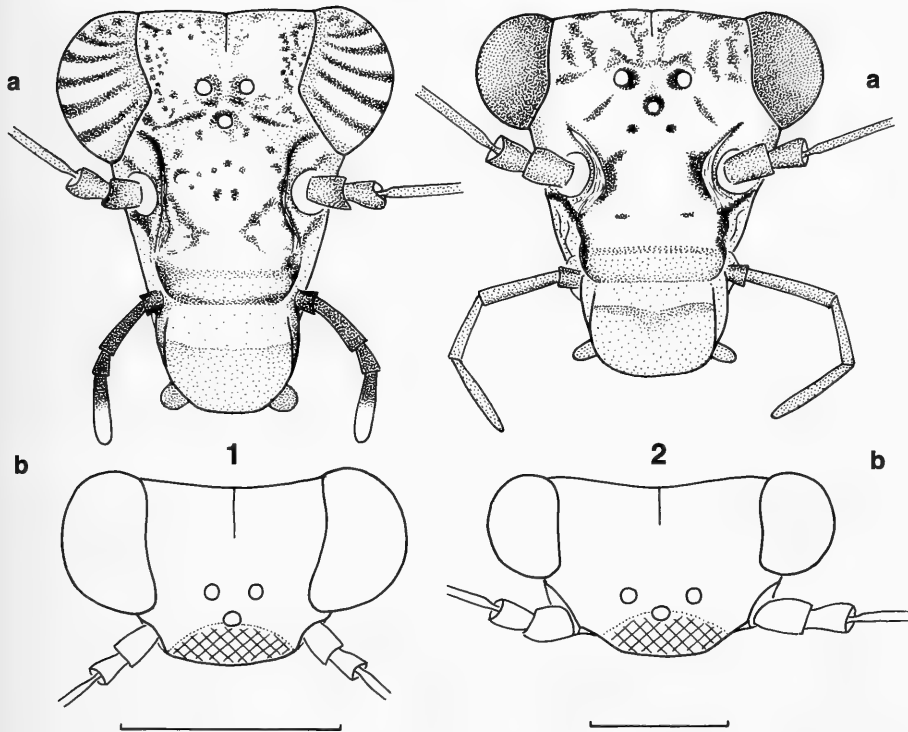
The epithet *zebrinus* (-a, -um) refers to the banded eyes recalling the colour pattern of a zebra.

## DESCRIPTION (male holotype, female not known)

*Coloration.* Head (Fig. 1a) yellowish to light brown, with some small dark brown patches of hypodermal pigmentation. Compound eye yellowish grey with black transversal bands (observed after one month in alcohol; six months later the ground colour had turned to dark grey and the bands were hardly visible). Antenna medium brown. Maxillary palpus dark brown, except for whitish apical half of P4. Thorax yellowish to medium brown with some small dorsal and lateral spots of brown hypodermal pigment on pterothorax. Membrane of wings unmarked (Figs 3, 4), completely transparent also in PS, wing veins brown. Legs light to medium brown, tibiae with a dark brown external spot in 1/3 and 1/2 of their length and with a dark brown subapical ring (hypodermal pigment); first tarsomeres medium brown, apical 1/4 light brown, second and third tarsomeres rather dark brown. Abdomen yellowish, dorsally with numerous patches of dark brown hypodermal pigment, same pigment also ventrally in basal half. Phallosome and other terminalia light brown.

*Morphology.* Head (Fig. 1a) much longer than wide in frontal view. Edge of vertex regularly rounded. Vertical suture distinct, frontal suture absent, ocelli well-developed. Compound eye relatively large and prominent. Bulging postclypeus and epistomal suture not differentiated, head capsule flat or slightly concave from frontal ocellus to anterior region of clypeus, the latter slightly bulging (Figs 1a, b). Antenna long and slender, flagellomeres with annulate sculpture. Distal half of both antennae broken off, on both sides only the eight most basal flagellomeres remaining (length of incomplete antenna from base of scape to tip of f8 about 2.6 mm, see also "Measurements"). Maxillary palpus relatively short (Figs 1a, 10), about half of head length (measured in frontal view, from edge of vertex to tip of labrum), P3 slightly shorter than half of P4, P2 without sensory spur. Labial palpus with two articles, terminal one shorter than twice its width, with two thin-walled sensilla distally to middle of inner side (Fig. 8). Distal margin of labrum with a row of 5 placoids, each containing a very short conical sensillum (Fig. 13). Mandibles (Fig. 12) sickle-shaped, slightly asymmetrical, with rounded apex, lacking chewing sculpture on molar region, inner margin of incise part with a row of small denticles, outer margin slightly serrate. Hypopharynx (Fig. 9) very similar to *Prionoglaris* (cf. Lienhard, 1998: fig. 39a), with characteristic basal sclerite; oval lingual sclerites not differentiated; tubular filaments very weakly differentiated, not fused in basal part; margin of lingua densely covered with very fine microtrichia. Lacinia virtually absent, only a microscopical remnant (Fig. 7; length about 100  $\mu\text{m}$ ) visible at high magnification after slide-mounting of the head.

Wings as in Figs 3 and 4, similar to *Prionoglaris*, but vein *an2* present in forewing. Wing margin and veins (except for *pcu*) with very sparse microscopical pilosity, these hairs somewhat stouter and longer on veins of hindwing, especially in apical half. Legs with uniform short overall pilosity, lacking trichobothria, with some short spine-like setae on tibiae and tarsi. Pearman's organ of hindcoxa well-developed, midcoxa with a hyaline tubercle on inner side. Preapical claws of all legs strikingly



FIGS 1-2

Fig. 1. *Siamoglaris zebrina* gen. n., sp. n., male holotype: a, head in frontal view (pilosity not shown); b, head in dorsal view (pilosity and coloration not shown, cross-hatched region flat or slightly concave). - Fig. 2. *Prionoglaris stygia* Enderlein, male (from type locality, cf. Figs 16-18): idem. Scale lines = 0.5 mm.

asymmetrical, lacking preapical tooth (Figs 5, 6). Anterior claw bearing a large membranous extension enveloping almost the whole claw, leaving only the tip of the anterior claw uncovered; the surface of these membranous structures covered with short and fine microtrichia or denticles (Fig. 5). Each anterior claw with an elongate basal process bearing also some microtrichia, and with a slender hair-like filament on inner side (Fig. 5). Posterior claw much simpler than anterior one, lacking membranous extension, with a relatively short basal process bearing some small microtrichia in its basal half (Fig. 6).

Male terminalia. Epiproct and paraproct (Fig. 14) similar to *Prionoglaris stygia* (Fig. 16). Epiproct regularly rounded, its pilosity relatively sparse, limited to posterior third. Paraproct densely pilose, with some longer setae on the slightly bulged dorsal part, lacking setae with basal rosettes, inner margin of paraproct strongly sclerotized, no marginal spine present. Hypandrium simple (Fig. 15), pilosity mostly in apical half, hind margin regularly rounded, basal angles with a slightly sclerotized stylus-like structure on each side. Phallosome (Fig. 11) an elongated slightly sclerotized sac (length 0.6 mm), roughly circular in cross-section, bearing the following relatively

weakly sclerotized apical processes (homologous structures described by Lienhard, 1988, 1998, for *Prionoglaris* mentioned in parentheses): medioventral process ("äusserer Medianfortsatz", "appendice médio-ventral"), mediointernal process ("innerer Medianfortsatz", "appendice médio-interne"), a pair of dorsolateral processes ("Lateralfortsätze", "appendices dorso-latéraux"). Medioventral process short and rounded, almost hemispherical, bearing a pair of membranous ventrolateral blisters (shown in their inflated state in Fig. 11). Mediointernal process well-developed, with a pair of sclerotized and apically slightly hooked claspers (subtriangular in lateral view, Fig 11b) in its apical region and a small mediiodistal protrusion. These structures partly covered by complex membranous swellings (shown in their inflated state in Fig. 11). Dorsolateral processes (not covered by these membranes) elongate, finger-like and bearing some pores on their lateral margin and some short apical hairs. Dorsolateral processes originating near mid-line of dorsal side of the phallosome (Fig. 11a) and in situ laterally prominent, situated close to ventral base of paraprocts, slightly ventrally directed in lateral view (Fig. 11b).

*Measurements* (holotype; in  $\mu\text{m}$  except for BL, FW, HW). BL = [1.6 mm] (abdomen strongly shrunk); FW = 3.4 mm; HW = 2.2 mm; F = 740; T = 1290; t1 = 710; t2 = 155; t3 = 163; IO/D = 1.14; flagellomeres of both antennae: f1 = 790/790; f2 = 270/280; f3 = 350/340; f4 = 240/250; f5 = 230/240; f6 = 200/200; f7 = 160/170; f8 = 200/200. NOTE: Both antennae are damaged in the holotype (see "Morphology"). The remaining eight flagellomeres of both antennae are practically equal in length (see measurements above). This indicates that the antennae of this specimen were not subjected to an asymmetrical regenerative length growth of the remaining flagellomeres after having been damaged during nymphal life, as it often can be observed in the suborders Trogiomorpha and Troctomorpha (cf. Seeger, 1975).

#### BIOLOGY

Very little is known about the biology of *S. zebrina*. However, the specialization of the mouthparts and the situation of the type locality (see "Material") suggest that the biology of this species is similar to that of *Prionoglaris* (cf. Badonnel & Lienhard, 1994): i.e. larval development essentially in subterranean habitats (in caves or under stones in rocky debris), adults sometimes also found outside caves (according to A. Baz, in litt. 1999, *P. stygia* has been captured several times outside caves in Spain, in Malaise traps and on vegetation).

#### KEY TO ADULTS OF THE GENERA OF PRIONOGLARIDIDAE

NOTE: Figures concerning the diagnostic characters of *Speleketor* and *Sensitibilla* have been published by Gurney (1943), Mockford (1984, 1993) and Lienhard (2000). For *Prionoglaris* see Figs 2 and 16-18, Plate 1A-C and figures published by Lienhard (1988, 1998). Due to the striking metamorphosis during adult moult in *Prionoglaris* (and very probably also in *Siamoglaris*), many features of mouthparts and pretarsal claws of nymphs of Prionoglaridinae differ greatly from those described here for adults (see Lienhard, 1988, 1998). In particular the rod-like laciniae, typical for nymphs and adults of all other Psocoptera but strongly reduced in adults of Prionoglaridinae, are well-differentiated in nymphs of this subfamily (cf. Plate 1C).

- 1 Bulging postclypeus, epistomal suture, epipharyngeal sclerite, cup-like cibarial sclerite (hypopharynx), oval lingual sclerites (hypopharynx) and rod-like laciniae well-differentiated, as usually in Psocoptera. P2 with a small subbasal sensory spur. Distal margin of labrum with a row of 5 setiform sensilla. Legs with some trichobothria. Pretarsal claws symmetrical, with a preapical tooth (or short filament), lacking basal process or filament and membranous extension . . . . . Speleketorinae 2
- Bulging postclypeus, epistomal suture, epipharyngeal sclerite, cup-like cibarial sclerite and oval lingual sclerites not differentiated, laciniae reduced to a microscopical remnant (only visible at high magnification after slide-mounting of the head, cf. Plate 1B). P2 without sensory spur. Distal margin of labrum with a row of 5 placoids, each containing a very short conical sensillum (Figs 13, 17). Legs lacking trichobothria. Pretarsal claws asymmetrical, usually with a basal process and/or filament and lacking preapical tooth, anterior claw of each leg bearing a membranous extension . . . . . Prionoglaridinae 3
- 2 Forefemur with a longitudinal row of articulated spines on anterior face. Trichobothria present on femora and on some trochanters. Female genitalia: ovipositor valvula simple and not fused to subgenital plate . . . . . *Speleketor* Gurney
- Forefemur only with a longitudinal row of normal short hairs on anterior face. Trichobothria present on tibiae and hindtarsus. Female genitalia: ovipositor valvula basally fused to subgenital plate, with a distal process bearing spine-like setae . . . . . *Sensitibilla* Lienhard
- 3 Compound eye with striking colour pattern (Fig. 1a) (only distinct in living and freshly killed animals!). Maxillary palpus relatively short, about half of head length (measured in frontal view, from edge of vertex to tip of labrum), with P3 shorter than half of P4 (Fig. 10). Terminal article of labial palpus shorter than twice its width, with two thin-walled sensilla distally to middle of inner side (Fig. 8). Vein *an2* of forewing present (Fig. 3). Membranous extension of anterior preapical claw of each leg strongly developed, covering almost the whole claw (Fig. 5). Phallosome (Fig. 11): medioventral process short and rounded, with a pair of membranous ventrolateral blisters; mediointernal process well-developed, with a pair of sclerotized and apically slightly hooked claspers; dorsolateral processes well-developed, bearing some lateral pores . . . . . *Siamoglaris* gen. n.
- Compound eye uniform in colour (yellowish grey to greenish in living and freshly killed animals, dark grey to black in old alcohol material). Maxillary palpus much longer than half of head length, with P3 longer than half of P4 (Fig. 2a, Plate 1B). Terminal article of labial palpus elongate, length about twice its width, with two thin-walled sensilla basally to middle of inner side (Fig. 18, Plate 1B). Vein *an2* of forewing absent. Membranous extension of anterior preapical claw of each leg developed as a ventrointernal vesicle, not reaching apex of claw. Phallosome:

medioventral process elongate, longer than other phallic processes, lacking membranous blisters; mediointernal process short and simple, lacking apical claspers; dorsolateral processes well-developed, lacking pores . . . . . *Prionoglaris* Enderlein

## DISCUSSION

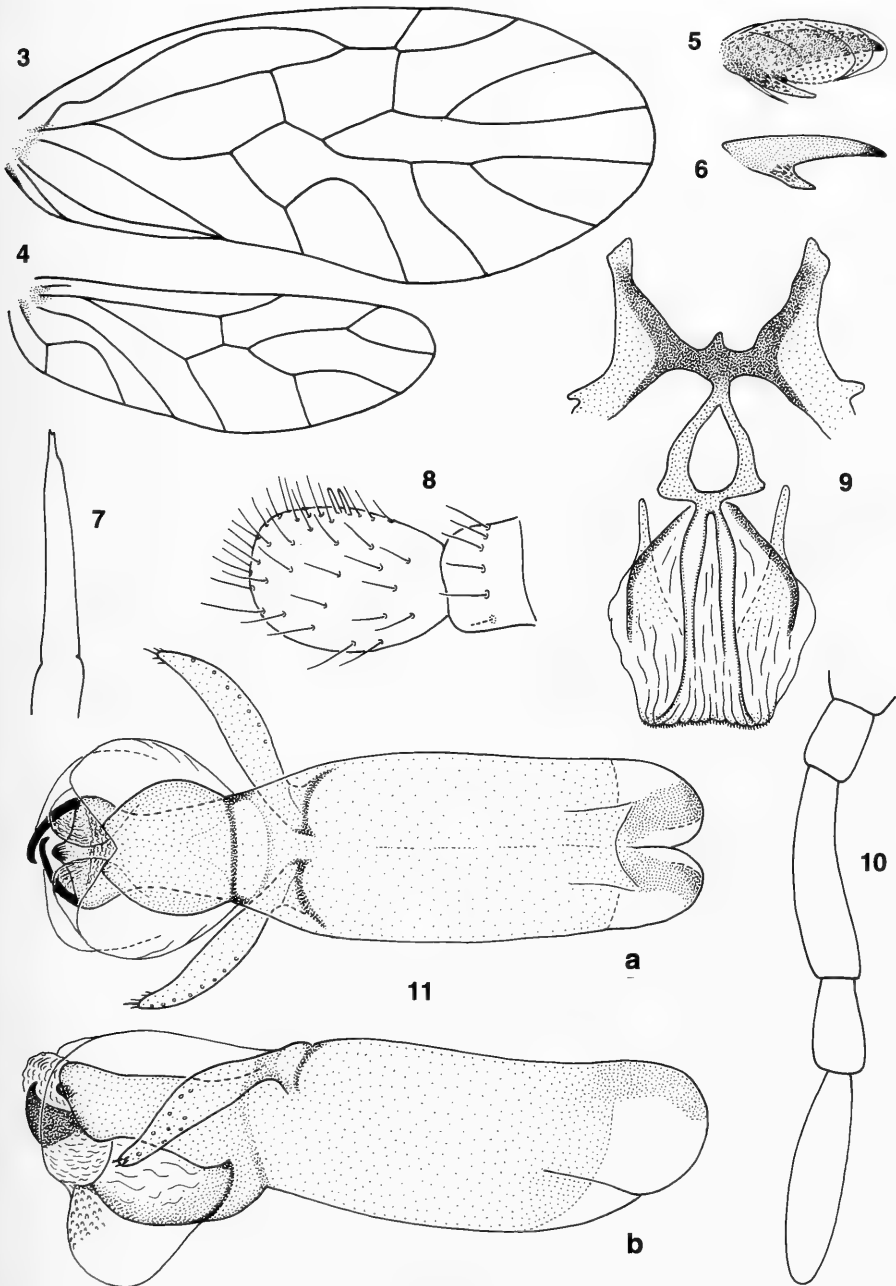
According to Lienhard (2000) the family Prionoglarididae can be subdivided into two main groups, corresponding to two phylogenetic clades, one comprising the genera *Speleketor* and *Sensitibilla*, the other the genus *Prionoglaris*. The new genus *Siamoglaris* belongs without any doubt to the second clade, which is characterized by the strongly apomorphic morphology of head capsule, mouthparts and pretarsal claws (see key to genera). The first clade is defined by the synapomorphic presence of trichobothria on legs in both genera, which otherwise have preserved a plesiomorphic morphology of head and pretarsal claws and show only a slight tendency towards a metamorphosis of the mouthparts during adult moult. This metamorphosis, unique in Psocoptera, is complete in *Prionoglaris* and *Siamoglaris*.

The very particular morphology of the phallosome in these genera, unique in Psocoptera, may be interpreted as an autapomorphy of the family (cf. Mockford, 1984). In males of *Speleketor*, *Prionoglaris* and *Siamoglaris* (the male of *Sensitibilla* is not yet known), the phallosome consists largely of a cuticular sac with a pair of "external parameres protruding posterolaterally" (cit. after Mockford, 1984: p. 179). In *Speleketor* the phallic sac is membranous and encloses some sclerotized structures (basal struts of Mockford, 1984). In *Prionoglaris* and *Siamoglaris* the phallic sac is itself sclerotized, lacking internal sclerotized structures but bearing two additional apical processes (medioventral process and mediointernal process). The posterolateral processes (dorsolateral processes of *Prionoglaris* and *Siamoglaris*) were interpreted as external parameres in *Speleketor* by Mockford (1984: p. 171), because they bear some lateral pores. Such pores are also present in *Siamoglaris* but they could not be observed in *Prionoglaris*.

In spite of the very similar, characteristic wing venation and the probably synapomorphic basic structure of the phallosome the above mentioned groups differ from each other in several characters which usually do not vary much within families of Psocoptera (e. g. morphology of head capsule, mouthparts, pretarsal claws and pilosity of legs). Therefore these groups are considered here as subfamilies, using the family-group names proposed by Smithers (1972: p. 337, Speleketoridae) and Badonnel (1943: p. 134, Prionoglaridinae, incorrectly spelled Prionoglarinae). For diagnoses of Speleketorinae and Prionoglaridinae, see key to genera.

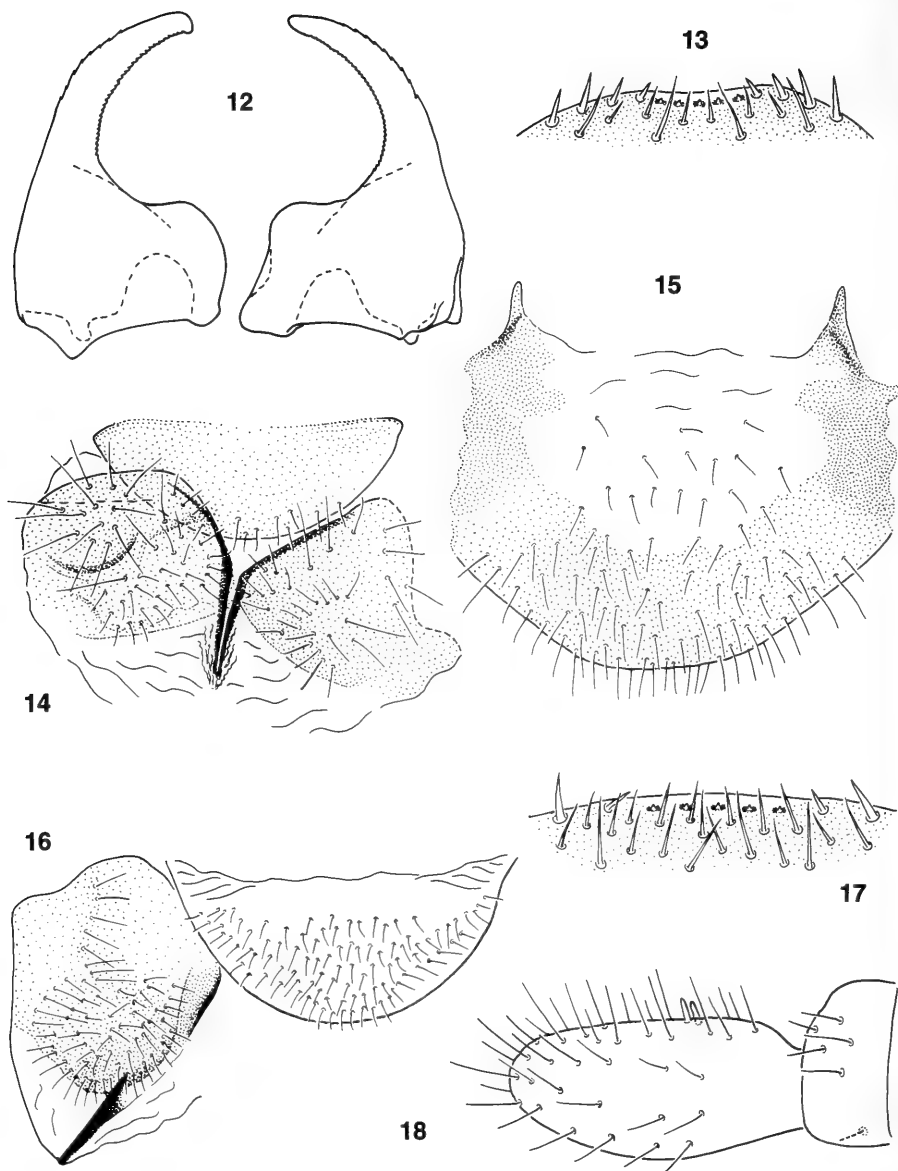
Fresh material of *Prionoglaris*, *Sensitibilla* and *Siamoglaris* has recently been sent to Kazunori Yoshizawa (Sapporo) for DNA extraction. The future analysis of DNA sequences and data on geographical distribution will hopefully give more information on the phylogeny of these interesting genera and on their position within the Psocoptera.





FIGS 3-11

*Siamoglaris zebrina* gen. n., sp. n., male holotype: 3, forewing; 4, hindwing; 5, anterior pretarsal claw of hindtarsus; 6, posterior pretarsal claw of hindtarsus; 7, remnant of lacinia (length about 100  $\mu$ m); 8, labial palpus (ventral view); 9, hypopharynx (frontal view); 10, maxillary palpus (pilosity not shown); 11, phallosome, a: ventral view, b: lateral view.



FIGS 12-18

Figs 12-15. *Siamoglaris zebrina* gen. n., sp. n., male holotype: 12, mandibles (frontal view); 13, sensilla on distal margin of labrum; 14, epiproct and paraprocts (in natural position but slightly deformed and right paraproct broken along dashed line); 15, hypandrium. - Figs 16-18. *Prionoglaris stygia* Enderlein, male (from cave "Compagnaga lecia", French Pyrenees, type locality, cf. Lienhard, 1988): 16, epiproct and left paraproct; 17, sensilla on distal margin of labrum (same magnification as in Fig. 13); 18, labial palpus (ventral view, same magnification as in Fig. 8).

## ACKNOWLEDGEMENTS

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## New species of *Hybos* from Guangxi, China (Diptera, Empidoidea, Hybotidae)

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**New species of *Hybos* from Guangxi, China (Diptera, Empidoidea, Hybotidae).** - The following species of *Hybos* from Guangxi (Southern China) are described, illustrated and compared with morphologically similar species: *Hybos liui* sp. n., *H. quadriseta* sp. n., and *H. shuwenae* sp. n. A key to the species of *Hybos* from Guangxi is presented.

**Keywords:** Diptera - Hybotidae - *Hybos* - new species - key - China.

### INTRODUCTION

*Hybos* Meigen is a cosmopolitan genus which belongs to the subfamily Hybotinae of the family Hybotidae. It is characterized by the following features (terminology after McAlpine, 1981 and Steyskal & Knutson, 1981): anal cell longer than basal cell, Rs rather short, R4+5 and M1 divergent apically and basal cells separated by distinct vein M1+2 (Chvála, 1983). The Oriental region is the most diverse with 37 described species up to the mid eighties (Smith, 1975) and 9 species were known from the Palaearctic region (Chvála & Kovalev, 1989) prior to the extensive studies of the Chinese fauna which started some 20 years ago. Currently 67 species are known to occur in China. They have been mainly described by Yang & Yang (1986, 1987, 1988a, b, 1989, 1991, 1995a, b), Saigusa & Yang (2002) and Yang *et al.* (2002). The major references dealing with *Hybos* in the Old World are Brunetti (1920), Frey (1953), Smith (1965), Saigusa (1963, 1965) and Chvála (1983).

Guangxi belongs to South China with a subtropical and tropical climate. Up to now 14 species of *Hybos* have been described from this region (Yang & Yang, 1986, 1995b). In the present paper, three species are described as new to science, based on the material collected by Ms Shuwen An and Mr Xingyue Liu by sweeping and with a light trap in Maoershan National Nature Reserve in 2003 (25.53°N, 110.25°E, North East of Guangxi). A key to the species of the genus from Guangxi is given.

## MATERIAL AND METHODS

The specimens for this study are deposited in the following collections:

CAU = Insect collection of China Agricultural University, Beijing, China

MHNG = Muséum d'histoire naturelle, Genève, Switzerland

The following abbreviations are used: acr = acrostichal, ad = anterodorsal, av = anteroventral, dc = dorsocentral, h = humeral, oc = ocellar, npl = notopleural, pd = posterodorsal, presc = prescutellar, psa = postalar, pv = posteroventral, v = ventral.

KEY TO SPECIES OF *HYBOS* FROM GUANGXI (SOUTHERN CHINA) (MALES ONLY)

- |     |  |  |
|-----|--|--|
| 1   | Femora chiefly yellow, at most hind femur partly or entirely black . . . . .           | 2  |
| 1*  | Femora black, at most apex of hind femur yellow . . . . .                              | 6  |
| 2   | Hind femur entirely yellow . . . . .   | 3  |
| 2*  | Hind femur partly or entirely black . . . . .  | 4  |
| 3   | Arista bare; scutellum black. Guangxi . . . . .  | <i>H. nasutus</i> Yang & Yang, 1986        |
| 3*  | Arista pubescent; scutellum yellow. Guangxi, Zhejiang . . . . .                        | <i>H. flaviscutellum</i> Yang & Yang, 1986 |
| 4   | Hind femur partly black . . . . .  | 5  |
| 4*  | Hind femur entirely black. Guangxi, Guizhou, Zhejiang, Fujian . . . . .                | <i>H. chinensis</i> Frey, 1953             |
| 5   | Hind femur tinged with black on apico-dorsal surface. Guangxi, Fujian, Henan . . . . . | <i>H. orientalis</i> Yang & Yang, 1986     |
| 5*  | Hind femur tinged with black on dorsal surface. Guangxi . . . . .                      | <i>H. guangxiensis</i> Yang & Yang, 1986   |
| 6   | Apex of hind femur yellow; arista bare . . . . .                                       | 7  |
| 6*  | Hind femur black . . . . .   | 8  |
| 7   | Mid tibia yellow. Guangxi, Fujian . . . . .  | <i>H. longshengensis</i> Yang & Yang, 1986 |
| 7*  | Mid tibia black. Guangxi, Guizhou, Fujian . . . . .                                    | <i>H. ancistroides</i> Yang & Yang, 1986   |
| 8   | All tibiae entirely black . . . . .  | 9  |
| 8*  | Tibiae partly yellow. Guangxi, Guizhou . . . . .                                       | <i>H. basiflavus</i> Yang & Yang, 1986     |
| 9   | First flagellomere black . . . . .   | 10   |
| 9*  | First flagellomere yellow; fore and mid tarsi yellow. Guangxi . . . . .                | <i>H. acutatus</i> Yang & Yang, 1986       |
| 10  | Hind tibia medially with 1-2 ad . . . . .  | 11   |
| 10* | Hind tibia medially without ad . . . . .   | 12   |
| 11  | Hind tibia with 1 ad. Guangxi . . . . .  | <i>H. liui</i> sp. n.                      |
| 11* | Hind tibia with 2 ad. Guangxi, Sichuan, Guizhou, Henan . . . . .                       | <i>H. ensatus</i> Yang & Yang, 1986        |
| 12  | Hypandrium not truncate apically . . . . .   | 13   |
| 12* | Hypandrium truncate apically. Guangxi . . . . .  | <i>H. truncatus</i> Yang & Yang, 1986      |
| 13  | Arista with swollen tip (Fig. 12). Guangxi . . . . .                                   | <i>H. shuwenae</i> sp. n.                  |
| 13* | Arista evenly thin at tip . . . . .  | 14   |
| 14  | Arista short pubescent (rays about as long as basal diameter of arista) . . . . .      | 15   |
| 14  | Arista bare. Guangxi . . . . .   | <i>H. maershanus</i> Yang & Yang, 1995     |
| 15  | Fore tibia without v or pv, mid tibia without apical av. Guangxi . . . . .             | <i>H. starki</i> Yang & Yang, 1995         |
| 15* | Fore tibia either with 3 very long v or 3 long pv; mid tibia with 1 apical v . . . . . | 16   |
| 16  | Fore tibia with 3 very long v. Guangxi . . . . .                                       | <i>H. jinxiuensis</i> Yang & Yang, 1986    |
| 16* | Fore tibia with 3 long pv. Guangxi . . . . .   | <i>H. quadriseta</i> sp. n.                |

## DESCRIPTIONS OF NEW SPECIES

*Hybos liui* sp. n.

Figs 1-6

## MATERIAL

Holotype male, Guangxi: Maoershan National Nature Reserve, Huajiang (350 m), 27. VI. 2003, Xingyue Liu (CAU).

## ETYMOLOGY

The species is named after the collector Mr Xingyue Liu.

## DIAGNOSIS

Wing slightly grayish. Legs entirely black. Hind tibia with 1 weak ad medially.

## DESCRIPTION (MALE)

*Measurements:* Body length 4.2 mm, wing length 3.7 mm.

*Head:* black, pale gray microtrichose. Eyes dark brown, enlarged upper facets brownish yellow, contiguous on frons for a long distance which is 3.0 times the length of the first flagellomere. Setae and setulae black; ocellar tubercle distinct, with one pair of long oc and 2 very short posterior setulae. Antenna black; scape without setulae; pedicel with a circle of subapical setulae; first flagellomere black without dorsal setulae; arista black, short pubescent except apical third bare. Proboscis black; palpus black with 1 long ventral setula apically.

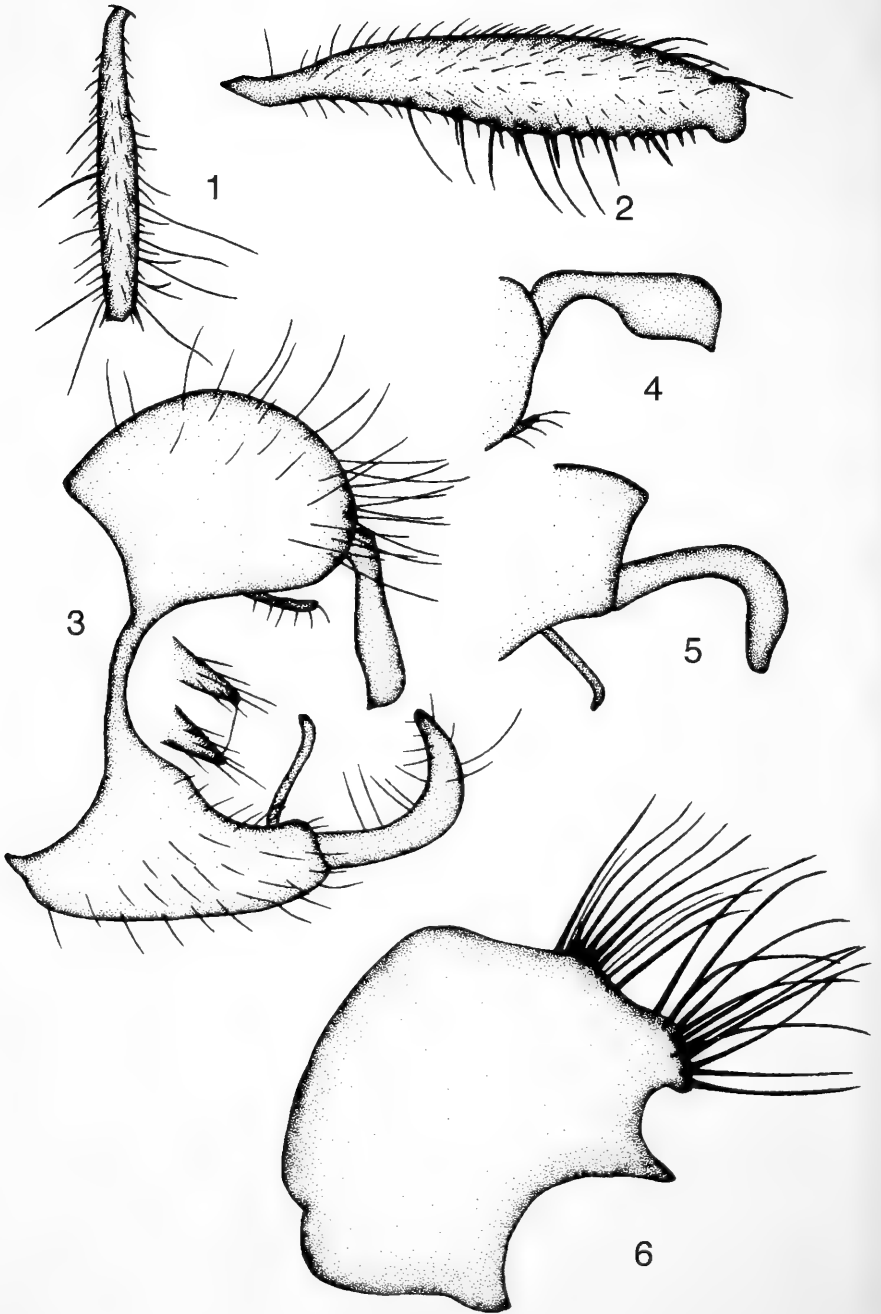
*Thorax:* black, pale grey microtrichose. Setae and setulae black; postpronotal lobe with black setulae; h absent, 2 npl (anterior npl short), acr in 6 more or less regular rows; dc in one row: 1 long posterior dc, 10 setulae anterior; 1 long presc, 1 long psa; scutellum with 8 marginal setulae and 2 long subapical setae.

*Legs:* entirely black, with black setae and setulae; fore and mid tibiae, first and second tarsomeres (except mid second tarsomere) with rather long setulae. Fore femur 1.25 times as wide as mid femur, with a row of long setulae-like pv; mid femur with some long setulae-like ad and one row of dense very long setulae-like pv; hind femur (Fig. 2) 2.1 times as wide as mid femur, with 3 preapical dorsal setae, and with about 3 rows of ventral spines located on weak tubercles, those of the av row (except 2 apical ones) are rather long and seta-like. Fore tibia (Fig. 1) with 1 ad at middle, 1 very short av and 1 very short pv apically; mid tibia with 2 ad medially, and 1 very long av apically; hind tibia with 1 weak ad at middle and with 1 long preapical pd. First mid tarsomere with 1 long ad in basal third and with 1 long ad at tip. First and second hind tarsomeres with short, strong v.

*Wing:* slightly tinged with grayish; veins dark brown; stigma longer than half the length of r1 along costa, dark brown. Squama dark yellow, bordered with pale setulae. Halter brown.

*Abdomen:* slightly curved downward, black, grey microtrichose. Setulae black. Male genitalia (Figs 3-6): left tergal lobe with long finger-like inner process, left surstylus hook-like; right tergal lobe with two short finger-like marginal processes, right surstylus curved medially with nearly straight dorsal margin; hypandrium rather wide, nearly as wide as long, distinctly incised apically, with two groups of dense long lateral setae.

*Female.* Unknown.



FIGS 1-6

*Hybos liui* sp. n. (male, holotype). 1, fore tibia, posterior view; 2, hind femur, anterior view; 3, genitalia, dorsal view; 4, right surstylus; 5, left surstylus; 6, hypandrium, ventral view.



## DISTRIBUTION

China (Guangxi).

## REMARKS

The new species is somewhat similar to *Hybos maoershanus* Yang & Yang from Guangxi by the rather short hypandrium. *H. liui* can be easily separated from the latter by the hind tibia with 1 ad at middle and pubescent arista. In *H. maoershanus*, the hind tibia has no ad at middle, and the arista is bare (Yang & Yang, 1995b).

*Hybos quadriseta* sp. n.

Figs 7-11

## MATERIAL

Holotype male, Guangxi: Maoershan National Nature Reserve, Antangping (1600 m), light trap, 1. VII. 2003, Shuwen An (CAU). Paratypes 2 males, Guangxi: Maoershan National Nature Reserve, near Antangping (1100-1600 m), 1. VII. 2003, Xingyue Liu (CAU & MHNG).

## ETYMOLOGY

The species is named after the hypandrium with 4 long setae. The name is a feminine noun in apposition.

## DIAGNOSIS

Wing hyaline with indistinct stigma; legs and antennae entirely black. Mid femur rather thin; mid tibia with one very long basal ad and a very long apical av; male genitalia characteristic with bifurcated hypandrium bearing 4 long, black setae (Fig. 11).

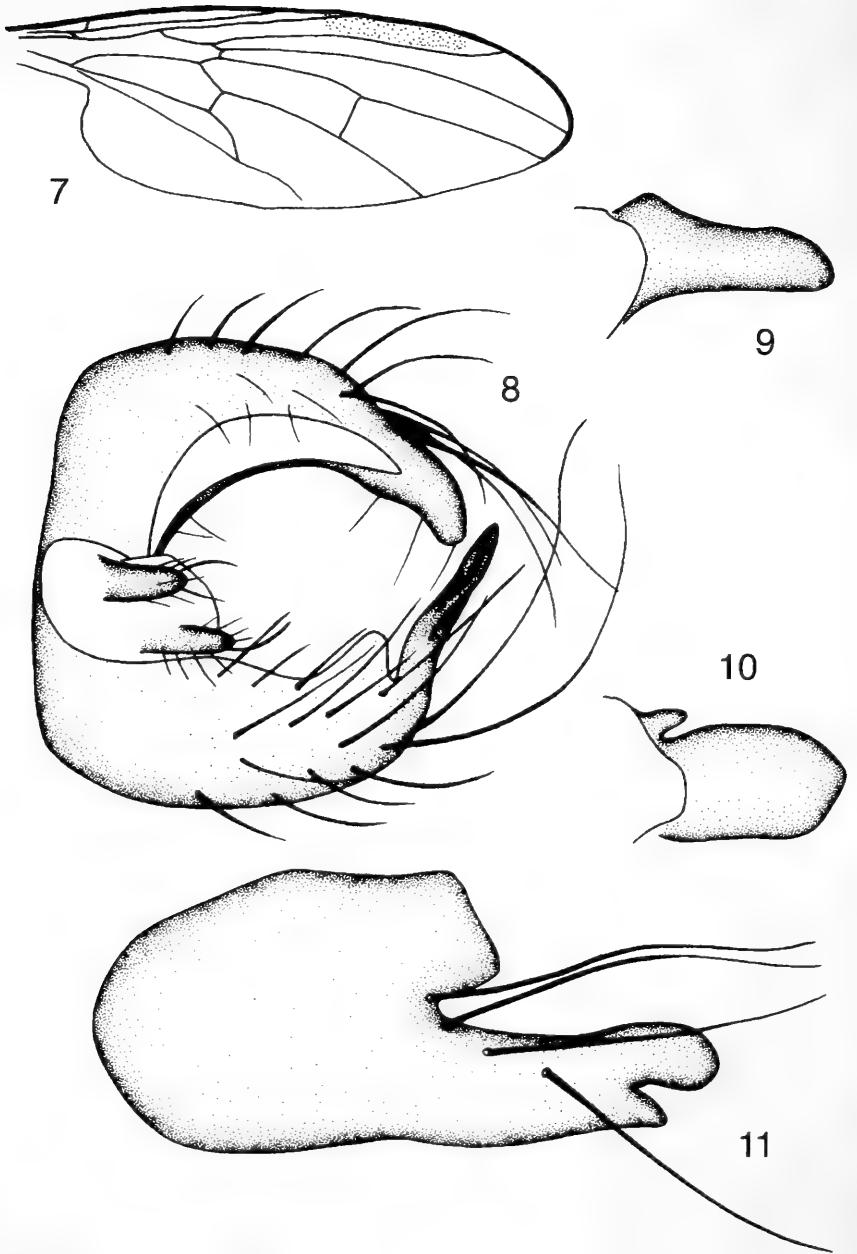
## DESCRIPTION (MALE)

*Measurements*: Body length 2.9-3.0 mm, wing length 3.3-3.4 mm.

*Head*: black, pale gray microtrichose. Eyes dark brown but enlarged upper facets dark yellow; contiguous on frons for a long distance more than 2.5 times the length of the first flagellomere. Setae and setulae black; ocellar tubercle distinct, with a pair of long oc and 2 very short posterior setulae. Antenna black; scape without setulae; pedicel with a circle of apical setulae; first flagellomere with or without dorsal setula at apex; arista black, short pubescent except for thin and bare apical quarter. Proboscis black; palpus black with 2 long ventral setulae.

*Thorax*: subshiny black, thin pale gray microtrichose. Setae and setulae black; postpronotal lobe with 2 short, pale setulae, 2 npl (anterior npl short), acr setulae-like, in 4 more or less regular rows; dc in one row: 1 long posterior dc, 6 setulae anterior; 1 psa; scutellum with 3 pairs of marginal setae, the subapical pair much longer and stronger than the basal and apical pairs.

*Legs*: entirely black. Setae and setulae black. Fore femur 1.3 times as wide as mid femur; mid femur rather thin; hind femur distinctly swollen, 2.1 times as wide as mid femur, without preapical setae, and with 3 rows of v (4 rather long spine-like av, very short spine-like v located on weak tubercles, pv long, setulae-like). Fore and mid femur with a row of long setulae-like pv (longer than femur width). Fore tibia with 3 long pv of increasing length on apical quarter, 1 long ad and 2 short av apically; mid



FIGS 7-11

*Hybos quadriseta* sp. n. (male, holotype). 7, wing; 8, genitalia, dorsal view; 9, right surstylus; 10, left surstylus; 11, hypandrium, ventral view.

tibia with 1 very long ad at basal third longer than half the length of the tibia, 1 very long av apically (more than half as long as mid basitarsus) and 1 short pv; hind tibia with 1 short av apically. First fore tarsomere with 2 long pv on basal third. First mid tarsomere with 1 short, strong v at extreme base. First and second hind tarsomeres with short, strong v.

*Wing*: hyaline; veins brown; stigma longer than half the length of r1 along costa, indistinctly brownish (Fig. 7). Squama yellow with pale hairs along margin. Halter dark yellow with dark brown base.

Abdomen curved downward, blackish, grey microtrichose. Setulae long, pale. Male genitalia (Figs 8-11): Left tergal lobe with inner margin weakly convex medially, left surstylus rather wide with small acute lateral process; right tergal lobe with a distinct inner incision, right surstylus slightly narrowing towards tip; hypandrium much longer than wide, with elongated lateral portion apically furcated into large obtuse process and small acute process, and with 4 long setae.

*Female*. Unknown.

#### DISTRIBUTION

China (Guangxi).

#### REMARKS

The new species is somewhat similar to *Hybos apicichamatus* Yang & Yang from Zhejiang, but may be separated from this species by the presence of 1 very long ad on the mid tibia and the absence of an apico-lateral hook on the hypandrium (see also Yang & Yang, 1995a).

#### *Hybos shuwenae* sp. n.

Figs 12-20

#### MATERIAL

Holotype male, Guangxi: Maoershan National Nature Reserve, Hongjunting, 1600 m, light trap, 28. VI. 2003, Shuwen An (CAU). Paratypes 1 female with same data (CAU); 1 male, Guangxi: Maoershan National Nature Reserve, 1100-1600 m, 1. VII. 2003, Xingyue Liu (MHNG).

#### ETYMOLOGY

The species is named after the collector Ms Shuwen An.

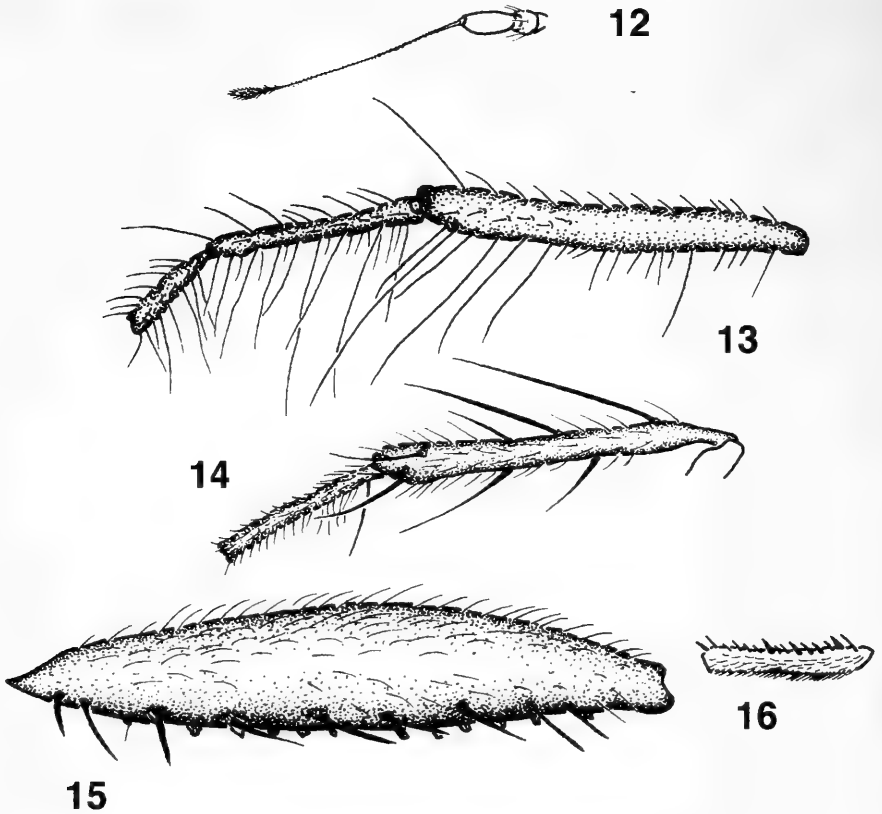
#### DIAGNOSIS

*Male*: Arista with swollen tip bearing short pubescence (Fig. 12). Antenna and legs black, only very base of hind tibia narrowly yellow; male genitalia characteristic with both surstyli and hypandrium bilobated (Figs 17-20).

#### DESCRIPTION

*MALE. Measurements*: Body length 4.7-5.3 mm, wing length 4.3-5.0 mm.

*Head*: black, pale gray microtrichose. Eyes dark brown with enlarged upper facets reddish yellow, contiguous on frons for a distance about twice as long as first flagellomere. Setae and setulae black; ocellar tubercle distinct, with one pair of long oc and 2 short to long posterior setulae. Antenna black; scape without setulae; pedicel with a circle of apical setulae; first flagellomere without dorsal setula; arista black,



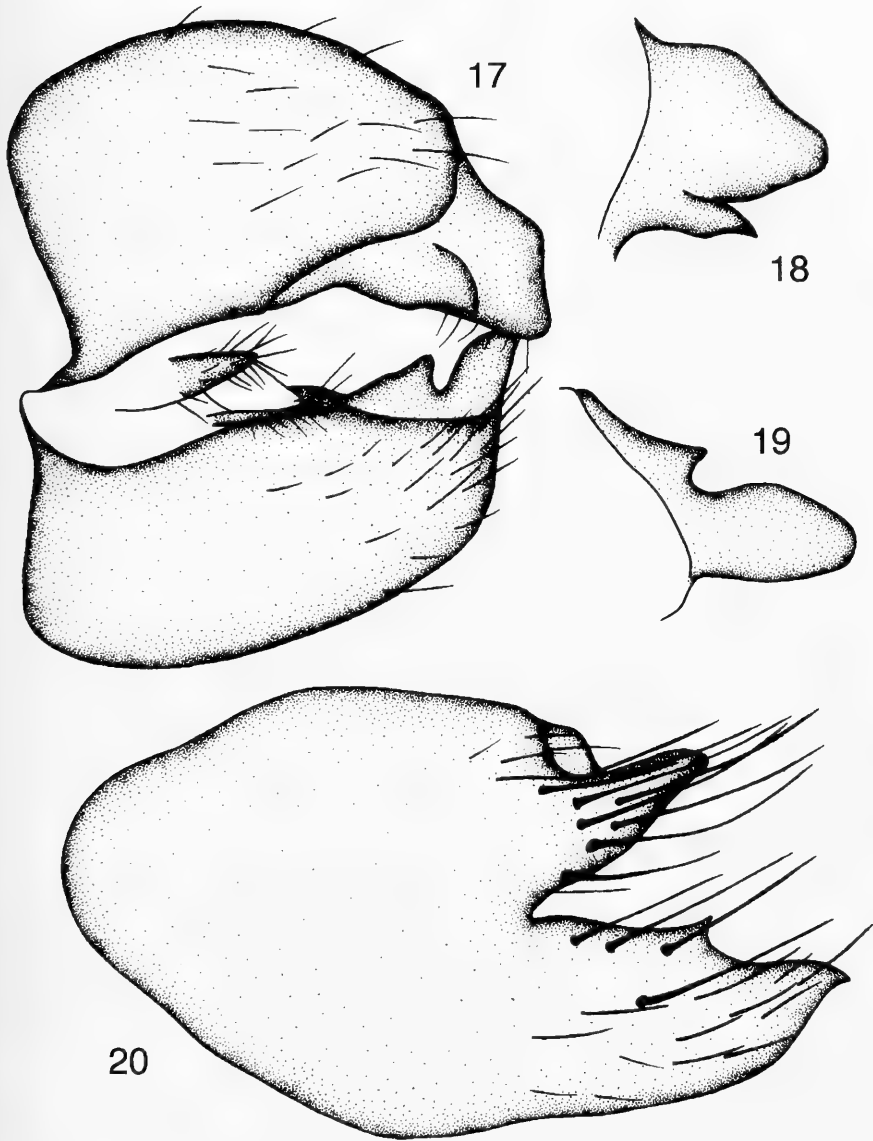
FIGS 12-16

*Hybos shuwenae* sp. n. (male, paratype). 12, antenna; 13, fore tibia and first and second tarsomeres, posterior view; 14, mid tibia and mid first tarsomere, posterior view; 15, hind femur, anterior view; 16, hind first tarsomere, anterior view.

short pubescent, with swollen tip bearing short pubescence (Fig. 12). Proboscis blackish; palpus blackish with 4-5 long ventral setulae.

*Thorax*: black, pale gray microtrichose. Setae and setulae black; h absent, but with a row of about 4 upright soft setulae, 2 npl (anterior npl very short), acr setulae-like, in 6-rows; dc in one row: 1 long posterior dc, 6 setulae anterior; 1 psa; scutellum with 3 pairs of small, soft setulae and a pair of strong, long subapical setae.

*Legs*: black, but base of hind tibia narrowly yellow. Setae and setulae black. Fore femur 1.1 times as thick as mid femur; hind femur swollen, 2.2 times as thick as mid femur; hind femur with 2 ad setae on apical two third, with an entire row of strong and long av on tubercles, a row of short v on tubercles and some pv on smaller tubercles in basal third; pv soft, much longer than diameter of femur in apical two third (Fig. 15). Fore and mid femora with a row of short setulae-like av about as long as diameter of tibia, and with a row of long setulae-like pv much longer than diameter of femur. Fore tibia (Fig. 13) with long pv on apical third of increasing length, the longest



FIGS 17-20

*Hybos shuwenae* sp. n. (male, holotype). 17, genitalia, dorsal view; 18, right surstylus; 19, left surstylus; 20, hypandrium, ventral view.

about half as long as the tibia length, with an apical ring of 1 long ad, d and av; mid tibia (Fig. 14) with 2 very long ad on basal half longer than half length of tibia, 2 av medially (the longer almost half as long as tibia length), apically 1 weak ad, 4 strong v and 1 very long av almost as long as mid basitarsus; hind tibia with an entire row of weak, soft pd about as long as diameter of tibia, without distinct setae apically. First

and second fore tarsomeres (Fig. 13) with entire rows of long sparse ad and pv, the longest setulae almost as long as first basitarsus length; The fore first tarsomere with 1 ventral spine-like v at extreme base; first mid tarsomere with a soft, long v at base almost half as long as length of tarsomere; First and second hind tarsomeres with short ventral spines (Fig. 16).

*Wing*: hyaline; veins dark brown; stigma brownish, long, extending from R1 to R2+3. Squama yellow with pale hairs along margin. Halter yellow.

Abdomen curved downward, black, gray microtrichose. Setulae black or pale. Male genitalia (Figs 17-20): Left tergal lobe with inner margin slightly convex medially, left surstylus wide basally with small acute lateral process; right tergal lobe with inner margin weakly incised, right surstylus rather wide basally with small acute lateral process; hypandrium longer than wide, distinctly furcated apically, 4 long setae on ventral branch.

**FEMALE.** Body length 5.0 mm, wing length 4.7 mm. Similar to male, but oc with distinctly longer posterior setulae; arista normal with very short tip which is bare and evenly thin; fore and mid tibiae and tarsomeres 1-2 without posterior setulae; hind femur with 1 preapical setae.

#### DISTRIBUTION

China (Guangxi).

#### REMARKS

The new species shares with *Hybos starki* Yang & Yang from Guangxi the furcated hypandrium, differing from the latter by the swollen tip of the distinctly pubescent arista and mid tibia with 2 av. In *H. starki*, the arista is not swollen apically and its tip is bare, and the mid tibia has no av (Yang & Yang, 1995b).

#### CONCLUSIONS

Including the present study 17 species of *Hybos* are known to occur in Guangxi. Among them 10 species are so far endemic to the province, 3 species are distributed also in other parts of Southern China, and 4 species are also recorded from provinces in Central China. Obviously, the fauna of *Hybos* in Guangxi has close relationships to other parts of Southern and Central China and differs strongly from the fauna in Northern and Western China.

#### ACKNOWLEDGEMENTS

The first author is much indebted to Prof. Min Wang (South China Agricultural University, Guangzhou) for organizing the survey of Guangxi, as well as to Ms Shuwen An and Mr Xingyue Liu (China Agricultural University, Beijing) for their help in many ways. The research was funded by the National Natural Science Foundation of China (No. 30070100\_No. 30225009).

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## **Campodéidés cavernicoles du nord-est de la péninsule Ibérique (Diplura: Campodeidae)**

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**Cave-dwelling Campodeids from the northeastern Iberian Peninsula (Diplura: Campodeidae).** - Two new species and one new subspecies of campodeids (Diplura) are described from caves of the northeastern Iberian Peninsula: *Campodea (Campodea) cossetana* sp. n., *Campodea (Campodea) maestrazgoensis* sp. n. and *Plusiocampa bonneti condei* ssp. n. Ten additional forms are studied, all of them belonging to the same biogeographic area. We finally discuss some hypotheses concerning the colonization's chronology of the northeastern Iberian Peninsula.

**Keywords:** Diplura - Campodeidae - *Campodea* - *Paratachycampa* - *Litocampa* - *Podocampa* - cave fauna - taxonomy - Iberian distribution - new species.

### INTRODUCTION

Depuis plus d'un demi-siècle, le personnel et les collaborateurs du Musée de Zoologie de Barcelona réalisent un travail méticuleux d'exploration et de collecte des Diploures Campodéidés cavernicoles, spécialement ceux des massifs karstiques du nord-est de la péninsule Ibérique. Les premiers résultats sont publiés par Condé (1951a) qui décrit les premières espèces de Campodéidés cavernicoles de Catalunya: *Campodea egena* Condé, 1951, *Plusiocampa pouadensis leoni* Condé, 1951, et signale la présence de *Plusiocampa bonneti* Condé, 1948 connue jusqu'alors de diverses grottes françaises. En trente ans le Musée a réuni 306 exemplaires provenant de 80 cavités du milieu souterrain du nord-est de la péninsule Ibérique, des Pyrénées de Catalunya et de Huesca, tout le long de la cordillère des Catalanides et des massifs montagneux du Système Ibérique du Maestrazgo, à l'extrémité méridionale des chaînes valenciennes, avant de pénétrer dans les contreforts du système Prébétique. De ce riche et précieux matériel Bareth & Condé (1981), Sendra (1985, 1990) et Sendra & Condé (1987) décrivent trois nouvelles espèces (*Paratachycampa hispanica* Bareth & Condé, 1981; *Paratachycampa peynoensis* Bareth & Condé, 1981, *Campodea (Campodea) grallesiensis* Sendra & Condé, 1987) et signalent quatre autres espèces cavernicoles connues seulement du versant français des Pyrénées (Figs 8 et 9).

Cette fois-ci, et grâce à nouveau aux activités du Musée de Zoologie de Barcelone, une riche collection de Diploures Campodéidés des massifs karstiques du nord-est de la péninsule Ibérique a pu être examinée.

## MATÉRIEL ET MÉTHODES

Au total 172 campodéidés cavernicoles ont été étudiés dans ce travail, récoltés dans 42 cavités naturelles du milieu souterrain de Catalunya, d'Aragón et du nord de la Communauté Valencienne. La capture des exemplaires a été réalisée par échantillonnages effectués dans les différentes grottes, depuis la zone non illuminée, jusqu'aux zones plus profondes, employant deux méthodes de capture: pièges Barber (glycol-bière) et ratissage.

La plupart des exemplaires ont été montés dans le milieu II de Marc André, après un lavage à l'eau distillée. L'étude des exemplaires se réalisa sous un microscope Leica DMLS, à contraste de phases, et les dessins ont été réalisés à l'aide d'un tube à dessin 1x.

Les mesures furent prises à l'aide d'un oculaire micrométrique. Pour la longueur du corps nous avons mesuré les exemplaires préparés 'in toto', depuis l'extrémité du processus frontal de la tête jusqu'à la valvule supra-anale de l'abdomen. Compte tenu des erreurs dues à la contraction des exemplaires, nous avons adopté comme estimation de la longueur totale du corps le LCT, c'est-à-dire la longueur combinée de la tête, du pronotum, du mésonotum et du métanotum (Sendra, 1988), mesurée comme suit: de la base du macrochète distal du processus frontal au bord postérieur de la capsule céphalique, pour la tête et de la base des macrochètes médiaux antérieurs à la base des soies marginales postérieures, pour chacun des notums thoraciques.

Abréviations: ma: médial antérieur; la: latéral antérieur; lp: latéral postérieur;  $\delta$ : distance entre les bases des macrochètes médiaux antérieurs de l'urotergite et les bases des soies marginales postérieures;  $\epsilon$ : distance entre les bases des deux macrochètes médiaux antérieurs d'un urotergite donné;  $\Sigma$  mar.: somme de la longueur des trois soies marginales postérieures notales les plus proches des macrochètes lp divisée par trois. Macrochètes de la portion antérieure de la capsule céphalique (a: macrochète antérieur; i: macrochète intermédiaire; p: macrochète postérieur; x: phanères x).

## RÉSULTATS

### *Litocampa vandeli* (Condé, 1947)

Syn. *Plusiocampa vandeli* Condé, 1947: 21.

Syn. *Plusiocampa vandeli longiseta* Condé, 1948.

1 ♀, Aragón, Huesca, Fanlo, Espluca Mayor, 25.VI.1985, leg. O. Escolà; 2 ♂♂, 2 ♀♀, Catalunya, Lleida, Pallars Jussà, Llesp, Aven d'Irgo, 27.VII.1986, leg. O. Escolà.

Total: 5 exemplaires; 2 ♂♂, 3 ♀♀. Une femelle avec deux antennes intactes de 25 articles et un mâle avec une de 24 articles.

L'article apical renferme, dans son organe cupuliforme, 4 sensilles robustes.

*Distribution.* Cette espèce est connue du milieu souterrain profond et du milieu superficiel de la région française d'Ariège (Bareth, 1983), aux Pyrénées centrales. En plus, *L. vandeli* se trouve sur le versant espagnol, où elle est signalée de trois grottes

des Pyrénées de Huesca et de Lleida. Bareth & Condé (1981) la mentionnèrent dans une grotte très éloignée de ses localités habituelles, au Aven d'En Serenge (Cabanes, Castellón).

***Litocampa coiffaiti*** (Condé, 1948)

Syn. *Plusiocampa coiffaiti* Condé, 1948a: 41.

1 ♀, Aragón, Huesca, Ansó, Grotte Faixa des Anollos, 2.VIII.1985, leg. O. Escolà; 1 ♂, Aragón, Huesca, Hecho, Aven Torrent-Cema Blanca-Agüerri, 8.X.1988, leg. O. Escolà.

La femelle possède une antenne intacte de 41 articles et le mâle une de 38 articles.

*Distribution.* Espèce limitée à la zone axiale des Pyrénées centrales (cinq cavités du versant de Huesca) et une grotte des Pyrénées Atlantiques françaises (Grotte d'Ayssaguer, localité type).

***Litocampa drescoi*** (Condé, 1949)

Syn. *Plusiocampa drescoi* Condé, 1949: 572.

3 ♀♀, Aragón, Huesca, Abay, San Juan Peña, Grotte Mora, 4.XI.1984, leg. O. Escolà.

Femelles avec deux antennes intactes de 33 et 34 articles.

*Distribution.* Espèce connue du milieu endogé des régions françaises d'Ariège et Hautes Pyrénées (Condé & Mathieu, 1957), mais elle fut décrite dans une grotte, plus au nord, en Haute Garonne. Sur le versant espagnol, elle est exclusivement connue dans deux grottes des Pré-Pyrénées de Huesca.

***Podocampa jeanneli*** (Condé, 1947)

Syn. *Campodea (Podocampa) jeanneli* Condé, 1947: 18.

1 ♂ (piège glycol-bière), Catalunya, Lleida, Senterada, Aven Mollons, 23.IX.1984/1.I.1985, leg. O. Escolà.

*Distribution.* Cette espèce a été décrite et trouvée dans quatre grottes du versant français des Pyrénées Centrales. En plus, elle a aussi été signalée du milieu souterrain superficiel, en Ariège (Bareth, 1983). Sur le versant espagnol, elle est connue de six grottes des Pré-Pyrénées de Lleida, dans des chaînes de montagne comme celles de Montsec et Cadí.

***Plusiocampa bonneti bonneti*** Condé, 1948

Syn. *Plusiocampa pouadensis bonneti* Condé, 1948b: 54 [grottes françaises de l'Hérault et du Gard].

***Plusiocampa bonneti escolai*** Sendra, 1985 [diverses grottes espagnoles de Lleida, Huesca y Tarragona] **syn. nov.**

1 ♀, Aragón, Huesca, Fanlo, Grotte Molino de Aso, leg. O. Escolà; 1 ♂, Catalunya, Lleida, Fontllonga, Grotte Forat Or, 24.VII.1994; 4 ♂♂, 9 ♀♀, 1 juvénile (piège glycol-bière), Catalunya, Lleida, Tremp, Llastarri, Mine 'Inferior Canal', 28.XII.1982 / 29.XII.1984, leg. O. Escolà; 1 ♂, 3 ♀♀, 1 juvénile, Catalunya, Lleida, St. Esteve de la Sarga, Grotte Brugal, 10.XII.1967, leg. O. Escolà; 1 juvénile, Catalunya, Tarragona, Benifallet, Grotte Meravelles, IV.1979, leg. I. Gonzalez; 1 ♀, Catalunya, Tarragona, Cornudella, Grotte Santa du Montsant, 6.II.1966, leg. O. Escolà.

Total: 23 exemplaires; 6 ♂♂, 14 ♀♀ et 3 juvéniles. Seulement deux antennes de deux mâles sont intactes avec 34 et 37 articles.

Cette espèce fut décrite comme sous-espèce de *Plusiocampa pouadensis* (Denis, 1930) par Condé en 1948 de trois grottes françaises, deux de l'Hérault (Aven-Grotte du Berger et Grotte de la Colombière) et une du Gard (Aven de Paulin). Sendra (1985) a élevé au rang spécifique cette sous-espèce et décrit par erreur une nouvelle sous-espèce *Plusiocampa bonneti escolai* pour les exemplaires capturés dans 23 grottes espagnoles: 10 de Huesca, 11 de Lleida et 2 de Tarragona. Ces exemplaires appartiennent au taxon décrit par Condé (1948b), la sous-espèce décrite par Sendra (1985) en est un synonyme.

Plus récemment, Bareth & Condé (1996) ont cité *P. bonneti* de deux grottes espagnoles de Huesca (Grotte Esjamundo et Grotte Llobrica) et soulignent quelques différences morphologiques chez ces spécimens: la présence de deux macrochètes la3 sur l'urotergite III, inexistantes chez *bonneti* typique.

*Distribution.* L'espèce typique possède une vaste distribution, des trois grottes françaises de l'Hérault et du Gard (Condé, 1948b) aux Pyrénées et Pré-Pyrénées de Huesca et de Lleida (chaînes de Guara et de Montsec), avec la limite méridionale dans les chaînes sud-occidentales des Catalanides, à l'intérieur de Tarragona.

***Plusiocampa bonneti condei* ssp. n.**

Syn. *Plusiocampa pouadensis bonneti* sensu Condé, 1951 [2 grottes de Barcelona].

Syn. *Plusiocampa bonneti* sensu Sendra, 1985 [29 grottes de Barcelona, Lleida et Tarragona].

Holotype, ♀, Catalunya, Barcelona, Moia, Grotte du Toll, 16-XII-1962, leg. O. Escolà.

Paratypes: 1 ♀, Catalunya, Barcelona, Serra de l'Obac, Mura, Aven de la Canal de Mura, 28.II.1988, leg. O. Escolà; 1 ♀, 1 juvénile, Catalunya, Barcelona, Moia, Aven de Castellcir, 2.II.1986, leg. O. Escolà; 1 ♀, Catalunya, Barcelona, Caldes Montbui, Aven Farell, 19.XI.1989, leg. O. Escolà, 1 ♀, 4.II.1990, leg. O. Escolà; 1 ♂, 1 ♀, Catalunya, Barcelona, Collsuspina, Mines Santa Coloma, 29.IX.1984, leg. O. Escolà; 2 ♀♀, Catalunya, Barcelona, Mura, Aven de l'Esplugu, 6.XII.1986, leg. O. Escolà.

Total: 9 exemplaires; 2 ♂♂, 6 ♀♀, 1 juvénile.

L'holotype est la femelle de la Grotte du Toll (Moia, Barcelona) dont le processus frontal est figuré dans Sendra (1985: fig. 2.A). Il est monté dans le médium II de Marc André, préparation n° 346, et déposé dans la collection de Diploures du Musée de Zoologie de Barcelona. Les exemplaires restants, conservés dans le médium Marc André II et considérés comme paratypes, incluent tous les exemplaires déterminés comme *Plusiocampa bonneti* par Sendra (1985) et sont déposés au Muséum d'histoire naturelle de Genève (Département des Arthropodes et Insectes I), au Muséum National de Sciences Naturelles de Madrid et au Muséum Valencien d'Histoire Naturelle (Fondation Entomologique Torres Sala).

*Description.* Processus frontal (Sendra 1985: fig. 2.A) avec trois macrochètes à base tuberculée; le macrochète apical plus développé et barbulé à partir de sa moitié distale, les deux postérieurs barbulés dans leur tiers distal. Les soies postérieures du processus frontal sont glabres et tuberculées.

*Étymologie.* Espèce dédiée au Professeur Bruno Condé de l'Université de Nancy, meilleur spécialiste des Diploures Campodéidés, qui fut le premier à examiner cette nouvelle sous-espèce.

*Affinités.* Condé (1951a) détermine comme *Plusiocampa pouadensis bonneti* plusieurs exemplaires récoltés dans des cavités naturelles de la province de Barcelona

(Grotte Cau de la Guilla, Bigues et Grotte du Toll, Collsuspina). Quelques années plus tard, Sendra (1985) nomme, cette fois comme *Plusiocampa bonneti*, des exemplaires capturés dans ces mêmes grottes et dans 27 autres grottes (22 de Barcelona, 4 de Lleida et 1 de Tarragona), fournissant certaines considérations taxonomiques, y compris la description du processus frontal (Sendra, 1985: fig. 2.A). Condé & Bareth (1996) signalent quelques caractères taxonomiques de *Plusiocampa bonneti* que Condé (1948b) n'avait pas indiqués, surtout la morphologie des bases des soies qui accompagnent les trois macrochètes du processus frontal, qui sont clairement tuberculés chez *Plusiocampa bonneti* des grottes françaises.

Cette sous-espèce comprend les exemplaires déterminés comme *P. bonneti* dans les travaux de Condé (1951a) et Sendra (1985). Dans tous les exemplaires examinés de *Plusiocampa bonneti condei* ssp. n. les soies postérieures aux trois macrochètes du processus frontal possèdent une base non tuberculée, fig. 2.A in Sendra (1985), à la différence des bases typiques tuberculées de la forme type de *P. bonneti*, fig. 2.B in Sendra (1985).

*Distribution.* Cette nouvelle sous-espèce est connue de nombreuses grottes des Catalanides, au nord de Tarragona et spécialement dans les chaînes de montagne de Sant Llorenç del Munt et de l'Obac. En plus, elle atteint sa limite nord-occidentale à la chaîne de Cadí, aux Pyrénées de Lleida.

### *Campodea (Campodea) egena* Condé, 1951

*Campodea (Campodea) egena* Condé, 1951a: 54.

3 ♂♂, 1 ♀, Catalunya. Barcelona, Esparreguera, Aven Montserrat, 12.V.1991, leg. O. Escolà; 3 ♀♀, Catalunya, Barcelona, Anoià, Cabrera, Grotte Dakotes, 23.II/15.III.1998, leg. O. Escolà; 1 ♂, 3 ♀♀ (piège), Catalunya, Barcelona, Anoià, Cabrera, Grotte Mamut, 15.III.1998/13.IX.1999, leg. O. Escolà. Total: 11 exemplaires; 4 ♂♂, 7 ♀♀. Seule une femelle possède ses antennes intactes: 44 et 46 articles.

*Distribution.* Endémique du Massif barcelonais de Montserrat et des reliefs karstiques voisins, de la zone de l'Anoià.

### *Campodea (Campodea) cf. egena* Condé, 1951

1 ♂, Catalunya, Tarragona, Tivissa, Grotte Marcó, 16.IV.1989, leg. F. Fabrique; 1 ♀, Communauté Valencienne, Castellón, Cabanes, Aven d'En Serenge, 1.12.2002, leg. S. Montagud.

Sensille du troisième article en position latéro-sternale. Deux antennes intactes de 34 articles chez la femelle. L'organe cupuliforme renferme 7 sensilles. Chez les deux exemplaires étudiés les submacrochètes médiaux urotergaux sont absents. Le mâle adulte, avec des faisceaux de spermatozoïdes, possède un champ glandulaire continu de soies  $g_1$  à l'urosternite I et de soies glandulaires et sensorielles  $a_1$  et  $a_2$  sur ses appendices.

Bareth & Condé (1981) décrivent des spécimens de l'Aven d'En Serenge (Cabanes, Castellón), qui diffèrent de *egena* typique par l'absence complète des submacrochètes médiaux antérieurs des urotergites I à VII, en plus de la présence chez le mâle d'un champ glandulaire continu de soies glandulaires et sensorielles  $g_1$ . Sendra (1988, 1990) observe les mêmes caractères chez des spécimens de la Grotte d'En Janet (Llaberia, Tarragona).

Les caractères mentionnés plus haut ont été observés chez tous les exemplaires étudiés par Bareth & Condé (1981) et Sendra (1988, 1990). Cette constance chez des exemplaires de trois grottes différentes pourrait indiquer une différence sous-spécifique des spécimens de *C. egena* hors du Massif karstique de Montserrat.

*Distribution.* Forme connue jusqu'à présent de trois cavités, distribuées d'une part et d'autre de la vallée de l'Ebre. D'un côté, dans les massifs de Llaberia et Tivissa à Tarragona et de l'autre, au karst de Cabanes, à Castellón.

***Campodea (Campodea) grallesiensis* Sendra & Condé, 1987**

4 ♂♂, 5 ♀♀, Communauté Valencienne, Valencia, Dos Aguas, Grotte Merevelles, 30-XI-2003, A. Moreno, S. Teruel, S. Montagud leg.

*Distribution.* Connue jusqu'à présent dans deux cavités du secteur nord oriental du Massif du Caroch, au bout méridional du Système Ibérique, en contact avec les Cordillères Bétiques.

***Campodea (Campodea) cossetana* sp. n.**

Syn. *Campodea (Campodea) zuluetai* sensu Sendra, 1990 [cinq cavités de Tarragona].

Holotype: ♀ de 5.8 mm, n° préparation 796, Catalunya, Tarragona, Espulga Francolí, Grotte Espluga de Francolí, 1.XII.1985 au 14.XII.1986, leg. O. Escolà; montée en Marc André II et déposée au Musée de Zoologie de Barcelona.

Paratypes: 18 ♂♂, 24 ♀♀, 2 juvéniles ♀♀ (piège de glycol-bière), Catalunya, Tarragona, Espulga Francolí, Grotte Espluga de Francolí ou Aigües, 1.XII.1985 au 14.XII.1986, leg. O. Escolà; conservés dans le médium Marc André II et déposés au Musée d'histoire naturelle de Genève (Département des Arthropodes et Insectes II), au Musée National de Sciences Naturelles de Madrid et au Musée Valencien d'Histoire Naturelle (Fondation Entomologique Torres Sala).

Autre matériel étudié: 1 ♀, Catalunya, Tarragona, Espulga Francolí, Grotte Espluga de Francolí ou Aigües, 14.XII.1986, leg. O. Escolà, 1 ♂, 28.III.1971, leg. G.I.E.M.; 1 ♂, Catalunya, Tarragona, Vimbodí, Aven Julivert, 6.VII.1969, leg. G.I.E.M.; 2 ♂♂, Catalunya, Tarragona, Vimbodí, Grotte Assedegats, 12.VII.1973, leg. A. Martínez; 2 ♂♂, 1 juvénile, Catalunya, Tarragona, Cornudella, Grotte Santa du Montsant, 6.II.1966, 2 ♂♂, 2 ♀♀, 17.VII.1967, leg. O. Escolà; 1 ♀, Catalunya, Tarragona, Mont-ral, Grotte Codó, 18.VI.1967, leg. O. Escolà; 2 ♀♀, Catalunya, Tarragona, Grotte de la Moneda, 4.IV.1965, leg. L. Auroux, 1 ♂, 11.IV.1952, leg. F. Español.

La description de la nouvelle espèce est fondée, outre le matériel étudié cité ci-dessus, sur les exemplaires cités par Sendra (1990) comme *C. zuluetai*, de cinq grottes de la province de Tarragona: Aven du Julivert, Grotte Assedegats, Grotte Santa de Montsant, Grotte Codó et Grotte Font Major. Ces spécimens sont considérés comme paratypes.

Total: 58 exemplaires; 23 ♂♂, 33 ♀♀, 2 ♀♀ juvéniles.

*Etymologie.* Espèce dédiée aux Cossetans, peuple ibérique pré-romain qui s'étendait de la région du Camp de Tarragona jusqu'au Col de Balaguer; les régions du Conca de Barberà et Penedès faisaient peut-être aussi partie de leur territoire.

*Description.* Longueurs. Mâles 3,83 à 5,95 mm; femelles 4,55 à 6,45 mm; juvéniles 3,05 à 3,75 mm.

Téguments. Epicuticule dépourvue d'ornementation. Soies de revêtement glabres ou un peu barbelées; macrochètes robustes et bien barbelés.

Tête. Les antennes intactes ont 43 (1 cas), 39 (1 cas), 38 (2 cas), 37 (5 cas) et 36 (2 cas) articles (voir Tableau I); longueur similaire ou légèrement inférieure à celle du corps (voir Tableau I). Le troisième article est presque aussi long que large, avec un

sensille bacilliforme (Fig. 1b) qui occupe une position latéro-sternale (entre les macrochètes *d* et *e*). Les articles suivants sont un peu plus allongés, l'apical étant presque trois fois plus long que large. Sensilles en gouge (Fig. 1a) à partir du quatrième article, celui-ci avec un sensille seulement, augmentant en nombre dans les articles suivants, arrivant jusqu'à 6 distribués en un seul verticille distal. L'organe cupuliforme (Fig. 1c) occupe 1/9 de la longueur de l'article et renferme de 4 à 9 sensilles robustes et avec au moins 3 collerettes chacun.

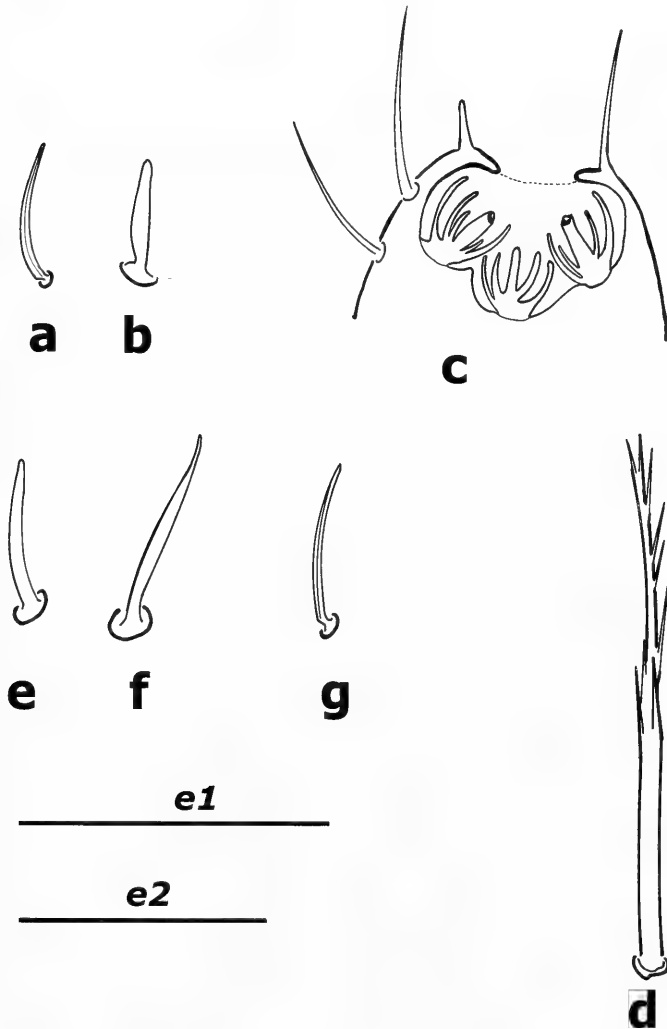


FIG. 1

*Campodea (Campodea) cossetana* sp. n.: a, sensille en rouge; b, sensille du III<sup>e</sup> article antennaire; c, coupe de l'organe cuculiforme de l'article apical; d, macrochète sternale du fémur III. *Campodea (Campodea) maestrazgoensis* sp. n.: e, sensille du III<sup>e</sup> article antennaire; f, sensille bacilliforme du trochanter II; g, sensille en gouge. Echelle *e1* = 50  $\mu$ m (a, b, c, e, f et g), *e2* = 100  $\mu$ m (d).

TABLEAU I. Antennes complètes, apparemment non régénérées, chez *Campodea (Campodea) cossetana* sp. n., holotype et paratypes, (1) derniers articles régénérés.

Sexe	Longueur corps (mm)	LCT ( $\mu\text{m}$ )	Antenne	Articles	Longueur antenne (mm)
♂	5,95	1490	gauche	38	4,55
♂	4,02	1565	gauche	37	4,00
♀ holotype	5,8	1610	gauche	39	4,55
♂	5,4	1640	gauche	43	5,20
♀	4,55	1705	droite	37	5,35
			gauche(1)	36	4,72

Les palpes labiaux sont subovales et présentent une centaine de phanères sensoriels. Le processus frontal porte les trois macrochètes typiques, l'antérieur plus long que les postérieurs (138  $\mu\text{m}$ /92  $\mu\text{m}$ ; sur l'holotype), avec des barbules sur leur moitié distale. Les macrochètes bordant la ligne d'insertion des antennes sont glabres (intermédiaires et postérieurs) ou avec quelques barbules distales (antérieurs et phanères x). Leurs longueurs sont similaires; a: 85  $\mu\text{m}$ , i: 102  $\mu\text{m}$ , p: 80  $\mu\text{m}$ , x: 95  $\mu\text{m}$ . Entre les macrochètes occipitaux on trouve une rangée latérale de 4 macrochètes avec une ou deux barbules qui sont postérieurs homologues aux *lp* de Wygodzinsky (1944).

Thorax. Les macrochètes notaux sont longs, bien développés et barbelés sur leur moitié ou leurs deux tiers distaux (voir Tableau II et Fig. 2). Les soies marginales sont un peu plus longues que les soies ordinaires; seules les deux soies marginales qui sont plus proches des macrochètes *lp* sont plus robustes et barbelées vers leur 2/3 distal, spécialement celles du pronotum et mesonotum.

TABLEAU II. Répartition des macrochètes notaux et leurs longueurs (unités en  $\mu\text{m}$ ) chez *Campodea (Campodea) cossetana* sp. n., holotype et paratypes; (1) segments de l'abdomen partiellement imbriqués.

	LCT	Pronotum				Mesonotum				Metanotum		
		ma	la	lp	$\Sigma\text{mar}$	ma	la	lp	$\Sigma\text{mar}$	ma	lp	$\Sigma\text{mar}$
Juvenile ♀, 3,05 mm	860	78	77	180	70	90	132	200	72	93	200	59
Juvenile ♀, 3,75 mm	1025	100	88	200	70	88	145	220	78	110	218	65
♂, 3,83 mm	1080	112	100	222	82	115	198	238	88	118	225	72
♂, 5,4 mm	1395	140	150	272	140	130	188	298	116	130	272	90
♂, 5,95 mm	1490	150	160	292	108	130	220	305	111	142	280	89
♀, 5,15 mm	1505	140	141	265	115	125	192	275	106	112	260	90
♂, 4,73 mm	1540	140	128	268	98	128	182	288	102	109	262	79
♂, 4,02 mm	1565	142	145	275	113	140	205	278	116	142	238	91
♀ holotype, 5,8 mm	1610	136	150	295	127	142	209	305	128	150	280	103
♂, 5,4 mm (1)	1640	158	155	285	125	162	190	300	122	155	272	99
♀, 4,55 mm (1)	1705	143	148	270	116	120	200	295	109	132	262	85
♀, 6,45 mm	1760	152	162	272	128	138	210	293	137	130	277	100

Les pattes sont relativement longues, les métathoraciques peuvent atteindre le VII segment abdominal. Le fémur III porte un macrochète sternal barbelé sur son 2/3 distal de 208  $\mu\text{m}$  (Fig. 1d), inséré, chez l'holotype, à 325  $\mu\text{m}$  du bout proximal du segment (longueur totale du fémur III de 692  $\mu\text{m}$ ). Les tibias I à III portent un macrochète sternal court, simplement bifurqué, accompagné parfois d'une ou deux petites



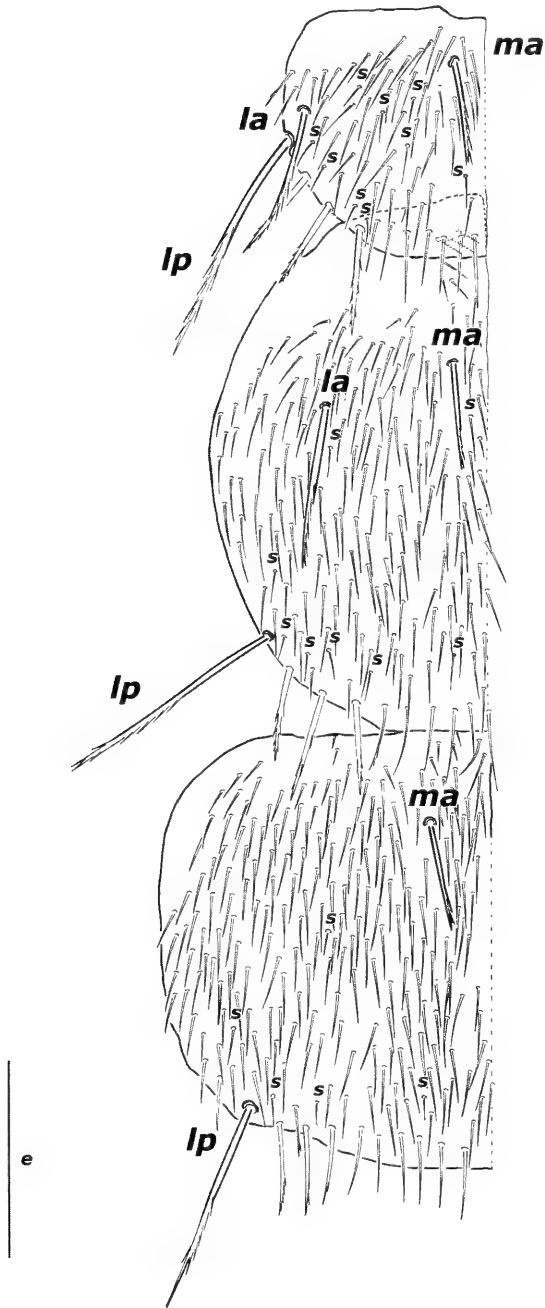


FIG. 2

*Campodea (Campodea) cossetana* sp. n.: pro-, méso- et métanotum (*ma* macrochète médial antérieur, *la* macrochète latéral antérieur, *lp* macrochète latéral postérieur, *s* sensille sétiforme). Echelle *e* = 250  $\mu$ m.

barbules. Les calcars sont bien barbelés presque depuis leur base. Les tarses portent deux rangées de soies ventrales, avec des fines barbules vers la portion médiale; les soies subapicales de l'extrémité distale du tarse sont glabres. Griffes subgêales simples, et graduellement courbées, avec les processus télotarsaux sétiformes et glabres.

Abdomen. Les urotergites portent des macrochètes médiaux antérieurs sur les segments I à VII et médiaux postérieurs sur le huitième segment; on trouve aussi des macrochètes latéraux antérieurs et postérieurs sur les urotergites V à VII et des macrochètes latéraux postérieurs sur le segment VIII (voir Tableau III et Fig. 3). Les macrochètes latéraux antérieurs et postérieurs, les médiaux postérieurs et les médiaux antérieurs des urotergites IV à VII sont longs, bien développés (spécialement les postérieurs) et avec des barbules sur leur 1/2 à 1/4 distal. Cependant, les macrochètes médiaux antérieurs des urotergites I à III sont courts et bifurqués à l'apex et n'atteignent jamais les embases des soies marginales postérieures, à la différence des *ma* des urotergites IV à VII qui les atteignent et même les dépassent, tant chez les exemplaires juvéniles que chez les adultes de grande dimension (voir Tableau IV).

TABLEAU III. Répartition des macrochètes urotergaux chez *Campodea* (*Campodea*) *cossetana* sp. n.

	ma	lp	la	mp
Ab. I-IV	1+1	-	-	-
Ab. V-VII	1+1	1+1	1+1	-
Ab. VIII	-	3+3	-	1+1
Ab. IX	-	6+6 (total)	-	-

TABLEAU IV. Longueurs des macrochètes médiaux antérieurs des urotergites III et IV, et distance entre leurs bases ( $\epsilon$ ) et celles des soies marginales postérieures ( $\delta$ ) chez *Campodea* (*Campodea*) *cossetana* sp. n., holotype et paratypes (unités en  $\mu\text{m}$ ); (1) segments de l'abdomen partiellement imbriqués.

	LCT	Urotergite III			Urotergite IV		
		ma	$\delta$	$\epsilon$	ma	$\delta$	$\epsilon$
Juvénile ♀, 3,05 mm	860	58	68	98	108	60	110
Juvénile ♀, 3,75 mm	1025	68	78	113	118	62	120
♂, 3,83 mm	1080	65	100	110	128	118	129
♂, 5,4 mm	1395	100	122	160	145	112	185
♂, 5,95 mm	1490	75	135	155	145	125	190
♀, 5,15 mm	1505	80	125	130	160	105	173
♀, 4,73 mm	1540	70	150	160	145	128	165
♂, 4,02 mm (1)	1565	72	147	155	138	137	207
♀ holotype, 5,8 mm	1610	75	146	160	160	127	195
♂, 5,4 mm	1640	85	158	165	172	150	186
♀, 4,55 mm (1)	1705	75	150	162	138	138	202
♀, 6,45 mm	1760	85	172	185	162	142	215

Les pleurites II à VII portent une soie différenciée et barbelée sur leur 1/2 à 1/3 distal. L'urosternite I possède 6+6 macrochètes; les urosternites II à VII présentent 4+4 macrochètes et le VIII 1+1; tous ces macrochètes sont bien développés et portent des longues barbules. La soie apicale des styles a deux denticules basilaires et jusqu'à 6

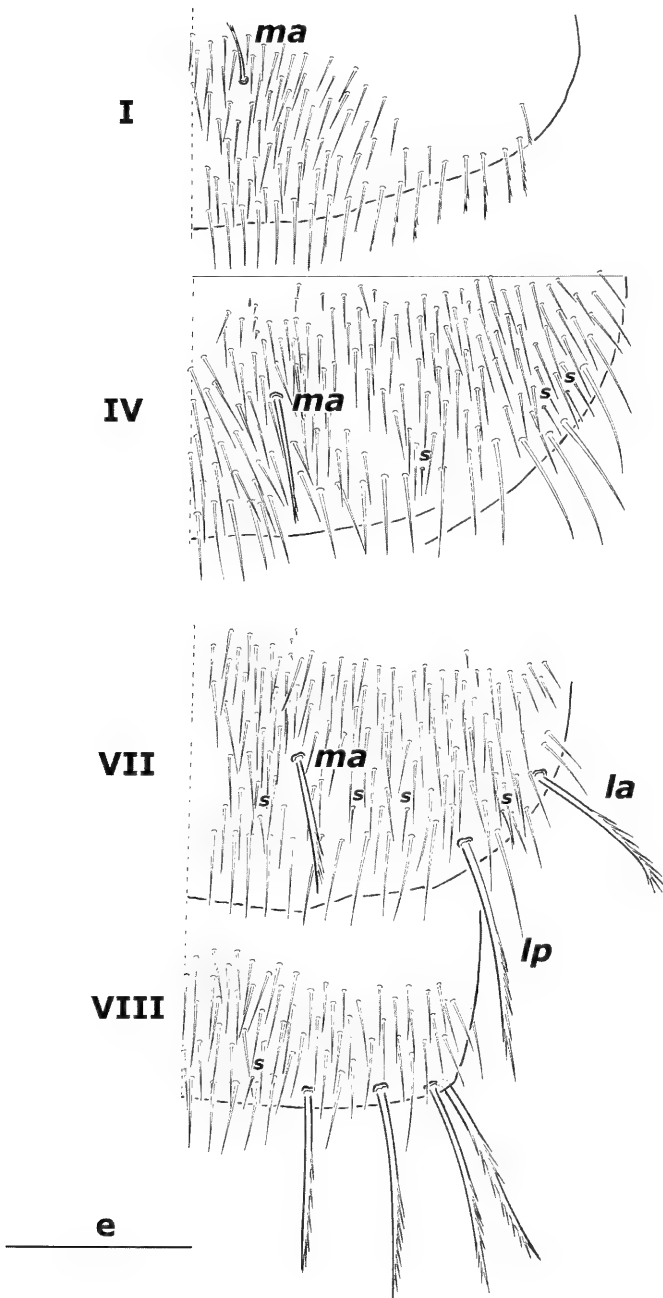


FIG. 3

*Campodea (Campodea) cossetana* sp. n.: urotergites I, IV, VII et VIII (*ma* macrochète médial antérieur, *la* macrochète latéral antérieur, *lp* macrochète latéral postérieur, *s* sensille sétiforme). Echelle *e* = 250  $\mu$ m.

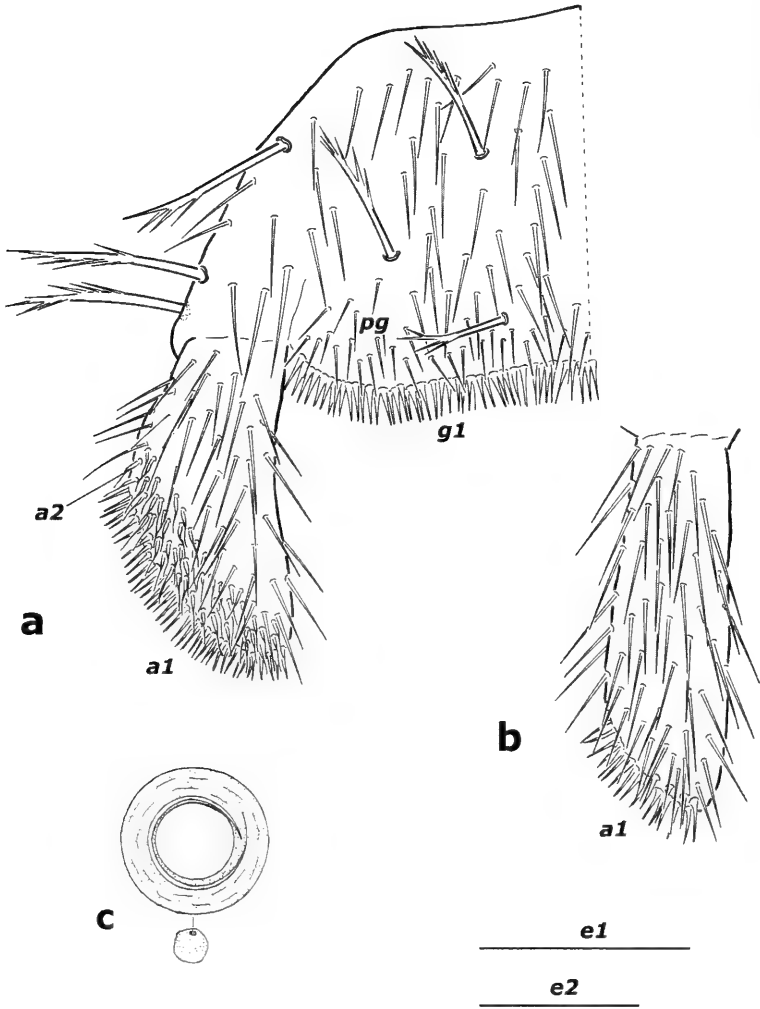


FIG. 4

*Campodea (Campodea) cossetana* sp. n.: a, urosternite I du mâle; b, appendice de l'urosternite I de la femelle; c, faisceau de spermatozoïdes avec une coupe transverse montrant le filament en section. Soies glandulaires et sensorielles: a1, a2 et g1; poils grêles pg. Echelle e1 = 250  $\mu$ m (a et b), e2 = 100  $\mu$ m (c).

barbules distales. La soie subapicale possède 1 ou 2 barbules et la moyenne sternale est bifurquée.

Cerques. L'unique cerque complet appartient à une femelle de 4 mm de la Grotte Codó (Mont-ral) et présente une base et 12 articles, avec une longueur totale de 5 mm. Chaque article présente 2 ou 3 verticilles de macrochètes barbelés sur leur tiers distal, 1, 2 ou 3 verticilles de longues soies glabres et finit avec un verticille apical de soies intégrales plus courtes ou avec une barbule distale.

Mâle. L'urosternite I (Fig. 4a) porte, sur le bord postérieur et chez les mâles les plus grands, plus d'une centaine de soies glandulaires et sensorielles  $g_1$  ordonnées en deux ou trois rangées, précédées de deux ou trois rangs de poils grêles. Les appendices sont élargis vers leur moitié distale et leur largeur maximum ne dépasse pas le double de la minimum. La portion distale montre une quarantaine de soies glandulaires et sensorielles  $a_1$ , précédées par un champ glandulaire et sensoriel d'une soixantaine de soies  $a_2$ .

Les faisceaux de spermatozoïdes du mâle de l'Aven Julivert (Fig. 4c) sont de 70 à 80  $\mu\text{m}$  de diamètre externe et d'environ 17  $\mu\text{m}$  d'épaisseur; le filament est plein et décrit un peu plus d'un tour, et sa longueur atteint 165  $\mu\text{m}$ , avec un diamètre de 3,5  $\mu\text{m}$ .

Femelle. Les appendices de l'urosternite I sont subcylindriques (Fig. 4b) et portent un champ d'une vingtaine de soies glandulaires  $a_1$ .

*Affinités.* Ces dernières années, on a signalé des espèces exclusivement souterraines de Diploures Campodéidés qui diffèrent peu des espèces les plus proches d'habitat endogé (Condé, 1993; Sendra *et al.*, 2003). C'est aussi le cas avec *Campodea* (*Campodea*) *cossetana* sp. n. qui possède la même chétotaxie que certaines espèces, généralement endogées ou troglaphiles, des régions méridionales françaises, des Pyrénées et du nord-est de la péninsule Ibérique, aussi qu'en Sardaigne. *Campodea cossetana* sp. n. est particulièrement proche de *C. zuluetai* Silvestri, 1932 et de *C. procera* Condé, 1948. La première est connue du milieu édaphique et endogé du nord-est de la péninsule Ibérique et de la Sardaigne (Silvestri, 1932; Condé, 1951a et b; Condé & Mathieu, 1957; Bareth, 1980; Sendra, 1988, 1990) et la deuxième est connue du milieu endogé et souterrain au sud du Massif Central français (Condé, 1948b, 1997). *Campodea zuluetai* comme *C. procera* montrent une variabilité anormale de certains caractères, spécialement au niveau des dimensions et de la barbulation des macrochètes médiaux antérieurs des tergites abdominaux: 8 formes différentes de *C. zuluetai* et 2 de *C. procera* ont été décrites. *Campodea cossetana* sp. n. représente une première tentative de scinder ce complexe *C. zuluetai*-*C. procera* en taxons naturels, en se basant sur l'étude d'un abondant matériel recueilli dans un bon nombre de localités. Son confinement au milieu souterrain des massifs karstiques des chaînes de Prades et Montsant, au nord de la province de Tarragona, est un argument supplémentaire pour valider ce nouveau taxon. *Campodea cossetana* sp. n. présente quelques caractères différentiels, d'une importance taxonomique limitée, par rapport aux différents taxons du complexe *C. zuluetai*-*C. procera*. Parmi eux, il faut citer la grandeur et la barbulation des macrochètes médiaux antérieurs des urotergites I à III et IV à VII, qui diffèrent de celles observées chez la plupart des spécimens décrites de *C. zuluetai*-*C. procera*, à l'exception de la femelle récoltée à Tamariu, province de Girona (Sendra, 1988). De plus, les faisceaux de spermatozoïdes des mâles sont plus grands que ceux décrits par Bareth (1980) pour *C. cf. zuluetai* II et V mais de même style; on ne connaît pas non plus ceux des autres formes de *zuluetai*. Par contre ils sont très différents de ceux de *C. procera* qui sont énormes avec un filament spiralé d'au moins 10 tours de spire. Cependant la plus grande différence entre *C. cossetana* sp. n. et des espèces affines sont: son faciès cavernicole, avec des antennes de 36 à 43 articles (de 20 à 30 chez les différentes formes de *C. zuluetai*, à l'exception de la population de la Grotte

d'Anes de Lleida avec 30 à 36; et de 30 à 37 chez *C. procera*), une longueur des appendices qui dépasse celle de toutes les formes endogées (articles plus longs que larges, pattes métathoraciques atteignant le VII segment abdominal et cerques plus longs que la longueur du corps), les sensilles en gouge qui débutent sur le 4<sup>e</sup> segment antennaire et n'existent pas chez les 2 autres espèces, et présence d'un macrochète ventral absent également chez les autres espèces.

***Campodea (Campodea) maestrazgoensis* sp. n.**

Holotype: ♀ de 5,8 mm, n° de préparation 810, Communauté Valencienne, Castelló, Serratella, l'Aven de la Solaneta, (UTM: 246.366/4467.576/850 m); montée dans le médium de Marc André II et déposée au Musée de Zoologie de Barcelona.

Paratypes: 2 ♀♀, Communauté Valencienne, Castelló, Serratella, Aven de la Solaneta (UTM: 246.366/4467.576/850 m.), 29.VIII.1984, leg. J. Pallarés, 1 ♀, 1.V.1998, leg. F. Fadrique et O. Escolà. Conservées dans le médium Marc André II et déposées au Musée d'histoire naturelle de Genève (Département des Arthropodes et Insectes II), au Musée National de Sciences Naturelles de Madrid et Musée Valencien d'Histoire Naturelle (Fondation Entomologique Torres Sala).

Autre matériel étudié: 2 ♀♀, Aragón, Teruel, Ejulve, La Zoma, Gouffre Val de la Zoma, 7.III.1998, leg. R. Gracia; 1 ♂, Catalunya, Tarragona, La Sènia, Grotte Trobada, 1.I.1993, leg. F. Fadrique et O. Escolà; 1 ♀, 1 juvénile, Communauté Valencienne, Castellón, Sant Mateu, Grotte des Encenalls, 21.III.2003, leg. S. Montagud et S. Teruel; 1 ♂, 1 ♀, Communauté Valencienne, Castellón, Serra Engalceran, Grotte Santa ou du Mas de Gaspar (UTM: 753.750/4459.550/550 m), 4.XI.1979, leg. J. V. Gonzalez, 1 ♂, 1 ♀ juvénile, 12.VIII.2001, leg. A. Moreno et A. Sendra; 1 ♂, Communauté Valencienne, Castellón, Santa Magdalena de Pulpis, Aven del Pla de Valentí o Malentiu (UTM: 263.430/4476.548/460 m), 1 au 11.VIII.1993, leg. F. Fadrique et O. Escolà, 2 ♀ (piège avec du sucre), 1 au 11.VIII.1993, leg. F. Fadrique y O. Escolà; 2 ♀♀, Communauté Valencienne, Castellón, Càlig, Aven Plà de Lifrago (UTM: 273.135/4480.664/135 m), 29.XII.1992, leg. F. Fadrique et O. Escolà.

Total: 16 exemplaires; 4 ♂♂, 11 ♀♀ et 1 ♂ juvénile.

*Etymologie.* Le nom fait référence à la région naturelle du Maestrazgo, où l'on peut trouver cette nouvelle espèce dans le milieu souterrain.

*Description.* Longueurs. Mâles 3,85 à 4,60 mm; femelles 4,75 à 6,10 mm.

Téguments. Epicuticule dépourvue d'ornementation. Soies de revêtement glabres ou un peu barbelées; macrochètes robustes et bien barbelées.

Tête. Toutes les antennes intactes appartiennent à des exemplaires adultes et possèdent 36 (6 cas) ou 37 (1 cas) articles. La longueur totale des antennes est similaire à celle du corps étendu (voir Tableau V). L'article III est à peine un peu plus long que large, il porte un long sensille bacilliforme (Fig. 1e) en position latéro-sternale (entre les macrochètes d et e). Les articles suivants s'allongent jusqu'à une longueur équivalente au double de sa largeur. Sensilles en gouge (Fig. 1g), avec une unique sensille au V<sup>e</sup> article, ordonnés en un verticille distal en 3 sur le VI à IX articles, son nombre augmente progressivement, jusqu'à 8 sensilles chez les articles distaux. L'article apical est presque deux fois plus long que large. L'organe cupuliforme occupe moins d'un cinquième de la longueur de l'article apical et renferme 7 ou 8 sensilles simples, formés par deux collerettes. Sensilles des palpes maxillaires et labiaux en forme de cône, les labiaux étant un peu plus longs que les maxillaires. Les palpes labiaux sub-ovalaires portent jusqu'à 130 phanères sensoriels. Le processus frontal ne ressort pas et supporte 3 macrochètes frontaux, l'antérieur un peu plus long que les deux postérieurs, chez les exemplaires jeunes comme chez les adultes (voir Tableau VI).

Tous les macrochètes du processus frontal et de la portion antérieure de la capsule céphalique portent des barbules sur leur 1/2 à 2/3 distal. Macrochètes *i* un peu plus longs que le reste des macrochètes de la portion frontale.

TABLEAU V. Antennes complètes, non régénérées, chez *Campodea* (*Campodea*) *maestrazgoensis* sp. n.

	Longueur du corps (mm)	LCT ( $\mu\text{m}$ )	Antenne	Articles	Longueur antenne (mm)
♂, Grotte Santa	4,6	1555	gauche	36	4,95
♀, Grotte Trobada	4,75	1965	gauche	36	4,75
♀, Grotte Santa	5,85	2005	droite	36	6,15
♀ holotype, Aven Mas de la Solaneta	5,8	2030	droite	37	5,8
♀, Aven Pla Lifrago	6,1	2180	gauche	36	5,7

TABLEAU VI. Longueur des macrochètes (unités en  $\mu\text{m}$ ) du processus frontal et de la portion antérieure de la capsule céphalique chez *Campodea* (*Campodea*) *maestrazgoensis* sp. n.; (1) longueur moyenne de deux macrochètes postérieurs.

	LCT	Macrochètes du processus frontal		Macrochètes portion antérieure de la capsule céphalique			
		antérieur	postérieurs(1)	a	i	p	x
♀, Aven Pla Malentiu	1120	108	98	75	90	80	88
♀, Aven Pla Lifrago	2180	180	175	125	150	128	132
♀, Aven Mas de la Solaneta	2190	158	130	115	140	92	88

Thorax. La répartition des macrochètes notaux est typique du sous-genre *Campodea* s.str. Tous les macrochètes sont longs, bien développés et barbelés sur leur 2/3 distal. Les macrochètes *lp* sont plus longs que les autres, on remarque entre eux les *lp* mésonotaux (voir Tableau VII et Fig. 5).

TABLEAU VII. Répartition des macrochètes notaux et longueurs (unités en  $\mu\text{m}$ ) chez *Campodea* (*Campodea*) *maestrazgoensis* sp. n.

	LCT	Pronotum				Mesonotum				Metanotum			
		ma	la	lp	$\Sigma\text{mar}$	ma	la	lp	$\Sigma\text{mar}$	ma	lp	$\Sigma\text{mar}$	
♀, Aven Pla Malentiu	1120	135	120	222	86	172	175	252	98	165	250	88	
♂, Aven Pla Malentiu	1275	162	150	245	105	215	188	285	122	190	265	83	
♂, Grotte Trobada	1965	150	140	255	120	178	200	280	100	182	270	92	
♀ holotype, Aven Mas de la Solaneta	2030	200	188	288	150	228	238	-	149	200	302	115	
♀, Aven Pla Lifrago	2180	212	208	340	166	252	275	360	154	245	330	118	
♀, Aven Mas de la Solaneta	2190	212	202	300	163	250	258	328	172	255	322	132	

Chez les jeunes, les griffes de la troisième paire de pattes dépassent l'extrémité postérieure de l'abdomen, et chez les adultes elles arrivent seulement au IX segment

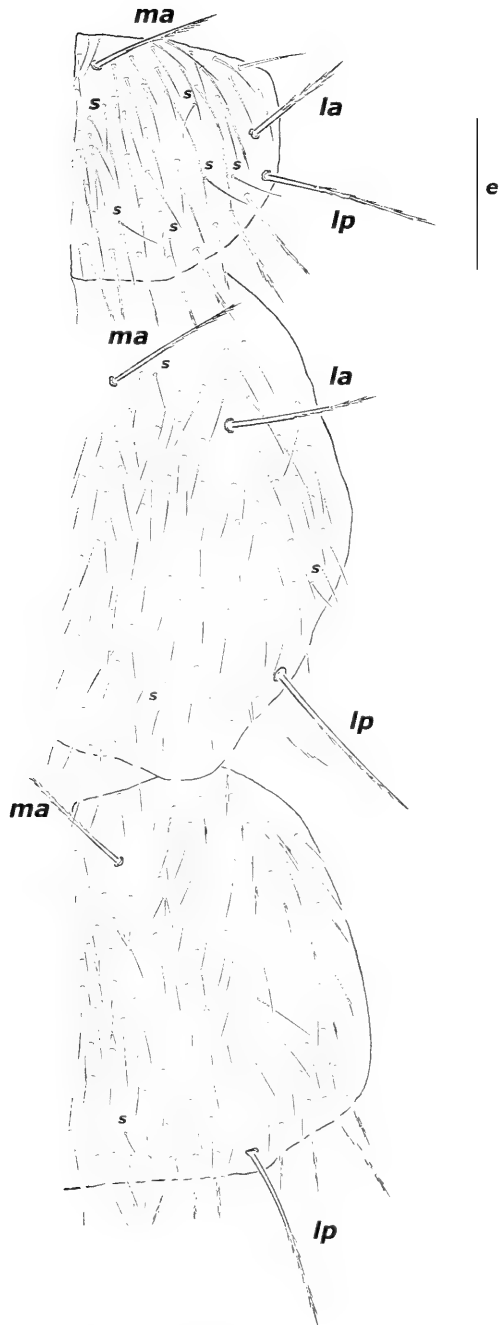


FIG. 5

*Campodea (Campodea) maestrazgoensis* sp. n.: pro-, méso- et métanotum (*ma* macrochète médial antérieur, *la* macrochète latéral antérieur, *lp* macrochète latéral postérieur, *s* sensille sétiforme). Echelle *e* = 250  $\mu$ m.



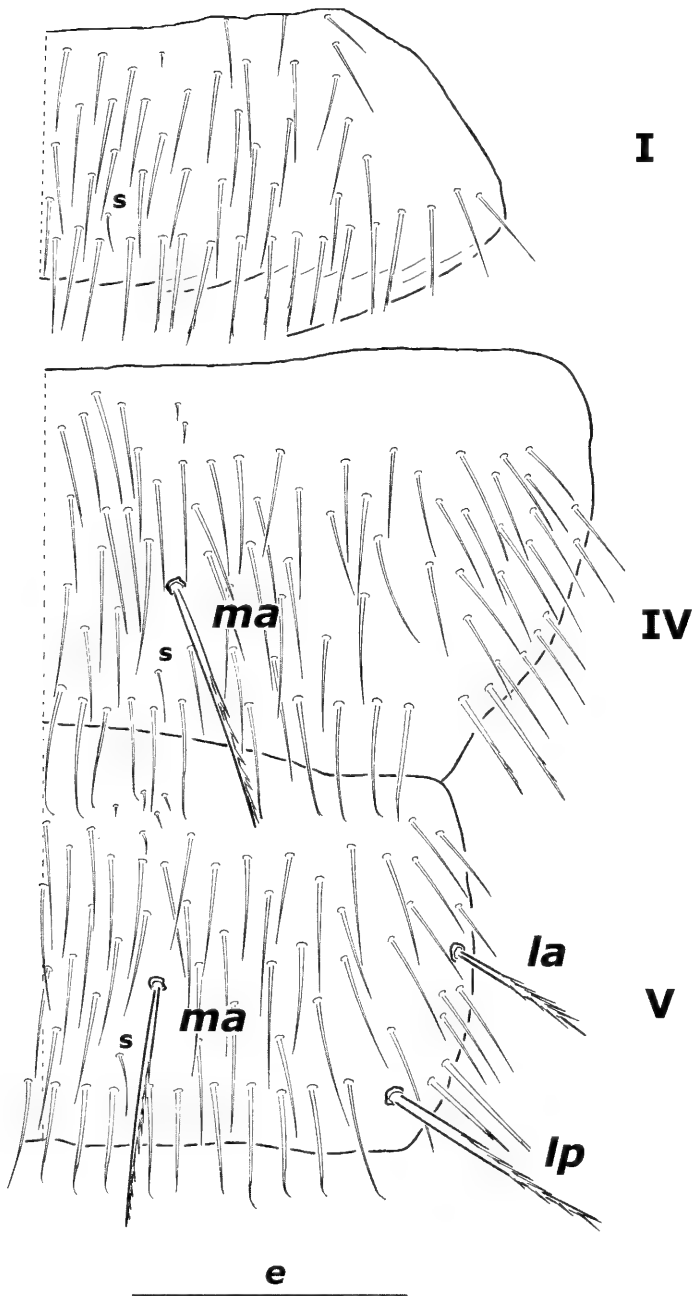


FIG. 6

*Campodea (Campodea) maestrazgoensis* sp. n.: urotergites I, IV et V (*ma* macrochète médial antérieur, *la* macrochète latéral antérieur, *lp* macrochète latéral postérieur, *s* sensille sétiforme). Echelle *e* = 250  $\mu$ m.

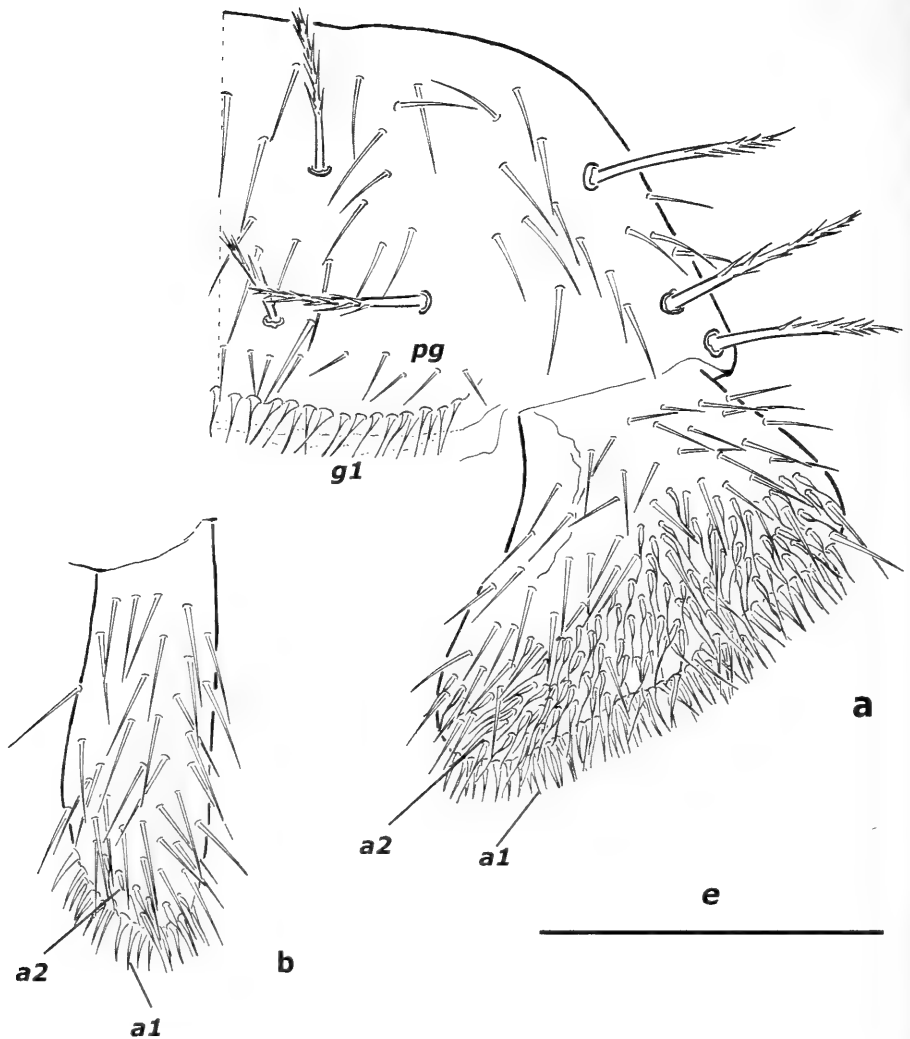


FIG. 7

*Campodea (Campodea) maestrazgoensis* sp. n.: a, urosternite I du mâle; b, appendice de l'urosternite I de la femelle. Soies glandulaires et sensorielles: a1, a2 et g1; poils grêles pg. Echelle e = 250  $\mu$ m.

abdominal. Les trochanters I à II portent un long sensille bacilliforme (Fig. 1f) qui est sétiforme sur le trochanter III. Fémur avec un macrochète sternal inséré à mi-longueur de l'appendice, bien développé et barbelé sur son 2/3 distal (la longueur des macrochètes sternaux du fémur III chez l'holotype est de 182 et 200  $\mu$ m pour chaque patte métathoracique). Tibia avec un macrochète sternal court (85  $\mu$ m chez l'holotype), inséré plus proche de l'extrémité proximale de l'article que de la distale. Calcars bien barbelés presque depuis la base. Les deux rangées de soies qui parcourent la partie

ventrale du tarse se différencient des soies ordinaires par leur longueur, leur grosseur et leur fine barbulation sur la portion médiale. Les soies subapicales de l'extrémité distale du tarse sont glabres. Les griffes du tétotarse sont similaires, sans crêtes, et courbées régulièrement. Les processus latéraux du tétotarse sont sétiformes et glabres; son extrémité peut être légèrement élargie.

Abdomen. La répartition des macrochètes urotergaux est détaillée au Tableau VIII (Fig. 6). Tous les macrochètes urotergaux sont longs, robustes et barbelés sur leur 2/3 distal. Il convient de souligner que les macrochètes médiaux antérieurs, dépassant toujours les embases des soies marginales postérieures, même les *ma* de l'urotergite IV. Chez les exemplaires jeunes, les macrochètes *ma* de l'urotergite IV sont un peu plus courts que les *ma* de l'urotergite V, mais arrivent à être de longueur similaire chez les exemplaires plus grands. (voir Tableau IX et Fig. 6).

TABLEAU VIII. Répartition des macrochètes urotergaux chez *Campodea (Campodea) maestrazgoensis* sp. n.

Urotergites	ma	la	lp	mp
I-III	-	-	-	-
IV	1+1	-	-	-
V-VII	1+1	1+1	1+1	-
VIII	-	-	3+3	1+1
IX	-	-	6+6 (total)	

TABLEAU IX. Longueur des macrochètes médiaux antérieurs (unités en  $\mu\text{m}$ ) des urotergites IV et V chez *Campodea (Campodea) maestrazgoensis* sp. n.

	LCT	ma IV	ma V
, Aven Pla Malentiu	1275	178	250
, Grotte Trobada	1965	178	195
, Aven Pla Litrago	2180	250	258
, Aven Mas de la Solaneta	2190	280	278

L'urosternite I porte 6+6 (6+7 chez l'holotype) macrochètes bien développés avec des longues barbules. Les urosternites II à VII supportent 4+4 macrochètes bien développés et barbelés, accompagnés de 2+2 soies parastylaires. L'urosternite VIII possède 1+1 macrochètes bien développés.

La soie moyenne sternale (*ms*) des styles est bifurquée, la soie subapicale (*sa*) possède une barbule chez les exemplaires plus jeunes et jusqu'à quatre chez les adultes; soie apicale (*a*) avec un court denticule basal sub-divisé et avec une barbule chez les exemplaires jeunes et jusqu'à cinq barbules distales chez les exemplaires de grandes dimensions.

Cerques. Chez le mâle de l'Aven Pla Malentiu, les cerques sont un peu plus de deux fois la longueur du corps, avec un total de 13 articles et une base sub-divisée en trois. Le cerque de la femelle du Gouffre Val de la Zoma est probablement un régénérat, car il possède seulement huit articles (voir Tableau X). Le revêtement de chaque article est formé par 2 à 5 verticilles de longs macrochètes, barbelés sur leur moitié distale, accompagné de 2 à 6 verticilles de longues soies glabres; le nombre de

verticilles de macrochètes et de soies augmente régulièrement des articles proximaux vers les distaux. Le bord distal de chaque article présente un verticille de soies glabres et fines.

Mâle. Les appendices de l'urosternite I (Fig. 7a) sont grands et de forme subtrapezoïdale, avec près de septante soies glandulaires et sensorielles  $a_1$  et plus de cent vingt soies glandulaires  $a_2$ ; marge postérieur de l'urosternite avec une quarantaine de soies glandulaires et sensorielles  $g_1$  et une vingtaine de poils grêles.

Femelle. Les appendices de l'urosternite I sont subcylindriques, presque trois fois plus longs que larges, et possèdent sur leurs portions distales jusqu'à 18 soies glandulaires  $a_1$  et 8  $a_2$  (Fig. 7b).

TABLEAU X. Longueur (unités en  $\mu\text{m}$ ) des cerques intactes et leurs articles chez *Campodea* (*Campodea*) *maestrazgoensis* sp. n.

	LCT	b	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	Total	
♂, Aven Pla Malentiu,	3,85 mm	1275	860	370	425	480	515	730	675	690	650	650	675	675	650	550	8595
♀, Gouffre Val de la Zoma,	5,2 mm	1790	990	440	555	670	775	900	1035	1175	1180						7720

*Affinités.* Chez *C. maestrazgoensis* sp. n. les macrochètes médiaux antérieurs urotergaux sont absents sur les urotergites I à III et diffèrent ainsi de toutes les espèces proches. À signaler aussi la longueur et la robustesse de tous les macrochètes tergaux. *C. maestrazgoensis* sp. n. est une espèce d'habitat souterrain, de grande dimension, avec de nombreux articles antennaires (36-37), longs appendices, avec des cerques 2 fois plus longs que le corps. Il s'agit d'une espèce à faciès cavernicole trouvée dans six grottes des régions karstiques du Maestrazgo, depuis l'extrême sud de la province de Tarragona, tout au long des reliefs carbonatés de Castellón (où elle cohabite avec *Paratachycampa hispanica* à l'Aven Plà Lifrago, Càlig.), et jusqu'au Maestrazgo de Teruel, à l'ouest.

### *Paratachycampa hispanica* Bareth & Condé, 1981

*Paratachycampa hispanica* Bareth & Condé, 1981: 776

1 ♀, Communauté Valencienne, Castelló, Montan, Grotte de Cirat (UTM: 700.697/4455.823/780 m), 19.XII.1998, leg. O. Escolà; 1 ♀, Communauté Valencienne, Castelló, Càlig, Aven Pla de Lifrago (UTM: 273.135/4480.664/135 m), 29.XII.1992, leg. O. Escolà; 1 ♀, Communauté Valencienne, Castelló, Sant Mateu, Grotte des Encenalls, 28.XII.1976, leg. C. Ribera, 1 ♀, 30.XII.1992, leg. O. Escolà, 9 ♂♂, 14 ♀♀, 2 juvéniles, 26.VI.1993, leg. F. Fadrique; 1 juvénile, 21.III.2003, leg. S. Montagud et S. Teruel; 1 ♀, Communauté Valencienne, Castelló, Cabanes, Aven d'En Soria (UTM: 250.132/ 4447.251/ 333 m), 8.VIII.1964, leg. Figaró; 1 ♂, 1 ♀, Communauté Valencienne, Castelló de la Plana, Grotte des Meravelles (UTM: 742.529/4434.95/125 m), 11.III.1979, leg. J. V. González; 1 ♂, 1 ♀, Communauté Valencienne, Castellón, Alcalà de Xivert, Aven Murs I (UTM: 260.6897/4464.595/340 m), 17.IV.1994, leg. F. Fadrique et O. Escolà. 2 ♀♀ Communauté Valencienne, Castelló, Eslida, Grotte Ferrera, 11-I-2004, leg. S. Teruel.

Total: 36 exemplaires; 11 ♂♂, 23 ♀♀ et 2 juvéniles.

*Distribution.* Espèce connue de neuf grottes dans les reliefs karstiques de la chaîne du Montsià de Tarragona, et dans les chaînes côtières de Castelló jusqu'à la Chaîne du Espadán, Grotte Ferrera (Eslida), sans passer, dans les chaînes intérieures, plus au-delà de la Grotte de Cirat (Montan).

***Paratachycampa peynoensis* Bareth & Condé, 1981**

*Paratachycampa peynoensis* Bareth & Condé, 1981: 780

1 ♂, Communauté Valencienne, Valencia, Serra, Grotte Soterranya, 5.VIII.1976, leg. S. Montagud.

*Distribution.* Espèce connue exclusivement de deux grottes de la chaîne du Calderona: Grotte du Penyo (localité type) et Grotte Soterranya, toutes deux à Serra (Valencia).

## DISCUSSION

Le milieu souterrain du nord-est de la péninsule Ibérique contient une faune de Campodéidés cavernicoles riche et diverse (Figs 8 et 9) caractérisée par la présence de quatre groupes monophylétiques (Sendra, 2003): Podocampoïde (avec des macrochètes *ma* urotergaux), Plusiocampoïde (sans macrochètes *mp* méso- et métanotaux), Campoïde (macrochètes médiaux urotergaux) et Tachycampoïde. Son aire de distribution s'étend de la chaîne Pyrénéenne, traversant la chaîne côtière de Catalunya (Catalanides), aux contreforts sud-orientaux du système Ibérique. Cette province biogéographique fut définie récemment par Sendra (2003) dans un travail sur la faune de Campodéidés cavernicoles de la péninsule Ibérique et des îles Baléares.

Les reliefs des Pré-Pyrénées et des Pyrénées Centrales contiennent, tant dans le milieu souterrain profond que dans le milieu superficiel (Condé & Mathieu, 1957; Bareth, 1983), divers représentants de la lignée Podocampoïde (Fig. 8), des genres *Litocampa* (*L. coiffaiti*, *L. drescoi* et *L. vandeli*) et *Podocampa* (*P. jeanneli*), qui se trouvent sur les versants français et espagnols. Alors que la lignée Plusiocampoïde n'apparaît que sur le versant espagnol, représentée par la forme type de *Plusiocampa bonneti*, sa limite plus occidentale étant la Grotte Mora (massif de Huesca de San Juan de la Peña) où elle cohabite avec *L. drescoi*.

Cependant, la répartition du genre *Plusiocampa* (Fig. 9) ne se limite pas uniquement aux Pyrénées Centrales, car elle s'étend vers les Pyrénées Orientales, au nord, jusqu'à la vallée du Rhône, à travers des régions françaises de l'Aude, de l'Hérault et du Gard (*Plusiocampa bonneti bonneti*, *Plusiocampa bonneti deharvengi* Bareth & Condé, 1996), et au sud, tout au long des Catalanides, spécialement aux massifs de Sant Llorenç de Munt et Garraf (*Plusiocampa bonneti condei* ssp. n.), atteignant même diverses grottes de l'intérieur de Tarragona (*Plusiocampa bonneti bonneti*).

De la moitié méridionale des Catalanides au sud de Valencia se trouve la troisième lignée monophylétique, les Campoïdes, qui comprennent, pour l'instant, cinq espèces cavernicoles du sous-genre *Campodea* s. str., distribuées, du nord au sud (Fig. 8), dans les grottes du massif de Montserrat à Barcelona (*C. egena*), les chaînes de Prades et Montsant (*C. cossetana* sp. n.), les chaînes de Tivissa, Cardó et Plà de Cabanes (*C. cf. egena*), le Maestrazgo de Castellón et de Teruel (*C. maestrazgoensis*

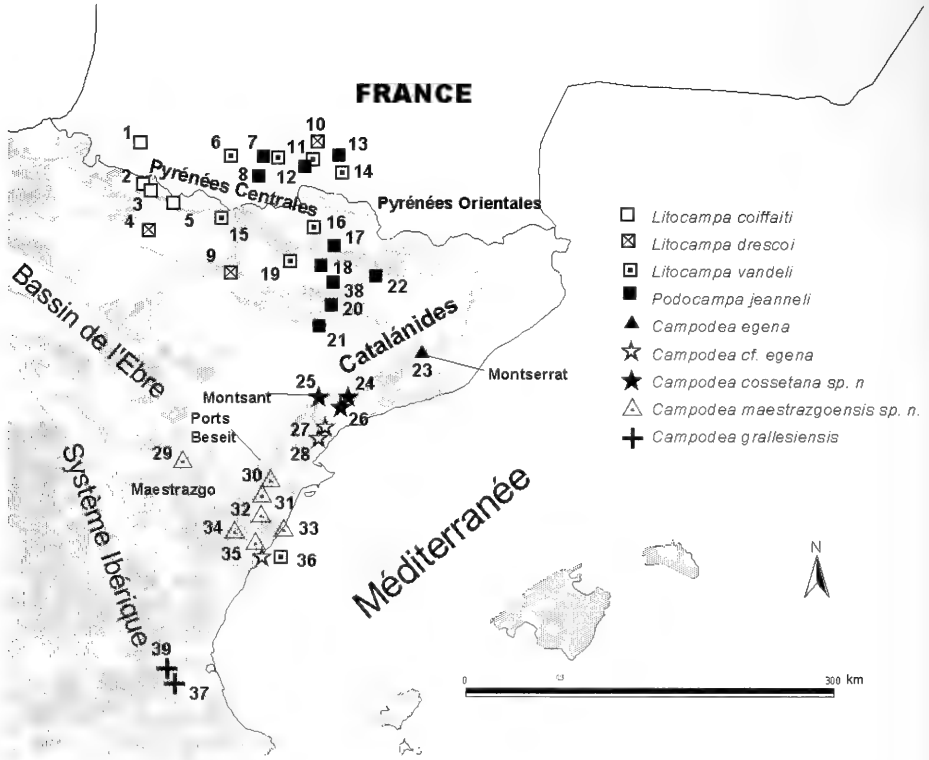


FIG. 8

Distribution des Campodéidés cavernicoles du nord-est de la péninsule Ibérique. groupes monophylétiques: Podocampoide et Campoide. 1.- Grotte d'Ayssaguer; 2.- Aven R-3. Grotte Faixa des Anollos; 3.- Grotte Allará. Aven Torrent-Cema Blanca; 4.- Grotte Mora; 5.- Grotte de l'Aire, Grotte du Molino; 6.- Grotte de Campan; 7.- Grotte de Bas-Nistos; 8.- Grotte d'Ilhet; 9.- Grotte Chaves. Solencio de Bastaras. Grallera Guara; 10.- Grotte de Ganties-Montespan; 11.- Grotte de St. Paul; 12.- Grotte de Goillon; 13.- Grotte de Peyort; 14.- Grotte de Moulins; 15.- Espluga Mayor; 16.- Grotte Enroia; 17.- Aven Mohínos; 18.- Grotte de l'Ensenyat; 19.- Aven de la Cuneta. Aven d'Irgo; 20.- Aven de St. Gervàs; 21.- Aven Tabaco; 22.- Forat des Cases Noves; 23.- Grotte du Salitre; Grotte Patracó; Aven N° 6 de la Puda; Aven Montserrat de la Puda; Aven Clast de Coll Cassot. Aven Montserrat de Coll Cassot; 24.- Grotte Espluga de Francolí; Grotte Aigües; Grotte Font Major; Aven du Julivert; Grotte Assedagats; 25.- Grotte Santa; 26.- Grotte Codó; Grotte de la Moneda; 27.- Grotte d'En Janet; 28.- Grotte Marcó; 29.- Gouffre Val de la Zoma; 30.- Grotte Trobada; 31.- Grotte des Encenalls; 32.- Aven de la Solaneta; 33.- Aven Plà de Lifrago; 34.- Grotte Santa; 35.- Aven Pla de Valentí; 36.- Aven d'En Serenge; 37.- Grotte du Alto de Tous; 38.- Grotte Represa Pont de Muntanya; 39.- Grotte Meravelles. Il est étonnant de trouver deux ou plus de deux espèces de Campodéidés cavernicoles cohabitant ensemble dans une même cavité; dans cinq cavités seulement on a trouvé deux (4 cas) ou même trois (1 cas) espèces: Grotte Mora (*L. drescoi* et *P. bonneti bonneti*); Grotte de Bas-Nistos (*L. vandeli* et *P. jeanneli*); Grotte Santa de Montsant (*C. cossetana* n. sp. et *P. bonneti bonneti*); Aven Plà de Lifrago et Grotte des Encenalls (*P. hispanica* et *C. maestrazgoensis* sp. n.); et Aven d'En Serenge (*P. hispanica*, *C. cf. egena* et *L. vandeli*). Les taches grises indiquent la distribution du milieu souterrain.

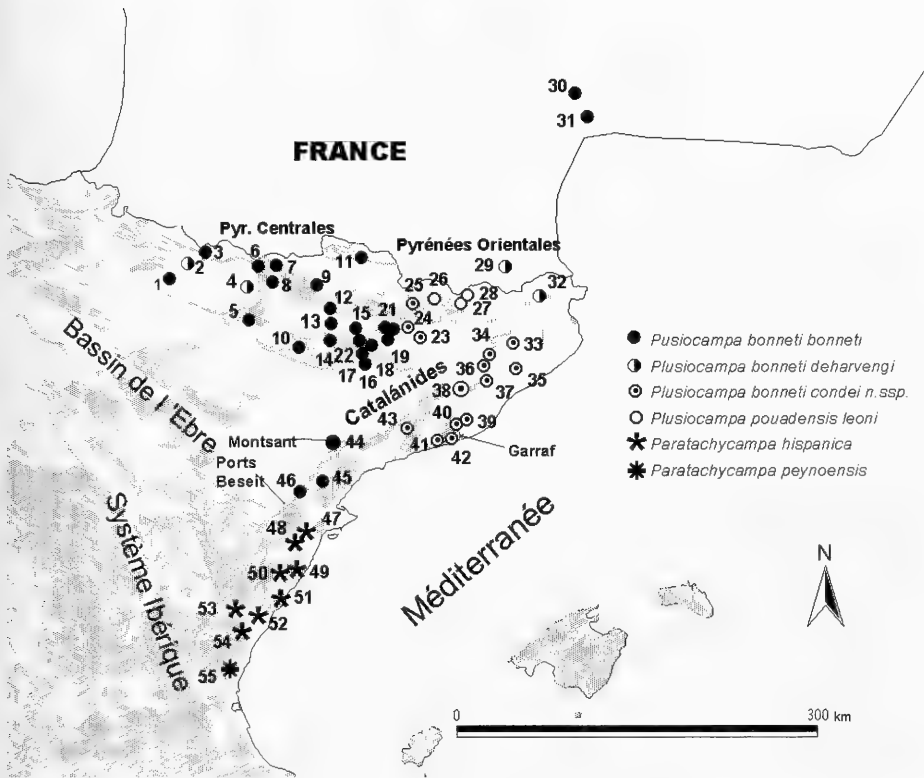


FIG. 9

Distribution des Campodéidés cavernicoles du nord-est de la péninsule Ibérique, groupes monophylétiques: Plusiocampoïde et Tachycampoïde. 1.- Grotte Mora; 2.- Grotte de Esjamundo; 3.- Aven Mohínos; 4.- Grotte Llobrica; 5.- Grotte Chaves, Solencio de Bastaras; 6.- Grotte Manatuero-Malapreciata; 7.- Grotte Peguera; 8.- Grotte Hueso Santo; 9.- Grotte Tollasses; 10.- Pou de la Mina Porroi; 11.- Aven de Safor, Mine Superior Canal, Mine Inferior Canal; 12.- Grotte de l'Ensenyat; 13.- Grotte Gran Berganui; 14.- Grotte Brugal; 15.- Grotte des Porquers; 16.- Aven de la Dona Morta; 17.- Forat de l'Or; 18.- Aven T-38; 19.- Grotte de Cal Salitre; 20.- Aven du Xato; 21.- Grotte du Pont d'Espies; 22.- Aven de la Cuneta; 23.- Bòfia de Sant Jaume; 24.- Pou du Coll d'Alzina; 25.- Aven de la Cabana d'En Garraba, Grotte des Encantades; 26.- Fou Bor; 27.- Grotte des Encantades; 28.- Grotte du Roc Blanc; 29.- Grotte de Crouanques; 30.- Aven-grotte du Berger; 31.- Grotte de la Colombière; 32.- Aven de Taleixà; 33.- Bora Fosca; 34.- Grotte de la Pollosa, Mines de Sta. Coloma; 35.- Aven de les Pedreres; 36.- Aven de Castellcir; 37.- Grotte Cau de la Guilla; 38.- Grotte de Mura, Aven du Club, Aven de la Falconera; Aven du Canal Ravella; Aven de la Carbonera; Grotte du Toixó; Aven du Castellet de Dalt; Aven de l'Esplugu; Aven de Castellsapera, Aven Sant Jaume de la Mata; Aven de Brega, Aven du Picarol; Aven du Canal de Mura; 39.- Grotte Santa Creu d'Olorde; 40.- Aven T-38; 41.- Grotte Negra; 42.- Aven de la Roca; 43.- Grotte Mandill; 44.- Grotte Santa; 45.- Grotte des Meravelles; 46.- Grotte du Conill; 47.- Grotte Boixa; 48.- Grotte des Encenalls; 49.- Aven Plà de Lifrago; 50.- Aven Murs I; Grotte Masies d'Abad; 51.- Aven d'En Serenge; 52.- Grotte des Meravelles; 53.- Grotte de Cirat; 54.- Grotte Ferrera; 55.- Grotte du Penyo, Grotte Soterranya. Les taches grises indiquent la distribution du milieu souterrain.

sp. n.) et, constituant sa localité la plus méridionale, la grotte valencienne de l'Alto de Tous (*C. grallesiensis* Sendra & Condé, 1987).

Dans les chaînes côtières de Castelló, connues pour leur surprenante faune cavernicole, apparaît la dernière lignée monophylétique, les Tachycampoides (Fig. 9), représentés par deux espèces du genre *Paratachycampa*: *P. hispanica* qui peuple la zone entre les reliefs karstiques du Montsià à Tarragona jusqu'à la Grotte Ferrera à Castelló, et *P. peynoensis* limitée à la chaîne valencienne de Calderona.

Sendra (1990, 2003) a proposé quelques hypothèses sur l'arrivée à la péninsule Ibérique de ces quatre lignées monophylétiques de Campodéidés, dont voici un bref résumé de cette colonisation historique. Par ordre chronologique, les premiers à s'établir sur la plaque Ibérique seraient les Tachycampoides, déjà présents peut-être pendant le Mésozoïque. Un représentant du genre *Paratachycampa* (*P. bonneti* Wygodzinsky, 1944) est connu d'une cavité mexicaine, de l'autre côté de l'Atlantique. Aussi, Bareth & Condé (1981) le considèrent comme une relique laurasienne du Crétacé.

Ce type de disjonction amphiatlantique, présente chez *Paratachycampa*, a été employée à plusieurs reprises dans la considération de l'âge d'une lignée, même avant l'acceptation mondiale de la «théorie des translations continentales» d'Alfred Wegener (Brehm, 1947). Cette disjonction amphiatlantique se retrouve aussi dans la lignée Podocampoïde, mais cette fois avec une aire de distribution plus grande que chez les Tachycampoides, englobant la Méditerranée occidentale (Iberia, la France continentale, Magreb et l'île de Sardaigne), d'un côté de l'Océan Atlantique, et l'Amérique Centrale et la chaîne des Appalaches de l'autre. De la même façon que pour *Paratachycampa*, l'arrivée dans la région ibérique des Podocampoides put se réaliser à la fin du Mésozoïque ou au début du Cénozoïque (70-40 m.a.)

La lignée Plusiocampoïde suit un patron de distribution correspondant à l'existence de l'ancien massif Catalano-Provençal ou massif Protoligurique. L'extension maximum de ce massif comprend les terres continentales de la région Catalano-Provençal, et aussi les micro-plaques formées par la Corse, Sardaigne, îles Baléares et celles qui correspondraient au massif Bético-Rifain (en comprenant Kabylie et massif Calabrais) (López Martínez, 1989; Giusti & Manganelli, 1984; Altaba, 1998). L'arrivée des Plusiocampoïdes au massif Protoligurique, venant du nord-est, put se produire au début de l'Oligocène (37 m.a.). Ils restèrent alors séparés du reste de la péninsule Ibérique à cause de la formation d'un bassin qui sera le futur système Ibérique. Sur la rive opposée, la plaque Ibérique put alors isoler les Tachycampoides.

La phylogénie des Campoïdes reste encore peu connue et l'interprétation de leur possible colonisation est très difficile. Néanmoins, les données actuelles sur la distribution des *Campodea* s. str., avec des macrochètes médiaux urotergaux, semblent suggérer, au moins, un âge similaire à la lignée des Podocampoïdes.

Les Campodéidés cavernicoles ont connu au moins deux périodes d'introduction dans le milieu souterrain, comme ceci a été mis en évidence par Español (1969) pour d'autres groupes de la faune cavernicole ibérique. Une première période s'est produite pendant le Pliocène et l'autre au long des glaciations du Pléistocène.



## REMERCIEMENTS

Il est important de remercier l'effort et le travail de tous les entomologistes et naturalistes qui ont mis à notre disposition les précieux échantillons, objet de notre étude. Nous remercions aussi tous les récolteurs cités dans le texte, qui déposèrent leurs échantillons tant au Museu de Zoologia de Barcelona qu'au Museu Valencià d'Història Natural, institutions que nous remercions sincèrement.

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**Au cours de la publication de ce travail, nous avons reçu une triste nouvelle pour la communauté zoologique: le décès de l'éminent entomologiste Professeur Dr Bruno Condé, de l'Université de Nancy. Nous voulons lui dédier cet article, en reconnaissance de son immense travail centré spécialement sur la systématique des Diploures Campodéidés.**

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**Peritelini nuovi o interessanti della fauna paleartica. VIII.  
*Pseudomeira* balcaniche (Coleoptera Curculionidae Entiminae)**

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**New or interesting Peritelini of the Palaearctic fauna. VIII. *Pseudomeira* from the Balkans (Coleoptera Curculionidae Entiminae).** - *Pseudomeira kapleri* sp. n. from Greece is described; *Pseudomeira obscura* (A. & F. Solari), so far only known from southern Italy and Sicily, is mentioned from Greece and Albania.

**Keywords:** Coleoptera - Curculionidae - Peritelini - Balkans - *Pseudomeira* - new species.

INTRODUZIONE

Nel corso delle ricerche che da anni stiamo conducendo sui Peritelini paleartici abbiamo individuato una nuova specie di Grecia ed accertato l'estensione all'Albania ed alla Grecia settentrionale dell'areale di un'altra specie nota sinora della Sicilia nord-orientale e dell'Italia meridionale.

Le due specie appartengono entrambe al genere *Pseudomeira* Stierlin, 1881 non conosciuto finora di regioni situate ad oriente della Puglia. Quella che abita le regioni montuose più settentrionali non sembra differenziarsi apprezzabilmente da *Pseudomeira obscura* (A. & F. Solari, 1907), il cui areale noto non superava a oriente la Lucania, mentre quella raccolta sulla costa greca occidentale rappresenta un nuovo taxon appartenente al gruppo *echidna* come da noi (1995) definito, la cui rappresentante geograficamente più vicina è *Pseudomeira apula* Bellò & Pierotti, 1992, della costa leccese.

Le collezioni nelle quali sono conservati gli esemplari studiati sono indicate con le seguenti sigle rispettive:

- BEL collezione Bellò, Castelfranco Veneto (Treviso, Italia)
- MHNG collezione Muséum d'histoire naturelle, Ginevra (Svizzera)
- MMI collezione Museo Civico di Storia Naturale - Milano (Italia)
- MTO collezione Museo Regionale di Scienze Naturali - Torino (Italia)
- OSE collezione Osella, L'Aquila (Italia)
- PIE collezione Pierotti, Treviso (Italia)
- VOR collezione Vorisek, Kladno (Repubblica Ceca)

## PARTE TASSONOMICA

1. *Pseudomeira obscura* (A. & F. Solari, 1907)

*Peritelus obscurus* A. & F. Solari, 1907: 117; Porta, 1932: 64

*Peritelus (Pseudomeira) obscurus*, Lona, 1937: 264

*Pseudomeira obscura*, F. Solari, 1954: 49,53; Pierotti & Bellò, 1994: 111; Abbazzi *et al.*, 1995: 23

*Diagnosi.* Specie di piccola statura (3,5-3,8 mm), caratterizzata da forma un po' tozza, rostro e pronoto marcatamente trasversi, occhi subemisferici, margine sopra-oculare del vertice normalmente declive verso l'occhio, elitre subovoidali, gibbose in avanti sul dorso, vestitura terrea con qualche macchia più chiara e setole alquanto robuste, semierette o sollevate.

Gli apparati genitali maschili e femminili sono riprodotti in Pierotti & Bellò (1994).

*Loci tipici.* Sicilia, Messina; Calabria, S.Eufemia d'Aspromonte; Salernitano, Vallo di Lucania. In MMI sono conservati 24 sintipi.

*Distribuzione.* La specie ci era nota sinora di diverse località della Sicilia nord-orientale (dintorni di Messina, Monti Peloritani, Monti Nebrodi, Monte Etna), della Calabria (Aspromonte, Sila, Orsomarso), della Campania meridionale (Vallo di Lucania) e della Lucania interna (Monte Pollino, Piccole Dolomiti Lucane). Abbiamo ora potuto esaminare quattro esemplari provenienti dall'Albania: Mal Shent (MHNG) e tre provenienti dalla Grecia: Epiro, Monte Pindo, m 1200, Kriovrísí (Métsovon) (BEL, OSE, PIE), tutti di sesso femminile, che non evidenziano caratteri distintivi rispetto a quelli degli esemplari topotipici.

*Note ecologiche.* La specie si rinviene solitamente nelle lettiere di *Quercus*, *Fagus*, *Castanea* e sotto pietre. In Grecia, è stata raccolta al vaglio, ai margini di una faggeta.

2. *Pseudomeira kapleri* sp. n.

*Serie tipica.* Holotypus ♂: "Grecia, Préveza, Ag. Triáda, 22.VIII.94, leg. Osella" (MHNG); paratypi: "Grecia, Préveza, Ag. Triáda, 22.VIII.94, leg. Osella" (BEL) 30 exx., (OSE) 9 exx., (PIE) 31 exx.; "Greece occ., Preveza, env. St.Thomas, VI.1991, leg. Kapler" (BEL) 1 ex.; "Gr., Preveza, Aghios Triadá, m. 50, 22.8.1994, leg. Meregalli" (MTO) 16 exx., (VOR) 2 exx., (BEL) 25 exx., (PIE) 24 exx.; "Grecia, Preveza, Aghios Thomas, 28.VI.97, leg. Bellò" (BEL) 6 exx., (PIE) 5 exx.; "Grecia, Preveza, Aghios Triadá, 28.VI.97, leg. Bellò" (BEL) 45 exx. (PIE) 44 exx., "Grecia, Preveza, Aghios Triadá, 28.VI.97, leg. Osella" (BEL) 10 exx. (PIE) 10 exx.; "Grecia, Epiro, nom. Preveza, Agia Triada, 12.VII.2000, leg. Osella" (BEL) 5 exx., (PIE) 4 exx..

*Diagnosi.* Specie di piccola statura (3,4-4,5 mm), caratterizzata da forma alquanto robusta, rostro e pronoto trasversi, occhi un po' appiattiti, margine sopra-oculare del vertice rialzato, elitre subovoidali (♂) o alquanto allungate, a lati subparalleli (♀), vestitura terrea, con macchie irregolari più scure e più chiare e setole più o meno robuste, sollevate o semierette sulle elitre.

*Descrizione.* Forma alquanto robusta. Vestitura dorsale costituita da squame fortemente embricate, terree, spesso qua e là più chiare e più scure, queste ultime disposte a formare due grosse macchie sulla metà basale del pronoto, una macchia postscutellare e numerose altre, irregolarmente distribuite, sulle interstrie elitrati, nella regione anteapicale per lo più fuse tra loro, e da setole più o meno robuste, sollevate o semierette sulle elitre.



FIG. 1

⊗ Loci tipici di *Pseudomeira obscura* A. & F. Solari. ● Altre località di cattura di *Pseudomeira obscura* A. & F. Solari. ▲ Locus typicus di *Pseudomeira kapleri* sp. n.

Rostro più (♀) o meno (♂) trasverso, a lati un po' convergenti in avanti; clipeo incavato; pterigi poco salienti; fronte un po' più larga dell'epifronte, con un breve accenno di carena longitudinale mediana; epifronte poco rialzata ai lati, longitudinalmente infossata al centro. Vertice alto, nel mezzo con una fossetta, sul margine sopraoculare rialzato. Occhi normali, non o appena prominenti. Antenne con scapo robusto anche nel primo terzo e articoli 4-6 del funicolo più o meno trasversi, i primi quattro o cinque con setole più robuste; clava allungata, col primo articolo talora infudibuliforme.

Pronoto più (♀) o meno (♂) trasverso, largo alla base quanto al margine anteriore, debolmente arrotondato ai lati, sul dorso con punteggiatura irregolare, discretamente fitta.

Elitre subovoidali, più (♀) o meno (♂) allungate, debolmente insellate, con strie di punti forti, ravvicinati ed interstrie debolmente convesse.

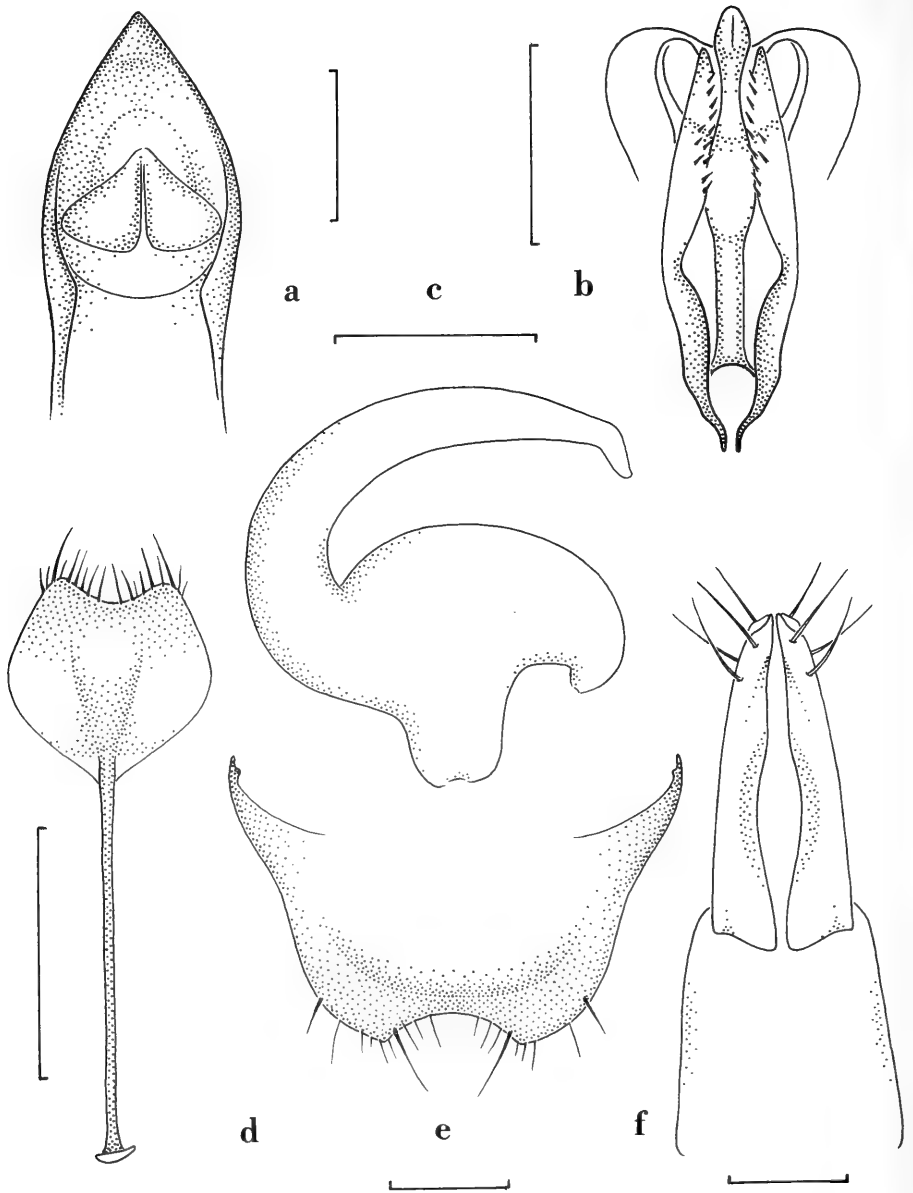


FIG. 2

*Pseudomeira kapleri* sp. n.: a, apice del pene in visione dorsale (scala: 0,15 mm); b, armatura genitale (scala: 0,10 mm); c, spermatheca (scala: 0,10 mm); d, spiculum ventrale (scala: 0,50 mm); e, propigidio ♀ (scala: 0,15 mm); f, ovopositore (scala: 0,15 mm).

Zampe robuste; tibie anteriori sul margine esterno diritte.

Propigidio sul margine posteriore incavato al centro (Fig. 2.e).

Pene in visione dorsale lanceolato nella regione antepiciale (Fig.2.a); armatura genitale: Fig. 2.b.

Coxiti: Fig. 2.f; spiculum ventrale: Fig. 2.d; spermateca: Fig. 2.c.

*Derivatio nominis.* La specie è dedicata al Signor Oldrich Kapler sr., padre del primo raccoglitore, il dott. Oldrich Kapler jr. di Praga.

*Distribuzione geografica.* Grecia centro-orientale (Fig. 1). La specie sembra estremamente localizzata.

*Note ecologiche.* La specie è stata rinvenuta in lettiera di *Olea europaea* L.

*Note sistematiche.* La nuova specie è molto vicina a *Pseudomeira binaghii* F. Solari, 1954, della Campania, della Lucania occidentale e della Calabria, ed a *Pseudomeira lucana* Bellò & Pierotti, 1992, della Lucania meridionale, dalle quali si distingue per il funicolo antennale più robusto, con gli articoli 4-6 più o meno trasversi, oltre che per la forma marcatamente lanceolata dell'apice del pene.

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## The status of *Barbitistes serricauda* (Fabricius, 1794) (Ensifera: Phaneropteridae) – a re-assessment

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**The status of *Barbitistes serricauda* (Fabricius, 1794) (Ensifera: Phaneropteridae) – a re-assessment.** - In this paper, we examine the taxonomic and nominal status of a widespread species of European bush-cricket, *Barbitistes serricauda* (Fabricius, 1794) (Ensifera: Phaneropteridae). The name *B. serricauda* has almost exclusively been applied to a species occurring mainly north of the Alps from Spain through Central Europe to the Black Sea. A re-examination of two syntypes of *B. serricauda* has now revealed that they represent a different species occurring on the south side of the Alps in France, Italy and Switzerland, currently treated as *B. obtusus* Targioni-Tozzetti, 1881. Therefore, the species from the south side of the Alps should be called *B. serricauda* (instead of *B. obtusus*), while a new name would have to be found for the species from the north side of the Alps (hitherto *B. serricauda*). Considering the long established and well-defined use of *B. serricauda* and *B. obtusus*, this scenario would inevitably result in severe confusion and nomenclatural instability. Hence, a formal request will be submitted in December 2004 to the *International Commission on Zoological Nomenclature* to preserve the accustomed use of these names. Meanwhile, we suggest maintaining the prevailing usage in both cases. We furthermore discuss the status of *Barbitistes obtusus alpinus* Fruhstorfer, 1920, for which an invalid neotype was designated in a recent publication.

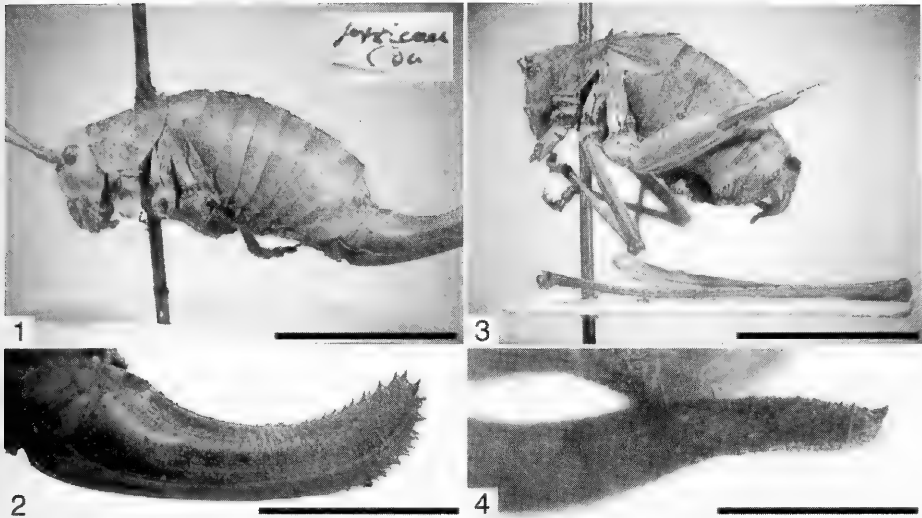
**Keywords:** Phaneropteridae - *Barbitistes* - *alpinus* - invalid neotype - *obtusus* - *serricauda* - *taurinensis* - nomenclature - taxonomy.

In a recent paper, Fontana & Buzzetti (2004) discussed the status of *Barbitistes obtusus* Targioni-Tozzetti, 1881 (Ensifera: Phaneropteridae). They showed that this name – contrary to accustomed usage (Brunner von Wattenwyl, 1882; Harz, 1969; Nadig, 1987; Coray & Thorens, 2001; among many others) – cannot be used for a species distributed on the southern slopes of the Alps in France, Switzerland and Italy as well as in the central Apennines. Targioni-Tozzetti (1881) actually based his taxon on some male specimens (type considered lost) from Sardinia (Italy), where the genus *Barbitistes* – in the current, narrow sense (Harz, 1969) – is absent; according to the

original description, the specific name *obtusus* thus applies to a Sardinian species of short winged Phaneropteridae, i.e. of the genus *Leptophyes* Fieber, *Metaplastes* Ramme or *Odontura* Rambur (the true identity is unclear). Therefore, Fontana & Buzzetti (2004) adopted *Barbitistes alpinus* Fruhstorfer, 1921 [*recte* 1920!] as the valid name for the respective species in the southern Alps and the Apennines [= *B. obtusus* of authors (not Targioni-Tozzetti) below]. They also erected a neotype for *B. alpinus* from northern Italy.

While we agree with Fontana & Buzzetti's (2004) interpretation of *Barbitistes obtusus* of Targioni-Tozzetti (1881), their choice of *B. alpinus* Fruhstorfer as a substitute name for *B. obtusus* of authors (not Targioni-Tozzetti) is problematic for two reasons. First, Fontana & Buzzetti (2004) overlooked the existence of original type material in the case of *B. alpinus* (lectotype designated by Baur & Coray, 2004: 616). According to article 75.8 of the *International Code of Zoological Nomenclature* (ICZN, fourth edition, 1999) the neotype designated by Fontana & Buzzetti (2004: 447) is thus invalid. Second, and more importantly, *B. alpinus* is not the oldest available name for *B. obtusus* of authors (not Targioni-Tozzetti), because *Locusta serricauda* Fabricius, 1794 has to be considered as well. This may look bewildering, because – since Brunner von Wattenwyl (1882: 268-269)! – the specific name *serricauda* has almost exclusively been adopted for a species of *Barbitistes* occurring mainly on the north side of the Alps from north-eastern Spain through France and Central Europe to the Black Sea (compare distribution map in Detzel, 1998: 208). For most parts of its range, the species is considered as a northern vicariate of *B. obtusus* of authors (not Targioni-Tozzetti) which is known only from the south side of the Alps (see above). However, the specific name *serricauda* was originally based on specimens collected at "Colline di Torino" in the Piedmont (Italy) on the southern slopes of the Alps (see Capra, 1946: 29). Nadig (1987: 268-271), who first called attention to this problem, collected specifically at the respective type locality where he found only one *Barbitistes* species, *B. obtusus* of authors (not Targioni-Tozzetti). Nadig therefore suggested that the name *B. serricauda* might apply to the latter species. In order to clarify this problem, we investigated the syntype series (1 ♂ 1 ♀, Figs 1-4) of *B. serricauda* which is deposited in the Fabricius collection in the Zoological Museum, University of Copenhagen, Denmark (see Zimsen, 1964)<sup>1</sup>. Not surprisingly, our examination of the diagnostic characters fully confirms the view of Nadig. For in-

<sup>1</sup> Zimsen (1964: 619) mentioned in her type catalogue 2 specimens under *Locusta serricauda*. However, 3 conspecific specimens (2 ♂, 1 ♀) stood under the respective name in the Fabricius collection. We accept the female (Figs 1, 2), which is labelled "serricauda [on two lines]" in Fabricius' handwriting, and also the unlabelled male (Figs 3, 4) as syntypes; the other male is labelled "ephippi ger [on two lines]" in Fabricius' handwriting and is obviously excluded as a syntype. In the brief original description of *Locusta serricauda*, Fabricius (1794: 455) gave only a few characters and stated "Habitat in Italia Dr. Allioni" as origin of the material (see also Capra, 1946: 29), but he neither specified the number nor the sex of his specimens. Therefore, his description is possibly based on several female and male specimens. We thus follow recommendation 73F of the ICZN and consider also the male as part of the type series. Though the specific name *serricauda* (meaning "saw-tail") and the description of the ovipositor ("ense recurvo serrato") obviously refer to the female, all other characters fit equally well for both sexes.



FIGS 1-4

*Locusta serricauda* Fabricius, syntypes: (1) female (scale 1 cm) with label in Fabricius' handwriting (original size), (2) ovipositor (scale 0.5 cm), (3) male (scale 1 cm); (4) apex of right cercus of male, from below (scale 0.1 cm). Photos H. Baur.

stance, the cerci of the male syntype (Fig. 4) are slightly obtuse at the apex and thus clearly lie within the range of *B. obtusus* of authors (not Targioni-Tozzetti) (Nadig, 1987: 269, figure 2). Furthermore, the female syntype has an almost flattened pronotal disc (Fig. 1) which corresponds well with the shape of the female pronotum of the same species (Harz, 1969: 69, figure 232; Coray & Thorens, 2001: 93, figure 29.4). Our analysis of the type series thus leaves no doubt, that *Barbitistes serricauda* (Fabricius, 1794) must be regarded as the valid name for *B. obtusus* of authors (not Targioni-Tozzetti), with *B. obtusus alpinus* Fruhstorfer, 1920 as a junior synonym<sup>2</sup>.

This situation, although conclusive from a taxonomic view point, is highly problematic with regard to nomenclatural stability. As outlined above, *B. serricauda* (Fabricius, 1794) and *B. obtusus* Targioni-Tozzetti, 1881 have been widely used for more than 120 years in the sense of Brunner von Wattenwyl (1882). In a thorough review of the literature, compiled for documenting the usage of the names, *B. serricauda* appears in at least 56 and *B. obtusus* in at least 36 major taxonomic and faunal works, not to mention innumerable additional, smaller faunistic or ecological papers. Considering the widespread and well-defined use of these names, a strict application of the rules of zoological nomenclature would inevitably result in severe confusion concerning their application. We are therefore preparing a formal request to the *International Commission on Zoological Nomenclature* to preserve the accustomed usage of *B. serricauda* and *B. obtusus*. This application will be submitted in December 2004

<sup>2</sup> *Barbitistes serricauda taurinensis* Griffini (see Griffini, 1893: 10) most likely is a further junior synonym of *B. serricauda*.

for publication in the *Bulletin of Zoological Nomenclature*. We are inviting interested researcher to comment on this case upon its publication. Meanwhile, we suggest that the prevailing usage of *B. serricauda* and *B. obtusus* be maintained (compare ICZN, art. 82).

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***Crocidura cossyrensis* Contoli, 1989 (Mammalia, Soricidae): karyotype, biochemical genetics and hybridization experiments**

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***Crocidura cossyrensis* Contoli, 1989 (Mammalia, Soricidae): karyotype, biochemical genetics and hybridization experiments.** - The shrew *Crocidura cossyrensis* Contoli, 1989 from Pantelleria (I), a Mediterranean island 100 km south of Sicily and 70 km west from Tunisia, was investigated in order to understand its origin and its relationship with *C. russula* from Tunisia, Morocco and Switzerland. With the exception of a single heterozygote centric fusion, *C. cossyrensis* had a karyotype identical with that of *C. russula* from Tunisia ( $2N = 42$ ,  $NF = 70$  to  $72$ ), but it differed from *C. russula* from Morocco and Switzerland ( $2N = 42$ ,  $NF = 60$ ). The former have 5-6 pairs of chromosomes with small arms that are acrocentric in the latter. Genetic comparisons with allozyme data revealed small genetic distance (0.04) between *C. cossyrensis* and *C. russula* from Tunisia. In contrast, this eastern clade (Tunisia and Pantelleria) is separated from the western clade (Switzerland and Morocco) by a genetic distance of 0.14. A hybridization experiment between shrews from Pantelleria and Switzerland lead rapidly to an F1 generation. From 12 F1 hybrids that were backcrossed, females reproduced normally, but none of the males did so. Concluding from the results, *C. cossyrensis* from Pantelleria and *C. russula* cf. *agilis* from Tunisia belong to the same taxon that may have reached the differentiation of a biological species within the *C. russula* group. More geographic samples are needed to determine the definitive taxonomic positions of these shrews.

**Keywords:** Soricidae - *Crocidura* - Pantelleria - Tunisia - phylogeography - chromosomes - hybrids.

## INTRODUCTION

The Mediterranean island of Pantelleria (Italy) is situated 100 km southwest of Sicily and about 70 km east of the Tunisian coast. It is of volcanic origin; the oldest volcanic event is dated 220'000 years B.P., the most recent eruption occurred 8'000 years B.P. (Civetta *et al.*, 1984). As on most Mediterranean islands, a small mammal

community is present, composed of typical elements of anthropic origin such as *Mus domesticus*, *Rattus* sp., *Apodemus sylvaticus* and two white toothed shrews, *Suncus etruscus* and a species of the genus *Crocidura*. First discovered as subfossil remains, the material was tentatively assigned by Felten & Storch (1970) to *Crocidura russula*. More recently, a live specimen was trapped (Contoli & Amori, 1986) and provisionally identified as *C. russula*. Later on, Contoli (in Contoli *et al.*, 1989) suggested in an infrapaginal remark specific rank for this island population and named it *C. cossyrensis*. Finally, an identification key and other morphological traits were presented by Contoli (1990), who suggests to verify this taxonomic conclusion by other techniques.

Such a verification was carried out in 1990/1991 and preliminary results (Vogel *et al.*, 1992: Abstract in *Israel Journal of Zoology* 38: 424) suggested a close relationship of *C. cossyrensis* with *C. russula* from Tunisia. A morphological study (Sarà & Vogel, 1996) revealed a discontinuity between *C. russula* from Tunisia and Morocco, confirmed by a *cytochrome b* study (Vogel *et al.*, 2003). Finally, a new investigation of mtDNA (Lo Brutto *et al.*, 2004) confirms a close relationship between the shrews from Pantelleria and Tunisia, contrasting with *C. russula* from continental Europe. We present here evidences from karyology, an allozymic study and breeding experiments, which shed new light on shrews from Pantelleria compared to shrews from Europe, Tunisia and Morocco.

## MATERIAL AND METHODS

The shrews from Pantelleria were collected by M.S., P.V. and Laura Zanca between 21 and 24 March 1990. We captured 1 *Suncus etruscus* and 8 *Crocidura cossyrensis*. Five were trapped at four places along the road from Siba (at 300 m) to Montagna Grande (800 m) and three around the lake Bagno dell'Acqua. For a comparison, 2 *C. russula*, captured by M.S. in Ain Draham (Tunisia) in July 1990 were included in this study. Moreover, for the hybridisation experiment, some *C. russula* from Switzerland were used. These shrews are shown in Figure 1.

The chromosomes were prepared from bone marrow with the air drying technique (Baker *et al.*, 1982), stained with Giemsa and prepared by G-banding (*C. cossyrensis*: 4 individuals: IZEA-3834, IZEA-3853, IZEA-4184, IZEA-4222; *C. russula* from Tunisia 2 individuals: IZEA-3897, IZEA-3898; hybrids 3 individuals: IZEA-4296, IZEA-4634, IZEA-4704). For a comparison, chromosomes of *C. russula* from Switzerland were reanalysed (IZEA-840, IZEA-1004, IZEA-1181, IZEA-2227).

The allozyme analysis was performed from liver, heart and kidney tissues using vertical starch gel electrophoresis following methods described in Maddalena (1990). It was based on three *C. cossyrensis* captured at different places in the field (IZEA-3834, IZEA-3853 and IZEA3895), the two *C. russula* from Tunisia (IZEA-3897, IZEA-3898) compared with data formerly published (Maddalena, 1990) concerning 5 *C. russula russula*, from Morges (Switzerland) and 10 *C. russula* from Oukaimeden and Imlil (Morocco). The amount of genetic divergence between populations was estimated by using the index of standard genetic distance (D) proposed by Nei (1978).

From the captured *C. cossyrensis*, six were used as founders for a breeding colony established at IZEA in Lausanne. The shrews were kept in the same conditions

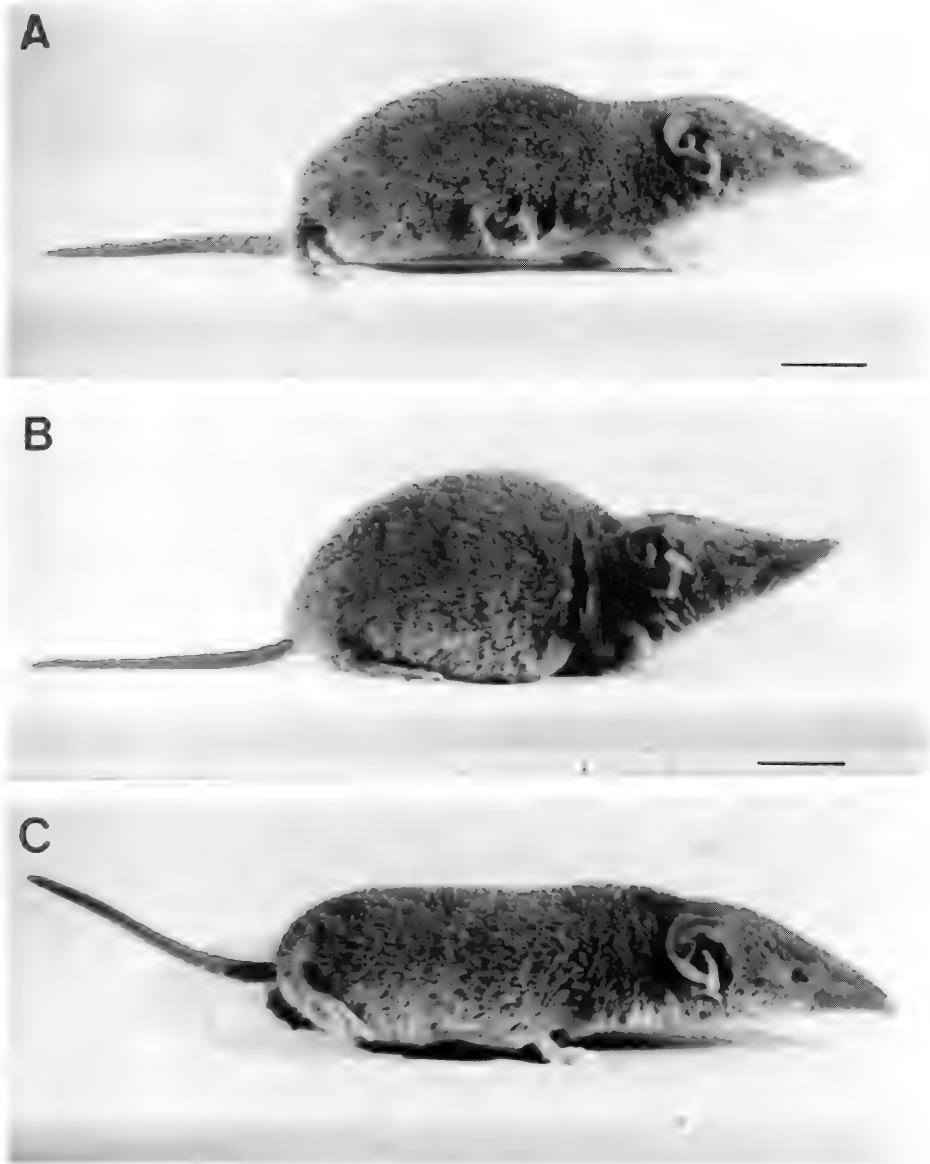


FIG. 1

A. *Crocidura russula* cf. *agilis* from Tunisia; B. *Crocidura cosyrensis* from Pantelleria; C. *Crocidura russula* from Switzerland. The pictures were taken in a standard cage (scale bar: 1 cm).

as *C. russula* described by Genoud & Vogel (1990). During summer 1990, three litters of *C. cosyrensis* with a total of 8 young were produced. In order to assess reproductive compatibility, a program of hybridisation was set up that started also in summer 1990 by forming mixed pairs of *C. cosyrensis* with *C. russula* from Switzerland, resulting

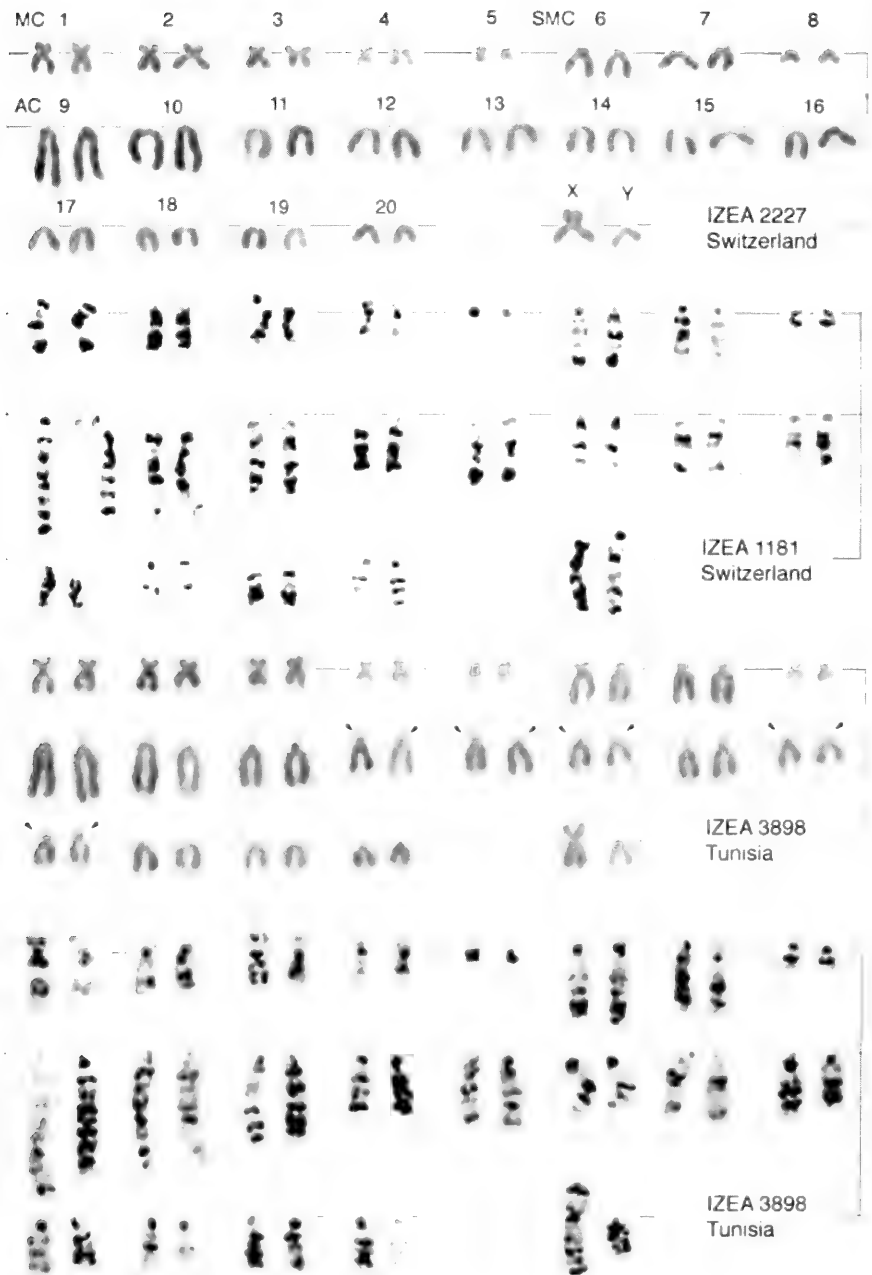


FIG. 2

Giemsa stained and G-banded karyotype of *Crocidura russula* from Switzerland (from Maddalena, 1990, but modified in the interpretation) and *C. russula* from Tunisia. MC = metacentrics, SMC = submetacentrics, AC = acrocentrics; arrows indicate supplementary chromosome arms.



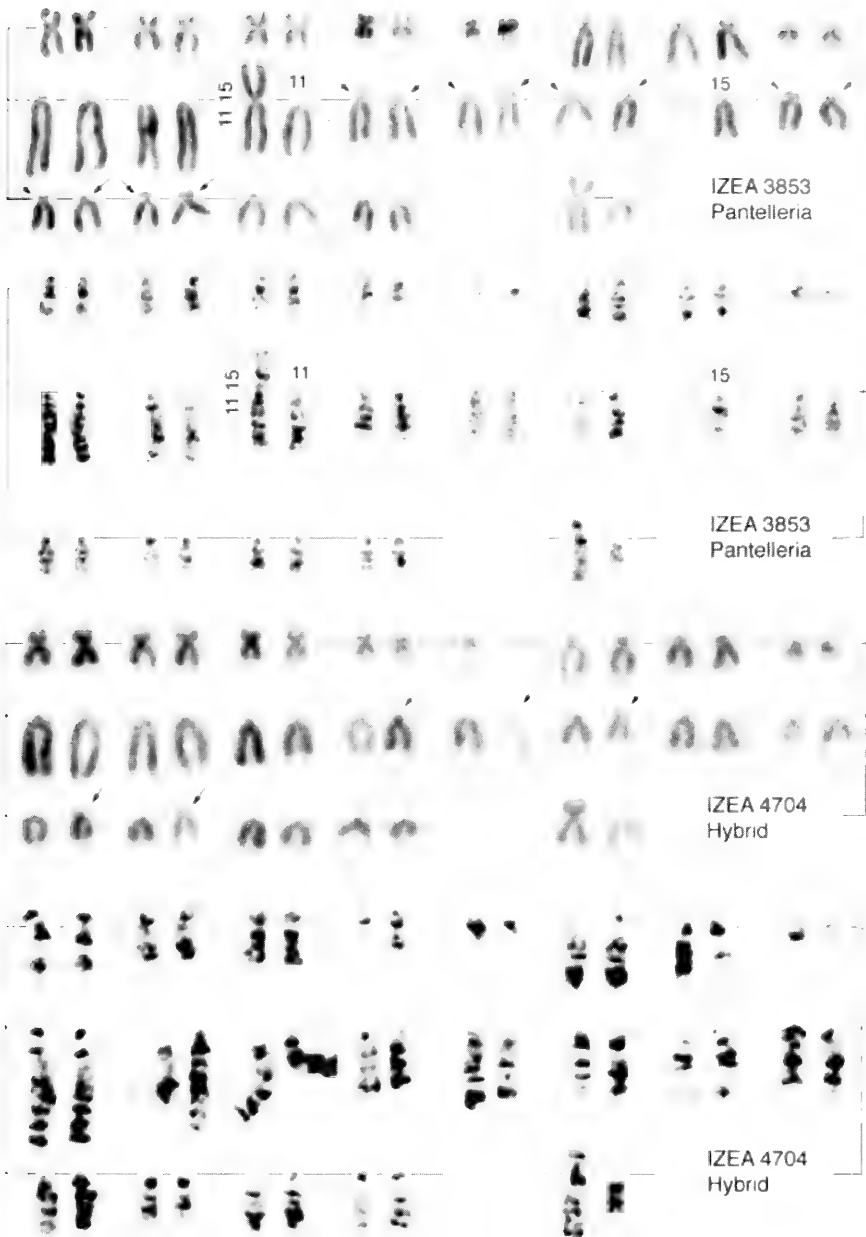


FIG. 3

Giemsa stained and G-banded karyotype of *Crocidura cossyrensis* from Pantelleria (IZEA 5853) with  $2N = 41$ ; and of a Hybrid (IZEA 4704). Arrows indicate supplementary chromosome arms.

in 5 litters with a total of 13 F1 hybrids. In 1991, after a period of winter inactivity, 12 hybrids (5 females and 7 males) were associated with *C. cossyrensis* (5 females, 1 male) and 7 *C. russula* from Switzerland (3 females, 4 males). The pairs were formed during 3 to 6 weeks. Such a back-cross experiment should show if the fertility of hybrids is normal.

## RESULTS

### THE KARYOTYPE

The classical Giemsa stained preparation revealed for *C. cossyrensis* as well as for *C. russula* from Tunisia a basic karyotype of  $2N = 42$ , similar to that of *C. russula* from Switzerland (Fig. 2 – 3), but not identical. Five pairs were metacentric, 8 or 9 were submetacentric and 6 or 7 pairs were acrocentric, resulting in a  $NF = 70 - 72$  (definition of FN see Reumer and Meylan, 1986) instead of a  $NF = 60$ . The X-chromosome was metacentric and the Y acrocentric. In G-banding, the small arms did not appear and revealed the homology between the chromosomes of each individual, independent of its origin (Pantelleria, Tunisia and Switzerland). One male *C. cossyrensis* (IZEA-3853), the young of a pregnant captured female (IZEA-4184), showed a karyotype of  $2N = 41$ , clearly heterozygous with one Robertsonian fusion between chromosome 11 and 15 (Fig. 3). Theoretically, the mother (IZEA-4184) could have been  $2N = 42, 41$  or  $40$ ; her control revealed the same heterozygosity ( $2N = 41$ ).

In the analysis of G-banding preparations of F1 hybrids (*C. cossyrensis* x *C. russula*), homologous chromosomes were easily recognised, whereas the association of the Giemsa stained chromosomes with the small arms in heterozygote state was a bit more problematic (Fig. 3).

### ALLOZYME COMPARISON

Three specimens from Pantelleria were compared by electrophoresis to *C. russula* from Morocco, Switzerland and Tunisia. Of the 32 loci analyzed, 25 were monomorphic (Adh, Ak, Alb, Ada, Ck-1, Ck-2, Est-1, Est-2, Got-1, Got-2, a-Gpd, Hbb, Hk, Hpd, Ipo-7, Ipo-8, Lap, Ldh-1, Ldh-2, Mdh-1, Mdh-2, Pa, 6-Pgd, Pgi and Sdh) and seven polymorphic (Table 1). The shrews of Pantelleria can be differentiated by the allele  $Mod^{-109}$  that is not present in the other populations. The G-6-pd<sup>114</sup> allele is common for the shrew of Pantelleria and Tunisia. Nei's 1978 values of genetic distance (D) were calculated among populations (Table 2). They were low between Pantelleria and Tunisia (0.04) and Morocco and Switzerland (0.03), but rather high between Tunisia and Morocco (0.14) and Pantelleria and Morocco (0.18).

### HYBRIDISATION EXPERIMENTS

For the fertility experiment, 12 of the F1 hybrids (*C. cossyrensis* x *C. russula* from Switzerland) were used for back-crossing with six pure *C. cossyrensis* born in summer 1990 and seven *C. russula* from Switzerland. Moreover, we tried also the combination between F1 hybrids. The results are shown in Table 3. Many of the pairwise associations were unsuccessful. This may happen even between fertile individuals (H-22 x Cr-34 or H-22 x Cr-35). After numerous combinations, more than 50% of all



categories combined with males and females of *C. russula* produced litters, e.g. 60% of the female F1 hybrids. However, no female became pregnant from a pairing with an F1 hybrid male. This result suggests reduced fertility in hybrid males, but not in hybrid females.

## DISCUSSION

Based on morphological features, Contoli (in Contoli *et al.*, 1989) interpreted the shrew of Pantelleria as an endemic island species. Our results show that this shrew is very close to *C. russula* from Tunisia, but differs from *C. russula* of Europe and Morocco.

In Europe, until now, each *Crocidura* species was considered to have a specific karyotype (Vogel *et al.*, 1990). According to the synthesis of Reumer & Meylan, (1986), *C. russula* from Europe is characterised by  $2N = 42$ ,  $NF = 60$ . Exactly the same was found in *C. russula* from Morocco (Hutterer *et al.*, 1987). The here presented results in regard to *C. cosyrensis* from Pantelleria and *C. russula* from Tunisia showed the same diploid number of chromosomes ( $2N = 42$ ) and the same banding pattern permitting to identify the same chromosomes. However, five to six pairs of normally acrocentric chromosomes have small arms, leading to a submetacentric morphology. Such small arms have been occasionally observed in European populations, e.g. by Schmid (1968) in one pair, and by Catalan (1984) in five chromosome pairs in one out of four karyotyped shrews from the island Ibiza, Spain (*Crocidura russula ibizensis*). In contrast to these reports, the shrews from Pantelleria and Tunisia show always a high number of submetacentric chromosomes, revealing without doubt a close phylogenetic relationship.

This result is confirmed by the allozyme analysis showing a close genetic relationship between the Tunisian and the Pantellerian populations. The genetic distances are typical for intraspecific populations and are of the same order as the genetic distance between the populations from Morocco and Europe, the latter having been derived from the former probably at the end of the last glaciation (Catzefflis *et al.*, 1985; Vogel & Maddalena, 1987).

Nei's mean genetic distance  $D = 0.14$  between the two clades is rather high for an intraspecific differentiation, but of the same level as between some populations in *C. suaveolens* (Catzefflis *et al.*, 1985). These data from nuclear genes confirm results based on the cytochrome *b* gene (Vogel *et al.*, 2003). In those analyses, *C. russula* as well as *C. suaveolens* seem to present species groups rather than single species. The split of the *C. russula* group into an eastern and western clade, was also evidenced by Lo Brutto *et al.* (2004) based on SSR and 12S-rRNA genes.

Finally, the results of our hybridization experiment indicate a clear but somewhat disrupted relationship between the European *C. russula* and the shrew from Pantelleria: An F1 generation and backcrosses from hybrid females were easily obtained, but hybrid males did not reproduce, suggesting at least partial sterility, in agreement with Haldane's rule.

From these results, the following taxonomic conclusion may be outlined:

i) The Tunisian population, characterized by numerous pairs of submetacentric chromosomes and also by two "private alleles" (shared with *C. cossyrensis*) should be separated from *C. russula yebalensis* Cabrera, 1913 from Morocco. Sarà & Vogel (1996) assigned the Tunisian population provisionally to *C. russula* cf *agilis* Levaillant, 1867, which was described from Algeria (Ellerman & Morrison-Scott, 1951). According to morphometric analyses (Sarà & Vogel, 1996), the geographic border between the two taxa is situated in eastern Algeria, as shown by a stepped cline.

ii) The shrew population on Pantelleria derived from a Tunisian population, most probably during historical time. The colonisation followed thus the classical model of postglacial human introduction as shown for the hedgehog *Erinaceus algirus* of Malta (Malec & Storch, 1972), *C. suaveolens* of Crete (Vogel *et al.*, 1986) and Corsica (Catalan, 1984; Maddalena, 1990) and *C. russula* of the Canary Islands (Vogel *et al.*, 2003).

iii) The clade including *C. cossyrensis* and *C. russula* from Tunisia may have reached the level of a biological species within the *C. russula* group. Samples from the whole geographic area of the group are needed to determine the definitive taxonomical position of these shrews.

A final remark concerns the shrews from Ibiza studied by Catalan *et al.* (1988). This island population compared to other European *C. russula* showed with a genetic distances of Nei of 0.1 the most isolated position, due to two specific alleles (in Aa-1<sup>120</sup> and Np-R<sup>132</sup>), while other alleles were shared with populations of Spain. As explanation, the authors supposed an African origin. The occurrence of karyotypes with and without supplementary small chromosome arms suggests a mixed origin, from continental Europe and from the eastern North African clade (*C. r.* cf *agilis*).

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## **First records of raccoon dog, *Nyctereutes procyonoides* (Gray, 1834), in Switzerland**

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**First records of raccoon dog, *Nyctereutes procyonoides* (Gray, 1834), in Switzerland.** - The raccoon dog was introduced to the European part of the former USSR in the last century. Since then, the species rapidly expanded its range throughout Europe and now occurs in Germany and eastern France. Herein, we report the first confirmed observations of the raccoon dog in Switzerland and discuss the potential risks associated to its presence.

**Keywords:** Raccoon dog - *Nyctereutes procyonoides* - first records - Switzerland.

### INTRODUCTION

Originally found across eastern Siberia, northern China, Korea, and Japan, the raccoon dog (*Nyctereutes procyonoides*) was introduced to Europe in the last century. Around 9'000 individuals were released between the late 1920s and mid 1950s in the European part of the former USSR in order to create new fur-producing populations. Since then, the species rapidly expanded its range westwards and colonized countries such as Finland (1935), Sweden (1945), Romania (1951), Poland (1955), Czechoslovakia (1959), Hungary and Germany (1962; Nowak, 1984). Further west, in France, the first documented observation of a raccoon dog was recorded in 1979 (Artois & Duchêne, 1982).

During the last decade, raccoon dog numbers increased dramatically throughout its European range. In Germany for instance, hunting statistics report a 10-fold increase in the number of raccoon dogs killed between 1995 and 1998 (from 398 to 3'250 individuals) in the whole country. Moreover, 4'325 individuals were killed in the state of Brandenburg alone in 2001/02. For comparison, only 94 raccoon dogs were killed in that state in 1995 (Anonymous, 2002). In France, where most observations are restricted to the eastern part of the country, this increase seems less pronounced, though there are strong evidences of reproduction in the wild (Léger, 2001; pers. comm.).

Considering this impressive evolution and its proximity – occurrence of raccoon dog was confirmed in the Rhine valley in Baden-Württemberg (Linderoth, 1997) –, the species could have reached Switzerland already a few years ago. However, if some observations of raccoon dog were occasionally announced in the country, none of them was confirmed (Schmid, 1995). Here, we report on the first documented evidences of raccoon dogs in Switzerland.

## MATERIAL AND METHODS

Observation quality for uncommon and/or secretive species like most carnivores varies greatly in precision and reliability. Three degrees of quality (Q1-Q3) are usually considered to standardize data interpretation in the monitoring of carnivore distribution (Molinari-Jobin *et al.*, 2001), Q1 data (e.g. “hard facts” such as individual shot or found dead, and observations documented with photographs) being the most reliable. In this paper, only Q1 observations were taken into account.

Nocturnal, direct observations of raccoon dogs were made using a second generation light intensifier (Carl Zeiss 5.6 x 62 T) and a 30W infra-red illuminator. Pictures were taken with a digital camera (Nikon Photosmart 850) coupled to the nightvision system.

When possible, raccoon dog carcasses were weighed and the following morphometrical measures taken: 1) head and body length (HB), tail length (T), hind foot length (HF), ear length (E) and shoulder height (S). A necropsy was performed at the Institute of Animal Pathology (University of Bern) and stomach content examined for dietary purposes.

## RESULTS

The first confirmed observation of a raccoon dog (NP1) in Switzerland was made in Leuggern (47° 33' N, 8° 11' E; altitude: 400 m a.s.l.; Fig. 1[1]) on September 15<sup>th</sup> 1997. The animal was run over by a car. Details on this individual are missing since no official report was established. According to the game keeper who found it, the origin of the animal could not be determined. The raccoon dog was stuffed and nowadays is exposed in Leibstadt schoolhouse.

Looking for signs of lynx presence along the river Doubs, one of us (DF) observed during about five minutes on December 4<sup>th</sup> 2002 (21h50) what he considered to be a raccoon dog. The animal was foraging along the shore. Five weeks later, on January 15<sup>th</sup> 2003 (23h35) and in the same circumstances, a raccoon dog was observed some 500 m downstream from the first spot. However, both observations could not be documented. Finally on April 24<sup>th</sup> 2003 (03h55), after 144 hours of night observation in the area, a raccoon dog (NP2) was seen again 300 m upstream from the first spot (Commune of Les Bois; coordinates: 47° 11' N, 6° 52' E; altitude: 540 m a.s.l.; Fig. 1[2]). Three pictures of the animal were taken.

On August 6<sup>th</sup> 2003, a raccoon dog (NP3) was found dead on the verge of the A16 highway between Alle and Porrentruy (Commune of Alle; coordinates: 47° 25' N, 6° 52' E; altitude: 460 m a.s.l.; Fig. 1[3]). The individual, killed by a vehicle, was an adult male in good condition (Table 1). Plums (*Prunus insititia*) formed the bulk – ca.



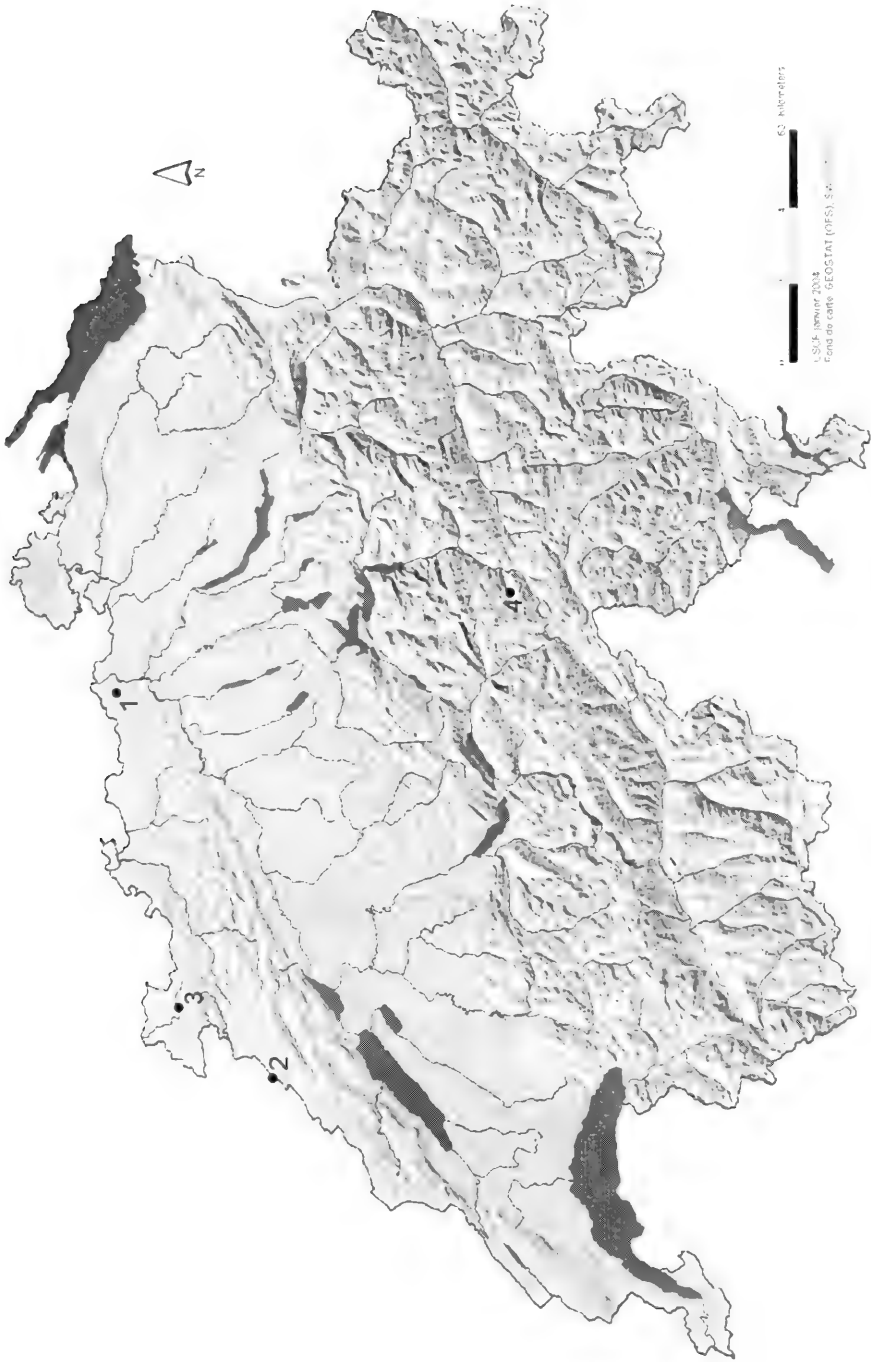


FIG. 1. Location of confirmed raccoon dog observations in Switzerland. 1 = Leuggern, 2 = Les Bois, 3 = Alle, 4 = Göschenen.

95% of the volume – of the stomach content (80 g). The remaining 5 % were made of maize (*Zea mays*), two adults Coleoptera (*Abax* sp.), one larva of an unidentified Diptera, and a few rodent hair and earthworm chetae.

TABLE 1. Morphometric measures of the two raccoon dogs killed in 2003 (see text for abbreviations).

Individual	Weight (kg)	HB (mm)	T (mm)	S (mm)	HF (mm)	E (mm)
NP3	5.8	640	184	285	113	62
NP4	7.6	590	180		115	40

An additional observation of a raccoon dog (NP4) was recorded on October 1<sup>st</sup> 2003 in central Switzerland. An adult male was shot in the Commune of Göschenen (coordinates: 46° 39' N, 8° 30' E; altitude: 1570 m a.s.l.; Fig. 1[4]). Body condition was good (Table 1), though pronounced tooth wear and the presence of a tumour on the testes suggested the individual to be quite old (M.-P. Ryser, pers. comm.). Stomach content (22.4 g) was predominantly composed of plant material and a few rodent hair.

## DISCUSSION

The occurrence of raccoon dogs in Switzerland constitutes a further step in the colonization process of Europe by this exotic canid. Considering its rapid expansion through the continent and its status in the neighbouring German and French border regions (A. Elliger, pers. comm.; Léger, 2001), the presence of raccoon dogs in northern Switzerland is not surprising. The area and its extensive lowland deciduous forests certainly provide suitable habitats and enough food resources for this predator (Duchêne & Artois, 1988). On the other hand, more surprising is the observation reported from the mountains of central Switzerland, since raccoon dogs are seldom found above 600 m a.s.l. (Duchêne & Artois, 1988). Could this individual have escaped from captivity or does this observation reflect the high adaptability of the species? It is difficult to answer without reservation, but to our knowledge no raccoon dog is or was recently kept in captivity in this region.

The striking increase in raccoon dog numbers observed during the last decade notably in eastern Germany (Anonymous, 2002), emphasizes the outstanding capacity of expansion of the species. Several factors may explain this success. Like its close relative the red fox (*Vulpes vulpes*), the raccoon dog has a body size that is small enough to remain relatively inconspicuous, but large enough not to be too vulnerable. Moreover, it is a generalist opportunist predator that may well adapt to changing trophic conditions, and should food resources become scarce during harsh winters, the raccoon dog has the capacity to hibernate (Duchêne & Artois, 1988). Rapid colonization could also be explained by a high rate of reproduction (Helle & Kauhala, 1995). The number of cubs per litter is generally comprised between 3 and 8, but can reach a maximum of 19 (Duchêne & Artois, 1988). Lastly, apart from man, the most important natural predator of the raccoon dog, the wolf (*Canis lupus*), is still uncommon in Western Europe (Duchêne & Artois, 1988). Under these circumstances, it is likely that the colonization of new areas in Europe will continue.

Introduced exotic predators have usually a negative impact on the native fauna (Dickman, 1996; Ferreras & Macdonald, 1999 *inter al.*). Dietary analyses carried out in Romania (Barbu, 1972) and more recently in Finland (Kauhala & Auniola, 2001) showed that raccoon dogs fed extensively on waterfowl and their eggs, and on amphibians amongst others. Therefore, the spread of this predator in Switzerland could possibly threaten, by direct predation, some vulnerable and/or endangered ground-nesting bird species and also contribute to the on-going decline of amphibian populations. Interspecific competition is another potential problem linked to the introduction of raccoon dogs. In Belarus, Sidorovich *et al.* (2000) found a considerable dietary overlap among generalist carnivores, such as red fox, badger (*Meles meles*), pine marten (*Martes martes*), polecat (*Mustela putorius*) and raccoon dog. In addition, their study suggested that after the raccoon dog had reached a high population density, the native generalist predators began to decline. As far as we know, this is the only evidence of a possible intra-guild competition involving the raccoon dog and other carnivores. Therefore, further investigation is clearly required to confirm it unequivocally. Finally, the raccoon dog has an important potential role in disease transmission to native wildlife. In Russia and Poland for instance, it is the main vector of rabies beside the red fox. It also hosts a variety of parasitic helminths, such as trichina (*Trichinella spiralis*), and arthropods (i.e. *Sarcoptes scabiei*) (Duchêne & Artois, 1988).

As an exotic species, the raccoon dog can be shot year-round by game-keepers in Switzerland. However, regulation by hunting seems ineffective as suggested by the German example (Anonymous, 2002). Consequently, there is no obvious reason why colonization of suitable areas in Switzerland should stop. Actually, raccoon dogs could be more common in Switzerland than expected, recent observations being only the tip of the iceberg. For this reason, and considering the lack of scientific knowledge on the species in Western Europe and the above-mentioned potential problems, a monitoring program of the raccoon dog population should be implemented as soon as possible.

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## **A new species of scutacarid mites transferring fungal spores (Acari, Tarsonemina)**

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**A new species of scutacarid mites transferring fungal spores (Acari, Tarsonemina).** - The mite species *Imparipes (I.) breganti* sp. n. (Heterostigmata, Scutacaridae) is described. Females of this species use the atrium genitale as a transport container (sporothea) for fungal spores. The females have been found phoretic on soil-dwelling sphecids and, less commonly, on soil-dwelling bee species. The male and larva are still unknown. *Imparipes breganti* sp. n. is recorded from a number of collection sites in Austria, Belgium and Germany.

**Keywords:** Acari - Scutacaridae - new mite species - spore transfer - sporothecae - Sphecidae - wild bees - phoresy.

### INTRODUCTION

The transfer of fungal spores via a sporothea in mites is a rare phenomenon. Even though it has evidently evolved repeatedly, it – as far as our state of knowledge goes – only occurs in few of the heterostigmatid families (Lindquist, 1985). In the course of an examination of phoretic mites which mainly were collected from wild bees and sphecids we recently discovered two species of the mite family Scutacaridae that also transport fungal spores by means of a sporothea (Ebermann & Hall, 2003). Both species, *Imparipes haeseleri* Ebermann & Hall, 2003 and *Imparipes apicola* (Banks, 1914), use their atrium genitale as a transport container for fungal spores. We now also discovered this type of sporothea in another european scutacarid species of the genus *Imparipes*. The description of this new species is presented in this paper.

### MATERIAL AND METHODS

Wild bees, sphecids and slide preparations were placed at our disposal from the following collections: ISNB, OÖLM, LJG, ZMUH.

### LOCALITIES AND HYMENOPTEROUS HOSTS

The labelling of samples refers to original labels of microscopic preparations or prepared insects, respectively.

AUSTRIA: **AUT-BL-2b**: Oberhenndorf N Jennersdorf, S-Burgenland (46°59'N, 16°08'E); *Crossocerus elongatulus* (v. d. Linden, 1829) (Sphecidae): ♀, 25.06.1997, Bregant leg., Gusenleitner det.; (LJG), 1 mite. **AUT-BL-2c**: same as AUT-BL-2b; *Crossocerus ovalis* Lepeletier & Brullé, 1834) (Sphecidae): ♀, 19.05.1997, Bregant leg., Gusenleitner det.; (LJG), 1 mite. **AUT-BL-3**: Weiden bei Rechnitz (47°18'N, 16°21'E), *Hylaeus variegatus* (Fabricius, 1798) ["*Prosopis variegatus*"] (Apidae): ♀, 21.08.1996, Bregant leg., Hausl-Hofstätter det. (LJG), 3 mites. **AUT-BL-4**: Tauka; *Cerceris rybyensis* (Linnaeus, 1771) (Sphecidae): ♂, 31.07.2000, Gusenleitner leg. & det.; (OÖLM), 1 mite. **AUT-NÖ-1b**: Falkenstein, Dörfl-Glaserberg; *Andrena flavipes* Panzer, 1799 (Apidae): ♂, 13.05.1998, Ruckenstein leg., Gusenleitner det.; (OÖLM), 1 mite. **AUT-OÖ-2d**: Plesching near Linz; *Cerceris rybyensis* (Linnaeus, 1771) (Sphecidae): ♀, 29.08.2000, Schwarz leg., Gusenleitner det.; (OÖLM), 2 mites. **AUT-OÖ-5**: Mühlbach S Wilhering; *Cerceris rybyensis* (Linnaeus, 1771) (Sphecidae): ♂, 01.07.1999, Gusenleitner leg. & det.; (OÖLM), 2 mites. **AUT-OÖ-6**: Schabetsberg SE St. Agatha; *Andrena flavipes* Panzer, 1799 (Apidae): ♂, 21.04.2000 Gusenleitner leg. & det.; (OÖLM), 1 mite. **AUT-OÖ-7**: Müllerberg S Bad Schallerbach; *Andrena flavipes* Panzer, 1799 (Apidae): ♂, 07.04.2000, Gusenleitner leg. & det.; (OÖLM), 3 mites. **AUT-OÖ-8**: Weinzierlbruck N Prambachkirchen; *Andrena flavipes* Panzer, 1799 (Apidae): ♂, 21.04.2000, Gusenleitner leg. & det.; (OÖLM), 1 mite. **AUT-ST-3d**: Windische Bühel, Kranach (Menhart), NNE Leutschach (46°41'N, 15°28'E); *Lindenus panzeri* (v. d. Linden, 1829) (Sphecidae): ♀, 29.09.1996, Bregant leg., Gusenleitner det.; (LJG), 1 mite. **AUT-ST-3g**: Kranach NE Leutschach, farm Menhart, S-Styria (46°69'N, 15°48'E; 400 m), *Cerceris sabulosa* (Panzer, 1799) (Sphecidae): ♂, 08.08.1994, Hausl-Hofstätter leg., Bregant det. (LJG), 1 mite. **AUT-ST-9a**: Freienberg SW Stubenberg am See, E-Styria, *Diodontus luperus* Shuckard, 1837 (Sphecidae): ♀, 11.07.1995, Bregant leg. & det. (LJG), 1 mite. **AUT-ST-11a**: Weinburg or W-Styria; *Cerceris rybyensis* (Linnaeus, 1771) (Sphecidae): ♀, Maly leg. & coll., Dollfuss det.; (LJG), 3 mites. **AUT-ST-11b**: same as AUT-ST-11a; AUT-ST-11a; *Gorytes* sp. (Sphecidae): 1 ex., Maly leg. & coll.; (LJG), 10 mites. **AUT-?-1**: Seeboden; *Sphecodes monilicornis* (Kirby, 1802) (Apidae): ♀, 22.07.1909, Ebmer det., Salzmann coll.; (LJG), 1 mite.

BELGIUM: **BEL-5**: Uccle; *Lestica subterranea* (Fabricius, 1775) ["*Crabro subterraneus*"] (Sphecidae): ♂, 08.06.1946, Crevecoeur; (ISNB), 2 mites. **BEL-6**: Wesembeek; *Osmia papaveris* (Latreille, 1799) (Apidae): ♂, 22.06.1941, Crevecoeur; (ISNB), 1 mite.

GERMANY: **GER-12**: Hosüne; *Diodontus tristis* (v. d. Linden, 1829) (Sphecidae): ♀, 28.06.1903, Haeseler det.; (ZMUH), 4 mites. **GER-13**: Achim near Bremen; *Diodontus tristis* (v. d. Linden, 1829) (Sphecidae): ♂, 30.06.1979, Haeseler det.; (ZMUH), 2 mites. **GER-14**: Bornhausen; *Lindenus albilabris* (Fabricius, 1793) (Sphecidae): ♀, 09.08.1973, Haeseler det.; (ZMUH), 47 mites. **GER-19**: Dingstede; *Crossocerus varus* Lepeletier & Brullé, 1835 ["*Crossocerus pusillus*"] (Sphecidae): ♀, 08.07.1983, Haeseler det.; (ZMUH), 1 mite. **GER-20**: Quelkhorn near Bremen; *Diodontus tristis* (v. d. Linden, 1829) (Sphecidae): ♂, 09.08.1970, Haeseler det.; (ZMUH), 5 mites.

## ABBREVIATIONS

*Description:* aPS = anterior margin of segment PS; Ag = aggenital plate; ap = apodeme; aStpl = anterior sternal plate; b = anterior margin of ge; Fe = femur; ge = genital sclerite; Gen = genu; ITa = length of tarsus; IPrTa = length of pretarsus; n = number; PrTa = pretarsus; PS = segment PS; pStpl = posterior sternal plate; s1, s2 = lateral margins of ge; sol = solenidion; spo = spores; Ta = tarsus; Ti = tibia; TiTa = tibiotarsus; Tr = trochanter; x = average;  $\approx$  about the same length; < = shorter than; > = longer than;  $\geq$  = the same length or longer;  $\leq$  = the same length or shorter;  $\alpha_1$ ,  $\alpha_2$ ,  $\beta$  = enclosed angles of ge.

*Localities:* AUT = Austria, BEL = Belgium; GER = Germany; *Austrian provinces:* BL = Burgenland, NÖ = Lower Austria, OÖ = Upper Austria, ST = Styria.

*Collections:* CEE = Collection Ernst Ebermann, Karl-Franzens-University Graz, Austria; HNHM = Hungarian Natural History Museum, Budapest, Hungary; ISNB = Institut Royal des Sciences Naturelles de Belgique, Brussels, Belgium; MHNG = Muséum d'histoire naturelle, Geneva, Switzerland. OÖLM = Oberösterreichisches Landesmuseum, Linz, Austria; LJG = Landesmuseum Joanneum, Graz, Austria; ZMUH = Zoologisches Institut und Zoologisches Museum der Universität Hamburg, Germany.

## PREPARATION AND MEASUREMENTS

The dried phoretic mites were removed from their hymenopterous hosts with the tip of a moistened pencil, then transferred to 70% methanol and embedded in Swan' Medium. We measured the anterior and lateral margins of the genital sclerite and their angles. The calculated values are given as relative values in the descriptions.

## RESULTS AND DISCUSSION

*Imparipes (Imparipes) breganti* sp. n. (female)

Figs 1-2, 3a, 4-6

*Material:* 95 ♀♀ (11 of these were used for molecular-biological analysis: AUT-BL-4, AUT-NÖ-1b, AUT-OÖ-2d, AUT-OÖ-5, AUT-OÖ-6, AUT-OÖ-7, AUT-OÖ-8). Holotype (specimen from AUT-BL-3) and 83 paratypes from 16 localities in Austria, Belgium and Germany (see list of localities). *Deposition:* Holotype and 2 paratypes in MHNG, 81 slides with paratypes in CEE, HNHM, ISNB, MHNG, ZMUH.

*Diagnosis:* *Imparipes breganti* sp. n. is most closely related to *Imparipes apicola* (Banks, 1914); both species correspond in following characteristics: Similar setation of venter. Relative length of legs: Leg I < leg II < leg III << leg IV. Relative length of segments of leg IV: ITr to ITi < ITa to IPrTa. The manner of attachment of ge on segment PS. Possession of a sporotheca; similar type of enclosed fungal spores. Association with soil-dwelling hymenoptera. Differences between *I. breganti* and *I. apicola*: Setae of dorsum in *breganti* relatively longer and more slender than in *apicola*. Relative length of setae dTi, tc' and tc'' (leg IV): *breganti* dTi > tc' > tc'', *apicola*: tc' > dTi > tc''. Genital sclerite of *breganti* is generally broader than in *apicola* (Fig. 3a-b).

*Description:* Body dimensions (measurements given in  $\mu\text{m}$ ): Idiosoma length: 199 - 230, x = 209 (n = 20), holotype 210; broad (measured in the widest part of seg-

ment C): 146 - 182,  $x = 161$  ( $n = 20$ ), holotype 158; width of aStpl (measured as distance between insertion points of setae1b): 46 - 52,  $x = 48$  ( $n = 20$ ), holotype 49; width of pStpl (measured in the widest part laterally of 3c): 86 - 103,  $x = 94$  ( $n = 20$ ), holotype 96.

Entire surface of body with tiny pores; cupulae ia and ih large, roundish.

Dorsum (Fig. 1): Free margin of tergite C broad, with fine, radiating stripes (not illustrated in Fig. 1); c1 and c2 without alveolar canal. All setae barbed. Setae c1 and c2 somewhat more slender than the other dorsal setae. Identical setae of specimens from different localities moderately differing in length. Relative length of setae ( $x$  of 20 specimens):  $h1 \approx c2 \geq c1 \approx d \approx f > h2 \approx e$ .

Venter (Fig. 2): Gnathosoma: Setae ch1 not extending beyond palpal region; ap1 and ap2 well developed, ap3 weakly sclerotized, ap4 not reaching to acetabula of leg III, a small secondary apodeme present immediately below ap4, ap5 strongly reduced, its outer parts remaining before 4b. Ventral setae moderately varying length. Relative length of setae ( $x$  of 20 specimens):  $4c > 4b > 3b > 3a \geq 4a \geq 3c \approx 1a > 2a \geq 1b \geq 2b$ . All setae barbed, ps2 and some gnathosomal setae smooth. 2b daggerlike, with only a few barbs. 3b standing somewhat before 3a and 3c, 3a approaching insertion points of 4a, 3b extending to insertion points of 4b.  $ps1 \geq ps3 > ps2$ ; distance  $ps1-ps1 \geq$  distance  $ps2-ps3$  ( $x$  of 20 specimens).

Genital sclerite (Figs 2, 3a, 4): Strongly sclerotized, on its ventral surface irregularly scattered scratches, its attachment on the anterior margin of segment PS shown in Fig. 3a; anterior margin of segment PS lateral to ge bent backwards as shown in I. apicola; measurement of ge ( $x$  of 39 specimens):  $b \approx s1$  and  $s2$ ;  $l < b$ ;  $\beta \approx \alpha1$  and  $\alpha2$ .

Sporotheca (Figs 2, 4): The sporotheca is a broad, x-shaped hollow cavity anterior and/or lateral to the genital sclerite ("atrium genitale", see Ebermann & Hall, 2003) filled with fungal spores. Opening of sporotheca formed by fissure between posterior margin of aggenital plate (Ag) and the underlying segment PS (Fig. 2).

Frequency of infestation and diameter of spores: 70 of 95 examined specimens (73.7 %) with 2 to 23 spherical fungal spores in the frontolateral and/or laterocaudal area of genital sclerite (Figs 2, 4). In one and the same sporotheca the diameters of spores varying from 3 to 11  $\mu$ m.

Trichobothrium (Fig. 5a): Club-shaped, thin stemmed, with fine scales, outer seta  $v1 > v2$ .

Extremities: Relative length ( $x$  of 32 specimens): Leg I < leg II < leg III << leg IV. Leg I (Figs 5b, c): Setal formula: Tr 1, Fe 3, Ge 4, TiTa 16, 4 sol; sol  $\omega2$  slender, longer than tubercle,  $\omega1$  large, stout,  $\omega2$  club-shaped,  $\omega1$  similar to  $\omega2$  but thicker; relative length of sol ( $n = 18$ ):  $w2 \approx \omega1 \geq \omega1 \geq \omega2$ ; TiTa with small claw, tip of claw more or less elongated;  $v'$ Fe smooth, with thickened tip. Leg II (Fig. 6a): Setal formula: Tr 1, Fe 3, Ge 3, Ti 4 (sol  $\omega$ ), Ta 6 (sol  $\omega$ ); Ta with 2 claws and pulvillus. Leg III (Fig. 6b): Setal formula: Tr 1, Fe 2, Ge 2, Ti 4 (sol  $\omega$ ), Ta 6; Ta with 2 claws and pulvillus. Leg IV (Fig. 6c): Setal formula: Tr 1, Fe 2, Ge 1, Ti 4 (sol  $\omega$ ), Ta 4; relative length of tibial/tarsal setae ( $x$  of 21 specimens):  $dTi > tc' > tc'' > pv'' > pv'$ . Length ratios between Tr, Ta and PrTa ( $x$  of 21 specimens):  $lTa < lPrTa$ ;  $lTr$  to  $lTi < lTa$  to  $lPrTa$ .

Male and Larva: Unknown.





FIG. 1

*Imparipes (I.) breganti* sp. n., female (holotype), dorsum. Idiosoma length 210  $\mu$ m.

**Bionomics:** Phoretic females were mainly found upon soil-dwelling sphecids but also upon soil-dwelling bees.

**Etymology:** The species name "breganti" is dedicated to the former staff member of the Landesmuseum Joanneum (Graz, Austria), Mr Eugen Bregant (1937-2003), for his entomological research in the eastern part of Austria.

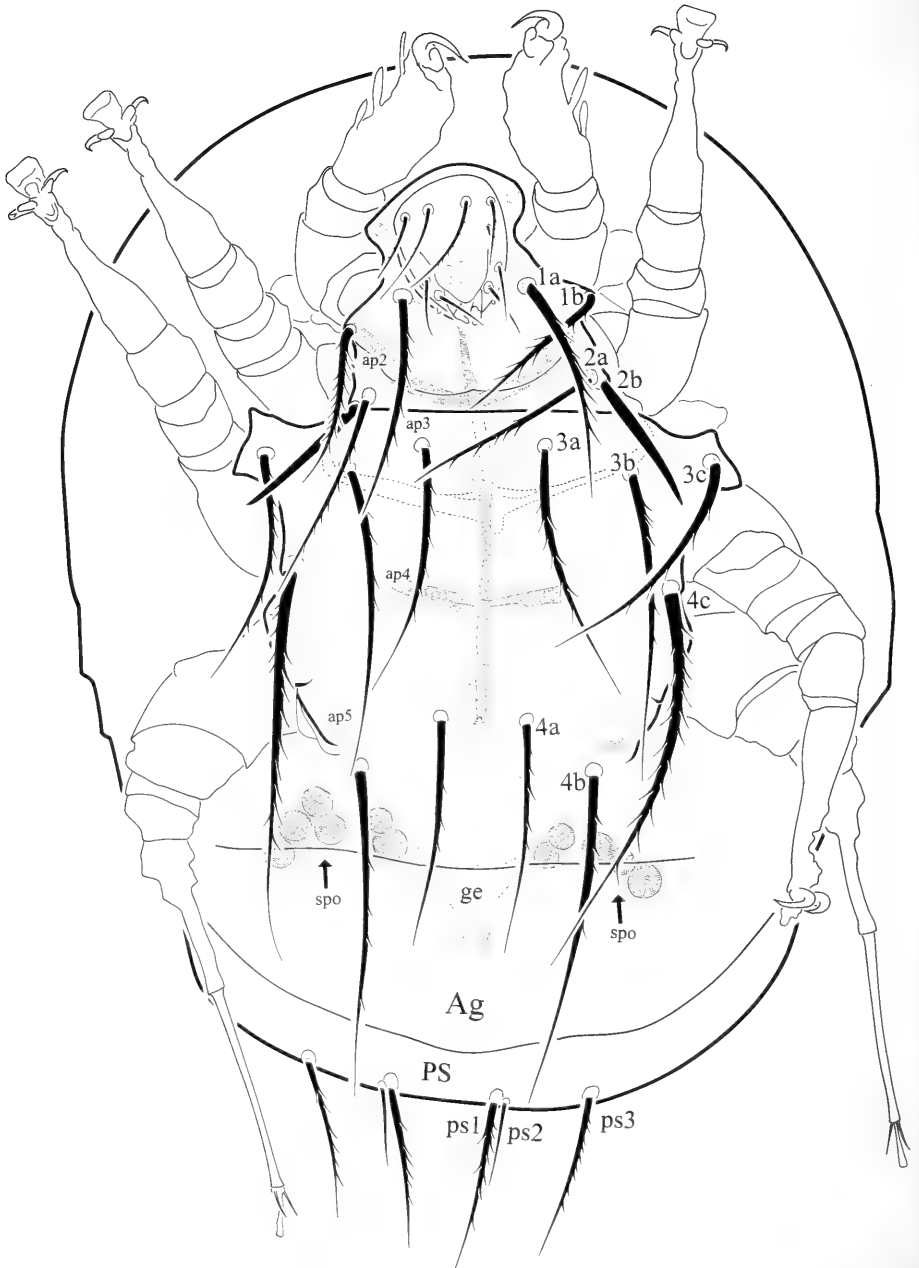


FIG. 2

*Imparipes (I.) breganti* sp. n., female (holotype), venter; arrows mark the fungal spores (spo) in the atrium genitale.

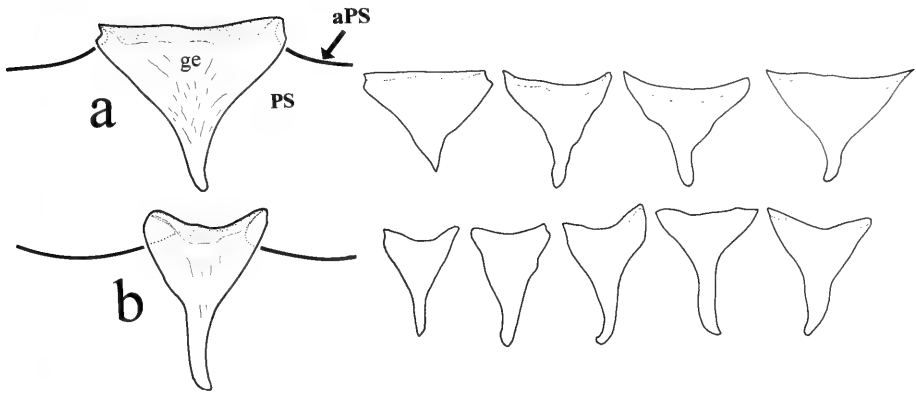


FIG. 3

Genital sclerite (ge): a = *Imparipes breganti* sp. n., b = *I. apicola*. Left: these figures show how the sclerite is anchored to the anterior margin (aPS) of segment PS; right: examples for the variability of ge.

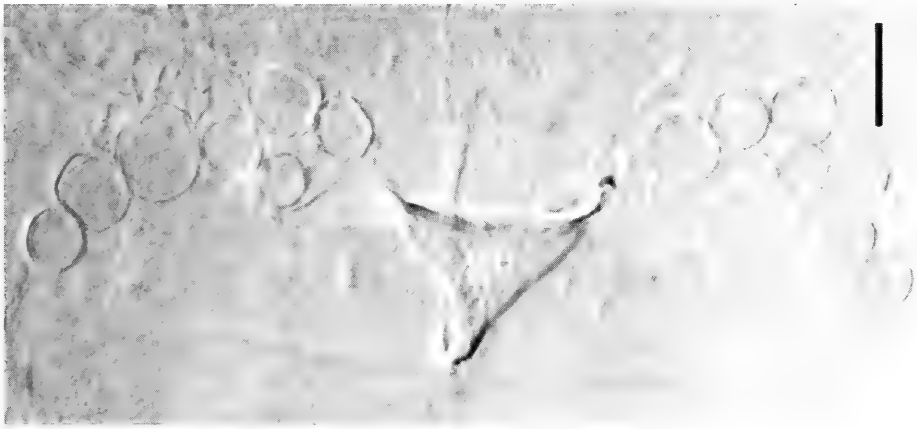


FIG. 4

*Imparipes (I.) breganti* sp. n., female with 15 fungal spores in the atrium genitale (microphotograph, bar = 10  $\mu$ m); ge = genital sclerite. Mite from sample GER-13.

#### TRANSPORT OF FUNGAL SPORES

*Imparipes breganti* sp. n. has been proven to be yet another scutacarid species transporting fungal spores in a sporotheca. The sporotheca of *I. breganti* sp. n. corresponds to the type which we also detected in *I. haeseleri* and *I. apicola*. The size and shape of the spores corresponds to the Type "B" found in *I. apicola*; the frequency of spore-carrying females of *I. breganti* sp. n. is at 73.7% significantly lower than that in *I. haeseleri* (99.6%) and *I. apicola* (99.1%) (Ebermann & Hall, 2003). Reasons for this are as yet unknown. This third record of a spore-carrying species is an indication that

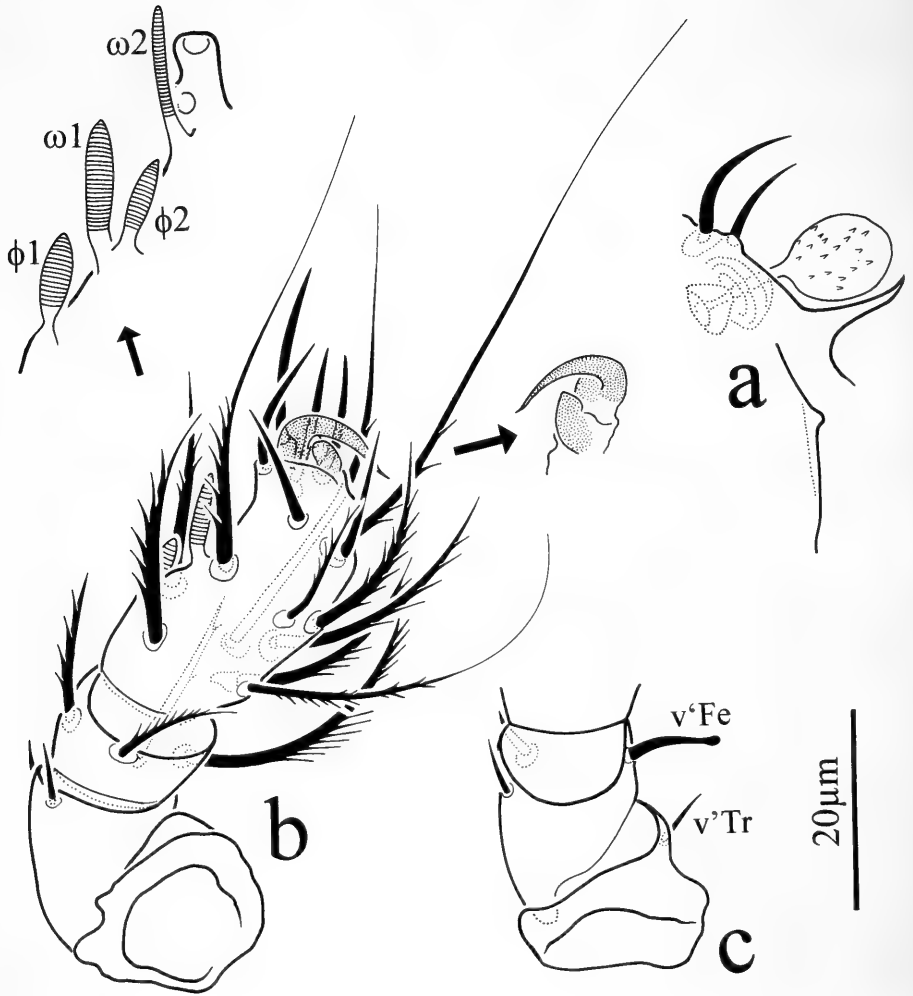


FIG. 5

*Imparipes (I.) breganti* sp. n., female (a - b = holotype), a = trichobothrium, b = leg I, arrows = claw and solenidia, c = proximal part of leg I of a paratype.

there may potentially be other scutacarid species associated to Aculeata using sporothecae for spore-transfer and that fungi probably play an important role in the mites' cycle of development. In an earlier paper we discussed the potential significance of the sporothecae among the Scutacaridae (Ebermann & Hall, 2003). A solution to the issue is still pending. Further details on the relationship of bee or sphecid hosts and mites, the occurrence of sporothecae and a discussion on zoogeographical aspects will be published elsewhere (Hall & Ebermann, in press).

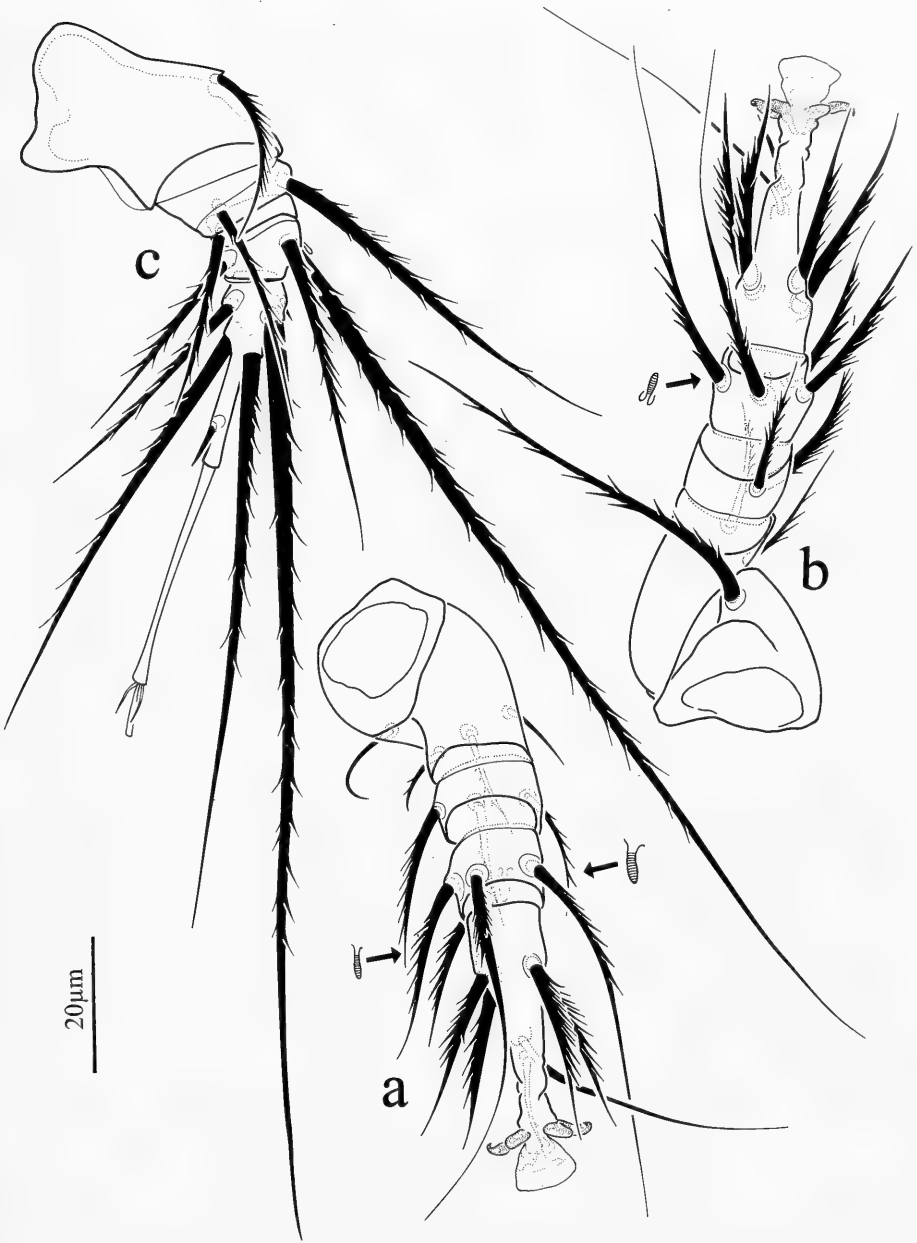


FIG. 6

*Imparipes (I.) breganti* sp. n., female (holotype): a = leg II, b = leg III, c = leg IV.

## ACKNOWLEDGEMENTS

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**A new replacement name for *Vincentia* Uhler, 1895  
(non Castelnau, 1872) (Insecta: Hemiptera: Cixiidae)**

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**A new replacement name for *Vincentia* Uhler, 1895 (non Castelnau, 1872) (Insecta: Hemiptera: Cixiidae).** - The preoccupied name *Vincentia* Uhler, 1895 nec Castelnau, 1872 is replaced by *Nivcentia* nom. nov. Five species are currently placed in this genus, namely *Nivcentia interrupta* (Uhler, 1895) comb. nov. (type species), *N. hewanorrae* (Fennah, 1945) comb. nov., *N. christopheri* (Fennah, 1945) comb. nov., *N. grenadana* (Fennah, 1945) comb. nov. and *N. substigmatica* (Lethierry, 1881) comb. nov.

**Keywords:** *Nivcentia* - Fulgoromorpha - Pisces - Apogonidae - Coleoptera - Cerambycidae.

INTRODUCTION

*Vincentia* was erected as monotypic genus by Castelnau (1872) to accommodate *V. waterhousii* Castelnau, 1872, a marine, south Australian ray-finned fish species (Vertebrata: Pisces: Actinopterygii: Perciformes: Apogonidae). Today, six species are included in this genus (Gomon *et al.*, 1994). Uhler (1895) described a new planthopper genus from St. Vincent (West Indies), and he also named it *Vincentia* (Insecta: Hemiptera: Fulgoromorpha: Cixiidae: Pentastirini). This genus comprises five species today (Holzinger *et al.*, 2002). Finally, the name *Vincentia* was also given to a genus of African cerambycid beetles (Insecta: Coleoptera: Cerambycidae) by Lepesme & Breuning (1956). Their type species, *Vincentia bingervillensis* Lepesme & Breuning, 1956 turned out to be a younger synonym of *Micrambyx brevicornis* Kolbe, 1893, so *Vincentia* Lepesme & Breuning, 1956 was placed in synonymy with *Micrambyx* Kolbe, 1893 (Mourglia, 1991).

NOMENCLATORIAL CONSEQUENCES

*Vincentia* Uhler, 1895 and *Vincentia* Lepesme & Breuning, 1956 are preoccupied genus names; thus only *Vincentia* Castelnau, 1872 may be used as a valid name. In case of *Vincentia* Lepesme & Breuning, 1956, a replacement name is unnecessary,

as this name is treated as younger synonym of *Micrambyx* Kolbe, 1893. Concerning the planthopper genus *Vincentia* Uhler, 1895, neither an objective nor a subjective synonym is available. Therefore a replacement name is necessary and herewith proposed:

*Nivcentia* nom. nov. pro *Vincentia* Uhler, 1895 nec Castelnau, 1872.

Type species: *Vincentia interrupta* Uhler, 1895.

Included species: *Nivcentia interrupta* (Uhler, 1895) comb. nov., *Nivcentia hewanorrae* (Fennah, 1945) comb. nov., *Nivcentia christopheri* (Fennah, 1945) comb. nov., *Nivcentia grenadana* (Fennah, 1945) comb. nov. and *Nivcentia substigmatica* (Lethierry, 1881) comb. nov.

Etymology: The name is an arbitrary combination of letters. Gender: feminine.

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**Five new species of the *Hypostomus cochliodon* group  
(Siluriformes: Loricariidae)  
from the middle and lower Amazon System**

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**Five new species of the *Hypostomus cochliodon* group (Siluriformes: Loricariidae) from the middle and lower Amazon System.** - Five new species of *Hypostomus* from the *cochliodon* group are described from the middle and lower Amazonian Basin. Data for a population of *H. hemicochliodon* Armbruster, 2003 from Rio Branco (Roraima, Brazil) and comments on the identity of *Hypostomus cochliodon* Kner, 1854, and on the parphyly of the group are given. A hypothesis that *Hypostomus soniae* sp. n. may have been separated from a Paraguayan species during the late Tertiary is advanced. A key for identification for the species of the *Hypostomus cochliodon* group from Amazon Basin is given.

**Keywords:** *Hypostomus* - *cochliodon* group - Amazon Basin - catfishes - new species - systematics.

## INTRODUCTION

*Hypostomus* La Cépède, 1803 is one of the most species rich genera among the South American fishes, with 111 valid species and about one third more still undescribed (Weber, 2003; Armbruster, 2003). The species of the *cochliodon* group are reported from the Amazon, Orinoco, La Plata and Guianese river systems. With 11 recognized species, it comprises the species of the former genus *Cochliodon* Heckel, 1853 and other recently described species. Closely related to *Hypostomus*, *Cochliodon* was based on a single apomorphy, its spoon shaped (called cochleariform) teeth. Later on, Eigenmann (1922) described *Cheiridodus*, differing from *Cochliodon* by the presence of a small outer cusp on the teeth, that was later recognized as a junior synonym by Dahl (1971). Based on morphological characters and mitochondrial DNA analysis, *Cochliodon* was placed in the synonymy of *Hypostomus* and treated as a monophyletic group within this genus (Montoya-Burgos *et al.*, 2002; Weber & Montoya-Burgos, 2002). Armbruster (2003) revised the *cochliodon* group, extending the distribution areas and variations of morphological characters of most species, which have been poorly described in several cases, also identifying their different

populations among different basins. From the Amazon, Aroa, Atrato, Essequibo, La Plata, Magdalena, Orinoco, Sinu, Tocuyo, Tuy and Yaracuy river drainages, and Lake Maracaibo drainage, the *Hypostomus cochliodon* group can be distinguished from most other loricariids by the combination of highly angled jaws and usually less than 20 teeth per jaw ramus (Armbruster, 2003). Cochleariform teeth, with or without apparent outer cusp, distinguishes this group of species from remaining *Hypostomus*.

In this paper, five new amazonian *Hypostomus* species of the *cochliodon* group are described and data for a population of *H. hemicochliodon* Armbruster, 2003 are given, expanding the known distribution area for this species. Comments on the redescription of *H. cochliodon* Kner, 1854 in Armbruster (2003) are made based on the Kner's original description and on the similarities between *Hypostomus soniae* sp. n. and *H. cochliodon* sensu Armbruster, 2003 (part) from Paraguay river basin, called here *Hypostomus* aff. *soniae*. A key is given for the fishes of the group recorded from the Amazon River System.

## MATERIAL AND METHODS

Measurements were made with a digital calliper to the nearest 0.1 mm; counts and measurements follow Boeseman (1968); description of buccal papilla size and count of odontodes on opercle follow Armbruster (2003). Vertebrae were counted on X-ray images of holotypes, except for *Hypostomus hemicochliodon* which was based on specimen MZUSP 34626. Drawings were made using a profile projector Nikon V12 and Nikon SMZ-10 stereomicroscope with camera lucida; teeth drawings were made from replacement teeth of upper right jaw. Colour description was based on preserved specimens; for *H. ericae* a brief note of colour in living specimens is based on pictures of a specimen taken in the field. Material not explicitly mentioned is listed in the Appendix.

Institutional abbreviations follow Eschmeyer (1998); other abbreviations are: col. (collectors), ex. (exemplar[s]), MG (Michael Goulding), n (number of specimens examined), PSM (Projeto Serra da Mesa), SD (standard deviation), SL (standard length).

## KEY TO THE SPECIES OF THE *HYPOSTOMUS COCHLIODON* GROUP FROM THE AMAZON BASIN

- |   |   |   |
|---|---|---|
| 1 | Absence of adipose fin . . . . .  | <i>H. levis</i> (Pearson, 1924). Upper Madeira River  |
| - | Presence of adipose fin . . . . .                                       | 2   |
| 2 | 0 to 10 odontodes on opercle . . . . .                                  | 3   |
| - | More than 10 odontodes on opercle . . . . .                             | 8   |
| 3 | Body covered by close-set spots (Figs 2, 9, 10) . . . . .               | 4   |
| - | Body covered by widely spaced spots (Figs 5, 7) . . . . .               | 6   |
| 4 | Presence of buccal papilla . . . . .                                    | <i>H. waiampi</i> sp. n. Cupixi River                 |
| - | Absence of buccal papilla (see Armbruster, 2003:14) . . . . .           | 5   |
| 5 | 0 to 10 odontodes on opercle; well developed keels on body<br>. . . . . | <i>H. oculus</i> (Fowler, 1943). Upper Amazonas River |

- 0 to 3 odontodes on opercle; keels on body absent or poorly developed  
 ..... *H. pyrineusi* (Miranda Ribeiro, 1920). Upper Amazonas River
- 6 Absence of buccal papilla. *H. ericius* Armbruster, 2003. Upper Amazonas River
- Presence of buccal papilla ..... 7
- 7 Adipose-fin spine strongly curved on adult specimens (Fig. 3B); caudal  
 peduncle deeper (2.3 to 3.0 in caudal peduncle length); 31 vertebrae  
 ..... *H. ericae* sp. n. Upper Tocantins River
- Adipose-fin spine not strongly curved (Fig. 3C); caudal peduncle  
 shallower (1.8 to 2.3 in caudal peduncle length); 33 vertebrae  
 ..... *H. paucipunctatus* sp. n. Itacaiúnas River
- 8 Body without spots, sometimes with longitudinal stripes (fig. 8); 25 to  
 27 scutes on lateral line; adipose-fin spine long (11.5 to 15.0 in SL) and  
 curved (fig. 3D) ..... *H. soniae* sp. n. Tapajós River
- Body covered with spots; 28 to 30 scutes on lateral line; adipose-fin  
 spine not so long (12.8 to 19.2 in SL) and curved ..... 9
- 9 Small interorbital width (2.2 to 2.6 in head length)  
 ..... *H. sculpodon* Armbruster, 2003. Upper Negro and Orinoco Rivers
- Large interorbital width (1.8 to 2.3 in head length) ..... 10
- 10 Large eye orbits, higher than frontals (fig. 9); tip of occipital bone high-  
 er than first predorsal plate ..... *H. simios* sp. n. Cupixi River
- Eye orbits at the same level of frontal head profile; tip of occipital bone  
 as high as first predorsal plate (Fig. 10) . *H. hemicochliodon* Armbruster,  
 2003 ..... Amazonas, Negro, Tapajós, Xingu and upper Orinoco Rivers

DESCRIPTIONS

*Hypostomus waiampi* sp. n.

Figs 2, 3 & 4; Tables 1 & 4

Holotype: MZUSP 82269, 169.3 mm SL. Brazil: Amapá: bridge on the road to Serra do Navio, Cupixi river (station nb. MIG 84010006); January 1984; col. Michael Goulding.

Paratypes: MZUSP 82270, 8 ex., 139.9 – 193.9 mm SL; MHNG 2652.016, 1 ex., 172.5 mm SL. Same data as holotype.

*Derivatio nominis.* Waiampi is an amerindian ethnic group from northeastern Brazil, presently established in an Indian Reserve with the same name, western Cupixi River Basin. Noun in apposition.

DIAGNOSIS

*Hypostomus waiampi* is distinguished from *H. soniae*, *H. sculpodon*, *H. simios* and *H. hemicochliodon* by the number of odontodes in the opercle (0 to 10 versus more than 10); it is distinguished from *H. ericius*, *H. ericae* and *H. paucipunctatus* by its colour pattern, with close-set spots covering its body (versus widely spaced spots; Figs 2, 5 & 7); from *H. oculus* and *H. pyrineusi* by the presence of a buccal papilla (versus absence); from *H. levis* by the presence of an adipose fin (versus absence). Its low number of teeth (6 to 8) also distinguishes him from *H. levis*, *H. soniae*, *H. simios* and *H. sculpodon* (more than 10 teeth).



FIG. 1

Localities of examined specimens. Type localities are: circle: *Hypostomus waiampi* sp. n. and *H. simios* sp. n. (syntopic); star: *H. ericae* sp. n.; diamond: *H. paucipunctatus* sp. n.; square: *H. soniae* sp. n. Localities of populations of other fishes examined: triangle: *H. hemicochliodon* Armbruster, 2003; asterisk: *H. cochliodon* Kner, 1854 and *H. aff. soniae*.

#### MORPHOLOGY

Standard length of examined specimens 139.9 to 193.9 mm; morphometric and meristic respectively in Tables 1 & 4.

Head dorsally covered with dermal ossifications, except for small amorphous naked area on snout tip, as large as nostril. Profile slightly convex, with very light depression between eyes. Dorsal margin of orbit slightly elevated, weakly continuing in inconspicuous ridge on posttemporal and following plates. A single plate bordering posterior margin of supraoccipital. Opercle supporting less than 10 odontodes. Outer face of upper lip covered with small odontodes, concentrated on middle and distal areas in smaller specimens. Barbells short. Few (6 to 8) large spoon-shaped teeth.

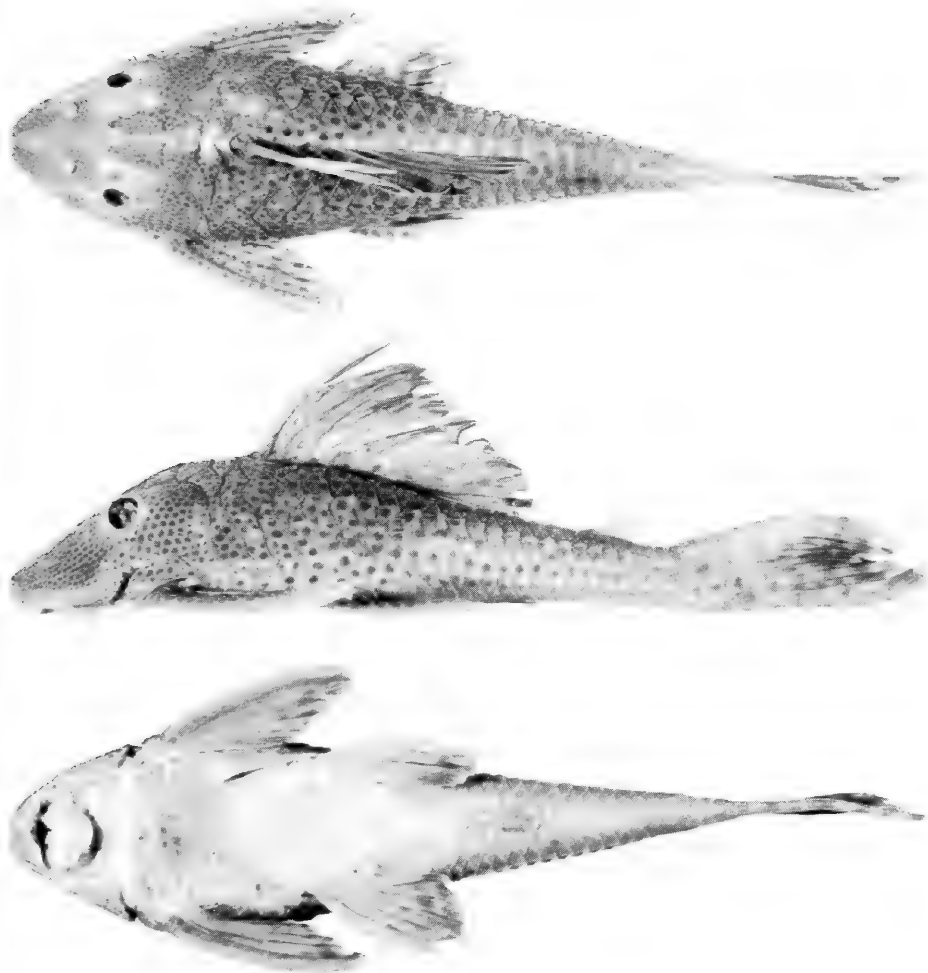


FIG. 2

Dorsal, lateral and ventral views of *Hypostomus waiampi* sp. n., MZUSP 82269, holotype (169.3 mm SL).

Body relatively deep and wide, covered with five rows of plates on each side; strong ridges, relatively smoother in younger specimens. Dorsal profile almost straight descending from dorsal-fin spine up to first plate after adipose fin. Caudal peduncle roughly ovoid in cross section, sometimes laterally compressed. Dorsal plates between end of dorsal fin and preadipose azyguous plate flattened dorsally, those closer to dorsal fin usually not meeting at midline, leaving naked central area. Ventral surface of head and abdomen completely covered by small platelets, except areas around urogenital opening, lower lip and fin insertions.

Pectoral fin spines covered with odontodes, progressively larger as approaching distal tip, hooked and more developed in larger specimens. Adipose-fin spine long and

straight, with slightly convex dorsal profile (Fig. 3A). Caudal fin concave to strongly concave. Medium sized outer rays; lower lobe longer than upper one. Dorsal fin usually reaching third preadipose plate when depressed.

#### COLOUR PATTERN (in alcohol)

Ground colour light brownish, becoming cream in ventral area. Body covered by black close-set spots, smaller on anterior third, becoming larger and ill defined approaching caudal fin; in some specimens few larger and darker spots below dorsal and adipose fin. A lighter area forming a belt between eyes usually present. Darkened areas can be found under dorsal fin and, more faintly, on caudal peduncle. Ventral surface poorly spotted; pectoral and pelvic girdles, and area around the mouth clearly spotted.

Dorsal fin poorly and sparsely dotted to not dotted. Caudal fin with vertical rows of ill defined spots, becoming coalescent as approaching distal border. Adipose fin usually unspotted.

#### DISTRIBUTION

*Hypostomus waiampi* is known only from its type locality, in the Cupixi River, State of Amapá, Brazil. It is syntopic with *H. simios*.

#### *Hypostomus ericae* sp. n.

Figs 3, 4, 5 & 6; Tables 1 & 4

*Hypostomus* sp. 1: Hollanda Carvalho & Weber, 2003

Holotype: MNRJ 27861, 164.3 mm SL. Brazil: Goiás: Tocantins River Basin: Rio Tocantins, Porto Alfreidinho, 14° 02' 22.1" S 48° 31' 28.6" W; October 1996; col.: D. A. Halboth, F. P. Matos & E. P. Caramaschi.

Paratypes: All specimens from Brazil: Goiás: Tocantins River Basin: MHNG 2650.025, 1 ex., 121.3 mm SL. Macaco river, left side tributary, 14° 21' 30" S 49° 5' W; 7<sup>th</sup> October 1985; col.: G. W. Nunan & D. F. Moraes Jr. – MHNG 2650.026, 1 ex., 130.8 mm SL. Maranhão river, next to Palmeiras stream mouth, left side next to Porto Alfreidinho; 7<sup>th</sup> October 1996; col.: E. P. Caramaschi; D. F. Moraes Jr. & D. A. Halboth. (GenBank number for PSM 06-2053: AJ 318347). – MHNG 2650.027, 3 ex., 114.6 – 146.0 mm SL. Maranhão river, next to Peixe river falls; 10<sup>th</sup> October 1996; col.: E. P. Caramaschi; D. F. Moraes Jr. & D. A. Halboth. – MHNG 2650.028, 1 ex., 170.1 mm SL. Almas river; 12<sup>th</sup> October 1996; col.: E. P. Caramaschi; D. F. Moraes Jr. & D. A. Halboth. – MNRJ 24251, 1 ex., 115.0 mm SL. Left side of UHE Serra da Mesa dam, Palmeirinha river affluent, Porto Serrinha station, 14° 02' 58" S 48° 29' 57" W; 16<sup>th</sup> December 1995; col.: D. F. Moraes Jr. & D. A. Halboth. – MNRJ 24252, 1 ex., 139.0 mm SL. Left side of UHE Serra da Mesa dam, Palmeirinha river affluent, Porto Serrinha station, 14° 02' 58" S 48° 29' 57" W; 10<sup>th</sup> August 1996; col.: D. F. Moraes Jr. & D. A. Halboth. – MNRJ 24253, 1 ex., 161.0 mm SL. Maranhão river, next to Peixe river falls, 14° 14' 54" S 48° 55' 59" W; 31<sup>st</sup> January 1996; col.: D. F. Moraes Jr. & F. P. Matos. – MNRJ 24254, 1 ex., 111.0 mm SL. Maranhão river, next to Peixe river falls, 14° 14' 54" S 48° 55' 59" W; 17<sup>th</sup> April 1996; col.: D. F. Moraes Jr. & F. P. Matos. – MNRJ 24255, 1 ex., 139.0 mm SL. Maranhão river, next to Peixe river falls, 14° 14' 54" S 48° 55' 59" W; 11<sup>th</sup> November 1996; col.: D. F. Moraes Jr. & F. P. Matos. – MNRJ 24256, 1 ex., 138.0 mm SL. Maranhão river, next to Peixe river falls, 14° 14' 54" S 48° 55' 59" W; 11<sup>th</sup> December 1996; col.: D. F. Moraes Jr. & F. P. Matos. – MNRJ 24257, 1 ex., 149.0 mm SL. Maranhão river, next to Peixe river falls, 14° 14' 54" S 48° 55' 59" W; 11<sup>th</sup> February 1997; col.: D. F. Moraes Jr. & F. P. Matos. – MNRJ 24258, 3 ex., 120.0 – 133.0 mm SL. Passa Três river, 14° 28' 39" S 49° 04' 33" W; 26<sup>th</sup> June 1996; col.: D. F. Moraes Jr. – MNRJ 24259, 1 ex., 154.0 mm SL. Right side of UHE Serra da Mesa dam, upstream of Castelo

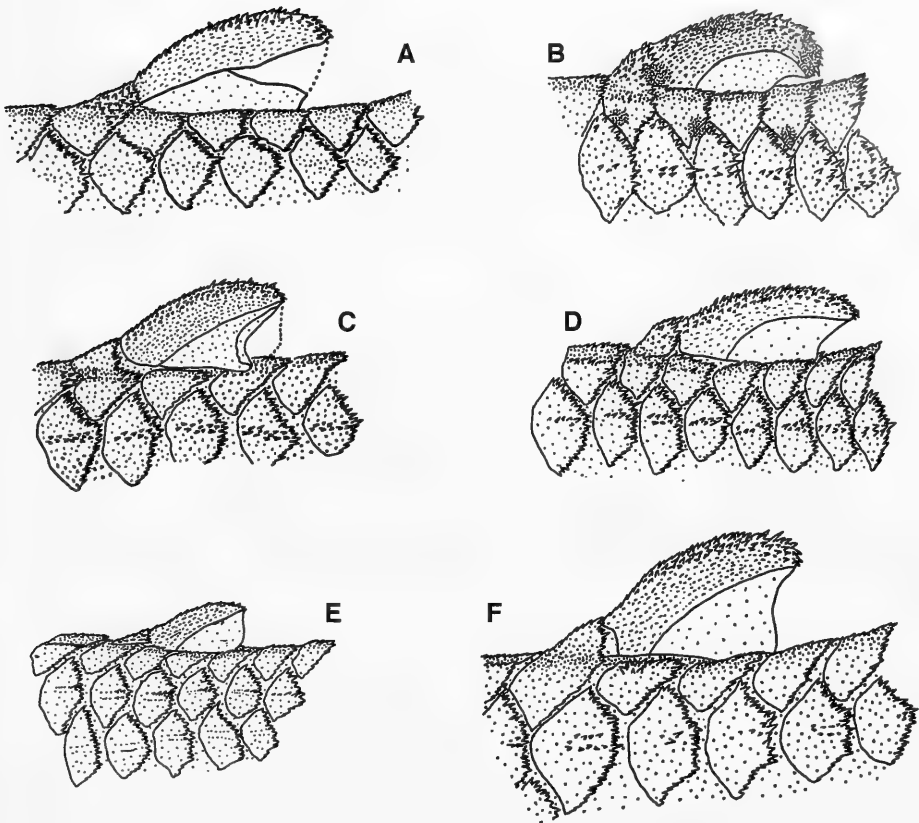


FIG. 3

Adipose fin and spine of: A. *Hypostomus waiampi* sp. n., MZUSP 82270; B. *H. ericae* sp. n., MNRJ 27861 (holotype); C. *H. paucipunctatus* sp. n., MZUSP 82271 (holotype); D. *H. soniae* sp. n., MZUSP 82272 (holotype); E. *H. simios* sp. n., MZUSP 34236; F. *H. hemicochliodon*, Armbruster, 2003, MZUSP 34624.

Grande river, upper Tocantins river, 14° 08' 03" S 48° 44' 23" W; 12<sup>th</sup> November 1996; col.: D. F. Moraes Jr. – MNRJ 24260, 1 ex., 128.0 mm SL. Almas river, 14° 37' 03" S 49° 03' 12" W; 9<sup>th</sup> December 1997; col.: D. F. Moraes Jr., D. A. Halboth & A. Suppa. – MNRJ 24261, 1 ex., 184.0 mm SL. Almas river, 14° 37' 03" S 49° 03' 12" W; 10<sup>th</sup> December 1997; col.: D. F. Moraes Jr., D. A. Halboth, A. Suppa & J. L. C. Novaes. – MNRJ 24262, 1 ex., 134.0 mm SL. Almas river, 14° 37' 03" S 49° 03' 12" W; 10<sup>th</sup> February 1998; col.: D. F. Moraes Jr., D. A. Halboth & A. Suppa. – MNRJ 24263, 1 ex., 164.0 mm SL. Bagagem river, upstream of a "remanso" of UHE Serra da Mesa dam; 9<sup>th</sup> June 1997; col.: D. F. Moraes Jr., D. A. Halboth & A. Suppa. – MNRJ 24264, 1 ex., 199.0 mm SL. Left side of UHE Serra da Mesa dam, affluent of Traíras river, upper Tocantins, 14° 12' 14" S 48° 32' 11" W; 9<sup>th</sup> June 1997; col.: D. F. Moraes Jr., D. A. Halboth & A. Suppa. MNRJ 27862, 1 ex., 118.0 mm SL. Das Almas river, 14° 37' 51.2" S 49° 01' 56.6" W; April 1996; col.: D. F. Moraes Jr. & J. K. Brondi. – MNRJ 27863, 4 ex., 104.6 – 128.3 mm SL. Bagagem river, 14° 22' 03.3" S 48° 12' 08.1" W; October 1996; col.: D. F. Moraes Jr, J. K. Brondi & E. P. Caramaschi.

*Derivatio nominis.* This species is dedicated to Érica Pellegrini Caramaschi, collector of this species, and professor and researcher at the Universidade Federal do Rio de Janeiro (UFRJ), for her great contributions to the knowledge of ecology of fishes.

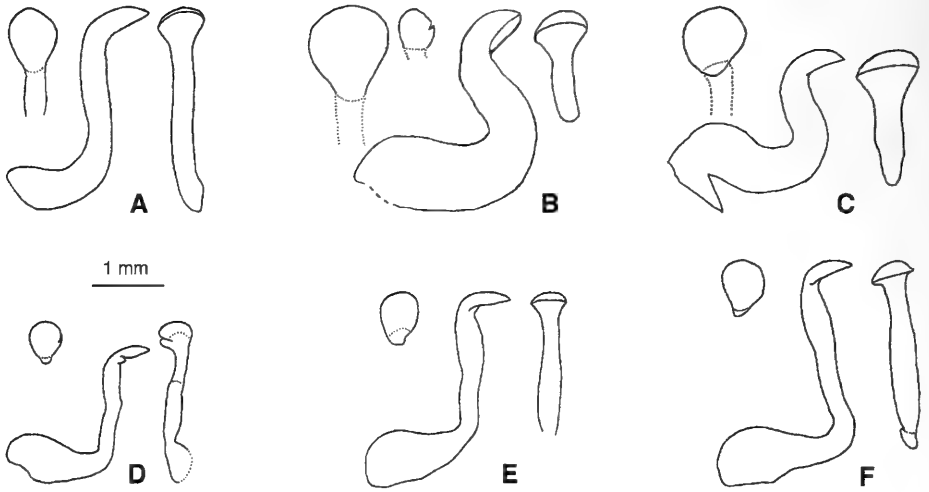


FIG. 4

Posterior, lateral and anterior views of replacement teeth from upper right jaw: A. *Hypostomus waiampi* sp. n.; B. *H. ericae* sp. n.; C. *H. paucipunctatus* sp. n.; D. *H. soniae* sp. n.; E. *H. simios* sp. n.; F. *H. hemicochliodon* Armbruster, 2003.

#### DIAGNOSIS

*Hypostomus ericae* is distinguished from *H. soniae*, *H. sculpodon*, *H. simios* and *H. hemicochliodon* by the number of odontodes in the opercle (0 to 10 versus more than 10); from *H. waiampi*, *H. oculus* and *H. pyrineusi* by its colour pattern, with widely spaced spots covering its body (versus close-set spots; Figs 2 & 5), from *H. ericius*, by the presence of a buccal papilla (versus absence), from *H. paucipunctatus* by a deeper caudal peduncle (2.3 to 3.0 in caudal peduncle length versus 1.8 to 2.3), darker body colour and less vertebrae (31 versus 33 on holotypes); from *H. levis* it is distinguished by the presence of an adipose fin (versus absence). Its low number of teeth (6 to 9) also distinguishes it from *H. levis*, *H. soniae*, *H. simios* and *H. sculpodon* (more than 10); its particular adipose fin spine, strongly curved in adult specimens (Fig. 3B) distinguishes it from all species of *Hypostomus cochliodon* group of Amazon Basin.

#### MORPHOLOGY

Standard length of examined specimens 104.6 to 199.0 mm; meristic and morphometric data in Tables 1 & 4.

Head dorsally covered with dermal ossifications, except for a small amorphous naked area on snout tip, as large as nostril. Profile almost straight, with a light depression between eyes. Dorsal margin of orbit slightly elevated, weakly continuing in an inconspicuous ridge on posttemporal plate and following plates. A single plate bordering posterior margin of supraoccipital plate, sometimes subdivided in two. Opercle supporting less than 10 odontodes. Outer face of upper lip covered with small odontodes, concentrated on middle and distal areas in smaller specimens. Barbells



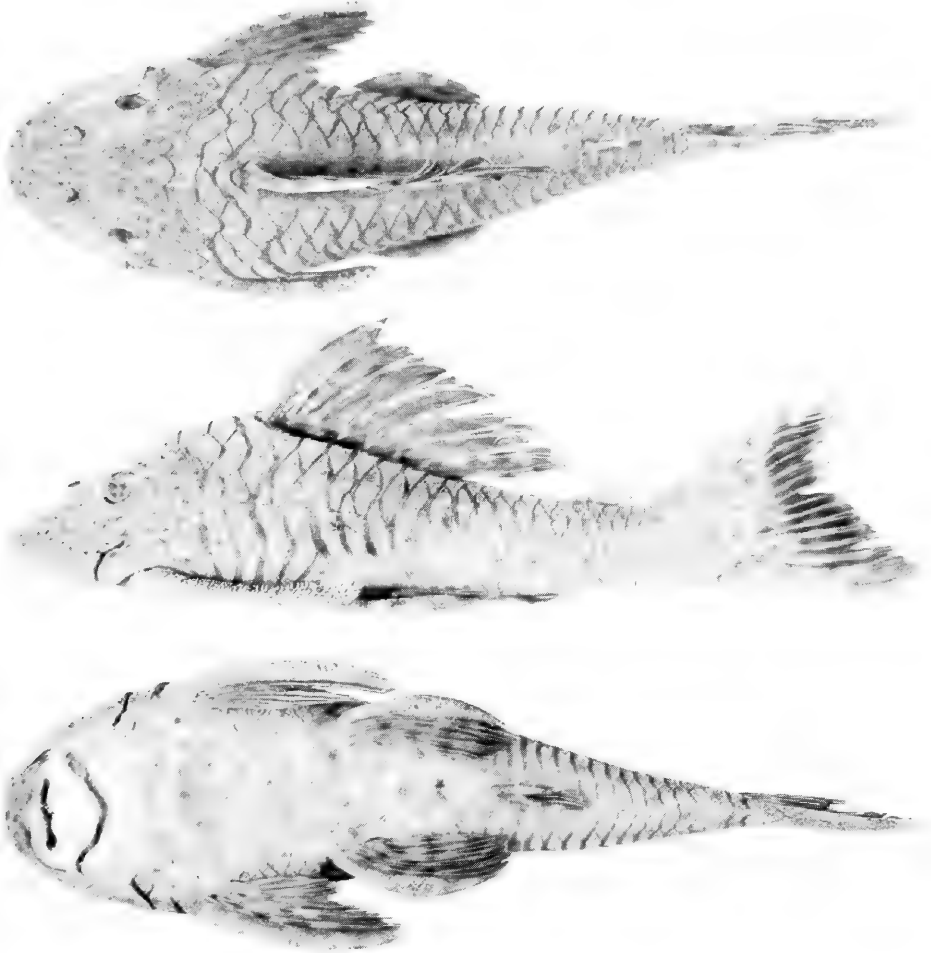


FIG. 5

Dorsal, lateral and ventral views of *Hypostomus ericae*, sp. n., MNRJ 27861, holotype (164.3 mm SL).

short. Few (6 to 9) large spoon shaped teeth, with a small outer cuspid in younger specimens.

Body relatively deep and wide, covered with five rows of plates on each side, slightly smoother in younger specimens. Dorsal profile almost straight descending from dorsal-fin spine usually up to second plate after adipose fin. Caudal peduncle roughly ovoid in cross section, sometimes laterally compressed. Dorsal plates between end of dorsal fin and adipose spine flattened in their dorsal portion, those closer to dorsal fin usually not meeting at midline, leaving naked central area. Ventral surface of head and abdomen completely covered by small platelets, except areas around urogenital opening, lower lip and fin insertions, and in some specimens a small naked area in the middle of coracoidal band.

Pectoral fin spines covered with odontodes, progressively larger as approaching distal tip, hooked and more developed in larger specimens. Adipose fin spine long and strongly curved, tip more curved in larger specimens (Fig. 3B). Caudal fin concave to strongly concave. Medium sized outer rays; lower lobe longer than upper one. Dorsal fin usually reaching up to the first or second preadipose plate when depressed.

#### COLOUR PATTERN

*In alcohol.* Ground colour of dorsal surface light brown to dark brown. Darkened regions under dorsal fin, caudal peduncle, and dorsal and frontal areas of head.

Ventral surface usually cream coloured, lighter in the head from mouth to gill openings. Body completely covered by few widely spaced spots, smaller on the anterior third, becoming fainter and sparse on body and fins. Lighter area forming a belt between the eyes usually present.

Ventral surface covered by few spots; area from opercular openings to mouth usually not or poorly spotted.

Fins with rows of larger, darker and ill defined spots, which become coalescent as approaching distal borders. The caudal fin is lighter as far as the proximal third of the upper ray and spotted in the border, sometimes as a "half-moon" shaped area extended from the upper to lower spine (fig. 6). Adipose fin spotted on tip and base of spine; in larger specimens one spot on dorsal surface usually present. Sometimes border of adipose membrane darkened.

*Living specimen.* Ground colour lighter, with spots and stripes better defined and more contrasting. Darkened belt present from tip of snout to mid distance between nostrils, and also darkened areas on opercle and square area between eyes and dorsal spine. Fading dark vertical bars under dorsal fin and caudal peduncle. Belly with strong creamy colouration. Lips and ventral area between opercular openings and mouth with yellowish colouration.

#### DISTRIBUTION

Upper Tocantins River drainage, State of Goiás, Brazil, on the region of influence of the Serra da Mesa dam.

#### *Hypostomus paucipunctatus* sp. n.

Figs 3, 4 & 7; Tables 2 & 4

*Hypostomus* sp. 2: Hollanda Carvalho & Weber, 2003

Holotype: MZUSP 82271, 177.1 mm SL. Brazil: Pará: municipality of Caldeirão, Itacaiúnas River, Igarapé Pojuca, Serra dos Carajás (5°52'S; 50°32'W; coordinates of Itacaiúnas River, near Castanhal, field nb. MIG 83101503); 15 October 1983; col. Michael Goulding.

Paratypes: MHNG 2652.017, 2 ex., 137.8 – 157.9 mm SL; MZUSP 34260, 1 ex., 134.1 mm SL. Same data as holotype. – MZUSP 34259, 11 ex., 147.5 – 188.0 mm SL. Brazil: Pará: Itacaiúnas River, Serra dos Carajás, Caldeirão (5°52'S; 50°32'W, field nb. MIG 83060007); June – July 1983; col. Michael Goulding.

Other specimen examined: ZMA 120.160, 1 ex., 165.3 mm SL. Same data as holotype.

*Derivatio nominis.* From the Latin paucus, few and punctatus, dotted, in allusion to the colour pattern.

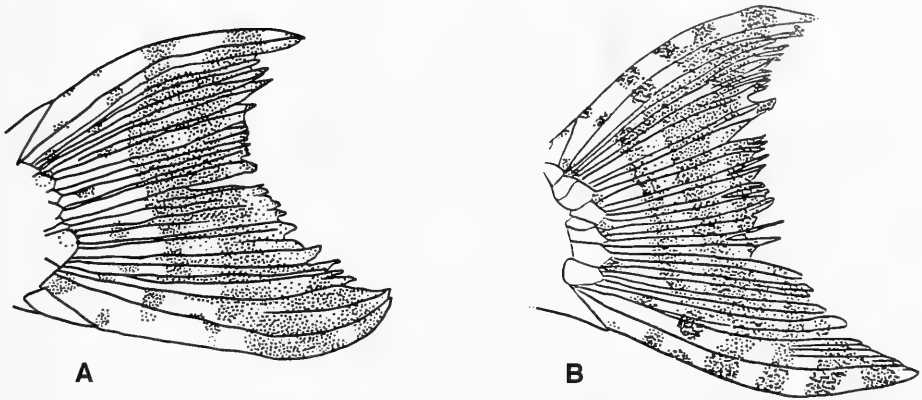


FIG. 6

Caudal fin of *Hypostomus ericae* sp. n., showing the range of its pattern from less pigmented (left) to more pigmented (right); A. MNRJ 27861, holotype (164.3 mm SL); B. MNRJ 15248 (146.0 mm SL).

#### DIAGNOSIS

*Hypostomus paucipunctatus* is distinguished from *H. soniae*, *H. sculpodon*, *H. simios* and *H. hemicochliodon* by the number of odontodes in the opercle (less than 10 versus more than 10); from *H. waiampi*, *H. oculus* and *H. pyrineusi* by its colour pattern, with widely spaced spots covering the body (versus close-set spots; Figs 2 & 7); from *H. ericius*, by the presence of a buccal papilla (versus absence); from *H. ericae* by a lower caudal peduncle (1.8 to 2.3 in caudal peduncle length versus 2.3 to 3.0), lighter body colour and more vertebrae (33 versus 31); from *H. levis* by the presence of adipose fin (versus absence). Its low number of teeth (6 to 10) also distinguishes it from *H. levis*, *H. soniae*, *H. simios* and *H. sculpodon* (more than 10).

#### MORPHOLOGY

Standard length of examined specimens 134.1 to 188.0 mm; meristic and morphometric data in Tables 2 & 4.

Head dorsally covered with dermal ossifications, except for small amorphous naked area on snout tip, as large as nostril. Profile slightly convex, but lightly depressed in area between the eyes. Dorsal margin of orbit slightly elevated, weakly continuing in inconspicuous ridge on posttemporal plate and following plates. A single plate bordering posterior margin of supraoccipital. Opercle supporting less than 10 odontodes. Outer face of upper lip covered by small odontodes. Barbells short. Few (6 to 10) large spoon-shaped teeth.

Body relatively deep, covered with five rows of plates on each side, relatively smoother in younger specimens. Dorsal profile almost straight descending from dorsal-fin spine usually up to second plate after adipose fin. Caudal peduncle ovoid in cross section, laterally compressed in smaller specimens. Dorsal plates between end of dorsal fin spine and adipose spine flattened in their dorsal portion; those closer to dorsal fin usually not meeting at midline, leaving naked central area. Abdomen and ventral



FIG. 7

Dorsal, lateral and ventral views of *Hypostomus paucipunctatus* sp. n., MZUSP 82271, holotype (177.1 mm SL).

surface of head completely covered by small platelets, except the areas around urogenital opening, lower lip and fin insertions.

Pectoral fin spines covered with odontodes, progressively larger as approaching distal extremity and more developed and hooked in larger specimens. Adipose fin spine long and slightly curved (Fig. 3C). Caudal fin concave to strongly concave. Medium sized outer rays; lower lobe longer than upper one. Dorsal fin usually reaching second plate before adipose fin spine when depressed.

#### COLOUR PATTERN (in alcohol)

Ground colour of dorsal surface light brown, with olivaceous greenish areas in some specimens, becoming lighter in the posterior half. Darkened regions under dorsal fin, and top and frontal areas of the head. Ventral surface colour and caudal peduncle, sometimes lighter; region from opercular openings to mouth usually lighter than belly.

Body completely covered by few widely spaced black dots, smaller in the anterior third, becoming sparse as approaches caudal fin. Darkened areas can be found under dorsal fin and, more faintly, on caudal peduncle and head. A lighter area forming a belt between eyes is usually present. Ventral surface covered by ill defined dots; area from opercular openings to mouth usually not or poorly dotted.

Fins usually ostensibly dotted, except anal fin. Dorsal fin dots coverage ranging from all surface, sometimes with inconspicuous horizontal rows, to very few dots only on the rays. On caudal fin, ranging from well defined blotches, progressively more concentrated at distal region. Adipose fin usually with one spot at its membrane and one or two spots on the spine, but generally not on spine extremity.

#### DISTRIBUTION

Found in the Rio Itacaiúnas drainage, Serra dos Carajás, State of Pará, Brazil.

#### *Hypostomus soniae* sp. n.

Figures 3, 4 & 8; Tables 2 & 4

Holotype: MZUSP 82272, 140.2 mm SL. Brazil: Pará: temporary pools on the riversides of the Rio Tapajós, between Vila Nova and Urua (station nb. 10); 26 – 28 September 1992; col. R. Stawikowski, S. Muller, P. Ludwig, C. Schaefer & B. Kilian.

Paratypes: MZUSP 82273, 3 ex., 48.6 – 112.5 mm SL. Same data as holotypes. – INPA 21972, 3 ex., 47.7 – 104.3 mm SL. Same data as holotype – MHNG 2547.012, 13 ex., 35.6 – 145.8 mm SL. Same data as holotype. – MNRJ 27864, 1 ex., 98.5 mm SL. Same data as holotype.

*Derivatio nominis.* This species is dedicated to Sonia Fisch-Muller, curator at the Museum of Geneva, specialist in loricariid systematics and one of the collectors of the type series.

#### DIAGNOSIS

*Hypostomus soniae* is distinguished from all other species of *Hypostomus cochliodon* group from the Amazon Basin by its particular colour pattern without spots, sometimes with darker longitudinal stripes (versus spotted pattern, without stripes), its particular long and slightly curved adipose fin spine (Fig. 3D), a pair of ridges between nostrils (see description), and its low number of plates in lateral line (25 to 27 versus 27 to 31). It is also distinguished from *H. waiampi*, *H. oculus*, *H. pyrineusi*, *H. ericius*, *H. ericae* and *H. paucipunctatus* by the number of odontodes in the opercle (more than 10 versus less than 10); it is distinguished from *H. levis* by the presence of an adipose fin (versus absence).

It is further distinguished from *H. aff. soniae* (*Hypostomus* sp. 1 in Weber & Montoya-Burgos, 2002), found in Paraguay River Basin by the absence of plates in the skin around dorsal fin (versus presence), colour pattern never spotted (versus sometimes spotted), a lower range of number of plates in lateral line (25 to 27 versus 26 to 30), and never less than 12 teeth (versus 6 – 27 teeth).

#### MORPHOLOGY

Standard length of examined specimens 76.4 to 145.8 mm; meristic and morphometric data in Tables 2 & 4.

Head relatively rough, with overall shape lines very well marked, almost “geometric”, dorsally covered with dermal ossifications, except for small amorphous naked area on snout tip, as large as nostril. Profile straight to slightly convex; tip of occipital plate higher than first predorsal plate. Dorsal margin of orbit slightly elevated, weakly



FIG. 8

Dorsal, lateral and ventral views of *Hypostomus soniae*, sp. n., MZUSP 82272, holotype (140.2 mm SL).

continuing in inconspicuous ridge on posttemporal plate and following plates. A pair of small parallel ridges between the nostrils, shorter than orbital diameter. A single plate bordering posterior margin of supraoccipital. Opercle supporting more than 10 odon-

todes. Outer face of upper lip covered with small odontodes, concentrated on middle and distal areas in smaller specimens. Barbells short. Numerous teeth (11 to 17) with a small outer cuspid.

Body relatively short and rough, covered with five rows of plates on each side, relatively smoother in younger specimens. Dorsal profile almost straight descending from dorsal-fin spine usually up to membrane of adipose fin. Caudal peduncle high and roughly ovoid in cross section, sometimes slightly laterally compressed. Predorsal and dorsal plates between end of dorsal fin and preadipose azygous plate flattened in their dorsal portion, those closer to the last dorsal fin rays usually not meeting at midline, leaving naked central area. Abdomen and ventral surface of head completely covered by small platelets, except areas around the urogenital opening, lower lip and fin insertions, and a small naked area in the middle of pectoral girdle; large naked areas around pelvic insertions in smaller specimens due to ontogeny.

Pectoral fin spines covered with odontodes, progressively larger as approaching distal extremity. Adipose-fin spine long and slightly curved (Fig. 3D). Caudal fin concave to strongly concave. Medium sized outer rays; lower lobe longer than upper one. Dorsal fin when laid down usually reaching the preadipose plate.

#### COLOUR PATTERN (in alcohol)

Ground colour greenish-brown to dark brown, becoming lighter in the posterior half. Ventral surface cream to greenish-cream coloured. Dots or spots completely absent in body surface and fins. Few specimens with a faint longitudinal dark stripe along lateral line.

#### DISTRIBUTION

*Hypostomus soniae* is only known from its type locality, in the Tapajós River, State of Pará, Brazil.

#### *Hypostomus simios* sp. n.

Figs 3, 4 & 9; Tables 3 & 4

Holotype MZUSP 82268, 157.9 mm SL. Brazil: Amapá: bridge on the road to *Serra do Navio*, Cupixi river (station nb. MIG 84010006); January 1984; col. Michael Goulding.

Paratypes MZUSP 34236, 3 ex., 107.3 – 155.2 mm SL; MHNG 2652.018, 1 ex., 113.5 mm SL. Same data as holotype.

*Derivatio nominis*. From the Greek "simios", meaning snub nosed, in allusion to its profile. Invariable epithet.

#### DIAGNOSIS

*Hypostomus simios* is distinguished from *H. waiampi*, *H. oculus*, *H. pyrineusi*, *H. ericius*, *H. ericae* and *H. paucipunctatus* by the number of odontodes in the opercle (more than 10 versus less than 10); from *H. soniae* by its colour pattern (spotted versus unspotted, sometimes with longitudinal stripes); from *H. sculpodon* by the pattern of spots on body (widely spaced versus close-set spots) and larger interorbital width (2.0 to 2.2 in head length versus 2.2 to 2.6); from *H. hemicochliodon* by its upper margin of orbits elevated, higher than frontal head profile (versus eye orbits at the same level of frontal head profile) and occipital bone, whose tip is higher than first predorsal plate (versus tip at the same level); from *H. levis* by the presence of adipose fin (versus absence).

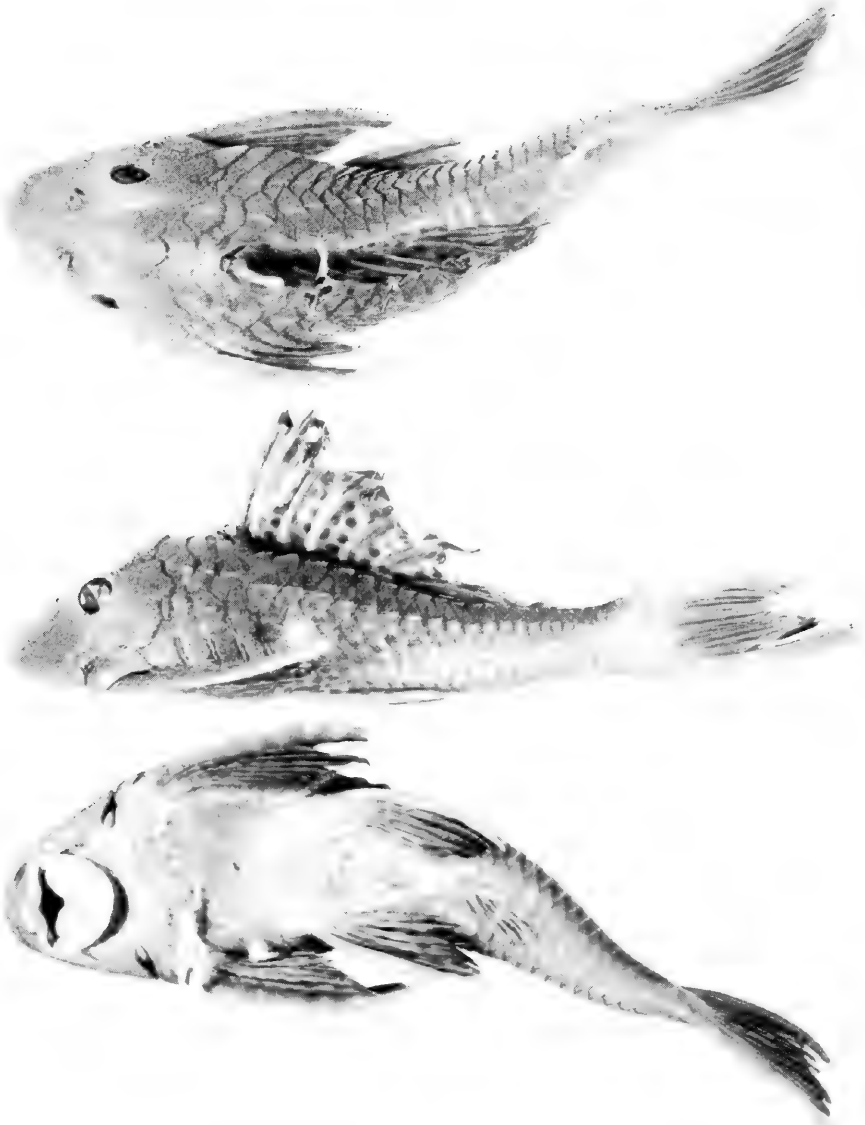


FIG. 9

Dorsal, lateral and ventral views of *Hypostomus simios* sp. n., MZUSP 82268, holotype (177.1 mm SL).

#### MORPHOLOGY

Standard length of examined specimens 108.8 to 157.9 mm; meristic and morphometric data in Tables 3 & 4.



Head dorsally covered with dermal ossifications, except for small amorphous naked area on snout tip, as large as nostril. Profile almost straight, with light depression between eyes; tip of occipital higher than first predorsal plate. Orbits large with dorsal margin very elevated, weakly continuing in inconspicuous ridge on posttemporal plate and following plates. A single plate bordering posterior margin of supraoccipital. Opercle supporting more than 10 odontodes. Outer face of upper lip covered with small odontodes. Barbells short. Several small spoon-shaped teeth (12 to 15) with a small outer cuspid in younger specimens.

Body relatively deep and wide, covered with five rows of plates on each side, relatively smoother in younger specimens. Ridges well developed on largest specimen (holotype). Dorsal profile almost straight descending from dorsal-fin spine usually up to the second plate after adipose fin. Caudal peduncle roughly ovoid in cross section, sometimes slightly laterally compressed. Dorsal plates between end of dorsal fin and preadipose azyguous plate flattened in their dorsal portion, those closer to dorsal fin usually not meeting in the midline, leaving naked central area. Abdomen and ventral surface of the head covered by small platelets, except the areas around urogenital opening, lower lip and fin insertions, and in some specimens a small naked area in the middle of the pectoral girdle.

Pectoral-fin spines covered with odontodes, slightly larger as approaching distal tip, and more developed in larger specimens. Adipose fin spine slightly curved (Fig. 3E). Caudal fin concave to strongly concave. Medium sized outer rays; lower lobe longer than upper one. Dorsal fin when laid down usually reaching up to the first or second preadipose plate.

#### COLOUR PATTERN (in alcohol)

Ground colour reddish-brown becoming lighter in the posterior half. Ventral surface cream coloured; a transverse darkened belt between pelvic and pectoral waist on largest specimen (holotype). Dark areas can be found under the dorsal fin.

Body covered by black close-set spots, smaller in the anterior third, becoming ill-defined, sometimes disappearing, as approaches caudal fin. Ventral surface spotted only on belly and area around the mouth, almost in a mosaic pattern.

Dorsal, pectoral and pelvic fins with spots arranged in longitudinal rows, increasing in size as approaching distal border. Caudal fin with ill defined spots on upper lobe; lower lobe darker. Anal fin with faint ill defined spots. Adipose fin and spine unspotted.

#### DISTRIBUTION

*Hypostomus simios* is only known from its type locality, in the Cupixi River, State of Amapá, Brazil. This species is syntopic with *H. waiampi*.

*Hypostomus hemicochliodon* Armbruster, 2003

Figs 3, 4 & 10; Tables 3 & 4

MZUSP 34210, 8 ex., 148.3 – 229.6 mm SL; MHNG 2652.019, 2 ex., 173.7 – 174.6 mm SL. Brazil: Roraima: municipality of Marará, Branco River (field nb. MIG 79102901); 29 October 1979; col. Michael Goulding.



FIG. 10

Dorsal, lateral and ventral views of *Hypostomus hemicochliodon* Armbruster, 2003, MZUSP 34626, (169.0 mm SL).

#### MORPHOLOGY

Standard length of examined specimens 148,3 mm to 229,6 mm; meristic and morphometric data in Tables 3 & 4.

Head dorsally covered with dermal ossifications, except for small amorphous naked area on snout tip, as large as nostril, on smaller specimens. Profile slightly convex, but lightly depressed between eyes.

Dorsal margin of orbit slightly elevated, weakly continuing in inconspicuous ridge on posttemporal plate and following plates. A single plate bordering posterior margin of supraoccipital. Body relatively deep, covered with five rows of plates on each side, relatively smoother in younger specimens. Opercle supporting more than 10 odontodes. Outer face of upper lip covered by small odontodes. Barbells short. Several small spoon-shaped teeth (13 to 18) with a small outer cusp in younger specimens.

Dorsal profile almost straight descendant from dorsal fin spine usually up to the precaudal azyguous plates. Caudal peduncle ovoid in cross section, laterally compressed in smaller specimens. Predorsal and dorsal plates between end of dorsal fin and preadipose azyguous plate flattened in their dorsal portion, those closer to the last dorsal fin rays usually not meeting in the midline leaving naked central area. Abdomen and ventral surface of head completely covered by small platelets, except the areas around urogenital opening, lower lip and fin insertions. One specimen with two small amorphous naked areas on pectoral girdle.

Pectoral-fin spines covered with odontodes, progressively larger as approaching distal extremity, hooked and more developed in larger specimens. Adipose-fin spine long and slightly curved (Fig. 3F). Caudal fin concave to strongly concave; medium sized outer rays. Dorsal fin when laid down usually reaching the second plate before adipose fin spine. A few platelets on the skin around the dorsal fin spine are often present in larger specimens.

#### COLOUR PATTERN (in alcohol)

Ground colour cream to brownish. Ventral surface coloured as caudal peduncle, sometimes lighter; region from opercular openings to mouth usually lighter than belly. Body completely covered by few black close-set spots, smaller in the anterior third, becoming fainter or disappearing as approaching caudal fin.

Fins spotted. Lower lobe of caudal fin darker than upper one; dorsal fin can form vertical rows and/or mosaic. Adipose usually not spotted.

#### DISTRIBUTION

This population of *Hypostomus hemicochliodon* was collected at Branco River, in Roraima, Brazil.

#### COMMENTS ON THE REDESCRIPTION OF *HYPOSTOMUS COCHLIODON* KNER, 1854 BY ARMBRUSTER (2003)

Kner's (1854) original description of *Hypostomus cochliodon* is based on five syntypes<sup>1</sup> of 184.4 to 210.7 mm total length, collected by Natterer. For the description of the colour pattern, Kner (1854:266) quotes Natterer's field notes: *The dominating colour is a rather light yellowish-greybrown; the head, specially at the parting [top of the head], with few, blackish, small round spots, not more than 3-4 along the whole*

<sup>1</sup> Designation of a lectotype for *H. cochliodon* in Armbruster, 2003: 21, is no longer valid in accordance with the Article 74.7.3 of the ICZN (ICZN, 2003).

trunk. The fins show at their bases the same colour as the body, while their respective tips are coloured a brownish-black. All fins are covered by a few black spots both on their skin [membrane] as well as on their rays. [translated from German].

In a revision of the species of the *Hypostomus cochliodon* group, Armbruster (2003) mentions that "*Hypostomus cochliodon* as presently delimited may represent more than one species" but he prefers to regard the material examined as a single species, by the fact that "opercular odontode number does not appear correlated with variations in other characteristics". Nevertheless, the redescription of *Hypostomus cochliodon* Kner, 1854 has to fit with the original description as long as the identity of this species is not clearly established among the populations of the Paraguay river basin. Armbruster's description concerns a form or a species of *Hypostomus* that does not fit with characters given in Kner (1854).

In Armbruster's description, the colour pattern characterizes a species "almost entirely brown" with two tan stripes along the body and occasionally with sparse small spots. Specimens entirely dark brown with no spots are also mentioned. Both colour patterns are in contradiction with Kner's original description. Aside from two syntypes (NMW 46277, alcohol preserved, and NMW 44101 stuffed and alcohol preserved), both showing unobvious remains of original colour patterns, Armbruster did not examine any "form" with rather light background and therefore no true *Hypostomus cochliodon*. The other characters given by Armbruster are not diagnostic enough, and seem to cover a too large range of value for a single species (e.g. number of teeth (6 to 27), odontodes on opercle (0 to 30) and most morphometric ratios).

Considering the discrepancy between original description and diagnostic characters given in Armbruster's redescription, it is premature, at this time, to establish the identity of the Paraguayan populations. Such a confused situation needs additional data before stating any definite conclusion. Collecting molecular data, based on specimens of different patterns, as well from Paraguayan streams as from those close to the type locality, seems to be the most appropriate strategy for further studies on *Hypostomus cochliodon* group of the Paraguay drainage.

Within the Paraguayan specimens of the *Hypostomus cochliodon* group examined by us, part of them fits with the dark brown tan striped pattern of *Hypostomus cochliodon* as in Armbruster, 2003. Sharing the same colour pattern with *Hypostomus soniae* sp. n., these are provisionally named *Hypostomus* aff. *soniae*.

## DISCUSSION

The five new *Hypostomus* species described herein are considered to be part of *Hypostomus cochliodon* group (Weber & Montoya-Burgos, 2002; Montoya-Burgos *et al.*, 2002; Armbruster, 2003) because of their highly angled jaws and the presence of few spoon-shaped teeth, with a small lateral cusp (see Armbruster, 2003) fused to the main one or, as in *H. soniae*, intermediately developed with a small lateral cusp.

Considering the four phenetic subgroups of the *Hypostomus cochliodon* group defined by Armbruster (2003), *H. ericae*, *H. waiampi* and *H. paucipunctatus* are placed in the "odontodeless opercle group", while *H. simios* and *H. soniae* fall within the "intermediate group", as it has an opercle supporting several odontodes and intermediately developed teeth. *H. soniae* share the same colour pattern with *H. aff. soniae*. If

they are really closely related, they may have arisen from an ancestral species after the isolation of the Paraguay and the Amazon River Basin during the late Tertiary, between 10 and 12 million of years ago (Lundberg *et al.*, 1998; Montoya-Burgos, 2003).

The similar overall body shape and dimensions of the species of the *Hypostomus cochliodon* group make the differentiation by morphometric data very difficult, as already stated by Armbruster (2003). Measurements on large series of fishes, including small specimens, results in a great amplitude of ratios of body proportions and large overlapping values among different species. As morphometry is frequently feeble to delimit these fishes, specific characters were detailed in the descriptions. The curved shape of the adipose fin, which becomes more evident in larger fishes, clearly distinguishes *H. ericae* from all the others species of the group. Also for this species, the colour pattern of fins appears to be unique. *H. soniae* is basically differentiated from *H. aff. soniae* by subtle morphological characteristics and colour pattern (see diagnosis). For *H. simios*, the large orbital diameter is the most easily recognized character.

The five new species described here are known basically from their type localities and no further information on geographical distribution or morphological variation among different populations can be given. The population referred to *H. hemicochliodon* from Rio Branco (Brazil: Roraima: middle Amazon Basin) is slightly different from Armbruster's description (2003) based on populations from middle and upper Amazon Basin (plus two specimens from the lower basin, from Juruena and Xingu Rivers, respectively). Differences are based on variable characters, as background colour, which is lighter in the Rio Branco population; keels not very sharp or strong; and teeth almost always with lateral cusp fused to main one. Confirmation of its taxonomic status as separate species needs comparison of supplementary morphological data, as well as genetic data.

*H. fonchii* Weber & Montoya-Burgos, 2002 is not discussed in this work, as the species was excluded from *Hypostomus cochliodon* group by Armbruster (2003: 249). However, this group is paraphyletic according to molecular data (Montoya-Burgos *et al.*, 2002).

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TABLE 1. Morphometric data of *Hypostomus waikampi* sp. n. and *Hypostomus ericae* sp. n.

	<i>Hypostomus waikampi</i>				<i>Hypostomus ericae</i>			
	n	holotype	range	mean $\pm$ SD	n	holotype	range	mean $\pm$ SD
Standard length in mm (A)	13	169.3	139.9-193.9	172.8 $\pm$ 15.41	16	164.3	104.6-199.0	137.64 $\pm$ 23.95
Ratio of standard length								
Predorsal distance (D)	10	2.68 (63.26)	2.51-2.71	2.63 $\pm$ 0.07	28	2.48 (66.30)	2.23-2.78	2.53 $\pm$ 0.10
Head length (E)	10	3.28 (51.62)	3.10-3.33	3.26 $\pm$ 0.07	28	3.04 (54.00)	2.65-3.43	3.03 $\pm$ 0.14
Dorsal fin spine length (K)	9	3.67 (46.08)	3.48-4.05	3.66 $\pm$ 0.20	23	broken	3.08-3.90	3.53 $\pm$ 0.23
Dorsal fin base length (L)	10	3.81 (44.47)	3.54-3.93	3.72 $\pm$ 0.14	28	3.58 (45.90)	3.29-4.11	3.56 $\pm$ 0.17
Interdorsal length (M)	10	4.43 (38.21)	4.04-4.76	4.43 $\pm$ 0.20	28	5.55 (29.60)	4.49-6.03	5.16 $\pm$ 0.35
Thoracic length (N)	10	4.53 (37.42)	4.11-4.53	4.30 $\pm$ 0.14	28	4.36 (37.65)	3.67-4.65	4.16 $\pm$ 0.22
Pectoral fin spine length (O)	10	3.50 (48.43)	3.18-3.50	3.31 $\pm$ 0.10	28	3.21 (51.20)	2.87-3.47	3.20 $\pm$ 0.14
Abdominal length (P)	10	5.22 (32.46)	4.73-5.22	4.97 $\pm$ 0.15	28	4.89 (33.60)	4.57-5.54	5.05 $\pm$ 0.25
Pelvic fin spine length (Q)	10	4.42 (38.31)	3.85-4.59	4.22 $\pm$ 0.20	28	4.19 (39.25)	3.69-4.44	4.07 $\pm$ 0.17
Caudal peduncle length (R)	10	2.95 (57.45)	2.86-3.11	2.99 $\pm$ 0.08	28	3.15 (52.50)	2.92-3.55	3.24 $\pm$ 0.15
Caudal peduncle depth (S)	10	11.95 (14.17)	10.65-12.24	11.50 $\pm$ 0.50	28	8.69 (18.90)	7.69-9.45	8.86 $\pm$ 0.38
Upper caudal ray length (U)	10	3.81 (44.44)	2.85-4.14	3.55 $\pm$ 0.38	23	3.83 (42.90)	3.00-4.64	3.69 $\pm$ 0.45
Lower caudal ray length (V)	9	3.39 (49.91)	3.02-3.67	3.27 $\pm$ 0.22	21	3.47 (47.40)	2.73-4.31	3.22 $\pm$ 0.45
Ratio of head length								
Cleithral width (F)	10	1.09 (47.49)	1.06-1.12	1.09 $\pm$ 0.02	28	1.04 (52.00)	1.00-1.13	1.07 $\pm$ 0.03
Head depth (G)	10	1.55 (33.29)	1.49-1.58	1.53 $\pm$ 0.03	28	1.44 (37.60)	1.32-1.47	1.42 $\pm$ 0.04
Snout length (H)	10	1.59 (32.5)	1.51-1.59	1.56 $\pm$ 0.03	28	1.55 (34.80)	1.48-1.61	1.55 $\pm$ 0.03
Orbital diameter (I)	10	6.00 (8.60)	5.50-6.20	5.86 $\pm$ 0.25	28	5.74 (9.40)	5.04-6.20	5.58 $\pm$ 0.31
Interorbital width (J)	10	2.25 (22.96)	2.13-2.27	2.21 $\pm$ 0.05	28	2.03 (26.60)	1.69-2.04	1.84 $\pm$ 0.09
Ratio of predorsal length								
Dorsal fin spine length (K)	9	1.37 (46.08)	1.30-1.50	1.38 $\pm$ 0.07	23	broken	1.22-1.58	1.39 $\pm$ 0.09
Ratio of caudal peduncle length								
Caudal peduncle depth (S)	10	4.05 (14.17)	3.60-4.08	3.85 $\pm$ 0.17	28	2.76 (18.90)	2.29-2.98	2.74 $\pm$ 0.16
Adipose fin spine length (T)	10	5.04 (11.40)	4.15-5.51	4.75 $\pm$ 0.41	28	4.70 (11.10)	3.80-5.62	4.76 $\pm$ 0.42
Ratio of interorbital width								
Right mandibular ramus (RM)	10	3.11 (7.38)	2.98-3.51	3.15 $\pm$ 0.15	28	4.03 (6.60)	3.54-6.21	4.47 $\pm$ 0.60

TABLE 2. Morphometric data of *Hypostomus paucipunctatus* sp. n. and *Hypostomus soniae* sp. n.

	<i>Hypostomus paucipunctatus</i>				<i>Hypostomus soniae</i>			
	n	holotype	range	mean ± SD	n	holotype	range	mean ± SD
Standard length in mm (A)	13	177.1	134.1-188.0	166.03±16.89	13	140.2	76.4-145.8	105.87±25.43
Ratio of standard length								
Predorsal distance (D)	16	2.66 (66.53)	2.47-2.79	2.62±0.09	13	2.37 (59.13)	2.34-2.53	2.41±0.05
Head length (E)	16	3.44 (51.47)	2.77-3.46	3.23±0.18	13	2.97 (47.16)	2.77-3.07	2.90±0.10
Dorsal fin spine length (K)	11	3.63 (48.83)	3.25-4.82	3.71±0.52	11	3.05 (46.03)	2.65-3.38	3.07±0.23
Dorsal fin base length (L)	16	3.80 (46.58)	3.34-3.92	3.59±0.15	13	3.50 (40.06)	3.50-3.77	3.62±0.06
Interdorsal length (M)	16	4.69 (37.77)	4.45-5.16	4.87±0.21	13	6.01 (23.33)	4.89-6.01	5.46±0.32
Thoracic length (N)	16	4.26 (41.53)	4.02-4.37	4.20±0.10	13	4.59 (30.53)	3.88-4.59	4.18±0.18
Pectoral fin spine length (O)	16	3.63 (48.82)	3.22-3.63	3.43±0.12	13	3.06 (45.87)	2.93-4.31	3.21±0.35
Abdominal length (P)	16	4.97 (35.61)	4.69-5.68	5.11±0.27	13	4.65 (30.14)	4.54-5.27	4.85±0.22
Pelvic fin spine length (Q)	16	4.43 (40.02)	4.15-4.44	4.29±0.09	13	3.82 (36.72)	3.54-3.89	3.75±0.11
Caudal peduncle length (R)	16	3.07 (57.70)	2.79-3.20	3.02±0.10	13	3.19 (44.00)	3.11-3.45	3.24±0.09
Caudal peduncle depth (S)	16	11.46 (15.45)	9.88-11.46	10.34±0.40	13	8.79 (15.95)	8.71-9.63	9.07±0.29
Upper caudal ray length (U)	12	3.29 (53.78)	2.96-3.87	3.36±0.29	7		2.42-3.44	2.97±0.36
Lower caudal ray length (V)	13	3.49 (50.73)	2.68-3.64	3.22±0.28	11		2.10-3.13	2.59±0.27
Ratio of head length								
Cleithral width (F)	16	1.11 (46.28)	1.03-1.21	1.09±0.04	13	1.04 (45.25)	1.00-1.11	1.06±0.03
Head depth (G)	16	1.38 (37.21)	1.31-1.52	1.41±0.05	13	1.46 (32.30)	1.39-1.62	1.49±0.07
Snout length (H)	16	1.54 (33.50)	1.53-1.72	1.58±0.05	13	1.45 (32.54)	1.45-1.58	1.54±0.04
Orbital diameter (I)	16	5.88 (8.75)	5.63-6.59	6.02±0.27	13	5.48 (8.60)	4.68-5.69	5.19±0.32
Interorbital width (J)	16	2.06 (24.96)	1.92-2.20	2.01±0.06	13	2.07 (22.76)	1.92-2.15	2.04±0.07
Ratio of predorsal length								
Dorsal fin spine length (K)	11	1.36 (48.83)	1.24-1.88	1.43±0.20	11	1.28 (46.03)	1.12-1.38	1.28±0.08
Ratios of caudal peduncle length								
Caudal peduncle depth (S)	16	3.73 (15.45)	3.26-3.73	3.43±0.14	13	2.76 (15.95)	2.66-2.98	2.80±0.11
Adipose fin spine length (T)	16	5.05 (11.42)	4.91-5.84	5.40±0.22	13	3.62 (12.17)	3.62-5.95	4.39±0.55
Ratio of interorbital width								
Right mandibular ramus (RM)	16	3.48 (7.18)	3.37-3.89	3.56±0.15	13	3.29 (6.91)	3.20-4.38	3.86±0.39

TABLE 3. Morphometric data of *Hypostomus simios* sp. n. and *Hypostomus hemicochliodon*

	<i>Hypostomus simios</i>				<i>Hypostomus hemicochliodon</i>			
	n	holotype	range	mean $\pm$ SD	n	holotype	range	mean $\pm$ SD
Standard length in mm (A)	16	157.9	108.8-157.9	124.70 $\pm$ 20.60	10	169.0	148.3-229.6	191.28 $\pm$ 27.99
Ratio of standard length								
Predorsal distance (D)	5	2.59 (60.94)	2.52-2.64	2.57 $\pm$ 0.05	10	2.66 (63.45)	2.23-2.78	2.53 $\pm$ 0.10
Head length (E)	5	3.11 (50.82)	2.94-3.11	3.02 $\pm$ 0.07	10	3.14 (53.74)	2.65-3.43	3.03 $\pm$ 0.14
Dorsal fin spine length (K)	2	broken	2.88-3.02	2.95 $\pm$ 0.10	8	3.15 (53.58)	3.08-3.90	3.53 $\pm$ 0.23
Dorsal fin base length (L)	5	3.39 (46.57)	3.34-3.60	3.45 $\pm$ 0.11	10	3.28 (51.50)	3.29-4.11	3.56 $\pm$ 0.17
Interdorsal length (M)	5	5.20 (30.40)	4.96-5.38	5.18 $\pm$ 0.19	10	5.47 (30.92)	4.49-6.03	5.16 $\pm$ 0.35
Thoracic length (N)	5	4.34 (36.41)	3.98-4.94	4.37 $\pm$ 0.36	10	4.33 (39.07)	3.67-4.65	4.16 $\pm$ 0.22
Pectoral fin spine length (O)	5	3.09 (51.19)	3.09-3.34	3.23 $\pm$ 0.11	10	2.99 (56.46)	2.87-3.47	3.20 $\pm$ 0.14
Abdominal length (P)	5	4.68 (33.74)	4.68-5.24	5.03 $\pm$ 0.22	10	4.95 (34.12)	4.57-5.54	5.05 $\pm$ 0.25
Pelvic fin spine length (Q)	5	3.96 (39.93)	3.82-4.29	4.03 $\pm$ 0.21	10	4.15 (40.76)	3.69-4.44	4.07 $\pm$ 0.17
Caudal peduncle length (R)	5	3.13 (50.40)	2.98-3.13	3.06 $\pm$ 0.07	10	3.12 (54.20)	2.92-3.55	3.24 $\pm$ 0.15
Caudal peduncle depth (S)	5	9.80 (16.11)	9.80-10.17	9.97 $\pm$ 0.14	10	9.66 (17.50)	7.69-9.45	8.86 $\pm$ 0.38
Upper caudal ray length (U)	4	3.49 (45.24)	2.63-3.49	3.09 $\pm$ 0.37	7	3.86 (43.77)	3.00-4.64	3.69 $\pm$ 0.45
Lower caudal ray length (V)	4	2.91 (54.25)	2.83-3.09	2.93 $\pm$ 0.11	8		2.73-4.31	3.22 $\pm$ 0.45
Ratio of head length								
Cleithral width (F)	5	1.08 (47.17)	1.08-1.19	1.17 $\pm$ 0.05	10	1.08 (49.74)	1.00-1.13	1.07 $\pm$ 0.03
Head depth (G)	5	1.47 (34.55)	1.47-1.53	1.50 $\pm$ 0.03	10	1.46 (36.74)	1.32-1.47	1.42 $\pm$ 0.04
Snout length (H)	5	1.59 (31.96)	1.59-1.64	1.62 $\pm$ 0.02	10	1.54 (34.91)	1.48-1.61	1.55 $\pm$ 0.03
Orbital diameter (I)	5	5.40 (9.41)	4.70-5.40	5.03 $\pm$ 0.27	10	5.78 (9.29)	5.04-6.20	5.58 $\pm$ 0.31
Interorbital width (J)	5	2.13 (23.83)	2.04-2.17	2.10 $\pm$ 0.06	10	2.01 (26.76)	1.69-2.04	1.84 $\pm$ 0.09
Ratio of predorsal length								
Dorsal fin spine length (K)	2	broken	1.09-1.20	1.15 $\pm$ 0.08	8	1.18 (53.58)	1.22-1.58	1.39 $\pm$ 0.09
Ratio of caudal peduncle length								
Caudal peduncle depth (S)	5	3.13 (16.11)	3.13-3.39	3.26 $\pm$ 0.12	10	3.10 (17.50)	2.29-2.98	2.74 $\pm$ 0.16
Adipose fin spine length (T)	5	5.33 (9.46)	5.33-6.23	5.87 $\pm$ 0.40	10	5.23 (10.37)	3.80-5.62	4.76 $\pm$ 0.42
Ratio of interorbital width								
Right mandibular ramus (RM)	5	3.34 (7.14)	3.34-3.82	3.65 $\pm$ 0.19	10	3.71 (7.21)	3.54-6.21	4.47 $\pm$ 0.60



TABLE 4. Meristic data of the five new species and *Hypostomus hemicochliodon*

	<i>Hypostomus waiampi</i>				<i>Hypostomus ericae</i>				<i>Hypostomus paucipunctatus</i>			
	holotype	n	range	SD	holotype	n	range	SD	holotype	n	range	SD
Lateral plates of median series	29	9	27-29	0.67	29	26	27-29	27.58	29	16	28-30	0.61
Dorsal fin base plates	8	9	8	0	8	28	7-9	7.96	8	15	8-9	0.42
Dorsal to adipose fin plates	8	4	8	0	7	28	6-8	7.04	8	15	7-9	0.53
Adipose to caudal fin plates	8	10	7-8	0.32	9	26	7-9	7.89	8	15	7-8	0.46
Anal to caudal fin plates	12	3	12-13	0.5	13	28	12-13	12.79	14	14	13-14	0.47
Teeth on left premaxilla	8	10	6-8	1.16	7	26	6-8	7.38	7	15	6-9	0.83
Teeth on right premaxilla	6	8	5-6	0.52	7	26	6-8	7.23	8	15	6-9	0.83
Teeth on left dentary	7	10	7-9	1.25	7	25	7-9	7.48	8	15	7-10	0.86
Teeth on right dentary	7	10	6-9	1.32	7	26	7-9	7.5	8	15	7-10	0.86
Vertebrae	33	1	33	0	31	1	31	31	33	1	33	0

	<i>Hypostomus simios</i>				<i>Hypostomus hemicochliodon</i>			
	holotype	n	range	SD	holotype	n	range	SD
Lateral plates of median series	27	12	25-27	0.65	28	5	28	28
Dorsal fin base plates	7	12	7-8	0.51	8	5	8	8
Dorsal to adipose fin plates	7	12	6-7	0.52	8	5	7-8	7.4
Adipose to caudal fin plates	8	12	7-8	0.48	8	5	8	8
Anal to caudal fin plates	12	12	12-13	0.39	13	5	13-14	13.8
Teeth on left premaxilla	14	11	11-14	1.1	14	5	14	14
Teeth on right premaxilla	13	12	11-16	1.51	14	5	13-15	14.2
Teeth on left dentary	15	10	12-17	1.69	12	5	12-13	12.2
Teeth on right dentary	15	12	12-17	1.6	14	5	13-14	13.4
Vertebrae	31	1	31	0	33	1	33	33

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## APPENDIX (other specimens examined):

BRAZIL. *Hypostomus cochliodon* Kner, 1853: Syntypes: NMW 46277 and 44101, 2 ex., 149.0 - 170.7 mm SL. Mato Grosso: Rio Cujaba; *Hypostomus pyrineusi* (Miranda-Ribeiro, 1920): Holotype: MNRJ 863, 200.0 mm SL. Amazonas: Rio Jamari. COLOMBIA: *Hypostomus oculus* (Fowler, 1943): NRM 27052, 104.3 mm SL. Caqueta: Quebrada Montanita. ECUADOR: *Hypostomus sculpodon* Armbruster, 2003: MEPN-RBS-88-E-4, 3 ex., 74.1 - 95.1 mm SL. Napo: rio Napo Basin: Estero Cantadoro, Rio Tiputini, 20 min. upstream of mouth of Rio Tivacuño. PARAGUAY: Concepción: *Hypostomus* aff. *soniae*: MHNG 2527.038, 1 ex., 162.0 mm SL. Riacho La Paz, 6 km north of Estancia Primavera; MHNG 2644.068, 5 ex., 115.7 - 121.6 mm SL. Estancia Primavera, riacho La Paz; MHNG 2644.069, 2 ex., 142.5 - 144.6 mm SL. Ford of Tagatiya-guazu; MHNG 2644.070, 1 ex., 142.0 mm SL. Estancia Primavera, Arroyo Alegre; MHNG 2644.071, 1 ex., 147.4 mm SL. Rio Alegre, 5 km east from Estancia Primavera; MHNG 2644.072, 1 ex., 130.0 mm SL. Arroyo Alegre, southeast of Estancia Primavera.

***Pseudosinella maros* sp. n., a troglobitic Entomobryidae (Collembola) from Sulawesi Selatan, Indonesia**

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***Pseudosinella maros* sp. n., a troglobitic Entomobryidae (Collembola) from Sulawesi Selatan, Indonesia.** - The new species *Pseudosinella maros* sp. n. is described from caves of south Sulawesi. It exhibits clear troglomorphic features (absence of eyes and pigment, relatively large body size, elongate claw and antennae), and is restricted to oligotrophic habitats in the caves of the Maros karst, where it is abundant. It is the first true subterranean species of the genus recorded from Indonesia.

**Keywords:** New species - Collembola - Entomobryidae - Sulawesi - subterranean fauna.

INTRODUCTION

The Maros karst in Sulawesi Selatan province (Indonesia) is the richest hot-spot of subterranean biodiversity in the tropics (Deharveng & Bedos, 2000). Yet, most of its terrestrial fauna remains undescribed. Collembola are, comparatively to other Arthropods, not very diversified in the caves of Maros, but at least three species (one *Pararrhopalites*, one *Pseudosinella* and one *Coecoloba*) seem to represent true troglobites. The most highly evolved in terms of troglomorphy is the new species *Pseudosinella maros* described here, which is widespread in oligotrophic habitats of all caves of the area. This species is the first troglobitic Collembola described from Indonesia.

The genus *Pseudosinella* is highly diversified in temperate caves, but is much less frequent and poorly known in tropical caves, where *Coecobrya* (mostly on guano) and Paronellidae (mostly in oligotrophic habitats) tend to replace it.

ABBREVIATIONS USED IN THE TEXT

*Material deposit:* MHNG, Muséum d'histoire naturelle de Genève; MNHN, Muséum national d'Histoire naturelle de Paris; MZB, Museum Zoologicum Bogoriense.

*Descriptions:* Abd., abdominal segment; Ant., antennal segment; Th., thoracic segment; Tita, tibiotarsus.

## SYSTEMATICS

### *Pseudosinella maros* sp. n.

#### STUDIED MATERIAL

For the description and localisation of caves, see Deharveng & Bedos (1986) and Brouquisse (2002).

*Holotype male.* Indonesia: Sulawesi Selatan: Maros karst: Patunuang: Gua N1, 9/07/1986, P. Leclerc leg. (sample # INDO-194). Mounted on slide in Marc-André II and deposited in MZB.

*Paratypes.* Indonesia: Sulawesi Selatan: Maros karst: Patunuang: Gua N1, 9/07/1986, 7 ex., P. Leclerc leg. (sample # INDO-194) (2 specimens in MZB, 3 specimens in MNHN, 2 specimens in MHNG); Patunuang: Leang Bone Patunuang, 04/2002, 18 specimens, Rahmadi & Suhardjono leg. (12 specimens in MZB, 3 specimens in MNHN, 3 specimens in MHNG).

*Other material.* The species seems to be widespread in the Maros karst. However, it exhibits variability in claw elongation and antennal S-chaetotaxy, and it cannot be ruled out that specimens collected in underground systems north and south of the type localities may belong to closely related but different forms. We therefore did not consider the cave populations listed below as paratypes.

Indonesia: Sulawesi Selatan: Maros karst: Bantimurung: Gua Baharuddin, 7/07/1986, 1 ex., P. Leclerc leg. (sample # INDO-187); Bantimurung: Gua Bantimurung, 8/07/1986, 9 ex., P. Leclerc leg. (sample # INDO-189); Bantimurung: Gua Mimpi, 1/07/1988, 1 ex., Deharveng leg. (sample # SULA-011); *ibid.*, 04/2002, 2 ex., Rahmadi & Suhardjono leg.; Kappang: Gua K9, 11/07/1986, 1 ex., P. Leclerc leg. (sample # INDO-198); Samanggi: Gua Saripa, 04/2002, 113 ex., Rahmadi & Suhardjono leg.; Samanggi: Saripa spring cave, 24/08/2002, 3 ex., Bedos & Deharveng leg. (sample # SULS-344); Balangajea: Gua S1, 04/2002, 5 ex., Rahmadi & Suhardjono leg.

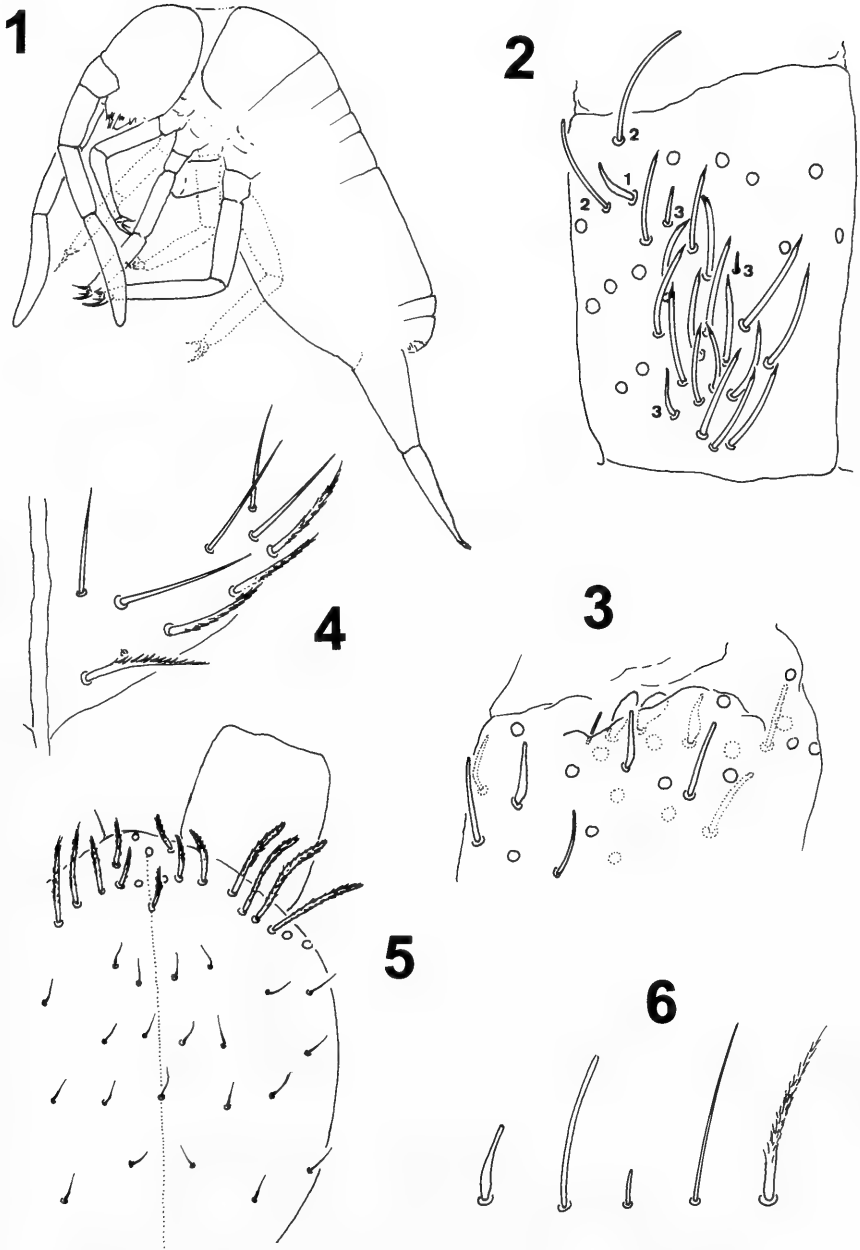
#### DISTRIBUTION

The species is restricted to caves of the southern part of the Maros karst.

#### DESCRIPTION

Body length 0.7 to 1.1 mm. White, blind. Antennae rather long, 1.65-2.05 times cephalic diagonal (Fig. 1).

Antennae. No scales. Ordinary chaetae densely and finely ciliated (Fig. 6). A few microchaetae at the basis of Ant. I (3 externo-basal, arranged in a triangle), Ant. II (one dorsal, one internal, one external), none seen on Ant. III and IV. S-chaetae smooth, of seven types: (1) medium-size, distinctly swollen with larger width at 1/4 to 1/2 of their length (Fig. 6); (2) long, thin, subcylindrical (Fig. 6); (3) short, thin, subcylindrical (Fig. 6); (4) swollen, oval (internal S-chaetae of Ant. III organ, Fig. 3); (5) subcylindrical, wider than type 1, rather long, tapered at the apex (sensorial field of Ant.



FIGS 1-6

*Pseudosinella maros* sp. n. 1, habitus in lateral view; 2, first antennal segment in ventral view (1, 2, 3: S-chaetae of types 1, 2, 3; other figured chaetae: ventral field of type 5 S-chaetae; circles: sockets of ordinary chaetae); 3, distal organite of Ant. III; 4, labial basis chaetotaxy; 5, dorsal chaetotaxy of head; 6, some types of antennal chaetae (from left to right: type 1, 2, 3, 6, and ordinary ciliated chaeta).

I, Fig. 2); (6) very thin, acuminate, straight, long (Fig. 6); (7) very thin, acuminate, straight, short. Types 1 to 3 more hyaline than ordinary chaetae, type 4 very hyaline, often difficult to distinguish, types 5 and 6 less hyaline and possibly not S-chaetae. Ant. I with S-chaetae of type 1 (2-3), type 2 (at least two ventro-distal), type 3 (at least three ventral) and type 5 (grouped in a conspicuous ventral sensorial field of 10-20 chaetae, in male and female, Fig. 2). Ant. II S-chaetae of type 1 (a few), and of type 2 (about 18-25 mostly ventral). Ant. III with S-chaetae of types 1, 2, 4 and 7 in the area of the organite (Fig. 3); one dorsal S-chaetae of type 1 and a few more of type (2) on other areas of Ant. III. Ant. IV with numerous S-chaetae of type 2, mainly ventro-external, some of types 1 and 3 mainly ventrally, and numerous dorso-external type 6 S-chaetae. No apical bulb. Subapical organite small, present.

Buccal region. Labium basis: MrEL1L2, with r extremely reduced (Fig. 4). Four ciliated prelabral chaetae.

Dorsal chaetotaxy. Dorsal macrochaetae R000/00/0201+1. The macrochaetae of abd. IV are P (near the anterior trichobothria) and M2 (postero-laterally to the pseudopore). Pattern of ordinary thin-smooth chaetae on head illustrated in Fig. 5. Abd. II chaetotaxic formula: -ABq1q2 (Fig. 9). Abd. IV: 5 triangular chaetae around anterior trichobothria of Abd. IV (S present) (Fig. 11). Ordinary chaetae similar to those of the antennae, finely ciliated. Typical S-chaetae very reduced in number, refringent (appear black contrary to ordinary chaetae), only seen laterally on Th. II (one long, Fig. 8) and Abd. I (one short).

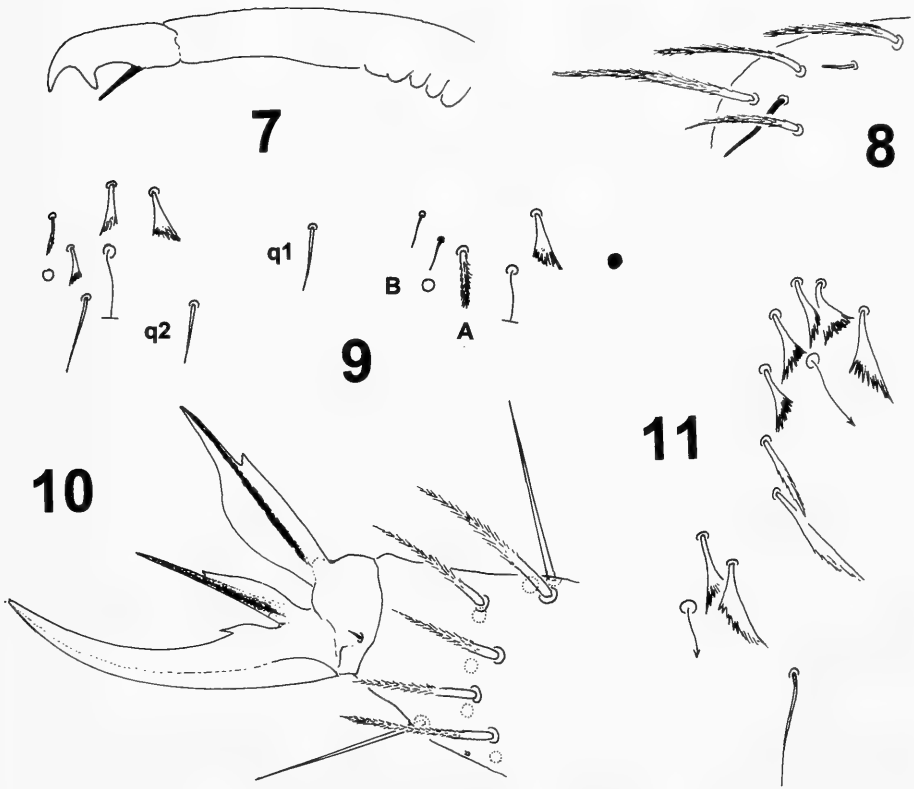
Legs. Claw long and thin (Fig. 10); without tooth on internal crest, but with a small basal hump or sometimes a small tooth at 1/5-1/6 of its length; an uneven lateral tooth in the form of a very long, narrow, acuminate wing inserted basally, with a minute external tooth at 60% from its crest basis. Empodial appendage 2/3 of claw III, moderately swollen, its internal crest smooth, its external crest with a strong tooth at the 1/3 from the apex. One distal tibiotarsal tenent hair, smooth and acuminate, hardly longer than closest chaetae. One subapical ventral chaeta smooth, thin and pointed. Other tibiotarsal chaetae thick and weakly ciliated. Ventro-basal tenent-hair of Tita hardly differentiated from other ordinary chaetae.

Ventral tube with 5+5 latero-distal smooth chaetae; 3+3 posterior long, thin, smooth or weakly ciliated; and 5-7+5-7 anterior, ciliated, long and thick.

Furca. Tenaculum with 4+4 teeth and a strong chaeta. Manubrium dorsally with two strips of thick, ciliated ordinary chaetae, and 4+4 (possibly 5+5?) long, thin, smooth and pointed chaetae spaced on two longitudinal lines; 6+6 dorso-distal thick ciliated chaetae surrounding 2+2 pseudopora; ventrally, 2+2 thick ciliated ventro-distal chaetae. Dens relatively short and stout, slightly shorter than manubrium, ventrally with scales, dorso-laterally with 3 or 4 ranks of thick ciliated chaetae, and with one long, thin, smooth and pointed chaeta dorso-basally. No basal tubercle. Mucro strong with a strong basal spine which reaches the basis of the proximal tooth of mucro or slightly more (Fig. 7).

#### ETYMOLOGY

The name refers to the region (the karst of Maros near the town of Maros) of the type locality, as a noun in apposition.



FIGS 7-11

*Pseudosinella maros* sp. n. 7, distal part of dens and mucro; 8, latero-distal chaetae of Th. II tergite (ordinary ciliated chaetae; a long, refringent S-chaeta; a shorter hyaline microchaeta); 9, Abd. II tergite chaetotaxy; 10, praetarsus and distal part of tibiotarsus of leg III (the internal part of the empodial appendage is often less swollen than on the drawing); 11, trichobothrial areas of Abd. IV.

#### DISCUSSION

*Relationships.* The new species has a unique combination of characters. The most outstanding feature is the conspicuous ventral sensorial field of Ant. I. Although grouping of S-chaetae ventrally on Ant. I is a trend observed in several species of *Pseudosinella* (see for instance *P. bessoni* in Deharveng, 1988), it is much less conspicuous and chaetae are less modified in the species described so far.

*Pseudosinella maros* is the first troglomorphic species described from the Sunda islands, and the second from Southeast Asia, after *P. chiangdaoensis* Deharveng, 1990 from Tham Chiang Dao in Thailand. This last species is not closely related to *P. maros* (labium with 2 chaetae M, dorsal macrochaetae as R000/22/0201+2).

The presence of only one M chaeta on labium basis is observed in very few species of the genus, among which *P. fujiokai* Yosii, 1964 is probably the most widespread. It differs from *P. maros* by its non-elongate claw, non-truncated empodial

appendage, and a more abundant macrochaetotaxy (0,0/0,3,0,1+3 according to Yoshii (1982), but the specimens of Hawaii described by Christiansen & Bellinger (1992) have usually only 1+1 on Abd. IV, like *P. maros*).

*P. maros* is also close to undescribed soil species of southern Sulawesi by most characters supposed to be not linked to subterranean life (reduced macrochaetotaxy, structure of the claw complex), while "adaptive" characters are clearly different (larger body size, thinner claw and longer appendages, see Deharveng, 1987).

*Ecology.* The new *Pseudosinella* is abundant in all caves of the Maros karst, where it lives in oligotrophic habitats. In Saripa cave, it was caught for instance in large number in baited traps placed on clay banks near the terminal lake, where no figured organic matter is present, but which are flooded each year. The gut of the new species was filled with mineral debris without recognizable mycelium or spores, as is often the case for cave species. *P. maros* is the main prey of small hunting spiders that are abundant in Saripa cave.

#### ACKNOWLEDGEMENTS

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